1) If two dice are rolled what is the conditional probability that the first one lands on 6 given that the sum of the dice is 11. Ans: 0.5
2) An urn contains 6 white and 9 black balls. if 4 balls are to be randomly selected without replacement, what is the probability that the first 2 selected are white and the last 2 black? Ans: 0.066
3) What is the probability that at tossing three dice 3 aces will appear at least one of the dice? Ans: 0.421
4) 7) What is the probability that the total of two dice will be greater than 9, given that the first die is a 5? Answer :1/3
5) 8) A student looks for one formula necessary to him in three directories. The probability that the formula is contained in the first, second and third directories, equal to 0.6: 0.7 and 0.8 respectively.
   a. A - the formula is contained in all 3 directories Ans: 0.336
   b. B - the formula is contained in at least one directory Ans: 0.976
   c. C - the formula is contained only in one directory Ans: 0.188.
   d. D-formula is contained only in 2 directories Ans: 0.452.
   e. E - the formula is contained in at least 2 directories Ans: 0.788.
6) Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by:

   a) only one student; ANS: 0,3*0,3*0,2+0,7*0,3*0,8+0,7*0,7*0,2 = 0.284

   b) two students; Ans: (p1*p2*q3)+(q1*p2*p3)+(p1*q2*p3) = 0.506

   c) at least one; Ans: 1 – (q1*q2*q3) = 1 – 0.042 = 0.958

   d) neither of the students? Ans: q1*q2*q3 = 0.7 * 0.3 * 0.2 = 0.042

7) Find the probability of a joint appearance of heads at tossing two coins. Ответ:1/4
8) A student looks for one formula necessary to him in three directories. The probability that the formula is contained in the first, is equal to 0,6; 0,7 and 0,8 respectively. Find the probability that the formula is contained in all the directories. Ответ: 0.336
9) The probability of appearance of any of two incompatible events is equal to Ответ: P(A+B)=P(A)+P(B)
10) There are 3 boxes containing 10 details each. There are 8 standard details in the first box, 7 – in the second and 9 – in the third box. One takes at random on one detail from each box. Find the probability that all three taken details will be standard. Answer: 0.504
11) A student looks for one formula necessary to him in three directories. The probability that the formula is contained in the first, second and third directories, is equal to 0,6; 0,7 and 0,8 respectively. Find the probability that the formula is contained in all the directories Answer: 0,336
12) A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,45 and in the second – 0,35. Find the probability that the shooter will hit at one shot either in the first area or in the second area. Answer: 0,80

13) The sum of probabilities of events A1, A2, A3, which form a complete group is equal to Answer: 1
14) A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will not be solved? Answer: 10/29

15) There are 5 white, 4 black and 3 blue balls in an urn. Each trial consists in extracting at random one ball without replacement. Find the probability that a white ball will appear at the first trial (the event A), a black ball will appear at the second trial (the event B), and a blue ball will appear at the third trial (the event C). Ans: 1/22
16) the fair dice are tossed. how many possible outcomes are there? ans: none of this
17) Four tickets are distributed among 25 students (15 of them are girls). Everyone can take only one ticket. What is the probability that owners of these tickets will be: four girls; ans:0,108
18) 10 persons participate in competitions, and three of them will take the first, second and third places. How many different variants are possible? ans: 720.
19) If two dice are tossed, what is the probability of rolling a sum of 10? ans: 1/12
20) Two dice are tossed. Find the probability that the sum of aces will exceed 10 3/36
21) The sum of the probabilities of opposite events is equal to 1
22) A coin is tossed and a fair six-sided die is thrown. How many possible outcomes are there? 12
23) There are 3 white and 3 black balls in an urn. One takes out twice on one ball from the urn without replacement. Find the probability of appearance of a white ball at the second trial (the event B) if a black ball was extracted at the first trial (the event A). Answer:3/5.
24) There are 30 balls in an urn: 10 red, 5 blue and 15 white. Find the probability of appearance of colour ball Answer:1/2
25) If an object A can be chosen from the set of objects by m ways and after every such choice an object B can be chosen by n ways then the pair of the objects (A, B) in this order can be chosen by ... ways Answer: n*m
26) There are 100 products (including 4 defective) in a batch. The batch is arbitrarily divided into two equal parts which are sent to two consumers. What is the probability that all defective products will be got: a) by one consumer; b) by both consumers fifty-fifty? The answer: a) 0,117; b) 0,383
27) Four tickets are distributed among 25 students (15 of them are girls). Everyone can take only one ticket. What is the probability that owners of these tickets will be: four girls; Ответ: 0.108
28) How many two-place numbers can be made of the digits 1, 4, 5 and 7 if each digit is included into the image of Ответ:24(не точно)
29) How many ways are there to choose two details from a box containing 10 details? Ответ: 45
30) How many ways are there to choose 2 details from a box containing 9 details? Ответ:36
31) There probability of a reliable event is equal to Ответ: 1
32) The are 3 boxes containing 10 details each. There are 8 standard details in the first box, 7-in the second and 9-in the third box. One takes at random on one detail from each box. Find the probability that all three taken details will be standard. ANSWER 0.504

1. A reliable event is: - **event is an event that necessarily will happen if a certain set of conditions S holds**

2. The probability of reliable event is the number: **1**

3. An impossible event is: (null) event is an event that certainly will not happen if the set of conditions S holds.

4. The probability of impossible event is the number: 0

5. A random event is: event is an event that can either take place, or not to take place for holding the set of conditions S.

6. The probability of an arbitrary event A is the number: 0<=P(x)<=1

7. Probabilities of opposite events *A* and $\overline{A}$ satisfy the following condition: *P(A) + P(* $\overline{A}$ *) = 1*

8. For opposite events A and $\overline{A}$ one of the following equalities holds: $P(A \cdot \overline{A}) =$ 0 $P(A + \overline{A}) =$ 1

9. Let A and B be opposite events. Find P(B) if P(A) = 3/5. 2/5

10. Let A and B be events connected with the same trial. Show the event that means simultaneous occurrence of A and B.

P=AB

11. Let A and B be events connected with the same trial. Show the event that means occurrence of only one of events A and B.

A*B s 4ertoi + $\overline{A}$ ***B**

12. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means occurrence only one of events A_1, A_2 and A_3. Express the event A by the events A_1, A_2 and A_3.

$\overline{A}$ **1*** $\overline{A}$ **2*A3 +** $\overline{A}$ **1*A2*** $\overline{A}$ **3+A1*** $\overline{A}$ **2*** $\overline{A}$ **3**

13. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means none of events A_1, A_2 and A_3 have happened. Express the event A by the events A_1, A_2 and A_3

A_3 **vse A s 4ertami**

14. Let *n* be the number of all outcomes, *m* be the number of the outcomes favorable to the event *A*. The classical formula of probability of the event *A* has the following form:

P(A) = m/n

15. The probability of an arbitrary event cannot be: less than 0 or more than 1

16. Let the random variable *X* be given by the law of distribution

x_i	-4	-1	0	1	4
p_i	0,2	0,1	0,3	0,2	0,2

Find mean square deviation σ (X):

M(x) = 0.1

D(x) = 6.69

σ (X) = 2.5865

17. Two events form a complete group if they are:

Some events form a *complete group* if in result of a trial at least one of them will appear.

18. A coin is tossed twice. Find probability that "heads" will land in both times.

1/4

19. A coin is tossed twice. Find probability that "heads" will land at least once.

3/4

20. There are 2000 tickets in a lottery. 1000 of them are winning, and the rest 1000 – non-winning. It was bought two tickets. What is the probability that both tickets are winning?

1000/2000 * 999/1999 = 0.24987

21. Two dice are tossed. Find probability that the sum of aces does not exceed 2.

1/36

22. Two dice are tossed. Find probability that the sum of aces doesn't exceed 5.

10/36

23. Two dice are tossed. Find probability that the product of aces does not exceed 3.

5/36

24. There are 20 white, 25 black, 10 blue and 15 red balls in an urn. One ball is randomly extracted. Find probability that the extracted ball is white or black.

45/70 = 9/14

25. There are 11 white and 2 black balls in an urn. Four balls are randomly extracted. What is the probability that all balls are white?

C(4,11)/C(4,13) = 0.46 or 11/13 * 10/12 * 9/11 * 8/10 = 0.46

26. Calculate C_{14}^{4}: 1001

27. Calculate A_{7}^{3}: 210

28. One chooses randomly one letter of the word "HUNGRY". What is the probability that this letter is "E"? 0

29. The letters T, A, O, B are written on four cards. One mixes the cards and puts them randomly in a row. What is the probability that it is possible to read the word "BOAT"? ¼! = 0.0416

30. There are 5 white and 4 black balls in an urn. One extracts randomly two balls. What is the probability that both balls are white? 5/9*4/8 = 0.2(7)

31. There are 11 white, 9 black, 15 yellow and 25 red balls in a box. Find probability that a randomly taken ball is white. 11/60

32. There are 11 white, 9 black, 15 yellow and 20 red balls in a box. Find probability that a randomly taken ball is black. 9/55

33. How many 6-place telephone numbers are there if the digits “0” and “9” are not used on the first place? 8*10^5

34. 15 shots are made; 9 hits are registered. Find relative frequency of hits in a target. 9/15

35. A point is thrown on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 5/6. (2 – 2*5/6)/2 = 1/6

36. Two dice are tossed. What is the probability that the sum of aces will be more than 8? 7/36

37. A coin is tossed 6 times. Find probability that “heads” will land 4 times. C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

38. There are 6 children in a family. Assuming that probabilities of births of boy and girl are equal, find probability that the family has 4 boys: C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

39. Two shots are made in a target by two shooters. The probability of hit by the first shooter is equal to 0,7, by the second – 0,8. Find probability of at least one hit in the target. 1 – 0.3*0.2 = 0.94

40. The device consists of two independently working elements of which probabilities of non-failure operation are equal 0,8 and 0,7 respectively. Find probability of non-failure operation of two elements. 0.8*0.7 = 0.56

41. There are 5 books on mathematics and 7 books on chemistry on a book shelf. One takes randomly 2 books. Find the probability that these books are on mathematics. 5/12 * 4/11 = 10/66

42. There are 5 standard and 6 non-standard details in a box. One takes out randomly 2 details. Find probability that only one detail is standard. 5*6/C(2,11) = 30/55 = 6/11

43. Three shooters shoot on a target. Probability of hit in the target at one shot for the 1st shooter is 0,85; for the 2nd – 0,9 and for the 3rd – 0,95. Find probability of hit by all the shooters. 0.85*0.9*0.95 = 0,72675

44. A student knows 7 of 12 questions of examination. Find probability that he (or she) knows randomly chosen 3 questions.

7/12*6/11*5/10 = 0.15(90)

45. Two shooters shoot on a target. The probability of hit by the first shooter is 0,7, and the second – 0,8. Find probability that only one of shooters will hit in the target. 0.7*0.2 + 0.8*0.3 = 0.38

46. Three dice are tossed. Find probability that the sum of aces will be 6.

10/216

47. At shooting from a rifle the relative frequency of hit in a target appeared equal to 0,8. Find the number of hits if 200 shots have been made. 200*0.8

48. In a batch of 200 details the checking department has found out 13 non-standard details. What is the relative frequency of occurrence of non-standard details equal to? 13/200 = 0.065

49. If A and B are independent events then for P(AB) one of the following equalities holds: P(AB) = P(A)*P(B)

50. If events A and B are compatible then for P(A + B) one of the following equalities holds: P(A+B) =P(A) + P(B) – P(AB)

51. If events A and B are incompatible then for P(A+ B) one of the following equalities holds: P(A+B) =P(A)+P(B)

52. The probability of joint occurrence of two dependent events is equal: $P(AB) = P(A) \cdot P_A(B)$

53. A point is put on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 4/7. (2 – 2*4/7)/2 = 3/7

54. There are 5 white and 7 black balls in an urn. One takes out randomly 2 balls. What is the probability that both balls are black?

7/12 * 6/11 = 0.318

55. There are 7 identical balls numbered by numbers 1, 2..., 7 in a box. All balls by one are randomly extracted from a box. Find probability that numbers of extracted balls will appear in ascending order. 1/7! = 1.98*10^4

56. There are 25 details in a box, and 20 of them are painted. One extracts randomly 4 details. Find probability that the extracted details are painted. 20/25 * 19/24 * 18/23 * 17/22 = 0.383

57. There are 20 students in a group, and 8 of them are pupils with honor. One randomly selects 10 students. Find probability that there are 6 pupils with honor among the selected students. C(6, 8) * C(4 , 12) / C(10, 20) = 28 * 495/184756 = 0.075

58. There are 4 detective lamps among 12 electric lamps. Find probability that randomly chosen 2 lamps will be defective.

4/12 * 3/11 = 0. (09)

59. A circle of radius *l* is placed in a big circle of radius *L*. Find probability that a randomly thrown point in the big circle will get as well in the small circle.

l^2/L^2

60. There are 6 white and 4 red balls in an urn. The event A consists in that the first taken out ball is white, and the event B – the second taken out ball is white. Find the probability $P(A) \cdot P_A(B)$ = 6/10 * 5/9 = 1/3

61. Probability not to pass exam for the first student is 0,2, for the second - 0,4, for the third - 0,3. What is the probability that only one of them will pass the exam? 0.8*0.4*0.3 + 0.2 * 0.6 *0.3 + 0.2 * 0.4 * 0.7 = 0.188

62. The probability of delay for the train №1 is equal to 0,1, and for the train №2 – 0,2. Find probability that at least one train will be late. 1 – 0.9*0.8 = 0.28

63. The probability of delay for the train №1 is equal to 0,3, and for the train №2 – 0,45. Find probability that both trains will be late. 0.3 * 0.45 = 0.135

64. The events A and B are independent, P(A) = 0,4; P(B) = 0,3. Find $P(\overline{A}B)$.

0.6*0.3 = 0.18

65. The events A and B are compatible, P(A) = 0,4; and P(B) = 0,3. Find P($\overline{A}+\overline{B}$). = 0.6 + 0.7 - 0.42 = 0.88

66. If the probability of a random event A is equal to P(A), the probability of the opposite event $\overline{A}$ is equal: 1 - P(A),

67. Show the formula of total probability:

$$P(A)=P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)$$

68. The formula $P_A(B_i)=\dfrac{P(B_i)\cdot P_{B_i}(A)}{\sum_{i=1}^{n}P(B_i)P_{B_i}(A)}$ is *Bayes's formulas*

69. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3 forming a complete group will occur, P (A) is calculated by the following formula: $P(A)=P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)$

70. Electric lamps are made at two factories, and the first of them delivers 60%, and the second – 40% of all consumed production. 80 of each hundred lamps of the first factory are standard on the average, and 60 – of the second factory. Find probability that a bought lamp will be standard.

0.6*08 + 0.4*0.6 = 0.72

71. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3, B_4 forming a complete group will occur, $P_A(B_2)$ is calculated by the following formula:

$$P_A(B_i)=\frac{P(B_i)\cdot P_{B_i}(A)}{P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)}$$

72. The probability of hit in 10 aces for a given shooter at one shot is 0,9. Find probability that for 10 independent shots the shooter will hit in 10 aces exactly 6 times. C(6, 10) * 0.9^6 * 0.1^4 = 0.0111

73. There are 6 children in a family. Assuming that probabilities of birth of boy and girl are equal, find the probability that there are 4 girls and 2 boys in the family. C(4, 6) * 0.5 ^4 * 0.5^2 = 15/64

74. It is known that 15 % of all radio lamps are non-standard. Find probability that among 5 randomly taken radio lamps appears no more than 1 non-standard. C(0, 5)*0.15^0 * 0.85^5 + C(1, 5)*0.15^1 * 0.85^4 = 0.8355

75. 10 buyers came in a shop. What is the probability that 4 of them will do shopping if the probability to make purchase for each buyer is equal to 0,2?

C (4, 10) * 0.2 ^ 4 * 0.8^6 = 0.088

76. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2
P	1/3	1/3	1/6	1/6

Find mathematical expectation M(X).

-4/3

77. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2
P	1/3	1/3	1/6	1/6

Find dispersion D (X).

M(x) = -4/3

M(x^2) = 5

D(x) = 5 – (4/3)^2 = 3, (2)

78. We say that a discrete random variable X is distributed under the binomial law (binomial distribution) if P (*X* = *k*) =

$P(X = m) = C_n^m p^m q^{n-m}$

79. We say that a discrete random variable X is distributed under Poisson law with parameter λ (Poisson distribution) if *P(X = k) =*

$P(X = m) = \frac{\lambda^m e^{-\lambda}}{m!}$

80. We say that a discrete random variable X is distributed under the geometric law (geometric distribution) if P*(X=k)* =

$P(X = m) = pq^{m-1}$

81. A random variable X is distributed under Poisson law with parameter λ (Poisson distribution). Find M (X) =λ

82. A random variable X is distributed under the binomial law: P *(X=k)* = $C_n^k p^k q^{n-k}$ (0 <*p* <1, *q* =1-*p*; *k=1*, 2, 3, ..., *n*). Find M(X) = np

83. Dispersion of a discrete random variable X is D(x) = $D(X) = M[X^2] - (M(X))^2$

84. Dispersion of a constant C is D(C) = 0

85. The law of distribution of a discrete random variable *X* is given. Find *Y*.

X	–2	4	6
P	0.3	0.6	*Y*

Y = 0.1

86. The law of distribution of a discrete random variable *X* is given, M (X) = 5. Find x_1.

X	x_1	4	6
P	0.2	p_2	0.3

P2 = 0.5

X1 = 11

87. Mathematical expectations $M(X)=5, M(Y)=4{,}3$ are given for independent random variables *X* and *Y*. Find $M(X \cdot Y)$ 21.5

88. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	0,1	0,3	p_3	0.2

Then the probability p_3 is equal to: 0.4

89. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	p_1	0.1	0.4	0.3

Then the probability p_1 is equal to: 0.2

90. For an event – dropping two tails at tossing two coins – the opposite event is: 2 heads

91. 4 independent trials are made, and in each of them an event A occurs with probability p. Probability that the event A will occur at least once is: 1 – q*(m);

92. Show the Bernoulli formula

$$P(X=m)=C_n^m p^m q^{n-m}$$

93. Show mathematical expectation of a discrete random variable X:

$$M(X)=\sum_{i=1}^{\infty} x_i p_i$$

94. Show the Chebyshev inequality

$P(|X-a| > \varepsilon) \leq D(X)/\varepsilon^2$

95. An improper integral of density of distribution in limits from $-\infty$ till ∞ is equal to **1**

96. The random variable *X* is given by an integral function of distribution: $F(x)=\begin{cases} 0 \quad if \quad x \leq -2, \\ \frac{1}{4}x+\frac{1}{2} \quad if \ -2 < x \leq 2, \\ 1 \quad if \quad x > 2. \end{cases}$

Find probability of hit of the random variable *X* in an interval (1; 1,5): = 1/8

97. Show one of true properties of mathematical expectation (C is a constant): $M(C)=$ C

98. Let M(X) = 5. Find M(X – 4) = 1

99. Let M(X) = 5. Find M(4X). = 20

100. Let D(X) = 5. Then D(X – 4) is equal to 5

101. Let D(X) = 5. Then D(4X) is equal to 80

102. Random variables *X* and *Y* are independent. Find dispersion of the random variable $Z=4X-5Y$ if it is known that D(X) = 1, D(Y) = 2.

*16*1 + 25*2 = 66*

103. A random variable *X* is given by density of distribution of probabilities: $f(x) = \begin{cases} 0 \text{ if } & x \le 0, \\ 1 \text{ if } & 0 < x \le 1, \\ 0 \text{ if } & x > 1 \end{cases}$

Find the function of distribution F(x).

F(x) = x 0<x<1…..

104. Let $f(x)$ be a density of distribution of a continuous random variable X. Then function of distribution is:

$$F(x) = \int_{-\infty}^{x} \varphi(t)dt$$

105. Function of distribution of a random variable X is:

F(x) = P(X < x),

106. If dispersion of a random variable D(X) = 5 then D(5X) is equal to 25*5 = 125

107. Differential function f(x) of a continuous random variable X is determined by the equality:

$$\varphi(x) = F'(x)$$

108. If F(x) is an integral function of distribution of probabilities of a random variable X then P(a < X < b) is equal to

$$P(a \le X \le b) = \int_{a}^{b} \varphi(x)dx$$

109. Show the formula of dispersion

$$D(X) = \int_{-\infty}^{+\infty} (x-a)^2 \varphi(x)dx$$

110. Which equality is true for dispersion of a random variable? $D(CX) =$ C^2 * D(x)

111. The probability that a continuous random variable X will take on a value belonging to an interval (a, b) is equal to $P(a < X < b) =$ $P(a \le X \le b) = \int_{a}^{b} \varphi(x)dx$

112. A random variable X is distributed under an exponential law with parameter λ = 2. Find the dispersion of X:

1/4

113. Show a differential function of the law of uniform distribution of probabilities

$$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 \quad if & x < a \text{ or } x > b. \end{cases}$$

114. Mathematical expectation of a continuous random variable X of which possible values belong to an interval [a, b] is

(a+b)/2

115. Mean square deviation of a random variable X is determined by the following formula

$$a = M(X) = \int_{-\infty}^{+\infty} x\varphi(x)dx$$

116. Dispersion D(X) of a continuous random variable X is determined by the following equality

$$D(X) = \int_{-\infty}^{+\infty} (x-a)^2 \varphi(x)dx$$

117. Function of distribution of a random variable X is given by the formula $F(x) = \begin{cases} 0 & if \quad x \le 0 \\ \sin 2x & \text{if } 0 < x \le \pi/4 \\ 1 & \text{if} \quad x > \pi/4 \end{cases}$. Find density of distribution f(x).

Тупо производная

118. Distribution of probabilities of a continuous random variable X is exponential if it is described by the density

$$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \ge 0, \\ 0 & for \quad x < 0. \end{cases}$$

119. A random variable X is normally distributed with the parameters *a* and σ^2 if its density $f(x)$ is:

$$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

120. Function of distribution of the exponential law has the following form:

$$F(x) = \begin{cases} 0 & for \ x < 0, \\ 1 - e^{-\lambda x} & for \ x \ge 0. \end{cases}$$

121. Mathematical expectation of a random variable X uniformly distributed in an interval (0, 1) is equal to

1/2

122. A random variable X $\in (-\infty, \infty)$ has normal density of distribution $f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-3)^2}{32}}$ Find the value of парамек σ. 4

123. A random variable X $\in (-\infty, \infty)$ has normal density distribution $f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-2)^2}{8}}$. Find the value of parameter σ. 2

124. Mathematical expectation of a normally distributed random variable X is *a* = 4, and mean square deviation is σ =5. Write the density of distribution X.

$$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

125. It is known that M (X) = - 3 and M (Y) = 5. Find M (3X – 2Y). = 1

126. Random variables X and Y such that Y =4X – 2 and D(X) = 3 are given. Find D(Y). 48

127. The number of allocations of *n* elements on *m* is equal to: $A_n^m = \dfrac{n!}{(n-m)!}$

128. The number of permutations of *n* elements is equal to: $P_n = n!$

129. How many various 7-place numbers are possible to make of digits 1, 2, 3, 4, 5, 6, 7 if digits are not repeated?

7! = 5040

130. How many ways is there to choose two employees on two various positions from 8 applicants?

A(2 , 8)

131. The number of combinations of *n* elements on *m* is equal to:

$$C_n^m = \frac{n!}{m!(n-m)!}$$

132. 3 dice are tossed. Find probability that each die lands on 5:

1/216

133. 2 dice are tossed. Find probability that the same number of aces will appear on each of the dice: 1/6

134. The pack of 52 cards is carefully hashed. Find probability that a randomly extracted card will be an ace: 4/36

135. The pack of 52 cards is carefully hashed. Find probability that two randomly extracted cards will be aces: C(2 , 4) / C(2,52)

136. How many ways are there to choose 3 books from 6? C(3, 6)

137. There are 60 identical details in a box, and 8 of them are painted. One takes out randomly one detail. Find probability that a randomly taken detail will be painted: 8/60

138. How many 4-place numbers can be composed of digits 1, 3, 9, 5? 4^4

139. Dialing the phone number, the subscriber has forgotten one digit and has typed it at random. Find probability that the necessary digit has been typed: 1/10

140. The urn contains 4 white and 6 black balls. One extracts by one randomly two balls without replacement. What is the probability that both balls will be black: 6/10 * 5/9

141. The urn contains 4 white and 6 black spheres. Two balls are randomly extracted from the urn. What is the probability that these balls will be of different color: 4*6/C(2, 10)

142. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that both of them will have the first sort: 3/ 7 * 2/6

143. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that they have the same sort: 3/7 * 2/6 + 4/7*3/6

144. A student knows 25 of 30 questions of the program. Find probability that the student knows offered by the examiner 3 questions. 25/30 * 24/29 * 23/28

145. A random variable X is distributed under an exponential law with parameter λ = 2. Find the mathematical expectation of X:

M(x) = λ = 2

146. Two shooters shoot on a target. The probability of hit in the target by the first shooter is 0,8, by the second – 0,9. Find probability that only one of shooters will hit in the target: 0.8 * 0.1 + 0.9* 0.2

147. A coin is tossed 5 times. Find probability that heads will land 3 times: C(3, 5) * 0.5 ^ 3 * 0.5 ^2

148. A coin is tossed 5 times. Find probability that heads never will land: C(0.5)*0.5^5

149. A coming up seeds of wheat makes 90 %. Find probability that 4 of 6 sown seeds will come up: C(4,6) * 0.9^4 * 0.1 ^2

150. A coming up seeds of wheat makes 90 %. Find probability that only one of 6 sown seeds will come up: C(6, 6) * 0.9 ^6

151. Identical products of three factories are delivered in a shop. The 1-st factory delivers 60 %, the 2-nd and 3-rd factories deliver 20 % each. 70 % of the 1st factory has the first sort, 80% of both the 2nd and the 3rd factories have the first sort. One product is bought. Find probability that it has the first sort: 0.74

152. The dispersion *D(X)* of a random variable *X* is equal to 1,96. Find σ(X): 1.4

153. Find dispersion *D(X)* of a random variable *X*, knowing the law of its distribution

x_i	1	2	3
p_i	0,2	0,5	0,3

M(x) = 0.2 + 1 + 0.9 = 2.1

M(x^2) = 0.2 + 2 + 2.7 = 4.9

D(x) = 0.49

154. If incompatible events **A**, **B** and **C** form a complete group, and P(**A**) + P(**B**) = 0,6 then P(**C**) is equal to: 0.4

155. Let **A** and **B** be events connected with the same trial. Show the event that means an appearance of **A** and a non-appearance of **B**. P(ABс чертой)

156. Let $\mathbf{A_1}$**,** $\mathbf{A_2}$**,** $\mathbf{A_3}$ be events connected with the same trial. Let **A** be the event that means occurrence only two of events $\mathbf{A_1}$**,** $\mathbf{A_2}$ and $\mathbf{A_3}$**.** Express the event **A** by the events $\mathbf{A_1}$**,** $\mathbf{A_2}$ and $\mathbf{A_3}$.

157. Let M be the number of all outcomes, and S be the number of non-favorable to the event **A** outcomes (S < M). Then P(A) is equal to: (M-S)/M

158. Five events form a complete group if they are: Some events form a *complete group* if in result of a trial at least one of them will appear.

159. There are 4000 tickets in a lottery, and 200 of them are winning. Two tickets have been bought. What is the probability that both tickets are winning? 200/4000 * 199/3999

160. If X is uniformly distributed over (0, 7), calculate the probability that X < 2: 2/7

161. If X is uniformly distributed over (0, 7), calculate the probability that X > 6: 1/7

162. There are 23 white, 35 black, 27 yellow and 25 red balls in an urn. One ball has been extracted from the urn. Find the probability that the extracted ball is white or yellow. 27/110

163. There are 15 red and 10 yellow balls in an urn. 6 balls are randomly extracted from the urn.

What is the probability that all these balls are red? C(6, 15)/ C(6, 25)

164. One letter has been randomly chosen from the word "STATISTICS". What is the probability that the chosen letter is "S"? 0.3

165. One letter has been randomly chosen from the word "PROBABILITY". What is the probability that the chosen letter is "I"? 2/11

166. How many 6-place phone numbers are there if only the digits “1”, “3” or “5” are used on the first place? 3*10^5

167. 150 shots have been made, and 25 hits have been registered. Find the relative frequency of hits in a target. 1/6

168. A point is thrown on an interval of length 3. Find the probability that the distance from the point to the ends of the interval is more than 1. 1/3

169. Two dice are tossed. What is the probability that the sum of aces will be more than 8?10/36

170. There are 4 children in a family. Assuming that the probabilities of births of boy and girl are equal, find the probability that the family has four boys: C(0, 4)*0.5^4

171. An urn contains 3 yellow and 6 red balls. Two balls have been randomly extracted from the urn. What is the probability that these balls will be of different color: 3*6/C(2, 9)

172. There are 5 books on mathematics and 8 books on biology in a book shelf. 3 books have been randomly taken. Find the probability that these books are on mathematics. 5/13 *4/12 *3 /11

173. There are 7 standard and 3 non-standard details in a box. 3 details have been randomly taken. Find the probability that only one of them is standard. C(1, 3) * C(2, 7)/ C(2, 10)

174. Three shooters shoot in a target. The probability of hit in the target at one shot by the 1st shooter is 0,8; by the 2^{nd} – 0,75 and by the 3^{rd} – 0,7. Find the probability of hit by all the shooters. 0.8*0.75*0.7 = 0.42

175. A student knows 17 of 25 questions of examination. Find the probability that he (or she) knows 3 randomly chosen questions. 17/25 * 16/24 * 15/23

176. One die is tossed. Find the probability that the number of aces doesn't exceed 3. 1/2

177. Show the Markov inequality:

$$P(X > A) \leq M(X)/A$$

178. Two shooters shoot in a target. The probability of hit by the first shooter is 0,85, and by the second – 0,9. Find the probability that only one of the shooters will hit in the target. 0.85*0.1 + 0.9 * 0.15 = 0.22

179. Three dice are tossed. Find the probability that the sum of aces will be 9. 1/9

180. At shooting by a gun the relative frequency of hit in a target is equal to 0,9. Find the number of misses if 300 shots have been made. 300*0.9 = 270

181. A point is put on an interval of length 2. Find the probability that the distance from the point to the ends of the interval is more than 3/4. 2/8

182. There are 6 yellow and 6 red balls in an urn. 2 balls have been randomly taken. What is the probability that both balls are red? 6/12 * 5/11

183. Events A_1, A_2, A_3, A_4, A_5 are called independent in union if: Several events are *independent in union* (or just *independent*) if each two of them are independent and each event and all possible products of the rest events are independent.

184. There are 12 sportsmen in a group, and 8 of them are masters of sport. 6 sportsmen have been randomly selected. Find the probability that there are 2 masters of sport among the selected sportsmen. C(2, 8) * C(4, 12)/ C(2, 20)

185. A pack of 52 cards is carefully shuffled. Find the probability that three randomly extracted cards will be kings:

C(3,4)/ C(3, 52)

186. A circle of radius 4 cm is placed in a big circle of radius 8 cm. Find the probability that a randomly thrown point in the big circle will get as well in the small circle. 16/64 = 1/4

187. There are 7 yellow and 5 black balls in an urn. The event A consists in that the first randomly taken ball is black and the event B – the second randomly taken ball is yellow. Find P(AB). = 5/12 * 7/11

188. The probability to fail exam for the first student is 0,3; for the second – 0,4; for the third – 0,2. What is the probability that only one of them will pass the exam? 0.7 * 0.4 * 0.2 + 0.3 * 0.6 * 0.2 + 0.3 * 0.4 * 0.8

189. The probability of delay for the train №1 is equal to 0,15; and for the train №2 – 0,25. Find the probability that at least one train will be late. 1 – 0.85 * 0.25 = 0.7875

190. The probability of delay for the train №1 is equal to 0,15, and for the train №2 – 0,25. Find the probability that both trains will be late. 0.15 * 0.25 = 0.0375

191. The events A and B are independent, P(A) = 0,6; P(B) = 0,8. Find $P(\overline{A}B)$. 0.4 *0.8 = 0.32

192. Two independent events A and B are compatible, P(A) = 0,6; and P(B) = 0,75. Find $P(\overline{A}+\overline{B})$ = 0.4 + 0.25 – 0.4 * 0.25

193. Details are made at two factories, and the first of them delivers 70%, and the second - 30% of all consumed production. 90 of each hundred details of the first factory are standard on the average, and 80 – of the second factory. Find the probability that a randomly taken detail will be standard. 0.7 * 0.9 + 0.3*0.8 = 0.87

194. The probability of hit in 10 aces for a shooter at one shot is 0,8. Find the probability that for 15 independent shots the shooter will hit in 10 aces exactly 8 times. C(8, 10) * 0.8^8 * 0.2^2

195. It is known that 25 % of all details are non-standard. 8 details have been randomly taken. Find the probability that there is no more than 2 non-standard detail of the taken.

C(0, 8) * 0.25 ^8 + C(1, 8)*0.25^1*0.75^7 + C(2, 8)* 0.25 ^2* 0.75 ^6

196. For an event – appearance of four tails at tossing four coins - the opposite event is:

4 heads

197. A random variable X is given by the integral function of distribution:

$$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \dfrac{1}{6}x & if \quad 0<x\le 6,\\ 1 & if \quad x>6.\end{cases}$$

Find the probability of hit of the random variable X in the interval (3; 5):

5/6 – 3/6 = 2/6 = 1/3

198. A random variable X is given by the density of distribution of probabilities:

$$f(x)=\begin{cases}0 \text{ if} & \mathrm{x}\le 0,\\ \mathrm{x}/4 \text{ if} & 0<\mathrm{x}\le 2\sqrt{2}\\ 0 \text{ if} & \mathrm{x}>2\sqrt{2}\end{cases}$$

Find the function of distribution F(x). первообразная

199. The function of distribution of a random variable X is given by the formula:

$$F(x)=\begin{cases}0 & if \quad x\le 0\\ \cos^2 4x \text{ if} & 0<x\le \pi/4\\ 1 & \text{if} \quad x>\pi/4\end{cases}.$$

Find the density of distribution f(x). производная

200. A die is tossed before the first landing 3 aces. Find the probability that the first appearance of 3 will occur at the fourth tossing the die. 0,096

1. **The probability that a day will be rainy is *p = 0,75*. Find the probability that a day will be clear.**

0,25

0,3

0,15

0,75

1

2. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,4; and by the third – 0,9. What is the probability that the exam will be passed on "excellent" by only one student?

0,424

0,348

0,192

0,208

0,992

3. If D(X)=3, find D(-3X+4).

12

-5

19

27

-9

4. The table below shows the distribution of a random variable X. Find M[x] and D(X).

X	-2	0	1
P	0.1	0.5	0.4

M[X]= 0,2; D(X) =0.8

M[X]= 0,3; D(X) =0.27

M[X]= 0,2; D(X) =0.76

M[X]= 0,2; D(X) =0.21

M[X]= 0,8; D(X) =0.24

5. Let *X* be a continuous random variable with density function $f(x)=\begin{cases} \frac{|x|}{10} & for -2 \le x \le 4 \\ 0 & otherwise \end{cases}$

Calculate the expected value of *X*.

1/5

3/5

1

28/15

12/15

6. **If P(E) is the probability that an event will occur, which of the following must be false?**

P(E)=1

P(E)=1/2

P(E)=1/3

P(E)= - 1/3

P(E)=0

7. **A movie theatre sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?**

1

3

9

27

62

8. **The probability is p = 0.85 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?**

40

20

8

34

124

9. **Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?**

0.99

0.25

0.49

0.45

0.01

10. **A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass**

	Passed	Did not pass
Female	430	60

Male	410	100

If one person is selected randomly, what is the probability that it did not pass given that it is male.

0.17

0.21

0.42

0.08

0.196

11. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

0.98

0.02

0.28

0.53

None of the shown answers

12. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

0.9995

0,00005

0.15

0.6

0.5220

13. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 3?

1/6

1/5

1/3

5/6

1/18

14. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be Spades?

4/17

1/17

2/17

1/4

4/17

15. **In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?**

0.2995

0.699

0.23336

1/4

0.4999

16. **Table shows the cumulative distribution function of a random variable X. Determine** $P(X > 4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

1/8

1

1/2

3/4

0

17. **A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?**

1/3

3/8

5/8

1/8

1

18. **A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.**

512/3375

28/65

8/15

1856/3375

36/65

19. We are given the probability distribution functions of two random variables X and Y shown in the tables below.

X	1	3	**Y**	2	4
P	0.4	0.6	**P**	0.2	0.8

Find M[X+Y].

5,8

2,2

2

8,8

10

20. In each of the 20 independent trials the probability of success is 0.2. Find the dispersion of the number of successes in these trials.

0

1

10

3.2

0.32

21. A coin tossed three times. What is the probability that head appears three times?

1/8

0

4:1

1

8:1

There are 10 white, 15 black, 20 blue and 25 red balls in an urn. One ball is randomly extracted. Find the probability that the extracted ball is blue or red.

5/14

1/70

1/7

9/14

3/98

A random variable *X* has the following law of distribution:

x_i	0	1	2	3

p_i	1/30	3/10	½	1/6

Find the mathematical expectation of *X*.

1

1,5

2

1,8

2,3

A random variable *X* is given by the integral function of distribution:

$$F(x)=\begin{cases}0 \quad if \quad x\le 2,\\ \frac{1}{2}x-1 \quad if \;\; 2<x\le 4,\\ 1 \quad if \quad x>4.\end{cases}$$

Find the probability of hit of the random variable *X* into the interval (2; 3).

0,25

0,5

1/3

2/3

1

An urn contains 5 red, 3 white, and 4 blue balls. What is the probability of extracting a black ball from the urn?

1/3

0

0,25

0,5

5/12

1. **A class in probability theory consists of 3 men and 12 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores (rankings) are possible?**
    - Answer: 15!=1 307 674 368 000

2. **Ms. Jones has 15 books that she is going to put on her bookshelf. Of these, 4 are math books, 3 are chemistry books, 6 are history books, and 2 are language book. Ms. Jones wants to arrange her books so that all the books dealing with the same subject are together on the shelf. How many different arrangements are possible?**
    - Answer: 4!4!3!6!2!=4 976 640

3. **How many different signals, each consisting of 9 flags hung in a line, can be made from a set of 4 white flags, 3 red flags, and 2 blue flags if all flags of the same color are identical?**
    - Answer: 9! / 4!3!2!=1260

4. **A student has to answer to 10 questions in an examination. How many ways to answer exactly to 4 questions correctly?**
    - Answer:

5. **A bag contains six Scrabble tiles with the letters A-K-T-N-Q-R. You reach into the bag and take out tiles one at a time exactly six times. After you pick a tile from the bag, write down that letter and then return the tile to the bag. How many possible words can be formed?**

6. **Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one F?**
    - Answer: 1-(4/5)^4

7. **Using the given data, answer the following question.**

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

What is the probability that a student, taken at random from teacher's class, would have succeded the course, given that they succeeded the final?

8. **At a certain gas station 40% of the customers request regular gas, 35% request unleaded gas, and 25% request premium gas. Of those customers requesting regular gas, only 30% fill their tanks fully. Of those customers requesting unleaded gas, 60% fill their tanks fully,**

while of those requesting premium, 50% fill their tanks fully. If the next customer fills the tank, what is the probability that regular gas is requested.

- Answer: 0.25

9. Insurance predictions for probability of auto accident.

	Under 25	25-39	Over 40
P	0.11	0.03	0.02

Table gives an insurance company's prediction for the likelihood that a person in a particular age group will have an auto accident during the next year. The company's policyholders are 25% under the age of 25, 25% between 25 and 39, and 50% over the age of 40. What is the probability that a random policyholder will have an auto accident next year?

10. A friend who works in a big city owns two cars, one small and one large. Three-quarters of the time he drives the small car to work, and one-quarter of the time he drives the large car. If he takes the small car, he usually has little trouble parking, and so is at work on time with probability 0.8. If he takes the large car, he is at work on time with probability 0.7. What is the probability that he will not be at work on time tomorrow?

11. A fair six-sided die is tossed. You win $3 if the result is a «5», you win $2 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the mathematical expectation of *X*?

12. A fair six-sided die is tossed. You win $3 if the result is a «1», you win $1 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the dispersion of *X*?

13. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation/ mean square (standard) deviation of X+Y?

- Answer: E[X+Y]=1 Var(X+Y)=1,68 sqrt(Var(X+Y))=1.2961

14. A set of families has the following distribution on number of children:

X	x_1	x_2	2	3	4
P(X)	0.1	0.2	0.4	0.2	0.1

Determine x_1, x_2, if it is known that $M(X) = 3, D(X) = 1.5$?

15. The lifetime of a machine part has a continuous distribution on the interval (0, 30) with probability density function $f(x) = c(10 + x)^{-2}$, $f(x) = 0$ otherwise. Calculate the probability that the lifetime of the machine part is less than 5.

16. A random variable X is given by the (probability) density function of distribution: $$f(x)=\begin{cases}0 & if \quad x<1 \text{ or } 7\le x,\\ \dfrac{x-1}{9} & if \ 1\le x<4,\\ \dfrac{7-x}{9} & if \ 4\le x<7.\end{cases}$$ Find the cumulative distribution function of the random variable X?

- Answer
- $$F(x)=\begin{cases}0 & if \quad x<1,\\ \dfrac{(x-1)^2}{18} & if \ 1\le x<4,\\ \dfrac{18-(7-x)^2}{18} & if \ 4\le x<7,\\ 1 & if \quad 7\le x.\end{cases}$$

17. A random variable X is given by the cumulative distribution function: $$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \dfrac{Cx^3}{125} & if \ 0\le x<5,\\ 1 & if \quad 5\le x.\end{cases}$$ Find the mathematical expectation/dispersion of the random variable X?

18. The probability that a shooter will beat out 10 points at one shot is equal to 0.1 and the probability to beat out 9 points is equal to 0.3. Find the probability of the event A – the shooter will beat out 6 or less points.

19. Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «only one student will pass the exam on "excellent"». Here $\overline{A}=A^c$.

- $A_1\overline{A}_2\overline{A}_3+\overline{A}_1A_2\overline{A}_3+\overline{A}_1\overline{A}_2A_3$

20. A random variable *X* is given by the cumulative distribution function:

$$F(x) = \begin{cases} 0 \quad if \quad x < 10, \\ \dfrac{x-10}{10} \ \ if \ \ 10 \le x < 20, \\ 1 \quad if \quad 20 \le x. \end{cases}$$

Find P (8 < X < 16).

21. A random variable X is given by the cumulative distribution function:

$$F(x) = \begin{cases} 0 \quad if \quad x \le 2, \\ \dfrac{1}{2}x - 1 \ \ if \ \ 2 < x \le 4, \\ 1 \quad if \quad x > 4. \end{cases}$$

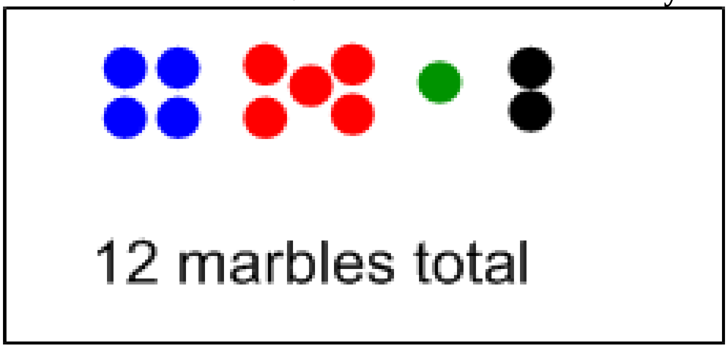
Find the probability of hit of the random variable X into the interval (2.5; 4).

22. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target at least one time. (exact value)

23. All of the letters that spell STUDENT are put into a bag. Choose the correctly calculated probability of events.

- P(drawing a S, and then drawing a T)=1/21
- P(drawing a T, and then drawing a D)=1/42
- P(selecting a vowel, and then drawing a U)=1/42
- P(selecting a vowel, and then drawing a K)=1/42
- P(selecting a vowel, and then drawing a T)=3/42

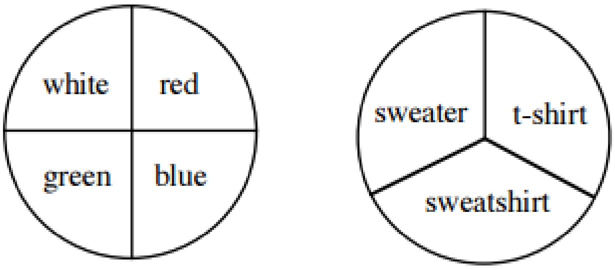
24. A jar of marbles contains 4 blue marbles, 5 red marbles, 1 green marble, and 2 black marbles. A marble is chosen at random from the jar. After returning it again, a second marble is chosen. Choose the correctly calculated probability of events.



- P(green, and then red)=5/144
- P(black, and then black)=1/12
- P(red, and then black)=7/72
- P(green, and then blue)=1/72

- P(blue, and then blue)=1/6

25. If each of the regions in each spinner is the same size.



Choose the correctly calculated probability of spinning each spinner.

- P(getting a red sweater)=1/12
- P(getting a white sweatshirt)=1/6
- P(getting a white sweater)=5/12
- P(getting a blue sweatshirt)=7/12
- P(getting a blue t-shirt)=1/6

26. Find the Bernoulli formula.

- $$P_n(k) = \frac{n!}{k!(n-k)!} \cdot p^k \cdot (1-p)^{n-k}$$
- $$P(B|A) = \frac{P(B) \cdot P(A|B)}{P(A)}$$
- $$P(B|A) = \frac{P(AB)}{P(A)}$$
- $$P_n(k) = \frac{1}{\sqrt{npq}} \cdot e^{-2pq}$$
- $$P_n(k) = \frac{1}{\sqrt{npq}} \cdot \Phi\left(\frac{k-np}{\sqrt{npq}}\right)$$

27. A coming up a grain stored in a warehouse is equal to 50%. What is the probability that the number of came up grains among 100 ones will make from *a* up to *b* pieces?

- $a = 5, b = 10, P = \Phi\left(\frac{10-100*0,5}{\sqrt{100*0,5*0,5}}\right) - \Phi\left(\frac{5-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

28. Find the right statements.

- $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx$
- $M(X) = \int_{-\infty}^{+\infty} xf(x)dx$
- $F(x) = f'(x)$
- $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx - M(X)$
- $P(X > A) > \frac{M(X)}{A}$

29. Find the false statements.

- $0 \le F(x) \le 1$
- $F(-\infty) = 0$
- $F(+\infty) = 0$
- $F(x) = P(X < x)$
- $\int_{-\infty}^{+\infty} f(x)dx = 1$

30. Let a series of distribution of a random variable be given:

$$X = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}$$

. **What does this tell us about the random variable X?**

- $$F(x) = \begin{cases} 0 \quad if \quad x \le 1, \\ 0.1 \ if \ 1 < x \le 2, \\ 0.3 \ if \ 2 < x \le 3, \\ 0.6 \ if \ 3 < x \le 4, \\ 1 \quad if \quad 4 < x. \end{cases}$$
- $$F(x) = \begin{cases} 0 \quad if \quad x \le 1, \\ 0.1 \ if \ 1 < x \le 2, \\ 0.2 \ if \ 2 < x \le 3, \\ 0.3 \ if \ 3 < x \le 4, \\ 0.4 \quad if \quad 4 < x. \end{cases}$$

- $M(X) = 1$
- $M(X^2) = 9$
- $D(X) = 10$

31. **The probability of working each of four combines without breakages during a certain time is equal to 0,9. The random variable X – the number of combines working trouble-free. What are the possible values of X?**

- 2
- -1
- 5
- 6
- -2

32. **The probability of working each of 3 combines without breakages during a certain time is equal to 0,9. The random variable X – the number of combines working trouble-free. What does this tell us about the random variable X?**

- $P(X = 2) = 0.243$
- $P(X = 3) = 0.001$
- $P(X = 1) = 0.009$
- $P(X = 2) = 0.081$
- $P(X = 0) = 0.1$

33. **Suppose that the random variable X is the number of typographical errors on a single page of book has a Poisson distribution with parameter $\lambda = \frac{1}{4}$. What does this tell us about the random variable X?**

- $M(X) = 0.25$
- $M(X) = 2$
- D(X)= - 8
- M(X) = 1
- $D(X) = 4$

34. **Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $a = 173$, $\sigma^2 = 36$. Find the correctly calculated probabilities of the events.**

- $P(|X - 173| \le 3) = 2\Phi\left(\frac{1}{2}\right)$

35. **Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(0; 10)$. Find the correctly calculated probabilities of the events.**

36. **The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter λ. Find the correctly calculated probabilities of the events.**

37. **Which of the following is a discrete random variable?**

- The time of waiting a train.
- The number of boys in family having 4 children.
- A time of repair of TVs.
- The velocity in any direction of a molecule in gas.
- The height of a man.

38. How would it change the expected value of a random variable X if we multiply the X by a number k.

39. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

- Answer: $f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$

40. Find the density function of random variable $X \sim U[a, b]$

$$\varphi(x) = \begin{cases} \frac{1}{b-a} & if \quad a \le x \le b, \\ 0 \quad if & x < a \ or \ \ x > b. \end{cases}$$

41. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

- 1/4, always
- 1/4, if A and B are independent
- 1/2, always
- 1/2, if A and B are independent
- None of the given answers

42. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

- Φ(1.5)

43. The cumulative distribution function for continuous random variable X is given by

$$F(x) = \begin{cases} 0, & x < 0 \\ x/2, & 0 \le x \le 2 \\ 1, & x > 2 \end{cases}$$ **. Find the variance Var(X).**

Answer: $\frac{1}{3}$

44. If the probability density function of a continuous random variable X is

$$f(x)=\begin{cases} kx^2 & 0\le x\le 3 \\ 0 & otherwise \end{cases}$$ then the value of k is

45. If E(X)=3, E(Y)=2 and X and Y are independent, find E(-3X+2Y-1).

46. The table below shows the distribution of a random variable X. Find $E[x^2]$.

X	-2	0	1
P	0.1	0.5	0.4

1. Events are *equally possible* if … two probability equally
2. The probability of the event *A* is determined by the formula P(A)=m/n
3. The probability of a reliable event is equal to … 1 или universal
4. The probability of an impossible event is equal to … 0 or null
5. The relative frequency of the event *A* is defined by the formula: W(A)=m/n
6. There are 50 identical details (and 5 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted. 1/10
7. A die is tossed. Find the probability that an even number of aces will appear. 1/2
8. Participants of a toss-up pull a ticket with numbers from 1 up to 60 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 3. 1/4
9. In a batch of 10 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to? 0.3
10. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,35. Find the number of hits if 20 shots were made. 7

11. **Two dice are tossed. Find the probability that the same number of aces will appear on both dice 1/6**

12. **An urn contains 15 balls: 4 white, 6 black and 5 red. Find the probability that a randomly taken ball will be white. 4/15**

13. **12 seeds have germinated of 36 planted seeds. Find the relative frequency of germination of seeds. 2.1/3**

14. **A point *C* is randomly appeared in a segment *AB* of the length 3. Determine the probability that the distance between *C* and *B* doesn't exceed 1. 1/3**

15. **A point *B(x)* is randomly put in a segment *OA* of the length 8 of the numeric axis *Ox*. Find the probability that both the segments *OB* and *BA* have the length which is greater than 3. 1/4**

16. **The number of all possible permutations Pn=n!**

17. **How many two-place numbers can be made of the digits 2, 4, 5 and 7 if each digit is included into the image of a number only once? 12**

18. **The number of all possible allocations An'm=n!/(n-m)!**

19. **How many signals is it possible to make of 5 flags of different color taken on 3? 60**

20. **The number of all possible combinations Cnm=n!/m!(n-m)!**

21. **How many ways are there to choose 2 details from a box containing 13 details? 78**

22. **The numbers of allocations, permutations and combinations are connected by the equality An"m=Pm*Cn'm**

23. **4 films participate in a competition on 3 nominations. How many variants of distribution of prizes are there, if on each nomination are established different prizes. 64**

24. **If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by … ways. n+m**

25. **There are 200 details in a box. It is known that 150 of them are details of the first kind, 10 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the second kind from the box are there? 25 (C150"1+C10"1)**

26. **If an object *A* can be chosen from the set of objects by *m* ways and after every such choice an object *B* can be chosen by *n* ways then the pair of the objects (*A*, *B*) in this order can be chosen by ... ways. n*m**

27. **There are 15 students in a group. It is necessary to choose a leader, its deputy and head of professional committee. How many ways of choosing them are there? 2730**

28. **6 of 30 students have sport categories. What is the probability that 3 randomly chosen students have sport categories? 1/203**

29. **A group consists of 10 students, and 5 of them are pupils with honor. 3 students are randomly selected. Find the probability that 2 pupils with honor will be among the selected. 1/12 это ответ апайки, мой 5/12**

30. **It has been sold 15 of 20 refrigerators of three marks available in quantities of 5, 7 and 8 units in a shop. Assuming that the probability to be sold for a refrigerator of each mark is the same, find the probability that refrigerators of one mark have been unsold. Апайкин: 0,0016, мой: 0,005**

31. **A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the i-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event A – «only two hit».**

    A.

    B.

    C.

    D.

    E.

32. **A randomly taken phone number consists of 5 digits. What is the probability that all digits of the phone number are different. It is known that any phone number does not begin with the digit zero. Апайкин: 0,0001, мой: 0,3204**

33. **The probability of appearance of any of two incompatible events is equal to the sum of the probabilities of these events: P(A+B)=P(A)+P(B)**

34. **A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,5 and in the second – 0,3. Find the probability that the shooter will hit at one shot either in the first area or in the third area. 0.7**

35. **The sum of the probabilities of events A_1, A_2, A_3, …, A_n which form a complete group is equal to … 1**

36. **Two uniquely possible events forming a complete group are …**

    A. Opposite

    B. Same

    C. Identically distributed

    D. Sample

    E. Density function

37. **The sum of the probabilities of opposite events is equal to … 1**

38. ***The conditional probability*** **of an event *B* with the condition that an event *A* has already happened is equal to: Pa(B)=P(AB)/P(A)**

39. **There are 4 conic and 8 elliptic cylinders at a collector. The collector has taken one cylinder, and then he has taken the second cylinder. Find the probability that the first taken cylinder is conic, and the second – elliptic. 8/33**

40. **The events *A, B, C* and *D* form a complete group. The probabilities of the events are those: *P(A)* = 0,01; *P(B)* = 0,49; *P(C)* = 0,3. What is the probability of the event *D* equal to? 0.2**

41. **For independent events theorem of multiplication has the following form: P(AB)=P(A)*P(B)**

42. **The probabilities of hit in a target at shooting by three guns are the following: $p_1 = 0,6; p_2 = 0,7; p_3 = 0,5$. Find the probability of at least one hit at one shot by all three guns. 0.94**

43. **Three shots are made in a target. The probability of hit at each shot is equal to 0,6. Find the probability that only one hit will be in result of these shots. 0.288**

44. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,5; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by neither of the students? 0.07**

45. **10 of 20 savings banks are located behind a city boundary. 5 savings banks are randomly selected for an inspection. What is the probability that among the selected banks appears inside the city 3 savings banks? Апайкин: 9/38, мой: 225/646**

46. **A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will be solved ? 19/29**

47. **An urn contains 10 balls: 3 red and 7 blue. A second urn contains 6 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.54 . Calculate the number of blue balls in the second urn. 9**

48. **A bag contains 7 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue. 4/165**

49. **Find the Bernoulli formula Pn(K)=n!/k!(n-k)!*PkQn-k**

50. **Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?**

A. $A + B + C$

B. $A \cdot B \cdot C$

C. $A \cdot B^c \cdot C^c + A^c \cdot B \cdot C^c + A^c \cdot B^c \cdot C$

D. $(A+B+C)^c$

E. $AB + AC + BC$

○

51. Find the dispersion for the given probability distribution.

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

52.

○

○ 2.85

52. How would it change the dispersion of a random variable X if we add a number a to the X.

A. D(X+a)=D(X)+a

B. D(X+a)=D(X)+a^2

C. D(X+a)=D(X)

D. D(X+a)= $a \cdot$D(X)

E. D(X+a)= a^2D(X)

53. The cumulative distribution function of a discrete random variable X is given by

$$F(x) = \begin{cases} 0 & if\ x \le 2 \\ 0.5 & if\ 2 < x \le 5 \\ 0.8 & if\ 5 < x \le 8 \\ 1 & if\ x > 8 \end{cases}$$

Find P{3<X<9}. 0,5

54. Find the expectation of a random variable X if the cumulative distribution function

$$F(x) = \begin{cases} 1 - e^{-x/4}, x \ge 0 \\ 0, \quad x < 0 \end{cases}$$

. 4

55. If the dispersion of a random variable X is given D(X)=4. Then D(2X) is D(2x)=16

56. Indicate the expectation of a Poisson random variable X with parameter λ. λ

57. The lifetime of a machine part has a continuous distribution on the interval (0, 20) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5. 0.5

58. **What kind of distribution is given by the density function** $f(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{\frac{(x-\mu)^2}{2\sigma^2}}$ **(** $-\infty < x < \infty$ **)?**

A. Poisson distribution

B. Normal distribution

C. Uniform distribution

D. Bernoulli distribution

E. Exponential distribution

59. **Suppose the test scores of 10000 students are normally distributed with an expectation of 76 and mean square deviation of 8. The number of students scoring between 60 and 82 is: 7065,6 or 71%**

60. **The distribution of weights in a large group is approximately normally distributed. The expectation is 80 kg. and approximately 68,26% of the weights are between 70 and 90 kg. The mean square deviation of the distribution of weights is equal to: 0,3413**

61. **A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value of *X* is 18**

62. **The cumulative distribution function for continuous random variable X is given by**

$$F(x)=\begin{cases} 0,\ x<0 \\ x/2,\ 0\le x\le 2 \\ 1,\ x>2 \end{cases}$$

. Find the standard deviation $\sigma(X)$**. Апайкин: 1/3, мой: 1/sqrt3**

63. **A continuous random variable X is exponentially distributed with the density**

$$f(x)=\begin{cases} 3e^{-3x},\ x\ge 0 \\ 0,\ x<0 \end{cases}$$

. What is the M[X] and D(X)? MX=1/3 DX=1/9

64. **How many different 5-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?6!**

65. **A fair coin is thrown in the air five times. If the coin lands with the head up on the first four tosses, what is the probability that the coin will land with the head up on the fifth toss? 1/2**

66. **A random variable Y has the following distribution:**

○ Y	○ -1	○ 0	○ 1	○ 2
○ P(Y)	○ C	○ 4C	○ 0.4	○ 0.1

67.

47. The value of the constant C is:0.1

67. Which one of these variables is a continuous random variable?

A. The time it takes a randomly selected student to complete an exam.

B. The number of tattoos a randomly selected person has.

C. The number of women taller than 68 inches in a random sample of 5 women.

D. The number of correct guesses on a multiple choice test.

E. The number of 1's in N rolls of a fair die

68. Heights of college women have a distribution that can be approximated by a normal curve with an expectation of 65 inches and a mean square deviation equal to 3 inches. About what proportion of college women are between 65 and 68 inches tall? 0,34134 Φ(1)-Φ(0)

69. A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...

A. Probability distribution

B. The expected value

C. The standard deviation

D. Coefficient of variation

E. Correlation

70. For a continuous random variable X, the probability density function f(x) represents

A. the probability at a fixed value of X

B. the area under the curve at X

C. the area under the curve to the right of X

D. the height of the function at X

E. the integral of the cumulative distribution function

71. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is Апайкин: 0,51, мой: 0,49

72. Suppose that 10% of people are left handed. If 6 people are selected at random, what is the probability that exactly 2 of them are left handed? 0,0984

73. Which of these has a Geometric model?

A. the number of aces in a five-card Poker hand

B. the number of people we survey until we find two people who have taken Statistics

C. the number of people in a class of 25 who have taken Statistics

D. the number of people we survey until we find someone who has taken Statistics

E. the number of sodas students drink per day

74. **In a certain town, 55% of the households own a cellular phone, 40% own a pager, and 25% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is 30%**

75. **A probability function is a rule of correspondence or equation that:**

    A. Finds the mean value of the random variable.

    B. Assigns values of x to the events of a probability experiment.

    C. Assigns probabilities to the various values of x.

    D. Defines the variability in the experiment.

    E. None of the given answers is correct.

76. **Which of the following is an example of a discrete random variable?**

    A. The distance you can drive in a car with a full tank of gas.

    B. The weight of a package at the post office.

    C. The amount of rain that falls over a 24-hour period.

    D. The number of cows on a cattle ranch.

    E. The time that a train arrives at a specified stop.

77. **Which of the following is the appropriate definition for the union of two events A and B?**

    A. The set of all possible outcomes.

    B. The set of all basic outcomes contained within both A and B.

    C. The set of all basic outcomes in either A or B, or both.

    D. None of the given answers

    E. The set of all basic outcomes that are not in A and B.

78. **What is the probability of drawing a Diamond from a standard deck of 52 cards?**

48. What is the probability of drawing a diamond from a standard deck of 52 cards?

- 1/52
- 13/39
- 1/13
- 1/4
- 1/2

79. **The probability density function of a random variable X is given by** $f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$.

49. What are the values of μ and σ?

- $\mu = 1, \sigma = 4$
- $\mu = -1, \sigma = 4$
- $\mu = -1, \sigma = 2$
- $\mu = 1, \sigma = 8$
- $\mu = 1, \sigma = 2$

80. The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=4. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:

50. **Апайкин: 0.14, мой: 0.24**

81. Table shows the cumulative distribution function of a random variable X. Determine

X	1	2	3	4
F(X)	3/8	1/8	3/4	1

82.

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3
- Ответ 5/8 я решила апай подтвердила

82. Which of the following statements is always true for A and A^C ?

A. $P(AA^c)=1$

B. $P(A^c)=P(A)$

C. $P(A+A^c)=0$

D. $P(AA^c)=0$

E. None of the given statements is true

83. If P(A)=1/6 and P(B)=1/3 then $P(A \cap B) =$

A. 1/18, always

B. 1/18, if A and B are independent

C. 1/6, always

D. 1/2, if A and B are independent

E. None of the given answers

84. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

- 24/75
- 24/35
- 6/35
- 12/75
- None of the given answers

85. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$ **.**

A. $\lambda = np \sim const$, $n \to \infty,\ p \to 0$

B. $\lambda = \frac{n}{p}$, $n \to \infty$

C. $\lambda = ep$, $n \to \infty$

D. $\lambda = n^p$, p is const

E. None of the given answers is correct

86. The probability density function of a random variable X is given by

$$f(x)=\begin{cases}\frac{1}{\gamma-2{,}5}, & if\ \ x\in(1{,}5;3)\\ 0, & otherwise\end{cases}$$

. Calculate the parameter γ **. 4**

87. Probability density function of the normal random variable X is given by

$$f(x)=\frac{1}{5\sqrt{2\pi}}e^{-\frac{(x-3)^2}{50}}$$

. What is the mean square deviation?

- 5
- 3
- 25
- 50
- 9

88. The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.

A. p^5

B. $1-(1-p)^5$ correct

C. $(1-p)^5$

D. $1-p^5$

E. None of the given answers is correct

89. Choose the density function of random variable

A. $\varphi(x)=\begin{cases}\lambda e^{-\lambda x} & for\ x\ge 0,\\ 0 & for\ \ x<0.\end{cases}$

B. $\varphi(x)=\begin{cases}\dfrac{1}{b-a} & if\quad a\le x\le b,\\ 0 & if\quad x<a\ or\ \ x>b.\end{cases}$

C. $F(x)=\begin{cases}0 & for\ x<0,\\ 1-e^{-\lambda x} & for\ x\ge 0.\end{cases}$

D. $\varphi_N(x)=\dfrac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$

E. $P(X=m)=\dfrac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

90. Choose the probability distribution function of random variable

A. $P(X=m)=\dfrac{\lambda^m e^{-\lambda}}{m!}$

B. $P(X=m)=\dfrac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

C. $P(X=m)=C_n^m p^m q^{n-m}$

D. $\varphi_N(x)=\dfrac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$

E. $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for\ x \ge 0, \\ 0 & for\ \ x < 0. \end{cases}$

91. Choose the probability density function of random variable

A. $\varphi_N(x) = \dfrac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

B. $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for\ x \ge 0, \\ 0 & for\ \ x < 0. \end{cases}$

C. $\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 & if \quad x < a\ or\ \ x > b. \end{cases}$

D. $F(x) = \begin{cases} 0 & for\ x < 0, \\ 1 - e^{-\lambda x} & for\ x \ge 0. \end{cases}$

E. $P(X = m) = C_n^m p^m q^{n-m}$

92. The mathematical expectation and dispersion of a random variable *X* distributed under the binomial law are …, respectively.

A.

B.

C.

D.

E.

93. The mathematical expectation and the dispersion of a random variable distributed under the Poisson are …, respectively.

A.

B.

C.

D.

E.

94. The probability distribution function of random variable is

A.

B. $P(X = m) = \dfrac{\lambda^m e^{-\lambda}}{m!}$

C. $P(X = m) = \dfrac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

D. $P(X = m) = C_n^m p^m q^{n-m}$

E. $\varphi_N(x) = \dfrac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

95. The mathematical expectation and dispersion of a random variable *X* having the geometrical distribution with the parameter *p* are …, respectively.

A.

B.

C.

D.

E.

96. The mathematical expectation and dispersion of a random variable *X* having the uniformly distribution on [a,b] are …, respectively.

A.

B.

C.

D.

E.

97. A normally distributed random variable *X* is given by the differential function:

$f(x) = \dfrac{1}{\sqrt{2\pi}} \cdot e^{-\frac{x^2}{2}}$ **. Find the interval in which the random variable *X* will hit in result of trial with the probability 0,9973. (-3,3)**

98. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

A. $f(x) = \dfrac{1}{3\sqrt{2\pi}} e^{-\frac{(x+3)^2}{18}}$

B. $f(x) = \dfrac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$

C. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{8}}$

D. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{16}}$

E. $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-4)^2}{16}}$

x_i	2	3	6	9
p_i	0,1	0,4	0,3	0,2

99. A discrete random variable X is given by the following law of distribution:

-
-
-
-
- **By using Chebyshev inequality estimate the probability that |X-M(X)|>3.1/3**

51. **The probabilities that three men hit a target are respectively 1/6, 1/4 and 1/3. Each man shoots once at the target. What is the probability that exactly one of them hits the target?**

1/6*3/4*2/3+5/6*1/4*2/3+5/6*3/4*1/3

- ○ 11/72
- ○ 21/72
- ● 31/72
- ○ 3/4
- ○ 17/72

52. **A problem in mathematics is given to three students whose chances of solving it are 1/3, 1/4, 1/5. What is the probability that the problem will be solved?**

- ○ 0.2
- ○ 0.8

- 0.4
- 0.6
- 1

53. You are given P[A∪B] = 0.7 and P[A∪B^c] = 0.9 . Determine P[A] .

- 0.2
- 0.3
- 0.4
- 0.6
- 0.8

54. An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.44 . Calculate the number of blue balls in the second urn.

4/10*16/20+6/10*4/20=(64+24)/200=88/200=44/100=0.44

- 4
- 20
- 24
- 44
- 64

55. The probability that a boy will not pass an examination is 3/5 and that a girl will not pass is 4/5. Calculate the probability that at least one of them passes the examination.

3/5*1/5+2/5*4/5+2/5*1/5= (3+8+2)/25=13/25

- 11/25
- 13/25
- 1/2
- 7/25
- 16/25

56. A bag contains 5 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue.

4/9*3/8*2/7=24/504=1/21

- 1/21
- 2/21
- 1/7
- 4/21
- 1/3

57. Find the variance for the given probability distribution.

X	0	2	4	6

P(x)	0.05	0.17	0.43	0.35

(4*0.17+16*0.43+36*0.35)-(2*0.17+4*0.43+6*0.35)^2

- ○ 1.5636
- ● 2.8544
- ○ 1.6942
- ○ 2.4484
- ○ 1.7222

58. A bag contains 5 white, 7 red and 8 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?

- ○ $1-\left(\frac{1}{4}\right)^4$
- ● $1-\left(\frac{3}{4}\right)^4$
- ○ $\left(\frac{3}{4}\right)^4$
- ○ 0.7182
- ○ $\left(\frac{1}{4}\right)^4$

59. Формулой Бернулли называется формула

- ○ $P_n(k)=\frac{1}{\sqrt{npq}}\cdot\varphi(x)$
- ● $P_n(k)=\binom{n}{k}\cdot p^k\cdot(1-p)^{n-k}$
- ○ $P_n(k)=\frac{\lambda^k e^{-\lambda}}{k!}$
- ○ $P(B|A)=\frac{P(B)\cdot P(A|B)}{P(A)}$
- ○ $P_n(k)=\frac{1}{\sqrt{npq}}\cdot e^{-2p(1-p)}$

60. Indicate the formula of computing variance of a random variable X with expectation μ.

- ● $Var(X)=E(X^2)-\mu^2$
- ○ $Var(X)=E(X-\mu)$
- ○ $Var(X)=(E(X^2)-\mu)^2$

- ○ $Var(X)=E\left(X^2\right)-\mu$
- ○ $Var(X)=E\left(X^2\right)$

61. **How would it change the variance of a random variable X if we add a number a to the X?**

- ○ Var(X+a)=Var(X)+a
- ○ Var(X+a)=Var(X)+a²
- ● Var(X+a)=Var(X)
- ○ Var(X+a)= $a^2 \cdot$ Var(X)
- ○ Var(X+a)=Var(X)+a²

62. **How would it change the expected value of a random variable X if we multiply the X by a number k.**

- ● $E[kX]=k\cdot E[X]$
- ○ $E[kX]=|k|\cdot E[X]$
- ○ $E[kX]=E[X]$
- ○ $E[kX]=E[X]+k$
- ○ $E[kX]=k^2\cdot E[X]$

63. **Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?**

- ○ $A+B+C$
- ○ $A\cdot B\cdot C$
- ● $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $AB+AC+BC$

64. **Which of the following expressions indicates the occurrence of at least one of the events A, B, C?**

- ● $A+B+C$
- ○ $A\cdot B\cdot C$
- ○ $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $A^c\cdot B^c\cdot C^c$

65. **Which of the following expressions indicates the occurrence of all three events A, B, C simultaneously?**

- ○ $A+B+C$

- $A \cdot B \cdot C$
- $A \cdot B \cdot C^c + A^c \cdot B \cdot C + A \cdot B^c \cdot C$
- $(A + B + C)^c$
- $A^c \cdot B^c \cdot C^c$

66. Which of the following expressions indicates the occurrence of exactly two of events A, B, C?

- $(A + B) \cdot C^c$
- $AB + AC + BC$
- $(A + B)(B + C)(A + C)$
- $A \cdot B \cdot C^c + A^c \cdot B \cdot C + A \cdot B^c \cdot C$
- $A \cdot B \cdot C^c$

67. Conditional probability P(A|B) can be defined by

- $P(A|B) = P(A) \cdot P(B)$
- $P(A|B) = \dfrac{P(A \cdot B)}{P(B)}$
- $P(A|B) = \dfrac{P(A \cdot B)}{P(A)}$
- $P(A|B) = P(A) - P(B)$
- $P(A|B) = P(A) + P(B) - P(A \cdot B)$

68. Urn I contains a white and b black balls, whereas urn II contains c white and d black balls. If a ball is randomly selected from each urn, what is the probability that the balls will be both black?

- $\dfrac{b}{a} + \dfrac{d}{c}$
- $\dfrac{b}{a+b} \cdot \dfrac{d}{c+d}$
- $\dfrac{b}{a+b} + \dfrac{d}{c+d}$
- $\dfrac{b}{a} \cdot \dfrac{d}{c}$
- $\dfrac{b+d}{a+b+c+d}$

69. The table below shows the probability mass function of a random variable X.

x_i	0	x_2	5
p_i	0.1	0.2	0.7

If E[X]=5,5 find the value of x_2.

5.5-(5*0.7)=x2*0.2

2=x2*0.2

X2=2/0.2

X2=10

- 3
- 1
- 12
- 0.8

- 10

70. The probability of machine failure in one working day is equal to 0.01. What is the probability that the machine will work without failure for 5 days in a row.

(1-0.01)^5

- 0.99999

- 0.95099

- 1
- 0.05
- 0.55

71. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.4 & if\ \ 2<x\le 5\\ 0.9 & if\ \ 5<x\le 8\\ 1 & if\ \ x>8\end{cases}$$

Find P{3<X<9}.

1-0.4

- 0,4
- 0,5

- 0,6

- 0,9
- 1

72. A fair die is rolled three times. A random variable X denotes the number of occurrences of 6's. What is the probability that X will have the value which is not equal to 0.

P(# of 6's is not 0)
= 1 - P(# of 6's is 0)

= 1 - (5/6)^3
= 0.4213=91/216

- 91/216
- 125/216
- 25/216
- 1/216
- 215/216

73. Find the expectation of a random variable X if the cdf $F(x) = \begin{cases} 1 - e^{-x/5}, x \geq 0 \\ 0, \quad x < 0 \end{cases}$.

- -5
- e^{-5}
- 5
- 6
- 1/5

74. Compute the mean for continuous random variable X with probability density function

$$f(x = \begin{cases} 2(1-x), & if \ 0 \leq x \leq 1 \\ 0, & otherwise \end{cases}.$$

- 2/3
- 0
- 1/3
- 1
- Mean does not exist

75. If the variance of a random variable X is given Var(X)=3. Then Var(2X) is

2^2*3=12

- 12
- 6
- 3
- 1
- 9

76. Indicate the expectation of a Poisson random variable X with parameter λ.

- 0
- λ
- $1/\lambda$
- $\lambda(1-\lambda)$

- λ^2

77. Indicate the variance of a Poisson random variable X with parameter λ.

- λ
- 0
- $\frac{1}{\lambda}$
- $\lambda(1-\lambda)$
- λ^2

78. Indicate the formula for conditional expectation.

- $E[E[X \mid Y] = E[X \mid Y]$
- $E[E[X \mid Y] = E[X]$
- $E[E[X \mid Y] = \{E[X \mid Y]\}^2$
- $E[E[X \mid Y] = E[X] \cdot E[Y]$
- $E[E[X \mid Y] = E[XY]$

79. The table below shows the pmf of a random variable X. What is the Var(X)?

X	-2	1	2
P	0,1	0,6	0,3

4*0.1+1*0.6+4*0.3-(-2*0.1+1*0.6+2*0.3)^2=1.2

- 0.5
- 1.67
- 4.71
- 1.2
- 4.7

80. The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 6.

- 0.04
- 0.15
- 0.47
- 0.53
- 0.94

81. **The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5.**

- ○ 0.03
- ○ 0.13
- ● 0.42
- ○ 0.58
- ○ 0.97

82. If Var(X)=2, find Var(-3X+4).

(-3)^2*2

- ○ 12
- ○ 10
- ○ 9
- ● 18
- ○ 3

83. The table below shows the pmf of a random variable X. Find E[X] and Var(X).

X	-1	0	1
P	0.2	0.3	0.5

0.7-0.09=0.61

- ○ E[X]= 0,7; Var(X) =0.24
- ○ E[X]= 0,3; Var(X) =0.27
- ● E[X]= 0,3; Var(X) =0.61
- ○ E[X]= 0,8; Var(X) =0.21
- ○ E[X]= 0,8; Var(X) =0.24

84. What kind of distribution is given by the density function $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ **(** $-\infty < x < \infty$ **)?**

- ○ Poisson distribution
- ● Normal distribution
- ○ Uniform distribution
- ○ Bernoulli distribution
- ○ Exponential distribution

85. If a fair die is tossed twice, the probability that the first toss will be a number less than 4 and the second toss will be greater than 4 is

3/6*2/6=6/36=1/6

- 1/3
- 5/6
- 1/6
- 3/4
- 0

86. A class consists of 490 female and 510 male students. The students are divided according to their marks

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, the probability that it did not pass given that it is female is:

(60/1000)/(490/1000)=0.12

- 0.06
- 0.12
- 0.41
- 0.81
- none of the shown answers

87. Marks on a Chemistry test follow a normal distribution with a mean of 65 and a standard deviation of 12. Approximately what percentage of the students have scores below 50?

(z<50)=z<(50-65)/12=z<-1.25=0.105 == 11%

- 11%
- 89%
- 15%
- 18%
- 39%

88. Suppose the test scores of 600 students are normally distributed with a mean of 76 and standard deviation of 8. The number of students scoring between 70 and 82 is:

70<z<82= (82-76)/8-((70-76)/8)=0.77-0.22=0.5

600*0.5

Vrode tak hz primernye cifry vzyalW

- 272
- 164
- 260
- 136
- 328

89. The distribution of weights in a large group is approximately normally distributed. The mean is 80 kg. and approximately 68% of the weights are between 70 and 90 kg. The standard deviation of the distribution of weights is equal to:

- 20

- 5
- 40
- 50
- 10

90. The probability density function of a continuous random variable *X* is

$$f(x) = \begin{cases} 0.5x & 0 \le x \le 2 \\ 0 & otherwise \end{cases}.$$ **Find** $P\{0 \le x \le 1.5\}$.

Интеграл мутим 0,5x

И будет ½ * (x^2)/2 = x^2/4=1.5^2/4=2.25/4=0.56

- 0.5625
- 0.3125
- 0.1250
- 0.4375
- 0.1275

91. Let *X* be a continuous random variable with density function

$$f(x) = \begin{cases} \frac{|x|}{10} & for -2 \le x \le 4 \\ 0 & otherwise \end{cases}$$ **Calculate the expected value of *X*.**

Tak kak zdes abs(x) to berem integral ot 2 do 4 (x*x/10 dx) = x3/30 ot 4 do 2 = 64/30-8/30=56/30=28/15

- 1/5
- 3/5
- 1
- 28/15
- 12/5

92. The probability density function of a continuous random variable X is

$$f(x) = \begin{cases} kx^2 & 0 \le x \le 2 \\ 0 & otherwise \end{cases}.$$ **Find the value of k.**

K * integral ot 0 do 2 (x^2) =1

k* x^3/3 ot 0 do 2 = 1

8/3=1/k

K=3/8=0.375

- 2
- 0.25
- 0.375
- 2.25
- Any positive value greater than 2

93. **A continuous random variable X is uniformly distributed over the interval [10, 16]. The expected value of X is**

(a+b)/2=(10+16)/2=13

- 16
- 13
- 10
- 7
- 6

94. **If X and Y are independent random variables with** $p_X(0)=0.5$, $p_X(1)=0.3$, $p_X(2)=0.2$ **and** $p_Y(0)=0.6$, $p_Y(1)=0.1$, $p_Y(2)=0.25$, $p_Y(3)=0.05$. **Then** $P\{X \le 1\, and\, Y \le 1\}$ **is**

(0.5+0.3)*(0.6+0.1)=0.8*0.7=0.56

- 0.30
- 0.56
- 0.70
- 0.80
- 1

95. **How many different three-member teams can be formed from six students?**

C (3,6) = 6!/(6-3)!3! = 20

- 20
- 120
- 216
- 720
- 6

96. **How many different 6-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?**

6!

- 6
- 36
- 720
- 46.656
- 72

97. **If P(E) is the probability that an event will occur, which of the followings must be false?**

- P(E)=1
- P(E)=1/2
- P(E)=1/3
- P(E)= -1
- P(E)=0

98. A die is rolled. What is the probability that the number rolled is greater than 2 and even? Only 4 and 6

2/6=1/3

- ○ 1/2
- ● 1/3
- ○ 2/3
- ○ 5/6
- ○ 0

99. A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?

1 4   4 1   3 2   2 3   5 5   4 6   6 4   so 7/36

Complement will be 29/36

- ○ 2/36
- ○ 12/36
- ● 29/36
- ○ 32/36
- ○ 9/36

100. The cumulative distribution function for continuous random variable X is given by $F(x) = \begin{cases} 0, & x < 0 \\ x, & 0 \le x \le 1 \\ 1, & x > 1 \end{cases}$**. Find the standard deviation** $\sigma(X)$**.**

Expectation : Integral from 0 to 1 xdx= x^2/2 ot 0 do 1= ½

Variance: integral from 0 to 1 (x- 1/2)^2 dx = 1/12

- ○ $\frac{1}{\sqrt{6}}$
- ○ $\frac{1}{6}$
- ● $\frac{1}{\sqrt{12}}$
- ○ $\frac{1}{4}$
- ○ $\frac{1}{12}$

101. A continuous random variable X uniformly distributed on [-2;6]. Find E[X] and Var(X).

(A+b)/2 = -2+6 / 2 = 2

(b-a)^2 / 12 = 64 / 12= 16/3

- ○ 4 and $\frac{4}{3}$

- $\frac{16}{3}$ and 2
- 2 and $\frac{16}{3}$
- $\frac{2}{3}$ and 2
- 2 and $\frac{4}{3}$

102. A continuous random variable X is exponentially distributed with the density $f(x)=\begin{cases}2e^{-2x}, & x\geq 0\\ 0, & x<0\end{cases}$. What is the E[X] and Var(X)?

Tut lambda = 2

So, mean = 1/lambda

Variance = 1/ lambda^2

- $\frac{1}{6}$ and $\frac{1}{2}$
- $\frac{1}{4}$ and $\frac{1}{2}$
- $\frac{1}{2}$ and $\frac{1}{4}$
- $\frac{1}{2}$ and $\frac{1}{6}$
- $\frac{1}{4}$ and $\frac{1}{6}$

103. The expression $\binom{9}{2}$ is equivalent to

- $\frac{9!}{7!}$
- $\frac{9!}{2!}$
- $\frac{9!}{7!\cdot 2!}$
- $\frac{9}{14}$
- $\frac{9!\cdot 2!}{7!}$

104. Evaluate 1!+2!+3!

- 5
- 6

- 9
  - 10
  - 12

105. A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?

  - 2/36
  - 12/36
- 29/36
  - 32/36
  - 1/36

106. Your state issues license plates consisting of letters and numbers. There are 26 letters and the letters may be repeated. There are 10 digits and the digits may be repeated. How many possible license plates can be issued with two letters followed by three numbers?

26*26*10*10*10

  - 25000
  - 67600
  - 250000
- 676000
  - 2500

107. A random variable *X* has the cumulative distribution function

$$F(x) = \begin{cases} 0 & for\ x < 1 \\ \dfrac{x^2 - 2x + 2}{2} & for\ 1 \le x < 2 \\ 1 & for\ x \ge 2 \end{cases}$$

Compute the expectation of X.

  - 7/72
  - 1/8
- 5/6
  - 4/3
  - 23/12

108. A fair coin is thrown in the air four times. If the coin lands with the head up on the first three tosses, what is the probability that the coin will land with the head up on the fourth toss?

  - 0
  - 1/16

- 1/8
- 1/2
- 1/4

109. **A movie theater sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?**

3*3

- 1
- 3
- 9
- 27
- 62

110. **A random variable Y has the following distribution:**

Y |	-1	0	1	2
P(Y)|	3C	2C	0.4	0.1

The value of the constant C is:

(1-0.5)=5c

0.5=5c

C=0.1

- 0.1
- 0.15
- 0.20
- 0.25
- 0.75

111. **A random variable X has a probability distribution as follows:**

X |	0	1	2	3
P(X) |	2k	3k	13k	2k

Then the probability that P(X < 2.0) is equal to

5k/20k=0.25k

- 0.90
- 0.25
- 0.65
- 0.15
- 1

112. **Which one of these variables is a continuous random variable?**

● The time it takes a randomly selected student to complete an exam.

○ The number of tattoos a randomly selected person has.

○ The number of women taller than 68 inches in a random sample of 5 women.

○ The number of correct guesses on a multiple choice test.

○ The number of 1's in N rolls of a fair die

113. Heights of college women have a distribution that can be approximated by a normal curve with a mean of 65 inches and a standard deviation equal to 3 inches. About what proportion of college women are between 65 and 67 inches tall?

65<z<67

(67-65)/3 – (65-65)/3= 0.74-0.5= 0.25

○ 0.75

○ 0.5

● 0.25

○ 0.17

○ 0.85

114. The probability is p = 0.80 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

40*0.8=32

○ 40

○ 20

○ 8

● 32

○ 124

115. A medical treatment has a success rate of 0.8. Two patients will be treated with this treatment. Assuming the results are independent for the two patients, what is the probability that neither one of them will be successfully cured?

1-0.8=0.2

0.2*0.2=0.04

○ 0.5

○ 0.36

○ 0.2

● 0.04

○ 0.4

116. A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...

● Probability distribution

○ The expected value

○ The standard deviation

- Coefficient of variation
- Correlation

117. **Given a normal distribution with μ=100 and σ=10, what is the probability that X>75?**

1-z<75= 1 – (z<(75-100)/10)=1- z(-2.5)= 1- 0.006=0.99

- 0.99
- 0.25
- 0.49
- 0.45
- 0

118. **Which of the following is not a property of a binomial experiment?**

- the experiment consists of a sequence of n identical trials
- each outcome can be referred to as a success or a failure
- the probabilities of the two outcomes can change from one trial to the next
- the trials are independent
- binomial random variable can be approximated by the Poisson

119. **Which of the following random variables would you expect to be discrete?**

- The weights of mechanically produced items
- The number of children at a birthday party
- The lifetimes of electronic devices
- The length of time between emergency arrivals at a hospital
- The times, in seconds, for a 100m sprint

120. **Two events each have probability 0.2 of occurring and are independent. The probability that neither occur is**

0.8*0.8 = 0.64

- 0.64
- 0.04
- 0.2
- 0.4
- none of the given answers

121. **A smoke-detector system consists of two parts A and B. If smoke occurs then the item A detects it with probability 0.95, the item B detects it with probability 0.98 whereas both of them detect it with probability 0.94. What is the probability that the smoke will not be detected?**

- 0.01
- 0.99
- 0.04
- 0.96

- None of the given answers

122. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, what is the probability that it did not pass given that it is male.

(100/1000)/(510/1000) = 0.196

- 0.066
- 0.124
- 0.414
- 0.812
- 0.196

123. A company which produces a particular drug has two factories, A and B. 30% of the drug are made in factory A, 70% in factory B. Suppose that 95% of the drugs produced by the factory A meet specifications while only 75% of the drugs produced by the factory B meet specifications. If I buy the drug, what is the probability that it meets specifications?

0.3*0.95+0.7*0.75=0.81

- 0.95
- 0.81
- 0.75
- 0.7
- 0.995

124. Twelve items are independently sampled from a production line. If the probability any given item is defective is 0.1, the probability of at most two defectives in the sample is closest to …

p(0) + p(1) + p(2)
p(0) = c(12,0) * .1^0 * .9^12 = .2824
p(1) = c(12,1) * .1^1 * .9^11 = .3766
p(2) = c(12,2) * .1^2 * .9^10 = .2301

add them up and you get .8891

- 0.3874
- 0.9872
- 0.7361
- 0.8891

- None of the shown answers

125. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

C(5,6)*c(3,4)/c(8,10)=

Or

C(5,6)/c(8,10)=0.133

- 0.282
- 0.02
- 0.376
- 0.133
- None of the shown answers

126. Suppose that 10% of people are left handed. If 8 people are selected at random, what is the probability that exactly 2 of them are left handed?

8c2*0,1^2*0.9^6

- 0.0331
- 0.0053
- 0.1488
- 0.0100
- 0.2976

127. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

1- 0.15^4

- 0.9995
- 5.06 × 10-4
- 0.15
- 0.6
- 0.5220

128. Which of these has a Geometric model?

- the number of aces in a five-card Poker hand
- the number of people we survey until we find two people who have taken Statistics
- the number of people in a class of 25 who have taken Statistics
- the number of people we survey until we find someone who has taken Statistics
- the number of sodas students drink per day

129. In a certain town, 50% of the households own a cellular phone, 40% own a pager, and 20% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is

0.5*(1-0.4)

- 90%

- 70%
- 10%
- 30%.
- 25%

130. Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that the first and third selected are women?

7/12*6/11*5/10+7/12*5/11*6/10= (7*6*5) / (12*11*10) * 2 =0.3182

- 0.3182
- 0.5817
- 0.78
- 0.916
- 0.1211

131. Twenty percent of the paintings in a gallery are not originals. A collector buys a painting. He has probability 0.10 of buying a fake for an original but never rejects an original as a fake, What is the (conditional) probability the painting he purchases is an original?

- 1/41
- 40/41
- 80/41
- 1
- 40/100

132. Suspose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{t \leq 0\}$.

- 0.8
- 0.5
- 0.3
- 0.2
- 0.1

133. A probability function is a rule of correspondence or equation that:

- Finds the mean value of the random variable.
- Assigns values of x to the events of a probability experiment.
- Assigns probablities to the various values of x.
- Defines the variability in the experiment.
- None of the given answers is correct.

134. Which of the following is an example of a discrete random variable?

- ○ The distance you can drive in a car with a full tank of gas.
- ○ The weight of a package at the post office.
- ○ The amount of rain that falls over a 24-hour period.
- ● The number of cows on a cattle ranch.
- ○ The time that a train arrives at a specified stop.

135. Which of the following is the appropriate definition for the union of two events A and B?

- ○ The set of all possible outcomes.
- ○ The set of all basic outcomes contained within both A and B.
- ● The set of all basic outcomes in either A or B, or both.
- ○ None of the given answers
- ○ The set of all basic outcomes that are not in A and B.

136. Johnson taught a music class for 25 students under the age of ten. He randomly chose one of them. What was the probability that the student was under twelve?

- ● 1
- ○ 0.5
- ○ 1/25
- ○ 0
- ○ 0.25

137. The compact disk Jane bought had 12 songs. The first four were rock music. Tracks number 5 through 12 were ballads. She selected the random function in her CD Player. What is the probability of first listening to a ballad?

8/12=2/3

- ○ 1/3
- ● 2/3
- ○ 1/2
- ○ 1/6
- ○ 1/12

138. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 5?

1 5 5 1 4 2 2 4 3 3 1/5

- ○ 1/6
- ● 1/5
- ○ 1/3
- ○ 5/6
- ○ 1/18

139. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be hearts?

13/52*12/51

- 4/17
- 1/17
- 2/17
- 1/4
- 4/17
- 33/68

140. What is the probability of drawing a diamond from a standard deck of 52 cards?

13/52=1/4

- 1/52
- 13/39
- 1/13
- 1/4
- 1/2

141. One card is randomly selected from a shuffled deck of 52 cards and then a die is rolled. Find the probability of obtaining an Ace and rolling an odd number.

4/52*3/6=1/26

- 1/104
- 7/13
- 1/39
- 1/26
- 1/36

142. The probability that a particular machine breaks down on any day is 0.2 and is independent of the breakdowns on any other day. The machine can break down only once per day. Calculate the probability that the machine breaks down two or more times in ten days.

Chance of exactly 0 breakdowns in 10 days: 0.8^10 = 0.1073741824
Chance of exactly 1 breakdown in 10 days: 0.8^9 * 0.2^1 * C(10,1) = 0.268435456
Chance of 2 or more breakdowns in 10 days: 1 - 0.1073741824 - 0.268435456 = 0.6241903616

- 0.0175
- 0.0400
- 0.2684
- 0.6242
- 0.9596

143. Let A, B and C be independent events such that P(A) = 0.5, P(B) = 0.6 and P(C) = 0.1. Calculate $P(A^c \cup B^c \cup C)$

0.5+0.4-0.5*0.4 = 0.7

0.7+0.1-0.7*0.1=0.73

- ○ 0.69
- ○ 0.71
- ● 0.73
- ○ 0.98
- ○ 1

144. The pdf of a random variable X is given by $f(x)=\frac{1}{\sqrt{8\pi}}e^{-\frac{(x+1)^2}{8}}$.

What are the values of μ and σ?

x-a po formule

2 * sigma^2=8

Sigma=2

- ○ $\mu=1, \sigma=4$
- ○ $\mu=-1, \sigma=4$
- ● $\mu=-1, \sigma=2$
- ○ $\mu=1, \sigma=8$
- ○ $\mu=1, \sigma=2$

145. What quantity is given by the formula $\frac{Cov(X,Y)}{\sqrt{Var(X)\cdot Var(Y)}}$ **?**

- ○ Covariance of the random variables X and Y
- ● Correlation coefficient
- ○ Coefficient of symmetry
- ○ Conditional expectation
- ○ None of the given answers is correct

146. In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?

C(4,1)*c(48,4) / c(52,5) =

- ● 0.2995
- ○ 0.699
- ○ 0.23336
- ○ 1/4
- ○ 0.4999

147. The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=3. It is assumed that

arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:

$$P(X = x) = e^{-\lambda}\frac{\lambda^x}{x!} \qquad x = 0, 1, 2, 3, 4, \ldots$$

E^(-3)*3^2/2! +e^(-3)*3+e^-3= 0.42319

- 0.64726
- 0.81521
- 0.42319
- 0.18478
- 0.08391

148. Table shows the cumulative distribution function of a random variable X. Determine $P(X \geq 2)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3

149. Table shows the cumulative distribution function of a random variable X. Determine $P(X > 4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 1
- 1/2
- 3/4
- 0

150. Which of the following statements is always true for A and A^C **?**

- $P(AA^c)=1$
- $P(A^c)=P(A)$
- $P(A+A^c)=0$
- $P(AA^c)=0$
- None of the given statements is true

151. **Consider the universal set U and two events A and B such that $A \cap B = \varnothing$ and $A \cup B = U$. We know that P(A)=1/3. Find P(B).**

- ● 2/3
- ○ 1/3
- ○ 4/9
- ○ Cannot be determined
- ○ 1

152. **A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?**

- ○ 1/3
- ● 3/8
- ○ 5/8
- ○ 1/8
- ○ 1

153. **If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$**

- ○ 1/4, always
- ● 1/4, if A and B are independent
- ○ 1/2, always
- ○ 1/2, if A and B are independent
- ○ None of the given answers

154. **Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).**

$$\mathbb{P}(A \mid B) = \frac{\mathbb{P}(A \cap B)}{\mathbb{P}(B)},$$

X / (2/7) = 3/5

X= 2/7 * 3/5 = 6/35

6/35 / 1/ 4 = p B | A

6/35* 4/1 = 24/35

- ○ 24/75
- ● 24/35
- ○ 6/35
- ○ 12/75
- ○ None of the given answers

155. **A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.**

((c(8,2)*c(7,1) + c(8,3)*c(7,0)))/ (15,3)=

- ○ 512/3375
- ● 28/65
- ○ 8/15
- ○ 1856/3375
- ○ 36/65

156. If the variance of a random variable X is equal to 3, then Var(3X) is :

3^2*3

- ○ 12
- ○ 6
- ○ 3
- ● 27
- ○ 9

157. Let X and Y be continuous random variables with joint cumulative distribution function $F(x,y)=\frac{1}{250}\left(20xy-x^2y-xy^2\right)$ **for** $0\le x\le 5$ **and** $0\le y\le 5$**. Find P(X>2).**

- ○ 3/125
- ○ 11/50
- ● 12/25
- ○ $1-\frac{1}{250}\left(36y-2y^2\right)$
- ○ $\frac{1}{250}\left(39y-3y^2\right)$

158. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$ **.**

- ● $\lambda=np\sim const$, $n\to\infty,\ p\to 0$
- ○ $\lambda=\frac{n}{p}$, $n\to\infty$
- ○ $\lambda=ep$, $n\to\infty$
- ○ $\lambda=n^p$, p is const
- ○ None of the given answers is correct

159. Let X be a continuous random variable with PDF f(x) = cx (0 ≤ x ≤ 1), where c is a constant. Find the value of constant c.

C * x^2/2 ot 0 do 1 = 1

C=1 / ½

C =2

- 1
- 2
- 1/2
- 3/2
- 4

160. We are given the pmf of two random variables X and Y shown in the tables below.

X	1	3
p_x	0,4	0,6

y	2	4
p_y	0,2	0,8

Find E[X+Y].

0.4+0.6*3+0.2*2+0.8*4

- 5,8
- 2,2
- 2
- 8,8
- 10

161. The pdf of a random variable X is given by $f(x)=\begin{cases} \dfrac{1}{\gamma-2{,}5}, & if \quad x\in(1{,}5;3), \\ 0, & otherwise \end{cases}$.

Calculate the parameter γ.

- 0
- 4
- 1,5
- 2
- 3,5

162. Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that three of those selected are women?

(7/12*6/11*5/10*5/9)* 4

- 0.35
- 0.65
- 0.45
- 0.25
- 0.1211

163. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{T\geq 0 \; and \; T<2\}$.

0.5+0.3

- 0.8
- 0.5
- 0.3
- 0.2
- 0.1

164. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Compute the mean of the random variable T.

0.3+0.2*2

- 0.8
- 0.5
- 0.7
- 0.1
- 1

165. Three dice are rolled. What is the probability that the points appeared are distinct.

- 1
- 5/9
- 2
- 1/3
- 1/2

166. Probability density function of the normal random variable X is given by $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-3)^2}{50}}$ **. What is the standard deviation?**

50=2*sigma^2

Sigma = 5

- 5
- 3
- 25
- 50
- 9

167. The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.

- p^5

- $1-(1-p)^5$
  - $(1-p)^5$
  - $1-p^5$
  - None of the given answers is correct

168. The cdf of a random variable X is given by $F(x)=\begin{cases} 0 & if \quad x \le 3/2 \\ 2x-3 & if \quad 3/2 < x \le 2 \\ 1 & if \quad x > 2. \end{cases}$ **Find the probability P(1.7<X<1.9).**

Z(1.9)-z(1.7)=1.9*2-3   - (2*1.7-3)

  - 0,16
  - 0,8
  - 1
- 0,4
  - 0.6

169. In each of the 20 independent trials the probability of success is 0.2. Find the variance of the number of successes in these trials.

Variance= sigma^2

Sigma= sqrt(npq)

So 20*0.2*0.8

  - 0
  - 1
  - 10
- 3.2
  - 0.32

170. A coin tossed twice. What is the probability that head appears in the both tosses.

HH th ht tt

  - 1/2
- 1/4
  - 0
  - 4:1
  - 1

171. Continuous random variable X is normally distributed with mean=1 and variance=4. Find P(4≤x≤6).

Z((6-1 / 4) – z((4-1)/ 4)=0.89-0.77=

- 0,0606

- 0,202
- 0,0305
- 0,0484
- 0,0822

172. **Random variable X is uniformly distributed on the interval [-2, 2]. Indicate the right values for E[X] and Var(X).**

(A+b)/2=mean

(b-a)^2 / 12= 16/12

- E[X]=0 and Var(X)=4
- E[X]=0 and Var(X)=1.33
- E[X]=0.5 and Var(X)=1.33
- E[X]=0 and Var(X)=0
- No right answer

173. **Expectation and standard deviation of the normally distributed random variable X are respectively equal to 15 and 5. What is the probability that in the result of an experiment X takes on the value in interval (5, 20)?**

- Φ(20) – Φ(5)
- Φ(5) + Φ(10)
- Φ(1) – Φ(0)
- Φ(20) + Φ(5)
- Φ(1) + Φ(2)-1
- Φ(2) – Φ(1)

174. **Normally distributed random variable X is given by density** $f(x)=\frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$ **. Find the mean.**

- -1/2
- 1/2
- 1/4
- 0
- 1

175. **Indicate the density function of the normally distributed random variable X when mean=2 and variance=9.**

Variance=sigma^2

- $\varphi(x)=\frac{1}{9\sqrt{2\pi}}e^{-\frac{(x-2)^2}{18}}$
- $\varphi(x)=\frac{1}{2\sqrt{2\pi}}e^{-\frac{(x-9)^2}{8}}$

- $\varphi(x)=\frac{1}{3\sqrt{2\pi}}e^{-\frac{(x-2)^2}{18}}$
  - $\varphi(x)=\frac{1}{6\sqrt{2\pi}}e^{-\frac{(x-a)^2}{72}}$
  - $\varphi(x)=-\frac{1}{\sigma\sqrt{2\pi}}e^{\frac{(x-a)^2}{2\sigma^2}}$

176. Indicate the PDF for standard normal random variable.

  - $f(x)=\lambda x^{-\lambda x}$, $x\geq 0$
  - $f(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$
  - $f(x)=\frac{1}{b-a}$, $a\leq x\leq b$
- $f(x)=\frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$
  - $f(x)=-\lambda e^{-\lambda x}$, $x\geq 0$

177. Random variable X is uniformly distributed in interval [0, 3]. What is the variance of X?

(b-a)^2 / 12 = 9/12

- 0.75
  - 1.5
  - 3
  - 0.25
  - 1

178. Random variable X is uniformly distributed in interval [0, 15]. What is the expectation of X?

15/2

  - 15
  - 3.75
- 7.5
  - 30
  - 0

179. Random variable X is uniformly distributed in interval [-2, 1]. What is the distribution of the random variable Y=2X+2?

2*-2+2=-2

2*1+2=4

Просто закидываем А потом Б вместо икса

- Y is normally distributed in the interval [-4, 2]
- Y is uniformly distributed in the interval [-2, 4]
- Y is normally distributed in the interval [-2, 4]
- Y is exponentially distributed in the interval [-4, 2]
- Y has other type of distribution

180. Random variable X is uniformly distributed in interval [-11, 26]. What is the probability P(X> - 4)?

- 29/38
- 29/37
- 30/37
- 15/19
- 0

181. Random variable X is uniformly distributed in interval [1, 3]. What is the distribution of the random variable Y=3X+1?

3*1+1=4

3*3+1=10

- Y is normally distributed in the interval [3, 9]
- Y is uniformly distributed in the interval [4, 10]
- Y is normally distributed in the interval [4, 10]
- Y is exponentially distributed in the interval [4, 10]
- Y has other type of distribution

182. Random variable X is uniformly distributed in interval [-11, 20]. What is the probability $P(X \leq 0)$?

- 11/32
- 5/16
- 10/31
- 11/31
- 0

183. Random variable X is given by density function f(x) in the interval (0, 1) and otherwise is 0. What is the expectation of X?

- $\int_{-\infty}^{+\infty} xf(x)dx$
- $\int_{-\infty}^{+\infty} f(x)dx$
- $\int_{0}^{1} xf(x)dx$

- $\int_0^1 f(x)dx$
- E[X]=0

184. **Random variable X is given by density function f(x) = x/2 in the interval (0, 2) and otherwise is 0. What is the expectation of X?**

Integral ot 0 do 2 x * x/2 = x^3 / 6 ot 0 do 2 = 8/6=4/3

- 1/2
- 1
- 4/3
- 2/3
- 0

185. **Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the expectation of X?**

Integral ot 0 do 1 x * 2x = 2x^3 /3 ot 0 do 1 = 2/3

- 1/2
- 1
- 4/3
- 2/3
- 0

186. **Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the probability P(0 < X < 1/2) ?**

Integral ot 0 do ½ 2x = x^2 ot 0 do ½ = ½ ^ 2 = ¼

- 1/2
- 1/4
- 0
- 1/8
- 0
- None of these

187. **Indicate the function that can be CDF of some random variable.**

- $F(x) = \begin{cases} 0, & x \le 1 \\ x - 1/2, & 1 < x \le 2 \\ 0, & x > 2 \end{cases}$
- $F(x) = \begin{cases} 0, & x \le 1 \\ 2 - x, & 1 < x \le 2 \\ 1, & x > 2 \end{cases}$

- $F(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$
- $F(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 4\\ 0, & x>4\end{cases}$
- None of these

188. Indicate the function that can be PDF of some random variable.

- $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 0, & x>2\end{cases}$
- $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$
- $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 4\\ 0, & x>4\end{cases}$
- $f(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$
- $f(x)=\begin{cases}0, & x\le 1\\ x/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

189. Continuous random variable X has the following CDF:

$F(x)=\begin{cases}0, & x\le 0\\ \frac{x}{2}, & 1<x\le 2\\ 1, & x>2\end{cases}$ **. What is the PDF of X in the interval $1<X\le 2$?**

2/2 – ½

- 1/2
- 0
- 1
- $X^2/4$
- x

190. Continuous random variable X is given in the interval [0, 100]. What is the probability P(X=50)?

- 0
- 1

- 0.5
- 0.75
- 0.25

191. CDF of discrete random variable X is given by

$$F(x) = \begin{cases} 0, & x \leq 1 \\ 0{,}3, & 1 < x \leq 2 \\ 0{,}5, & 2 < x \leq 3 \\ 1, & x > 3 \end{cases}$$

What is the probability P{1.3<X≤2.3}?

0.5-0.3

- 0.8
- 0.2
- 0
- 0.6
- 0.4

192. PMF of discrete random variable is given by

X	0	2	4
P	0,1	0,5	0,4

Find the value of CDF of X in the interval (2, 4].

- 0.4
- 0.5
- 0.2
- 0.6
- 1

193. PMF of discrete random variable is given by

X	0	2	4
P	0,3	0,1	0,6

Find F(2).

0.3+0.1

- 0.4
- 0.6
- 0.3
- 0.7
- 0.1

194. **PMF of discrete random variable X is given by**

X	-1	5
P	0,4	0,6

Find standard deviation of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

Variance = sigma^2

Sigma= 2.93

- ○ 15.4
- ○ 8.64
- ○ 2.6
- ● 2.9393
- ○ 3.3333

195. **PMF of discrete random variable X is given by**

X	-1	5
P	0,4	0,6

Find variance of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

- ○ 15.4
- ● 8.64
- ○ 2.6
- ○ 2.93
- ○ 3.33

196. **PMF of discrete random variable X is given by**

X	0	5	x_3
P	0,6	0,1	0,3

If E[X]=3.5 then find the value of x_3.

5*0.1+x3*0.3=3.5

x3*0.3=3

x3=10

- ● 10
- ○ 6
- ○ 8
- ○ 12

○ 24

197. **Probability of success in each of 100 independent trials is constant and equals to 0.8. What is the probability that the number of successes is between 60 and 88?**

Mean = 80

Sigma=sqrt(100*0.8*0.2)=4

(88-80 / 4) – (60-80 / 4)= 2 - -5

○ $P_{100}(60 \le m \le 88) \approx \Phi(88) - \Phi(60)$

● $P_{100}(60 \le m \le 88) \approx \Phi(2) - \Phi(-5)$

○ $P_{100}(60 \le m \le 88) \approx \Phi(88) + \Phi(60)$

○ $P_{100}(60 \le m \le 88) \approx \Phi(2) + \Phi(5)$

○ $P_{100}(60 \le m \le 88) \approx \Phi(8) + \Phi(20)$

198. **A man is made 10 shots on the target. Assume that the probability of hitting the target in one shot is 0,7. What is the most probable number of hits?**

○ 8

● 7

○ 6

○ 5

○ 9

199. **Consider two boxes, one containing 4 white and 6 black balls and the other - 8 white and 2 black balls. A box is selected at random, and a ball is drawn at random from the selected box. If the ball occurs to be white, what is the probability that the first box was selected?**

P(B|A)=p(A|B)*p(B)/p(A)

○ 0.4

○ 0.6

○ 0.8

● 1/3

○ 2/3

200. **Each of two boxes contains 6 white and 4 black balls. A ball is drawn from 1st box and it is replaced to the 2nd box. Then a ball is drawn from the 2nd box. What is the probability that this ball occurs to be white?**

(7/11+6/11) * ½

○ 0.3

○ 0.4

○ 0.5

● 0.6

○ 0.8

201. **Consider two boxes, one containing 3 white and 7 black balls and the other – 1 white and 9 black balls. A box is selected at random, and a ball is drawn at random from the selected box. What is the probability that the ball selected is black?**

(7/10 + 9/10) * ½ =8/10 =0.8

- 0.8
- 0.2
- 0.4
- 1.6
- 0.9

202. **Urn I contains 4 black and 6 white balls, whereas urn II contains 3 white and 7 black balls. An urn is selected at random and a ball is drawn at random from the selected urn. What is the probability that the ball is white?**

(6/10 + 3/10) * ½ = 9/10* ½ = 0.45

- 0.45
- 0.15
- 0.4
- 0.9
- 1

203. **A coin is tossed twice. Event A={ at least one Head appears}, event B={at least one Tail appears}. Find the conditional probability P(B|A).**

A= HT TH HH=3/4

B= TT HT TH=3/4

2/3 sovpadenie

- 2/3
- 1/3
- 1/2
- 3/4
- 0

204. **A coin is tossed twice. Event A={ Head appears in the first tossing}, event B={at least one Tail appears}. Find the conditional probability P(B|A).**

A=**HT** HH

B=**HT** TH TT

- 1/4
- 1/2
- 1/3
- 2/3
- 3/4

205. **Probability that each shot hits a target is 0.9. Total number of shots produced to the target is 5. What is the probability that at least one shot hits the target?**

- ○ $1-0{,}9^5$
- ○ $0{,}9^5$
- ○ 1-5·0,9
- ● $1-0{,}1^5$
- ○ $0{,}1^5$
- ○ 1-5·0,1

206. **An urn contains 1 white and 9 black balls. Three balls are drawn from the urn without replacement. What is the probability that at least one of the balls is white? ***

9/10*8/9*1/8 * 3= 0.3

- ○ 0.7
- ● 0.3
- ○ 0.4
- ○ 0.2
- ○ 0.6

207. **Four independent shots are made to the target. Probability of missing in the first shot is 0.5; in the second shot – 0.3; in the 3rd – 0.2; in the 4th – 0.1. What is the probability that the target is not hit.**

0.5*0.3*0.2*0.1=0.003

- ○ 1.1
- ○ 0.03
- ○ 0.275
- ● 0.003
- ○ 1.01

208. **Probability of successful result in the certain experiment is 3/4. Find the most probable number of successful trials, if their total number is 10.**

¾*10=7.5

- ○ 6
- ○ 7
- ● 8
- ○ 5
- ○ 10

209. **Let E and F be two mutually exclusive events and P(E)=P(F)=1/3. The probability that none of them will occur is:**

- ○ No correct answer
- ● $P((E \cup F)^c) = 1 - (P(E) + P(F)) = 1 - \frac{1}{3} - \frac{1}{3} = \frac{1}{3}$
- ○ $P(E \cup F) = P(E) + P(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$

- ○ $P(E \cap F) = P(E) + P(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
- ○ $P(E^c \cup F^c) = P(E^c)P(F^c) = \frac{2}{3}\frac{2}{3} = \frac{4}{9}$

210. Let E and F be two events. If $P(E) = \frac{3}{4}$, $P(F) = \frac{1}{2}$, $P(E \cup F) = 1$ and $P(E \cap F) = \frac{1}{4}$, then the conditional probability of E given F is:

¼ / ½ = ½

- ○ $P(E|F) = \frac{1}{4}$
- ○ $P(E|F) = \frac{3}{4}$
- ● $P(E|F) = \frac{1}{2}$
- ○ $P(E|F) = \frac{1}{3}$
- ○ No correct answer

211. Given that Z is a standard normal random variable. What is the value of Z if the area to the left of Z is 0.9382?

- ○ 1.8
- ● 1.54
- ○ 2.1
- ○ 1.77
- ○ 3

212. At a university, 14% of students take math and computer classes, and 67% take math class. What is the probability that a student takes computer class given that the student takes math class?

P(AB)=0.14

P(A)=0.67

P(B|A)=p(BA)/p(A)=0.14/0.67=0.21

- ○ 0.81
- ● 0.21
- ○ 0.53
- ○ No correct answer
- ○ 0.96

213. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint p.d.f. of X and Y. Find the marginal PDF of X.

X+y^2/2 ot 0 do 1 dlya Y= x + 1/2

- ○ x
- ● x+1/2
- ○ y+1/2

- x^2+1
- x^2+y^2

214. If two random variables X and Y have the joint density function, $f_{X,Y}(x,y)=\begin{cases} xy & \text{for } 0<x<1,\ 0<y<2 \\ 0 & \text{elsewhere} \end{cases}$**, find the probability P(X+Y<1).**

- 1/24
- 1/12
- 5/12
- 1/4
- 0.003

215. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases} \frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1 \\ 0 & \text{elsewhere} \end{cases}$**, find the conditional PDF** $f_{X|Y}(x\,|\,y)$**.**

- $\frac{(x+y^2)}{1+y^2}$
- $\frac{2(x+y^2)}{1+2y^2}$
- $\frac{5(x+y^2)}{12}$
- $\frac{\frac{6}{5}(x+y^2)}{1+y^2}$
- None of these

216. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases} \frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1 \\ 0 & \text{elsewhere} \end{cases}$**, find the conditional PDF** $f_{Y|X}(y\,|\,x)$**.**

- $\frac{(x+y^2)}{1+x}$
- $\frac{3(x+y^2)}{x}$
- $\frac{3(x+y^2)}{1+3x}$
- $\frac{\frac{6}{5}(x+y^2)}{1+3x}$
- None of these

217. A basketball player makes 90% of her free throws. What is the probability that she will miss for the first time on the seventh shot?

0.9^6*0.1

- ○ 0.0001
- ● 0.053
- ○ 0.002
- ○ 0.001
- ○ 0.01

218. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}2(1-x) & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Then find P(Y>0.5).

- ● 0.5
- ○ 0.25
- ○ 0.75
- ○ 1
- ○ 1.5

219. Let X be a continuous random variable with probability density given by $f(x)=\begin{cases}\frac{x}{12} & \text{for } 1<x<5\\ 0 & \text{elsewhere}\end{cases}$.

Let Y=2X-3. Find P(Y≥4).

- ○ 0.3438
- ● 0.53125
- ○ 0.0625
- ○ 0.1563
- ○ 0

220. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find $P(-0.8\le X\le 0.8)$**.**

- ○ 0.31
- ○ 0.428
- ● 0.512
- ○ 0
- ○ 0.78

221. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find E[X].

- ● 0

- 1
- 2
- 3
- 4

222. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find Var[X].

- 0
- 1
- 0.6
- 0.8
- 0.4

223. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find $E\left[\frac{1}{X}\right]$**.**

- 4
- 0
- 2
- 1
- -2

224. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the marginal density function for X.

- 6y
- $6y^2$
- $6x^2$
- $3x^2$
- $3x^3$

225. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the marginal density function for Y.

- $3x^2$
- 6y

- 2y
  - $2y^2$-1
  - y+6

226. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the E[X].

  - 0.25
- 0.75
  - 0.5
  - 0.95
  - None of these

227. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the E[Y].

  - 1
- 2/3
  - 1/3
  - 0.5
  - 0.25

228. Assume that Z is standard normal random variable. What is the probability P(|Z|>2.53)?

- 0.9943
- 0.0114
  - 0.0057
  - 0.9886
  - None of these

229. If Z is normal random variable with parameters μ=0, σ^2=1 then the value of c such that P(|Z|<c)=0.7994 is

- 1.28
- 0.84
  - 1.65
  - 2.33
  - None of these

230. The random variable X has the continuous CDF

$$F(x)=\begin{cases}0, & x<0\\ \dfrac{x^2}{9}, & 0\le x<3\\ 1, & 3\le x\end{cases}$$ **. Find P(2≤X≤4).**

- ○ 16/9
- ○ 4/3
- ○ 4/9
- ● 5/9
- ○ 2/3

231. Let X be the random variable for the life in hours for a certain electronic device. The probability density function is

$$f(x)=\begin{cases}\dfrac{200{,}000}{x^3} & \text{for } x>100\\ 0 & \text{elsewhere}\end{cases}$$ **. Find the expected life for a component.**

- ● 2000 hours
- ○ 1000 hours
- ○ 100 hours
- ○ 200 hours
- ○ None of these

232. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}x+y & \text{if } \quad 0\le x\le 1, 0\le y\le 1\\ 0, & \text{otherwise}\end{cases}$$. Find E[X-Y].

- ● 0
- ○ 7/6
- ○ 2/3
- ○ 1/6
- ○ None of these

233. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}x+y & \text{if } \quad 0\le x\le 1, 0\le y\le 1\\ 0, & \text{otherwise}\end{cases}$$. Find E[X+Y].

- ○ 1/6
- ○ 6/7
- ● 7/6
- ○ 5/6
- ○ 0

234. The joint density function for the random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases} xe^{-x(1+y)} & if \quad x\geq 0,\ y\geq 0 \\ 0, & otherwise \end{cases}$$

. Find E[X].

- ○ 0
- ● 1
- ○ 1.4142
- ○ 2
- ○ None of these

235. A box contains 15 balls, 10 of which are black. If 3 balls are drawn randomly from the box, what is the probability that all of them are black?

10/15*9/14*8/13=0.26

- ● 0.26
- ○ 0.52
- ○ 0.1
- ○ None of these
- ○ 0.36

236. The Cov(aX,bY) is equal to

- ○ $aCov(X,Y)+bCov(X,Y)$
- ○ $aCov(X,Y)-bCov(X,Y)$
- ● $abCov(X,Y)$
- ○ $a^2b^2Cov(X,Y)$
- ○ $\frac{a}{b}Cov(X,Y)$

237. If A and B are two mutually exclusive events with P(A) = 0.15 and P(B) = 0.4, find the probability P(A and B^c) (i.e. probability of A and B complement).

0.15*0.6

- ○ 0.4
- ● 0.15
- ○ 0.85
- ○ 0.6
- ○ 0.65

238. From a group of 5 men and 6 women, how many committees of size 3 are possible with two men and 1 woman if a certain man must be on the committee?

- ○ $\binom{5}{1}\times\binom{6}{1}$
- ● $\binom{4}{1}\times\binom{1}{1}\times\binom{6}{1}$

- $\binom{1}{1} \times \binom{6}{1}$
- $\binom{5}{2} \times \binom{6}{1}$
- None of these

239. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Find the marginal PDF of Y.

- y+1/2
- y
- 1/2y
- $y^2/2$
- 1/2

240. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Compute E[X].

- 0.2
- 0.823
- 0.583
- 1
- 0

241. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Compute E[Y].

- 0.2
- 0.823
- 0.583
- 1
- 0

242. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Compute E[2X].

- 7/6
- 0
- 1
- 7/12
- 1/6

243. Let X be continuous random variable with probability density function

$f(x) = \begin{cases} \frac{x}{6}, & if\ 2 < x < 4 \\ 0, & otherwise \end{cases}$ **Find the expected value of random variable X.**

.

- 19/3
- 13/3
- 12/7
- 28/9
- 27/4

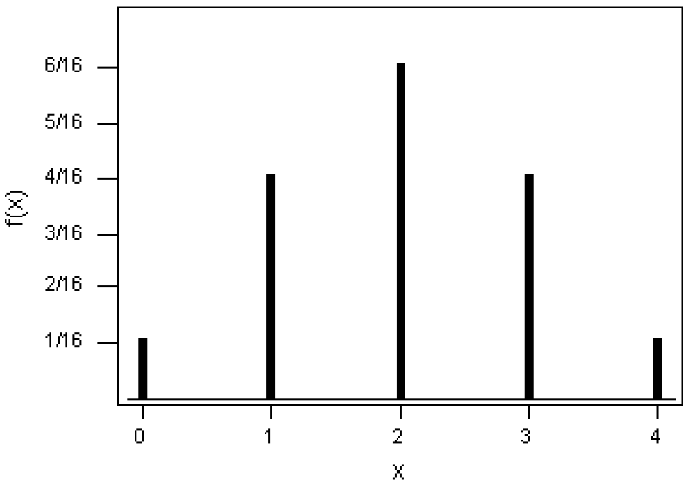
244. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}2(1-x) & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Then find P(X>0.5).

- 0.5
- 0.25
- 0.15
- 0.75
- 0.1

245. Probability mass function for discrete random variable X is represented by



the

graph. Find Var(X).

- 1
- 4
- 5
- 2
- 6

246. Two dice are rolled, find the probability that the sum is less than 13.

- 1
- 1.2
- 0.5
- 0.6

- 0.8

247. A bag has six red marbles and six blue marbles. If two marbles are drawn randomly from the bag, what is the probability that they will both be red?

C(2,6)/c(2,12)

- 1/2
- 11/12
- 5/12
- 5/22
- 1/3

248. A man can hit a target once in 4 shots. If he fires 4 shots in succession, what is the probability that he will hit his target?

$$1-\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)=1-\left(\frac{3}{4}\right)^4=1-\frac{81}{256}=\frac{256}{256}-\frac{81}{256}=\frac{175}{256}$$

- 175/256
- 1
- 1/256
- 81/256
- 144/256

249. Let random variable *X be normal with parameters mean=5, variance=9.* Which of the following is a standard normal variable?

- Z=(X-5)/5
- Z=(X-3)/5
- Z=(X-5)/3
- Z=(X-3)/3
- None of these

250. A coin is tossed 6 times. What is the probability of exactly 2 heads occurring in the 6 tosses.

- $\binom{6}{2}\left(\frac{1}{2}\right)^6$
- $\left(\frac{1}{2}\right)^6$
- $\left(\frac{1}{3}\right)^6$

- $\binom{6}{2}\left(\frac{1}{3}\right)^6$
- None of these

251. The number of all possible permutations : ***$P_n = n!$***

252. How many two-place numbers can be made of the digits 1, 4, 5 and 7 if each digit is included into the image of a number only once? 12

3 .The number of all possible allocations: $A_n^m = \frac{n!}{(n-m)!}$

253. The number of all possible combinations $C_n^m = \frac{n!}{m!(n-m)!}$

254. How many ways are there to choose 2 details from a box containing 9 details?: 36

255. The numbers of allocations, permutations and combinations are connected by the equality: $A_n^m = P_m \cdot C_n^m$.

256. If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by m+n… ways.

257. Events are *equally possible* if … there is reason to consider that none of them is more possible (probable) than other.

258. The probability of the event *A* is determined by the formula : $P(A) = \frac{m}{n}$

259. The probability of a reliable event is equal to … is equal to 1.

260. The probability of an impossible event is equal to … 0

12.The probability of a random event is … the positive number between 0 and 1.

The relative frequency of the event *A* is defined by the formula: $W(A) = \frac{m}{n}$

261.

262. There are 100 identical details (and 20 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted. : 20/100 = 1/5=0.2

263. A die is tossed. Find the probability that an even number of aces will appear. : 1/2

264. Participants of a toss-up pull a ticket with numbers from 1 up to 30 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 2. : 12/30= 0.4

265. In a batch of 8 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to? : 3/8

266. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,4. Find the number of hits if 20 shots were made. : 8

267. Two dice are tossed. Find the probability that different number of aces will appear on dices : 30/36=5/6

268. Two dice are tossed. Find the probability that the sum of aces will exceed 10. : 3/36=1/12

269. An urn contains 15 balls: 4 white, 6 black and 5 red. Find the probability that a randomly taken ball will be red or white. : 5/15 + 4/15

270. 12 seeds have germinated of 60 planted seeds. Find the relative frequency of germination of seeds. = 12/60 = 1/5

271. A point *C* is randomly appeared in a segment *AB* of the length 5. Determine the probability that the distance between *C* and *B* doesn't exceed 1. :: 1/5

272. A coin is tossed twice. Find the probability that the coin lands on tails in both times. : 1/4

273. There are 200 details in a box. It is known that 150 of them are details of the first kind, 10 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the third kind from the box are there? : C 200 150 + C200 40

274. If an object *A* can be chosen from the set of objects by *m* ways and after every such choice an object *B* can be chosen by *n* ways then the pair of the objects (*A*, *B*) in this order can be chosen by ... ways. :: m*n

275. There are 12 students in a group. It is necessary to choose a leader, its deputy and head of professional committee. How many ways of choosing them are there? :: C12 1 * C 11 1 = 132

276. 5 of 20 students have sport categories. What is the probability that 3 randomly chosen students have sport categories? :: C 5 3 / C 20 3 = 10/ 1140

277. A box contains 5 red, 6 green and 4 blue pencils. 3 pencils are randomly extracted from the box. Find the probability that all the extracted pencils are different color. :: 0.25

278. It has been sold 12 of 15 refrigerators of three marks available in quantities of 5, 7 and 3 units in a shop. Assuming that the probability to be sold for a refrigerator of each mark is the same, find the probability that refrigerators of one mark have been unsold. ???

279. A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the i-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event *A* – «only two hit».p

280. The probability of appearance of any of two incompatible events is equal to: p(A) + p(B)

281. There are 20 balls in an urn: 3 red, 2 blue and 15 white. Find the probability of appearance of a color (red or blue) ball. :: 2/20 + 3/20

282. A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,5 and in the second – 0,3. Find the probability that the shooter will hit at one shot either in the second area or in the third area. 0,5

283. The sum of the probabilities of events $A_1, A_2, \ldots, A_n$ which form a complete group is equal to 1…

284. A consulting point of an institute receives packages with control works from the cities *A*, *B* and *C*. The probability of receiving a package from the city *A* is equal 0,2; from the city *B* – 0,2. Find the probability that next package will be received from the city *C*. 1-0.4=0.6

285.* Two uniquely possible events forming a complete group are … *opposite

The sum of the probabilities of opposite events is equal to … $P(A) + P(\overline{A}) = 1$

286. The probability that a day will be rainy is $p = 0,75$. Find the probability that a day will be clear. 0.25

287. *The conditional probability* of an event *A* with the condition that an event B has already happened is equal to:Pb (A)= p(AB)/p(b)

288. There are 4 conic and 8 elliptic cylinders at a collector. The collector has taken one cylinder, and then he has taken the second cylinder. Find the conditional probability that the second taken cylinder is elliptic given that the first was conic. 8/11

289. There are 4 white, 5 black and 6 blue balls in an urn. Each trial consists in extracting at random one ball without replacement. Find the probability that a white ball will appear at the first trial (the event *A*), a black ball will appear at the second trial (the event *B*), and a blue ball will appear at the third trial (the event *C*). 4/15*5/14*6/13

290. The events *A*, *B*, *C* and *D* form a complete group. The probabilities of the events are those: $P(A) = 0,1$; $P(B) = 0,49$; $P(C) = 0,3$. What is the probability of the event *D* equal to? D()=0.11

291. For independent events theorem of multiplication has the following form: $P(AB) = P(A) \cdot P(B)$

292. Find the probability of joint hit in a target by two guns if the probability of hit in the target by the first gun (the event *A*) is equal to 0,3; and by the second gun (the event *B*) – 0,5. 0.15

293. There are 3 boxes containing 10 details each. There are 5 standard details in the first box, 6 – in the second and 3 – in the third box. One takes at random on one detail from each box. Find the probability that all three taken details will be standard. 0.09

294. **The probabilities of hit in a target at shooting by three guns are the following: $p_1 = 0{,}6$; $p_2 = 0{,}7$; $p_3 = 0{,}5$. Find the probability of at least two hits at one shot by all three guns.**

1-fneg+secn+thirdneg.

295. **There are 3 flat-printing machines at typography. For each machine the probability that it works at the present time is equal to *0,6*. Find the probability that at least one machine works at the present time**

(1-0.4^3);

296. **What is the probability that at tossing two dice 3 aces will appear at least on one of the dice?**

- 1/6 *5/6 +1/6 *1/6 +1/6 *5/6

297. **Three shots are made in a target. The probability of hit at each shot is equal to 0,6. Find the probability that only two hits will be in result of these shots.**

- 0.432

298. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,5; by the second – 0,2; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by only one student?**

- 0.42

299. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,5; by the second – 0,3; and by the third – 0,7. What is the probability that the exam will be passed on "excellent" by exactly two students?**

-

300. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by at least one student?**

- 1-0.7*0.3*0.2

301. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by neither of the students?**

- 0.7*0.3*0.2

302. **Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that two of them will make purchases.**

(0.64*0.2) *3 =0.384

303. **Four buyers went in a shop. The probability that each buyer makes purchases is equal to 0,5. Find the probability that three of them will make purchases.**

304. **Four buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that only one of them will make purchases.**

305. **There are 5 details made by the factory № 1 and 15 details of the factory № 2 at a collector. Two details are randomly taken. Find the probability that at least one of them has been made by the factory № 1.**

- 85/190

306. **There are 5 details made by the factory № 1 and 15 details of the factory № 2 at a collector. Two details are randomly taken. Find the probability that at least one of them has been made by the factory № 2.**

- 1-C 5 2/C20 2=18/19

307. **10 of 20 savings banks are located behind a city boundary. 4 savings banks are randomly selected for an inspection. What is the probability that among the selected banks appears inside the city 2 savings banks?**

- C10 2 *C10 2/C20 4

308. **The probabilities that three men hit a target are respectively 1/3, 1/4 and 1/2. Each man shoots once at the target. What is the probability that exactly one of them hits the target?**

309. **A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will not be solved?**

310. **A problem in mathematics is given to three students whose chances of solving it are 1/3, 3/4, 3/5. What is the probability that the problem will be solved?**

311. **There are two sets of details. The probability that a detail of the first set is standard is equal to 0,7; and of the second set – 0,4. Find the probability that a randomly taken detail (from a randomly taken set) is standard. 0.4*0.7**

312. **There are two sets of details. The probability that a detail of the first set is standard is equal to 0,7; and of the second set – 0,4. Find the probability that a randomly taken detail (from a randomly taken set) is not standard. 0.3*0.6**

313. **An urn contains 10 balls: 3 red and 7 blue. A second urn contains 6 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.54 . Calculate the number of blue balls in the second urn.**

- 9

314. **The probability that a boy will not pass M.B.A. examination is 1/5 and that a girl will not pass is 3/5. Calculate the probability that at least one of them passes the examination.**

315. **The probability that a boy will not pass M.B.A. examination is 1/5 and that a girl will not pass is 3/5. Calculate the probability that exactly one of them passes the examination.**

316. A bag contains 6 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the conditional probability that all three will be blue given that one of them is blue.

317. A bag contains 4 white, 6 red and 10 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?

318. Find the Bernoulli formula :

- P= C m n*p^m* q^n-m

319. How would it change the expected value of a random variable X if we multiply the X by a number k.

- M(kx)=k*M(x)

320. Find the dispersion for the given probability distribution.

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

321. The table below shows the probability distribution function of a random variable X.

x_i	0	x_2	5
p_i	0.1	0.4	0.5

If M[X]=5,3 find the value of x_2.

- 7

322. Indicate the formula of computing the dispersion of a random variable X with mathematical expectation μ.

- D(x)=M(X^2)-(M(X)^2)

323. The cumulative distribution function of a discrete random variable X is given by

324. $F(x)=\begin{cases} 0 & if\ x\le 2 \\ 0.5 & if\ 2<x\le 5 \\ 0.8 & if\ 5<x\le 8 \\ 1 & if\ x>8 \end{cases}$ **Find $P(3 \le X < 8)$.**

- 0.3

325. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ x\le 2\\ 0.3 & if\ 2<x\le 5\\ 0.9 & if\ 5<x\le 8\\ 1 & if\ x>8\end{cases}$$

Find $P(2\le X<5)$.

- **0.3**

326. **A fair die is rolled three times. A random variable X denotes the number of occurrences of 6's. What is the probability that X will have the value which is not equal to 3.**

- 215/216=1-p^3

Find the expectation of a random variable X if the cumulative distribution function

$$F(x)=\begin{cases}1-e^{-x/5}, x\ge 0\\ 0, \quad x<0\end{cases}.$$

- 5

327. **If the dispersion of a random variable X is given D(X)=5. Then D(2X) is 4*5=20**

328. **The table below shows the distribution of a random variable X. What is the D(X)?**

X	-2	1	2
P	0,2	0,5	0,3

329. **The table below shows the distribution of a random variable X. What is the M(X)?**

X	-2	1	2
P	0,2	0,5	0,3

330. **If D(X)=3, find D(-3X+4). =27**

331. **If D(X)=3, find D(2X-3).=12**

332. **The table below shows the distribution of a random variable X. Find M[x] and D(X).**

X	-2	0	1
P	0.1	0.5	0.4

333. **If a fair die is tossed twice, the probability that the first toss will be a number less than 3 and the second toss will be greater than 5 is**

- 1/3*1/6=1/18

334. **A class consists of 460 female and 540 male students. The students are divided according to their marks**

	Passed	**Did not pass**
Female	**400**	**60**

Male	**440**	**100**

If one person is selected randomly, the probability that it did not pass given that it is female is: 60/1000

335. A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value of *X* is

336. How many different two-member teams can be formed from six students? C 6 2

337. How many different 3-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once? C 6 3 *3!

338. If P(E) is the probability that an event will occur, which of the following must be false?

-

339. A die is rolled. What is the probability that the number rolled is greater than 3 and even?

1/3

340. How many different 6-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?

- 6!

341. Evaluate 0!+1!+4!=

342. Evaluate 6!-5!

343. Your state issues license plates consisting of letters and numbers. There are 26 letters and the letters may be repeated. There are 10 digits and the digits may be repeated. How many possible license plates can be issued with two letters followed by two numbers?1

- 26 ^2 *100

344. A fair coin is thrown in the air five times. If the coin lands with the head up on the first four tosses, what is the probability that the coin will land with the head up on the fifth toss?

- 1/2

345. A movie theatre sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?

- 27

346. A random variable Y has the following distribution:

Y	-1	0	1	2
P(Y)	C	4C	0.4	0.1

The value of the constant C is:0.1

347. A random variable X has a probability distribution as follows:

X	0	1	2	3
P(X)	2k	4k	12k	2k

Then the probability that P(X < 2) is equal to 6K

348. The probability is p = 0.85 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

- Np=34

349. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is 0.49

350. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, what is the probability that it did not pass given that it is male.

351. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

- C6 5*C4 3/C10 8

352. Suppose that 10% of people are left handed. If 6 people are selected at random, what is the probability that exactly 2 of them are left handed?

- 510/2280= C 18 4*C 2 2/C20 6

353. Suppose that the random variable T has the following probability distribution:

T	0	1	2
P(T=t)	0.4	0.4	0.2

Find $P(X \leq 0)$.

- 0 ili 0.4

354. Which of the following is the appropriate definition for the union of two events A and B?

- P(A+B)=P(a)+P(B)

355. Johnson taught a music class for 20 students under the age of ten. He randomly chose one of them. What was the probability that the student was under eleven?

○

356. The compact disk Jane bought had 12 songs. The first five were rock music. Tracks number 6 through 12 were ballads. She selected the random function in her CD Player. What is the probability of first listening to a ballad?

○ 7/12

357. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 3?

○ 1/5

358. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be Spades?

○ C13 2/c52 2

359. A standard deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. What is the probability of drawing a Diamond from a standard deck of 52 cards?

○ 13/52

360. One card is randomly selected from a shuffled deck of 52 cards and then a die is rolled. Find the probability of obtaining an Ace and rolling an odd number.

○ 4/52*1/2

361. In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?

C4 1* C4 48/C5 52

362. Table shows the cumulative distribution function of a random variable X. Determine $P(X \geq 2)$.

X	1	2	3	4
F(X)	1/8	1/4	3/4	1

1-F(1)=7/8

Table shows the cumulative distribution function of a random variable X. Determine $P(X \geq 3)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

363. Which of the following statements is always true for A and A^c?

○

364. **A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?**

4/9

365. **If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) = 1/4$**

366. **Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).**

21/40

367. **A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.**

368. **If the dispersion of a random variable X is equal to 3, then D(2X) is :12**

369. **We are given the probability distribution functions of two random variables X and Y shown in the tables below.**

X	1	3	**Y**	2	4
P	0.4	0.6	**P**	0.2	0.8

Find M[X+Y].M(X)+M(Y)

370. **Suppose that the random variable T has the following probability distribution:**

T	**0**	**1**	**2**
P	**0.5**	**0.3**	**0.2**

Compute the expectation of the random variable T.

371. **The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.**

1-q^5

372. **The cumulative distribution function of a random variable X is given by**

$$F(x)=\begin{cases}0 & if \quad x \le 3/2\\ 2x-3 & if \quad 3/2 < x \le 2\\ 1 & if \quad x > 2.\end{cases}$$

Find the probability $P(1.7 \le X < 1.9)$.

373. **In each of the 20 independent trials the probability of success is 0.2. Find the dispersion of the number of successes in these trials.**

4

374. **A coin tossed three times. What is the probability that head appears three times?**

○ 1/8

375. **There are 10 white, 15 black, 20 blue and 25 red balls in an urn. One ball is randomly extracted. Find the probability that the extracted ball is blue or red.**

- 45/70

376. **A random variable X is given by the integral function of distribution:**

$$F(x)=\begin{cases}0 \quad if \quad x\le -1,\\ \frac{1}{4}x+\frac{1}{4} \quad if \quad -1<x\le 3,\\ 1 \quad if \quad x>3.\end{cases}$$

Calculate the probability of hit of the random variable X in the interval (0; 2).

377. **A random variable X has the following law of distribution:**

x_i	0	1	2	3
p_i	1/30	3/10	½	1/6

Find the mathematical expectation of X.

378. **A random variable X is given by the integral function of distribution:**

$$F(x)=\begin{cases}0 \quad if \quad x\le 2,\\ \frac{1}{2}x-1 \quad if \quad 2<x\le 4,\\ 1 \quad if \quad x>4.\end{cases}$$

Find the probability of hit of the random variable X into the interval (2; 3).

- 0.5

379. **An urn contains 5 red, 3 white, and 4 blue balls. What is the probability of extracting a black ball from the urn?**

- 0

380. **Find the Bernoulli formula**

381. **Find the mathematical expectation *M(X)* of a random variable *X*, knowing its law of distribution:**

x_i	2	3	6	9
p_i	0,1	0,4	0,3	0,2

x_i	6	3	1
p_i	0,2	0,3	0,5

382. A group consists of 10 students, and 5 of them are pupils with honor. 3 students are randomly selected. Find the probability that 2 pupils with honor will be among the selected.

383. The profit for a new product is given by $Z = 3X - Y - 5$. X and Y are independent random variables with $D(X) = 1$ and $D(Y) = 2$. Calculate $D(Z)$. =11

ProbabilityTheoryMathematicalStatistics_Maksat/1

384. Bob has three bookshelves in his office and 15 books (5 are math books, 10 are novels). If each shelf holds exactly five books and books are placed randomly on the shelves (all orderings are equally likely), how many ways can 15 books be arranged on a bookshelves?

- ○ $\frac{15!}{10!}$
- ● $\frac{15!}{10!5!}$
- ○ $\frac{15!}{(5!)^3}$
- ○ $\frac{15!}{(3!)^3}$
- ○ $\frac{15!3!}{5!10!}$

385. A class in probability theory consists of 2 men and 8 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores are possible?

- ○ $2!\,8!$
- ● $10!$
- ○ $\frac{10!}{2!}$
- ○ $\frac{10!}{2!8!}$
- ○ $\frac{10!}{(2!)^2}$

386. A class in probability theory consists of 6 men and 4 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores are possible?

- ○ $6!\,4!$
- ● $10!$
- ○ $\frac{10!}{2!}$
- ○ $\frac{10!}{6!4!}$
- ○ $\frac{10!}{(2!)^2}$

387. Ms. Jones has 10 books that she is going to put on her bookshelf. Of these, 4 are math books, 3 are chemistry books, 2 are history books, and 1 is a language book. Ms. Jones wants to arrange her books so that all the books dealing with the same subject are together on the shelf. How many different arrangements are possible?

○ 288

● 6912

○ 12600

○ 525

○ 3456

388. How many different signals, each consisting of 9 flags hung in a line, can be made from a set of 4 white flags, 3 red flags, and 2 blue flags if all flags of the same color are identical?

○ 288

○ 6912

● 1260

○ 525

○ 3456

389. From a group of 5 women and 7 men, how many different committees consisting of 2 women and 3 men can be formed, if 2 of the men are refuse to serve on the committee together?

○ 350

● 300

○ 4200

○ 500

○ 220

390. A student answers to 10 questions in an examination. How many choices if she answered at 7 questions?

● 120

○ 176

○ 45

○ 10

○ 220

391. A student answers to 10 questions in an examination. How many choices if she answered at least 7 questions?

○ 120

● 176

○ 45

- ○ 10
- ○ 220

392. An urn contains 30 balls, of which 10 are red and the other 20 blue. Suppose you take out 8 balls from this urn, without replacement. In how many ways among chosen 8 balls in this sample exactly 3 are red and 5 are blue?

- ○ 5852925
- ● 1860480
- ○ 3720960
- ○ 2480640
- ○ 4961280

393. A bag contains six Scrabble tiles with the letters A-D-M-N-O-R. You reach into the bag and take out tiles one at a time. After you pick a tile from the bag, write down that letter and then return the tile to the bag. How many possible words can be formed?

- ○ 720
- ○ 6
- ● 46656
- ○ 120
- ○ 10240

ProbabilityTheoryMathematicalStatistics_Maksat/2

394. A police department in a small city consists of 10 officers. If the department policy is to have 5 of the officers patrolling the streets, 2 of the officers working full time at the station, and 3 of the officers on reserve at the station, how many different divisions of the 10 officers into the 3 groups are possible?

- ○ 350
- ● 2520
- ○ 4200
- ○ 300
- ○ 220

395. Joel has an MP3 player called the Jumble. The Jumble randomly selects a song for the user to listen to. Joel's Jumble has 2 classical songs, 13 rock songs and 5 rap songs on it. What is the probability that the selected song is classical song or rap song?

- ○ 0.9
- ○ $\frac{13}{20}$
- ● 0.35
- ○ 7
- ○ 0.7

396. A chess tournament has 10 competitors, of which 4 are Russian, 3 are from the USA, 2 are from Great Britain, and 1 is from Brazil. If the tournament result lists just the nationalities of the players in the order in which they placed, how many outcomes are possible?

- ○ 288
- ○ 6912
- ● 12600
- ○ 525
- ○ 3456

397. An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.44. Calculate the number of blue balls in the second urn.

- ○ 64
- ○ 16
- ● 4
- ○ 32
- ○ 8

398. An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the different color is 0.44. Calculate the number of blue balls in the second urn.

- ○ 4
- ○ 16
- ● 64
- ○ 32
- ○ 8

399. License plates in Minnesota are issued with three letters from A to Z followed by three digits from 0 to 9. If each license plate is equally likely, what is the probability that a random license plate starts with G-Z-N?

- ○ $\frac{10^3}{26^3}$
- ○ 10^3
- ● $\frac{1}{26^3}$
- ○ $\frac{1}{10^3}$
- ○ 26^3

400. A business man has 4 dress shirts and 7 ties. How many different shirt/tie outfits can he create?

- ○ 4
- ○ 7
- ● 28
- ○ 11
- ○ 8

401. Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one A?

- ○ 0.3264
- ○ 0.8712
- ● 0.5904
- ○ 0.6124
- ○ 0.9122

402. Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one B?

- ○ 0.3264
- ○ 0.8712
- ● 0.5904
- ○ 0.6124
- ○ 0.9122

ProbabilityTheoryMathematicalStatistics_Maksat/3

403. I tell students in my class that, although I use an average to calculate their course grades, I do weigh the final exam grade more heavily. I assure them that if they can perform well on my final, then even if they performed poorly on the other exams, they must have learned the material. For three semesters I kept track of how people did on the final and how they did in the course. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

Total number of students 321. What is the probability that a student, taken at random from my class, would have failed the course, given that they failed the final?

- ● 0.39
- ○ 0.72
- ○ 0.61
- ○ 0.44

- ○ 0.58

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- ○ 0.72
- ● 0.61
- ○ 0.44
- ○ 0.58

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	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

Total number of students 321. What is the probability that a student, taken at random from my class, would have passed the course, given that they passed the final?

- ○ 0.39
- ○ 0.72
- ● 0.81
- ○ 0.44
- ○ 0.61

406. I tell students in my class that, although I use an average to calculate their course grades, I do weigh the final exam grade more heavily. I assure them that if they can perform well on my final, then even if they performed poorly on the other exams, they must have learned the material. For three semesters I kept track of how people did on the final and how they did in the course. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

Total number of students 321. What is the probability that a student, taken at random from my class, would have failed the course, given that they passed the final?

- ● 0.19
- ○ 0.39
- ○ 0.81
- ○ 0.44
- ○ 0.61

ProbabilityTheoryMathematicalStatistics_Maksat/4

407. Insurance predictions for probability of auto accident.

	Under 25	25-39	Over 40
P	0.11	0.03	0.02

Table gives an insurance company's prediction for the likelihood that a person in a particular age group will have an auto accident during the next year. The company's policyholders are 20% under the age of 25, 30% between 25 and 39, and 50% over the age of 40. What is the probability that a random policyholder will have an auto accident next year?

- ○ 0.145
- ● 0.041
- ○ 0.367
- ○ 0.512
- ○ 0.845

408. At a certain university, 4% of men are over 6 feet tall and 1% of women are over 6 feet tall. The total student population is divided in the ratio 3:2 in favour of women (the number of women : the number of men). What is the probability that the randomly selected student is over 6 feet tall?

- ○ 0.05
- ● 0.022
- ○ 0.14
- ○ 0.028
- ○ 0.11

409. You enter a chess tournament where your probability of winning a game is 0.3 against half the players, 0.4 against a quarter of the players, and 0.5 against the remaining quarter of the players. You play a game against a randomly chosen opponent. What is the probability of winning?

- ○ 1.2
- ● 0.375
- ○ 0.12
- ○ 0.028

- ○ 0.648

410. If a person has the disease, the test will detect it with probability 0.95. Also, if the person does not have the disease, the test will report that they do not have it with the same probability 0.95. In addition, it is known from previous data that only 1% of the population has this particular disease. What is the probability that a particular person chosen at random will be tested positive?

- ○ 0.043
- ● 0.059
- ○ 0.01
- ○ 0.95
- ○ 1.2

411. Suppose that you have two bags with white and dark chocolates. Bag 1 has two white chocolates and six dark chocolates. Bag 2 has four white chocolates and two dark chocolates. You choose one bag at random, both being equally likely, and you grab one from the chosen bag. Let A be the event that you grab one white chocolate. Find $P(A)$.

- ○ $\frac{11}{12}$
- ● $\frac{11}{24}$
- ○ $\frac{13}{32}$
- ○ $\frac{1}{3}$
- ○ $\frac{1}{2}$

412. Amy has two bags of candy. The first bag contains two packs of M&Ms and three packs of Gummi Bears. The second bag contains four packs of M&Ms and two packs of Gummi Bears. Amy chooses a bag uniformly at random and then picks a pack of candy. What is the probability that the pack chosen is Gummi Bears?

- ○ $\frac{11}{12}$
- ● $\frac{7}{15}$
- ○ $\frac{14}{15}$
- ○ $\frac{1}{3}$
- ○ $\frac{1}{2}$

413. Amy has three bags of candy. The first bag contains one pack of M&Ms and two packs of Gummi Bears. The second bag contains four packs of M&Ms and two packs of Gummi Bears. The third bag contains five packs of M&Ms and three packs of Gummi Bears. Amy chooses a bag uniformly at random and then picks a pack of candy. What is the probability that the pack chosen is M&Ms?

- ○ $\frac{11}{12}$
- ● $\frac{13}{24}$

- ○ $\frac{2}{7}$
- ○ $\frac{5}{8}$
- ○ $\frac{1}{2}$

414. Amy has two bags of candy. The first bag contains two packs of M&Ms and three packs of Gummi Bears. The second bag contains four packs of M&Ms and two packs of Gummi Bears. Amy chooses the first bag with the probability 0.3 and the second – 0.7. Amy chooses a bag at random and then picks a pack of candy. What is the probability that the pack chosen is M&Ms?

- ○ $\frac{13}{24}$
- ● $\frac{44}{75}$
- ○ $\frac{7}{15}$
- ○ $\frac{5}{8}$
- ○ $\frac{1}{2}$

415. Tile values in Scrabble.

Point value	0	1	2	3	4	5	8	10
Number of tiles	2	68	7	8	10	1	2	2

In the game of Scrabble, there are 100 letters tiles with the distribution of point values given in Table. Let X be the point value of a random Scrabble tile. What is the mathematical expectation of X?

- ○ 187
- ● 1.87
- ○ 18.7
- ○ 0.187
- ○ 19

416. **Tile values in Scrabble.**

Point value	1	2	3	4	5
Number of tiles	68	7	10	10	5

In the game of Scrabble, there are 100 letters tiles with the distribution of point values given in Table. Let X be the point value of a random Scrabble tile. What is the mathematical expectation of X^2?

- ○ 1.87
- ● 4.71
- ○ 3.26
- ○ 5.2
- ○ 9.1

417. **A fair six-sided die is tossed. You win \$2 if the result is a «1», you win \$1 if the result is a «6», but otherwise you lose \$1. What is the dispersion of X?**

- ○ 1.74
- ● 1.47
- ○ -0.17
- ○ 1.5
- ○ 2.12

418. **A fair six-sided die is tossed. You win \$2 if the result is a «1», you win \$1 if the result is a «6» or «3», but otherwise you lose \$1. What is the dispersion of X?**

- ○ 1.74
- ● 1.47
- ○ -0.17
- ○ 1.5
- ○ 2.12

419. **Which of the following is a discrete random variable?**

- ○ The time of waiting a train.
- ● The number of boys in family having 4 children.
- ○ A time of repair of TVs.
- ○ The velocity in any direction of a molecule in gas.
- ○ The height of a man.

420. **Which of the following is a discrete random variable?**

- ○ The time of waiting a train.
- ● The number of people in a community living to 100 years of age.
- ○ The mistake of a rounding off of a number up to the whole number.

- ○ The velocity in any direction of a molecule in gas.
- ○ The amount of time (starting from now) until an earthquake occurs.

421. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation of X+Y?

- ○ 2.3
- ○ 3.8
- ● 1
- ○ 5.2
- ○ 2.4

422. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mean square deviation of X+Y?

- ○ 2.13
- ● 1.296
- ○ 1.457
- ○ 1.795
- ○ 2.4

423. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation of XY?

- ○ -3.8
- ● -3.36
- ○ -1.4
- ○ 4.26
- ○ 2.44

424. A set of families has the following distribution on number of children:

X	x_1	x_2	2	3	4
P(X)	0.1	0.2	0.4	0.2	0.1

Determine x_1, x_2, if it is known that $M(X) = 2, D(X) = 1.2$?

- ○ $x_1 = \frac{1}{3}, x_2 = \frac{4}{3}$

- $x_1 = 0, x_2 = 1$
- $x_1 = 0, x_2 = \frac{4}{3}$
- $x_1 = 0, x_2 = 10$
- $x_1 = \frac{1}{3}, x_2 = -1$

ProbabilityTheoryMathematicalStatistics_Maksat/6

425. The lifetime of a machine part has a continuous distribution on the interval (0, 30) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 6.

- $\frac{30}{53}$
- $\frac{1}{2}$
- $\frac{31}{35}$
- $\frac{13}{28}$
- $\frac{1}{17}$

426. The lifetime of a machine part has a continuous distribution on the interval (0, 11) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5.

- $\frac{1}{17}$
- $\frac{7}{20}$
- $\frac{10}{11}$
- $\frac{19}{35}$
- $\frac{7}{11}$

427. A random variable *X* is given by the density function of distribution:

$$f(x)=\begin{cases}0 \quad if \quad x<1 \ \text{ or } \ 7\le x,\\ \dfrac{x-1}{9} \ if \ 1\le x<4,\\ \dfrac{7-x}{9} \ if \ 4\le x<7.\end{cases}$$

Find the integral function of distribution of the random variable X?

- $$F(x)=\begin{cases}0 \quad if \quad x<1,\\ \dfrac{(x-1)^2}{18} \ if \ 1\le x<4,\\ \dfrac{18-(7-x)^2}{18} \ if \ 4\le x<7,\\ 1 \quad if \quad 7\le x.\end{cases}$$

- $$F(x)=\begin{cases}0 \quad if \quad x<1,\\ \dfrac{(x-1)^2}{18} \ if \ 1\le x<4,\\ \dfrac{-(7-x)^2}{18} \ if \ 4\le x<7,\\ 1 \quad if \quad 7\le x.\end{cases}$$

○ $$F(x)=\begin{cases}0 \quad if \quad x<1 \ \text{ or } \ 7\le x,\\ \dfrac{(x-1)^2}{18} \ if \ 1\le x<4,\\ \dfrac{-(7-x)^2}{18} \ if \ 4\le x<7.\end{cases}$$

○ $$F(x)=\begin{cases}0 \quad if \quad x<1,\\ \dfrac{(x-1)^2}{9} \ if \ 1\le x<4,\\ \dfrac{(7-x)^2}{18} \ if \ 4\le x<7,\\ 1 \quad if \quad 7\le x.\end{cases}$$

○ $$F(x)=\begin{cases}0 \quad if \quad x<1,\\ \dfrac{(x-1)^2-2}{18} \ if \ 1\le x<4,\\ \dfrac{(x-7)^2}{9} \ if \ 4\le x<7,\\ 1 \quad if \quad 7\le x.\end{cases}$$

428. A random variable *X* is given by the density function of distribution:

$$f(x)=\begin{cases}-x^2+8x-\dfrac{173}{12} \ if \ 2\le x<6,\\ 0 \quad otherwise.\end{cases}$$

Find the integral function of distribution of the random variable X?

- $$F(x) = \begin{cases} 0 \quad if \quad x < 2, \\ -\frac{x^3}{3} + 4x^2 - \frac{173x}{12} + \frac{31}{2} \quad if \;\; 2 \le x < 6, \\ 1 \quad if \quad 6 \le x. \end{cases}$$

- $$F(x) = \begin{cases} 0 \quad if \quad x < 2, \\ -\frac{x^3}{3} + 4x^2 - \frac{173x}{12} \quad if \;\; 2 \le x < 6, \\ 1 \quad if \quad 6 \le x. \end{cases}$$

- $$F(x) = \begin{cases} 0 \quad if \quad x < 2, \\ -\frac{x^3}{3} + 4x^2 - \frac{173x}{12} + \frac{173}{12} \quad if \;\; 2 \le x < 6, \\ 1 \quad if \quad 6 \le x. \end{cases}$$

- $$F(x) = \begin{cases} 0 \quad if \quad x < 2, \\ -\frac{x^3}{3} + 4x^2 - \frac{173x}{12} - \frac{31}{2} \quad if \;\; 2 \le x < 6, \\ 1 \quad if \quad 6 \le x. \end{cases}$$

- $$F(x) = \begin{cases} 0 \quad if \quad x < 2, \\ -\frac{x^3}{3} + 4x^2 - \frac{173x}{12} - \frac{31}{2} \quad if \;\; 2 \le x < 6, \\ 0 \quad if \quad 6 \le x. \end{cases}$$

429. A random variable *X* is given by the density function of distribution:

$$f(x)=\begin{cases}-x^2+8x-\dfrac{173}{12} & if\ \ 2\le x<6,\\ 0 & otherwise.\end{cases}$$

Find the integral function of distribution of the random variable X?

- ● $$F(x)=\begin{cases}0 & if\quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}+\dfrac{31}{2} & if\ \ 2\le x<6,\\ 1 & if\quad 6\le x.\end{cases}$$

- ○ $$F(x)=\begin{cases}0 & if\quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12} & if\ \ 2\le x<6,\\ 1 & if\quad 6\le x.\end{cases}$$

- ○ $$F(x)=\begin{cases}0 & if\quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}+\dfrac{173}{12} & if\ \ 2\le x<6,\\ 1 & if\quad 6\le x.\end{cases}$$

- ○ $$F(x)=\begin{cases}0 & if\quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}-\dfrac{31}{2} & if\ \ 2\le x<6,\\ 1 & if\quad 6\le x.\end{cases}$$

- $$F(x)=\begin{cases}0 & if \quad x<2,\\ -\frac{x^3}{3}+4x^2-\frac{173x}{12}-\frac{31}{2} & if \;\; 2\le x<6,\\ 0 & if \quad 6\le x.\end{cases}$$

430. A random variable *X* is given by the integral function of distribution:

$$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \frac{Cx^3}{125} & if \;\; 0\le x<5,\\ 1 & if \quad 5\le x.\end{cases}$$

Find the mathematical expectation of the random variable X?

- $\frac{15}{4}$
- 5
- $\frac{5}{2}$
- $\frac{3}{4}$
- 1

431. A random variable *X* is given by the integral function of distribution:

$$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \frac{Cx^3}{125} & if \;\; 0\le x<5,\\ 1 & if \quad 5\le x.\end{cases}$$

Find the mathematical expectation of the random variable X?

- $\frac{15}{4}$
- 5
- $\frac{5}{2}$
- $\frac{3}{4}$
- 1

432. A random variable X is given by the integral function of distribution:

$$F(x)=\begin{cases}0 & if \quad x\le -1,\\ \dfrac{Cx}{4} & if \quad -1\le x<1,\\ 1 & if \quad 1\le x.\end{cases}$$

If $M(X)=0$, then find the dispersion of the random variable X?

- $\frac{1}{3}$
- 1
- 0
- $\frac{3}{4}$
- $-\frac{2}{3}$

433. A random variable X is given by the integral function of distribution:

$$F(x)=\begin{cases}0 & if \quad x\le -1,\\ \dfrac{Cx}{4} & if \quad -1\le x<1,\\ 1 & if \quad 1\le x.\end{cases}$$

If $M(X)=0$, then find the dispersion of the random variable X?

- $\frac{1}{3}$
- 1
- 0
- $\frac{3}{4}$
- $-\frac{2}{3}$

434. The lifetime in hours of a certain kind of radio tube is a random variable having a probability density function given by: $f(x)=\begin{cases}0 & if \quad x\le 100,\\ \dfrac{100}{x^2} & if \quad x>100.\end{cases}$ **What is the probability that exactly 1 of 5 such tubes in a radio set will have to be replaced within the first 150 hours of operation?**

- $\frac{80}{243}$

- $\frac{40}{243}$
- 0
- $\frac{160}{243}$
- $\frac{1}{3}$

435. The lifetime in hours of a certain kind of radio tube is a random variable having a probability density function given by: $f(x)=\begin{cases} 0 & if \quad x \le 100, \\ \frac{100}{x^2} & if \quad x > 100. \end{cases}$ **What is the probability that exactly 3 of 5 such tubes in a radio set will have to be replaced within the first 150 hours of operation?**

- $\frac{80}{243}$
- $\frac{40}{243}$
- 0
- $\frac{160}{243}$
- $\frac{1}{3}$

436. A random variable *X* is given by the integral function of distribution:

$$F(x)=\begin{cases} 0 & if \quad x \le 0, \\ \frac{Cx^3}{125} & if \quad 0 \le x < 5, \\ 1 & if \quad 5 \le x. \end{cases}$$

Find the probability that random variable *X* takes the values on $(2, 6)$.

- $\frac{117}{125}$
- $\frac{208}{125}$
- $\frac{63}{125}$
- $\frac{113}{125}$
- $\frac{1}{5}$

437. A random variable *X* is given by the density function of distribution:

$$f(x)=\begin{cases} -x^2+8x-\dfrac{173}{12} & if\ \ C\le x<6 \\ 0\ , & \text{otherwise.} \end{cases}$$

Find the value of C?

- ● 2
- ○ -1
- ○ 1
- ○ 3
- ○ -3

438. A random variable *X* is given by the density function of distribution:

$$f(x)=\begin{cases} -x^2+8x-\dfrac{173}{12} & if\ \ C\le x<6 \\ 0\ , & \text{otherwise.} \end{cases}$$

Find the value of C?

- ● 2
- ○ -1
- ○ 1
- ○ 3
- ○ -3

ProbabilityTheoryMathematicalStatistics_Maksat/7

439. A discrete random variable *X* is given by the following law of distribution:

X	2	3	6	9
P	0,1	0,4	0,3	0,2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 3$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

440. A discrete random variable X is given by the following law of distribution:

X	2	3	6	9
P	0,2	0,3	0,3	0,2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 3$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

441. A discrete random variable X is given by the following law of distribution:

X	2	3	6	9
P	0.1	0.4	0.4	0.1

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 3$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

442. A discrete random variable X is given by the following law of distribution:

X	1	2	3	4
P	0.1	0.4	0.4	0.1

By using the Chebyshev inequality estimate the probability that $|X - M(X)| < 1$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

443. A discrete random variable X is given by the following law of distribution:

X	0	1	2	4
P	0.1	0.4	0.4	0.1

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 1$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

444. A discrete random variable X is given by the following law of distribution:

X	0	1	2	4
P	0.25	0.25	0.3	0.2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 2$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

445. A discrete random variable X is given by the following law of distribution:

X	0	1	2	4
P	0.25	0.25	0.25	0.25

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 3$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

446. A discrete random variable *X* is given by the following law of distribution:

X	1	3	6	9
P	0.25	0.25	0.3	0.2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 5$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

447. A discrete random variable *X* is given by the following law of distribution:

X	1	3	4	6
P	0.25	0.25	0.3	0.2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 4$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

448. A discrete random variable *X* is given by the following law of distribution:

X	-2	0	2	4
P	0.25	0.25	0.3	0.2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| < 4$.

- ○ 1
- ● $\frac{2}{3}$
- ○ $\frac{1}{6}$
- ○ $\frac{1}{4}$
- ○ $-\frac{1}{2}$

ProbabilityTheoryMathematicalStatistics_Maksat/8

449. The probability that a shooter will beat out 10 aces at one shot is equal to 0.1 and the probability to beat out 9 aces is equal to 0.3. Choose the correctly calculated probabilities of the events.

○ P(beat out more than 8 aces)= 0.5

○ P(beat out more than 10 aces)= 0.2

● P(beat out 9 or less aces)= 0.9

○ P(beat out more than 9 aces)= 0.3

○ P(beat out 9 or more aces)= 0.3

450. The probability that a shooter will beat out 10 aces at one shot is equal to 0.1 and the probability to beat out 9 aces is equal to 0.3. Choose the correctly calculated probabilities of the events.

○ P(beat out more than 8 aces)= 0.5

○ P(beat out more than 10 aces)= 0.2

● P(beat out 9 or less aces)= 0.9

○ P(beat out more than 9 aces)= 0.3

○ P(beat out 9 or more aces)= 0.3

451. The probability that a shooter will beat out 10 aces at one shot is equal to 0.1 and the probability to beat out 9 aces is equal to 0.3. Choose the correctly calculated probabilities of the events.

○ P(beat out more than 8 aces)= 0.5

○ P(beat out more than 10 aces)= 0.2

● P(beat out 9 or less aces)= 0.9

○ P(beat out more than 9 aces)= 0.3

○ P(beat out 9 or more aces)= 0.3

ProbabilityTheoryMathematicalStatistics_Maksat/9

452. Three students pass an exam. Let A_i be the event «the exam will be passed on “excellent” by the i-th student» (i = 1, 2, 3). Which of the following events correctly expressed by A_1, A_2, A_3 and their negations?

● D={exam will not be passed on "excellent" by three students}, $D = \overline{A_1 A_2 A_3}$.

○ A={exam will not be passed on "excellent" by only one student}, $A = A_1 A_2 \overline{A_3} + A_1 \overline{A_2 A_3}$.

○ B={exam will not be passed on "excellent" by only two students}, $B = \overline{A_1 A_2} + \overline{A_1 A_3} + \overline{A_2 A_3}$.

○ C={exam will not be passed on "excellent" by at least two students}, $C = A_1 A_2 \overline{A_3} + A_1 \overline{A_2} A_3 + \overline{A_1} A_2 A_3 + A_1 A_2 A_3$.

○ E={exam will not be passed on "excellent" by three students}, $D = A_1 + A_2 + A_3 + A_2 A_3 A_1$.

453. Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Which of the following events correctly expressed by A_1, A_2, A_3 and their negations?

- ● E={exam will not be passed on "excellent" by three students}, $D = \overline{A_1 A_2 A_3}$.
- ○ A={exam will not be passed on "excellent" by only one student}, $A = A_1 A_2 \overline{A_3} + A_1 \overline{A_2 A_3}$.
- ○ B={exam will not be passed on "excellent" by only two students}, $B = \overline{A_1 A_2} + \overline{A_1 A_3} + \overline{A_2 A_3}$.
- ○ C={exam will not be passed on "excellent" by at least two students}, $C = A_1 A_2 \overline{A_3} + A_1 \overline{A_2} A_3 + \overline{A_1} A_2 A_3 + A_1 A_2 A_3$.
- ○ D={exam will not be passed on "excellent" by three students}, $D = A_1 + A_2 + A_3 + A_2 A_3 A_1$.

ProbabilityTheoryMathematicalStatistics_Maksat/10

454. A random variable *X* is given by the integral function of distribution:

$$F(x) = \begin{cases} 0 \quad if \quad x < 10, \\ \dfrac{x-10}{10} \quad if \;\; 10 \le x < 20, \\ 1 \quad if \quad 20 \le x. \end{cases}$$

What does this tell us about the random variable X? More than one option may be correct.

- ○ $M(X) = 10$
- ○ $D(X) = \frac{1}{2}$
- ● $P(10 < X < 15) = \frac{1}{2}$
- ○ $P(X < 0) = 0$
- ○ $M(X) = \frac{3}{10}$

455. A random variable *X* is given by the integral function of distribution:

$$F(x) = \begin{cases} 0 \quad if \quad x < 10, \\ \dfrac{x-10}{10} \quad if \;\; 10 \le x < 20, \\ 1 \quad if \quad 20 \le x. \end{cases}$$

What does this tell us about the random variable X? More than one option may be correct.

- ○ $M(X) = 10$
- ○ $D(X) = \frac{1}{2}$

- $P(10 < X < 15) = \frac{1}{2}$
- $P(X < 0) = 0$
- $M(X) = \frac{3}{10}$

456. A random variable X is given by the integral function of distribution:

$$F(x) = \begin{cases} 0 \quad if \quad x < 10, \\ \dfrac{x-10}{10} \quad if \quad 10 \le x < 20, \\ 1 \quad if \quad 20 \le x. \end{cases}$$

What does this tell us about the random variable X? More than one option may be correct.

- $M(X) = 10$
- $D(X) = \frac{1}{2}$
- $P(10 < X < 15) = \frac{1}{2}$
- $P(X < 0) = 0$
- $M(X) = \frac{3}{10}$

ProbabilityTheoryMathematicalStatistics_Maksat/11

457. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Choose the correctly calculated probabilities of the events.

- P(at least 1 of 3 shots will strike the target)=0.384
- P(at least 1 of 3 shots will strike the target)=0.992
- P(at least 2 of 3 shots will not strike the target)=0.189
- P(at least 2 of 3 shots will strike the target)=0.845
- P(neither of 3 shots will strike the target)=0.8

458. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Choose the correctly calculated probabilities of the events.

- P(at least 1 of 3 shots will strike the target)=0.384
- P(at least 1 of 3 shots will strike the target)=0.992
- P(at least 2 of 3 shots will not strike the target)=0.189
- P(at least 2 of 3 shots will strike the target)=0.845
- P(neither of 3 shots will strike the target)=0.8

459. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Choose the correctly calculated probabilities of the events.

- P(at least 1 of 3 shots will strike the target)=0.384

- P(at least 1 of 3 shots will strike the target)=0.992
- P(at least 2 of 3 shots will not strike the target)=0.189
- P(at least 2 of 3 shots will strike the target)=0.845
- P(neither of 3 shots will strike the target)=0.8

460. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Choose the correctly calculated probabilities of the events.

- P(at least 1 of 3 shots will strike the target)=0.384
- P(at least 1 of 3 shots will strike the target)=0.992
- P(at least 2 of 3 shots will not strike the target)=0.189
- P(at least 2 of 3 shots will strike the target)=0.845
- P(neither of 3 shots will strike the target)=0.8

461. The probability to receive high dividends under shares at the first enterprise – 0.2, on the second – 0.35, on the third – 0.15. Choose the correctly calculated probabilities that a shareholder having shares of all the enterprises will receive high dividends.

- P(at least on two enterprises)= 0.1315
- P(exactly on two enterprises)= 0.4214
- P(only at one enterprise)= 0.7
- P(at least on one enterprise)= 0.4265
- P(exactly on three enterprises)= 0.105

462. The probability to receive high dividends under shares at the first enterprise – 0.2, on the second – 0.2, on the third – 0.3. Choose the correctly calculated probabilities that a shareholder having shares of all the enterprises will receive high dividends.

- P(only at one enterprise)=0.416
- P(only at one enterprise)=0.7
- P(at least on one enterprise)=0.426
- P(at least on two enterprises)=0.354
- P(exactly on three enterprises)= 0.105

463. The first brigade has 6 tractors, and the second – 9. One tractor demands repair in each brigade. A tractor is chosen at random from each brigade. Choose the correctly calculated probabilities of events.

- P(both chosen tractors demands repair)=1/54
- P(one of the chosen tractors demands repair)=0.5
- P(both chosen tractors demands repair)=0
- P(both chosen tractors demands repair)=1/27
- P(both chosen tractors are serviceable)=13/15

464. The first brigade has 5 tractors, and the second – 8. One tractor demands repair in each brigade. A tractor is chosen at random from each brigade. Choose the correctly calculated probabilities of events.

- P(one of the chosen tractors demands repair)=11/40
- P(one of the chosen tractors demands repair)=7/40
- P(both chosen tractors demands repair)=1/20
- P(both chosen tractors demands repair)=1/2
- P(both chosen tractors are serviceable)=1/3

465. All of the letters that spell STUDENT are put into a bag. Choose the correctly calculated probabilities of events.

- P(drawing a S, and then drawing a T)=1/21
- P(drawing a T, and then drawing a D)=1/42
- P(selecting a vowel, and then drawing a U)=1/42
- P(selecting a vowel, and then drawing a K)=1/42
- P(selecting a vowel, and then drawing a T)=3/42

466. All of the letters that spell MISSISSIPPI are put into a bag. Choose the correctly calculated probabilities of events.

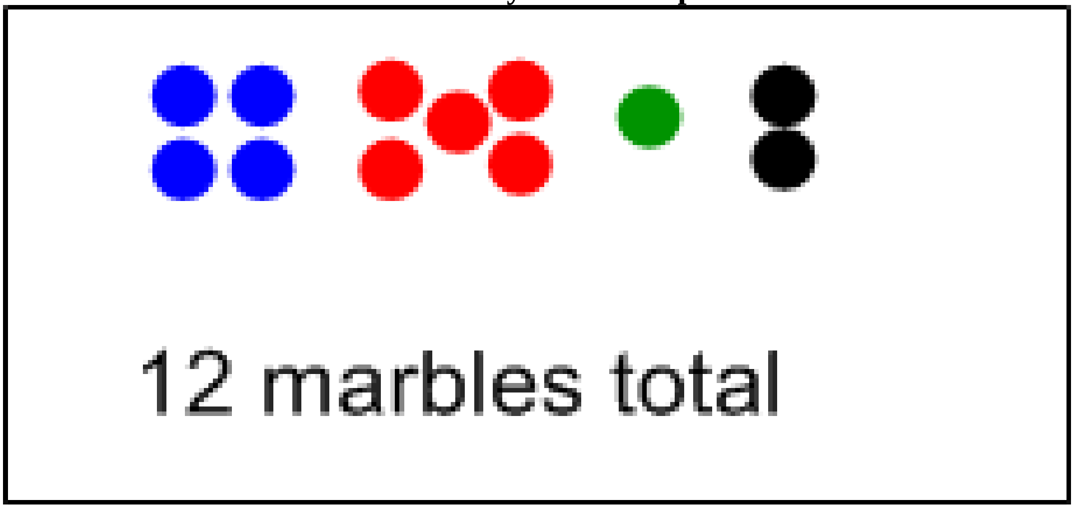
- P(of selecting a vowel, and then after returning the letter also drawing a M)=4/121
- P(of drawing an I, and then after returning the letter also drawing a M)=3/121
- P(of selecting a vowel, and then after returning the letter also drawing an O)=4/121
- P(of selecting a vowel, and then after returning the letter also drawing a P)=6/121
- P(of drawing a M, and then after returning the letter also drawing a S)=1/121

467. The first brigade has n tractors, and the second – m. One tractor demands repair in each brigade. A tractor is chosen at random from each brigade. Choose the correctly calculated probabilities of events.

- n=3, m=5, P(both chosen tractors demands repair)=1/15
- n=3, m=6, P(one of the chosen tractors demands repair)=7/12
- n=2, m=5, P(both chosen tractors demands repair)=0.3
- n=2, m=3, P(both chosen tractors demands repair)=1/3
- n=5, m=2, P(both chosen tractors are serviceable)=0.2

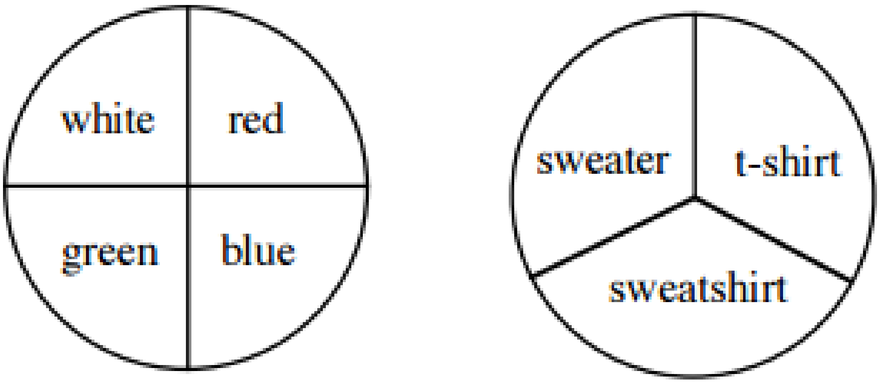
468. A jar of marbles contains 4 blue marbles, 5 red marbles, 1 green marble, and 2 black marbles. A marble is chosen at random from the jar. After returning it again, a second

marble is chosen. Choose the correctly calculated probabilities of events.



- P(green, and then red)=5/144
- P(black, and then black)=1/12
- P(red, and then black)=7/72
- P(green, and then blue)=1/72
- P(blue, and then blue)=1/6

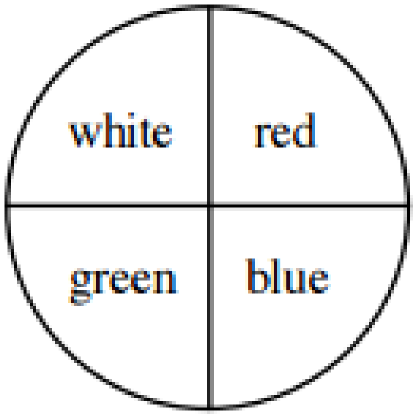
469. If each of the regions in each spinner is the same size.

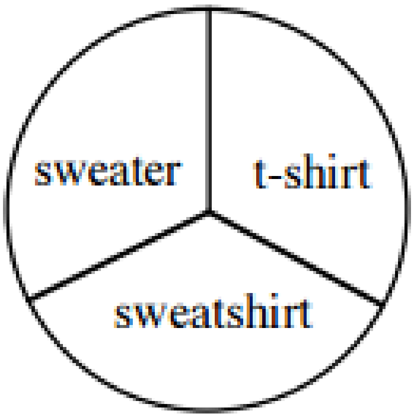


Choose the correctly calculated probabilities of spinning each spinner.

- P(getting a red sweater)=1/12
- P(getting a white sweatshirt)=1/6
- P(getting a white sweater)=5/12
- P(getting a blue sweatshirt)=7/12
- P(getting a blue t-shirt)=1/6

470 If each of the regions in each spinner is the same size





Choose the correctly calculated probabilities of spinning each spinner.

● P(getting a red sweater)=1/12

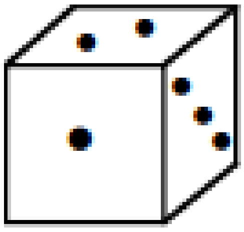
○ P(getting a white sweatshirt)=1/6

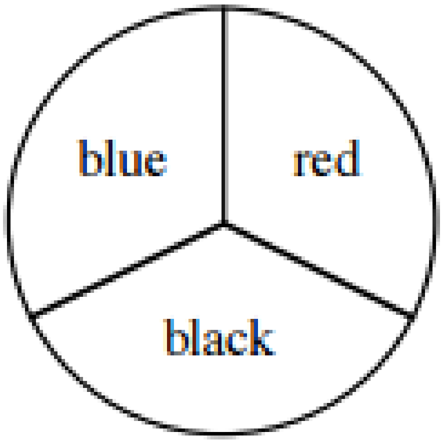
○ P(getting a white sweater)=5/12

○ P(getting a blue sweatshirt)=7/12

○ P(getting a blue t-shirt)=1/6

471. Mary is playing a game in which she rolls one die and spins a spinner.





Choose the correctly calculated probabilities of spinning each spinner.

● P(get the 1 and green)=0

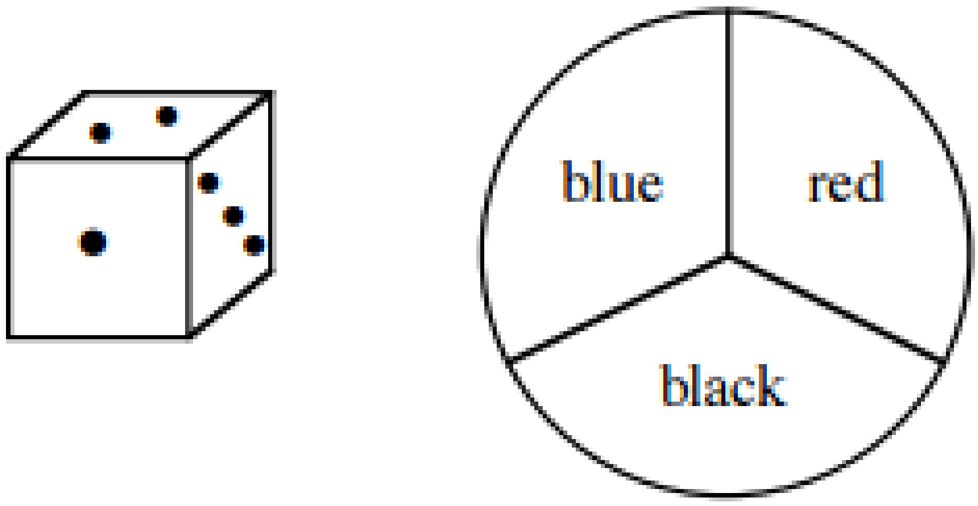
○ P(get the 7 and red)=1/18

○ P(get the 3 and green)=1/18

○ P(get the 2 and black)=1/4

○ P(get the 1 and white)=1

472 Mary is playing a game in which she rolls one die and spins a spinner.



Choose the correctly calculated probabilities of spinning each spinner.

● P(get the 1 and green)=0

○ P(get the 7 and red)=1/18

○ P(get the 3 and green)=1/18

○ P(get the 2 and black)=1/4

○ P(get the 1 and white)=1

ProbabilityTheoryMathematicalStatistics_Maksat/13

473. Find the Bernoulli formula.

● $$P_n(k) = \frac{n!}{k!(n-k)!} \cdot p^k \cdot (1-p)^{n-k}$$

○ $$P(B|A) = \frac{P(B) \cdot P(A|B)}{P(A)}$$

○ $$P(B|A) = \frac{P(AB)}{P(A)}$$

○ $$P_n(k) = \frac{1}{\sqrt{npq}} \cdot e^{-2pq}$$

○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot\Phi\left(\frac{k-np}{\sqrt{npq}}\right)$$

474. Find the Bernoulli formula.

○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot\varphi\left(\frac{k-np}{\sqrt{npq}}\right)$$

● $$P_n(k)=C_n^k\cdot p^k\cdot q^{n-k}$$

○ $$P(B|A)=\frac{P(AB)}{P(A)}$$

○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot e^{-2pq}$$

○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot\Phi\left(\frac{k-np}{\sqrt{npq}}\right)$$

ProbabilityTheoryMathematicalStatistics_Maksat/14

475. A coming up a grain stored in a warehouse is equal to 50%. What is the probability that the number of came up grains among 100 ones will make from *a* up to *b* pieces (a grain – зерно)?

● $a=5, b=10, P=\Phi\left(\frac{10-100*0,5}{\sqrt{100*0,5*0,5}}\right)-\Phi\left(\frac{5-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

○ $a=50, b=75, P=\frac{1}{75-50}\varphi\left(\frac{25-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

○ $a=10, b=40, P=\Phi\left(\frac{10-100*0,5}{\sqrt{100*0,5*0,5}}\right)-\Phi\left(\frac{40-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

○ $a=10, b=20, P=\Phi\left(\frac{55-50}{\sqrt{100*0,5*0,5}}\right)$

○ $a=55, b=75, P=2\Phi\left(\frac{75-55}{\sqrt{100*0,5*0,5}}\right)$

476. The probability of striking a target by a shooter at one shot is equal to $\frac{3}{4}$. Find the probability P that at 100 shots the target will be struck no less than *a* and no more *b* times.

- $a = 70, b = 80, P = \Phi\left(\frac{80-100*0,75}{\sqrt{100*0,75*0,25}}\right) - \Phi\left(\frac{70-100*0,75}{\sqrt{100*0,75*0,25}}\right)$
- $a = 5, b = 75, P = \frac{1}{75-5}\varphi\left(\frac{5-100*0,75}{\sqrt{100*0,75*0,25}}\right)$
- $a = 50, b = 75, P = \Phi\left(\frac{50-100*0,75}{\sqrt{100*0,75*0,25}}\right)$
- $a = 10, b = 20, P = \Phi\left(\frac{20-10}{\sqrt{100*0,75*0,25}}\right)$
- $a = 50, b = 75, P = 2\Phi\left(\frac{75-50}{\sqrt{0.75*0.25}}\right)$

477. The probability of striking a target by a shooter at one shot is equal to $\frac{1}{4}$. Find the probability P that at 100 shots the target will be struck no less than a and no more b times.

- $a = 50, b = 75, P = -\Phi\left(\frac{50-100*0,25}{\sqrt{100*0,75*0,25}}\right)$
- $a = 50, b = 75, P = \frac{1}{75-50}\varphi\left(\frac{75-100*0,25}{\sqrt{100*0,75*0,25}}\right)$
- $a = 70, b = 80, P = \Phi\left(\frac{80-100*0,25}{\sqrt{100*0,75*0,25}}\right) - \Phi\left(\frac{70-100*0,75}{\sqrt{100*0,75*0,25}}\right)$
- $a = 10, b = 20, P = \Phi\left(\frac{20-10}{\sqrt{100*0,75*0,25}}\right)$
- $a = 50, b = 75, P = \Phi\left(\frac{75-50}{\sqrt{100*0.75*0.25}}\right)$

478. Find approximately the probability that an event will happen exactly from a to b times at 400 trials if in each trial the probability of its occurrence is equal to 0.2.

- $a = 140, b = 170, P = \Phi\left(\frac{170-400*0,2}{\sqrt{400*0,8*0,2}}\right) - \Phi\left(\frac{140-400*0,2}{\sqrt{400*0,8*0,2}}\right)$
- $a = 80, b = 170, P = \frac{1}{170-80}\varphi\left(\frac{170-400*0,2}{\sqrt{400*0,8*0,2}}\right)$
- $a = 70, b = 80, P = \Phi\left(\frac{80-400*0,2}{\sqrt{400*0,8*0,2}}\right) + \Phi\left(\frac{70-400*0,2}{\sqrt{400*0,8*0,2}}\right)$
- $a = 110, b = 120, P = \Phi\left(\frac{120-110}{\sqrt{400*0,8*0,2}}\right)$
- $a = 50, b = 75, P = \Phi\left(\frac{75-50}{\sqrt{400*0,8*0,2}}\right)$

479. Find approximately the probability that an event will happen exactly from a to b times at 484 trials if in each trial the probability of its occurrence is equal to 0.5.

- $a = 180, b = 300, P = \Phi\left(\frac{300-242}{11}\right) - \Phi\left(\frac{180-242}{11}\right)$
- $a = 80, b = 240, P = 2\varphi\left(\frac{160}{11}\right)$
- $a = 70, b = 242, P = \Phi\left(\frac{70-484*0,5}{\sqrt{484*0.5*0.5}}\right)$
- $a = 110, b = 120, P = \Phi\left(\frac{10-484*0,5}{\sqrt{484*0.5*0.5}}\right)$
- $a = 50, b = 75, P = 2\Phi\left(\frac{75-484*0,5}{\sqrt{484*0.5*0.5}}\right)$

480. A factory has sent 2500 good-quality products. The probability that one product has been damaged at a transportation is $\frac{1}{5}$. Find the probability P that at the transportation it will be damaged from a to b products.

- $a = 510, b = 525, P = \Phi\left(\frac{25}{20}\right) - \Phi\left(\frac{1}{2}\right)$
- $a = 14, b = 170, P = \frac{1}{170-14}\varphi\left(\frac{156-2500*0.002}{\sqrt{2500*0.2*0.8}}\right)$
- $a = 100, b = 500, P = \Phi\left(\frac{100-2500*0.002}{\sqrt{2500*0.2*0.8}}\right)$
- $a = 110, b = 1000, P = \Phi\left(\frac{1000-2500*0.2}{\sqrt{2500*0.2*0.8}}\right) + \Phi\left(\frac{110-2500*0.2}{\sqrt{2500*0.2*0.8}}\right)$
- $a = 50, b = 75, P = 2\Phi\left(\frac{60-2500*0.2}{\sqrt{2500*0.2*0.8}}\right)$

ProbabilityTheoryMathematicalStatistics_Maksat/15

481. Find the right inequation.

- $P(|X - M(X)| < \varepsilon) < \frac{D(X)}{\varepsilon^2}$
- $P(|X - M(X)| \leq \varepsilon) \geq 1 - \frac{D(X)}{\varepsilon^2}$
- $P(|X - M(X)| \leq \varepsilon) > \frac{D(X)}{\varepsilon^2}$
- $P(X > A) > \frac{M(X)}{A}$
- $\left|\frac{X_1+X_2+\cdots+X_n}{n} - \frac{M(X_1)+M(X_2)+\cdots+M(X_n)}{n}\right| \geq \varepsilon$

482. Let $X\sim Binomial(n,p)$. Find the right inequation.

- $p = \frac{1}{3}, P\left(\left|X - \frac{n}{3}\right| < 1\right) \geq \frac{n}{3}$
- $p = \frac{1}{3}, P\left(\left|X - \frac{n}{3}\right| > 1\right) \leq \frac{2n}{9}$
- $p = \frac{1}{3}, P\left(\left|X - \frac{n}{3}\right| < 2\right) \geq \frac{1}{4}$
- $p = \frac{1}{3}, P\left(\left|X - \frac{n}{3}\right| > 1\right) > \frac{2n}{9}$
- $p = 0.8, P(X < 2n) < 0.3$

483. From past experience a professor knows that the test score of a student taking her final examination is a random variable with mean 75. Suppose, in addition, the professor knows that a variance of a student's test score is equal to 25. Find the right inequation.

- $P(|X - 75| < 30) > \frac{1}{36}$
- $P(65 \leq X \leq 85) \geq \frac{3}{4}$
- $P(60 \leq X \leq 90) \geq \frac{1}{9}$
- $P(X > 80) > \frac{75}{80}$

- ○ $P(|X-75|\leq 45)<\frac{80}{81}$

484. Find the right statements.

- ○ $D(X)=\int_{-\infty}^{+\infty}x^2f(x)dx$
- ● $M(X)=\int_{-\infty}^{+\infty}xf(x)dx$
- ○ $F(x)=f'(x)$
- ○ $D(X)=\int_{-\infty}^{+\infty}x^2f(x)dx-M(X)$
- ○ $P(X>A)>\frac{M(X)}{A}$

485. Find the <u>false</u> statements.

- ○ $0\leq F(x)\leq 1$
- ○ $F(-\infty)=0$
- ● $F(+\infty)=0$
- ○ $F(x)=P(X<x)$
- ○ $\int_{-\infty}^{+\infty}f(x)dx=1$

486. Find the <u>false</u> statements.

- ○ $\int_{-\infty}^{+\infty}f(x)dx=1$
- ○ $P(x_1\leq X\leq x_2)=\int_{x_1}^{x_2}f(x)dx$
- ○ $F(x)=\int_{-\infty}^{x}f(t)dt$
- ○ $P(x_1\leq X)=\int_{x_1}^{+\infty}f(t)dt$
- ● $P(x_1\leq X<x_2)=F(x_1)-F(x_2)$

487. Find the <u>false</u> inequations.

- ○ $P(|X-M(X)|>\varepsilon)\leq\frac{D(X)}{\varepsilon^2}$
- ○ $P(|X-M(X)|>\varepsilon)<\frac{D(X)}{\varepsilon^2}$
- ● $P(|X-M(X)|>\varepsilon)\geq\frac{D(X)}{\varepsilon^2}$
- ○ $P(X>A)\leq\frac{M(X)}{A}$
- ○ $P(X\leq A)>1-\frac{M(X)}{A}$

488. Find the right property of distribution function.

- ● $F(-\infty)=0$
- ○ $f(-\infty)=\frac{1}{2}$
- ○ $P(x_1\leq X)=\int_{x_1}^{1}f(x)dx$

- $\int_{-\infty}^{+\infty} f(x)dx = 1$
- $F(+\infty) = +\infty$

489. Find the right property of probability density.

- $\int_{-\infty}^{+\infty} f(x)dx = 1$
- $f(-\infty) = \frac{1}{2}$
- $P(x_1 \leq X) = \int_{x_1}^{1} f(x)dx$
- $F(-\infty) = 1$
- $P(x_1 \leq X < x_2) = F(x_1) - F(x_2)$

ProbabilityTheoryMathematicalStatistics_Maksat/16

490. Let a series of distribution of a random variable be given:

$$X = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}$$

. What does this tell us about the random variable X?

- $$F(x) = \begin{cases} 0 \quad if \quad x \leq 1, \\ 0.1 \; if \;\; 1 < x \leq 2, \\ 0.3 \; if \;\; 2 < x \leq 3, \\ 0.6 \; if \;\; 3 < x \leq 4, \\ 1 \quad if \quad 4 < x. \end{cases}$$
- $$F(x) = \begin{cases} 0 \quad if \quad x \leq 1, \\ 0.1 \; if \;\; 1 < x \leq 2, \\ 0.2 \; if \;\; 2 < x \leq 3, \\ 0.3 \; if \;\; 3 < x \leq 4, \\ 0.4 \quad if \quad 4 < x. \end{cases}$$
- $M(X) = 1$
- $M(X^2) = 9$

- $D(X) = 10$

491. Let a series of distribution of a random variable be given:

$$X = \begin{pmatrix} 0 & 2 & 4 & 8 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}$$

. What does this tell us about the random variable X?

- $$F(x) = \begin{cases} 0 & if \quad x \le 0, \\ 0.1 & if \quad 0 < x \le 2, \\ 0.3 & if \quad 2 < x \le 4, \\ 0.6 & if \quad 4 < x \le 8, \\ 1 & if \quad 8 < x. \end{cases}$$
- $$F(x) = \begin{cases} 0 & if \quad x \le 0, \\ 0.1 & if \quad 0 < x \le 2, \\ 0.2 & if \quad 2 < x \le 4, \\ 0.3 & if \quad 4 < x \le 8, \\ 0.4 & if \quad 8 < x. \end{cases}$$
- $M(X) = 4$
- $D(X) = 22.2$
- $M(X) = 9$

492. Let a series of distribution of a random variable be given:

$$X = \begin{pmatrix} -2 & -1 & 0 & 1 \\ 0.1 & 0.2 & 0.2 & 0.5 \end{pmatrix}$$

. What does this tell us about the random variable X?

- ○ $$F(x)=\begin{cases}0 & if \quad x\le -2,\\ 0.1 & if \quad -2<x\le -1,\\ 0.3 & if \quad -1<x\le 1,\\ 1 & if \quad 1<x.\end{cases}$$
- ● $D(X)=1.09$
- ○ $D(X)=1$
- ○ $M(X)=2$

493. Let a series of distribution of a random variable be given:

$$X=\begin{pmatrix}-2 & -1 & 0 & 1\\ 0.1 & 0.2 & 0.2 & 0.5\end{pmatrix}$$ **. What does this tell us about the random variable X?**

- ○ $$F(x)=\begin{cases}0 & if \quad x\le -2,\\ 0.1 & if \quad -2<x\le -1,\\ 0.2 & if \quad -1<x\le 0,\\ 0.2 & if \quad 0<x\le 1,\\ 0.5 & if \quad 1<x.\end{cases}$$
- ○ $$F(x)=\begin{cases}0 & if \quad x\le -2,\\ 0.1 & if \quad -2<x\le -1,\\ 0.3 & if \quad -1<x\le 1,\\ 1 & if \quad 1<x.\end{cases}$$
- ○ $M(X^2)=1$
- ○ $D(X)=1$
- ● $M(X)=0.1$

494. Let a series of distribution of a random variable be given:

$$X = \begin{pmatrix} -4 & -2 & 0 & 2 \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{8} & \frac{1}{8} \end{pmatrix}$$

. What does this tell us about the random variable X?

○ $$F(x) = \begin{cases} 0 \quad if \quad x \le -4, \\ 0.25 \; if \; -4 < x \le -2, \\ 0.5 \; if \; -2 < x \le 0, \\ 0.125 \; if \; 0 < x \le 2, \\ 0.125 \quad if \quad 2 < x. \end{cases}$$

● $M(X) = -\frac{7}{4}$

○ $M(X^2) = 4$

○ $D(X) = 8$

○ $D(X) = 55$

ProbabilityTheoryMathematicalStatistics_Maksat/17

495. The probability of working each of four combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What does this tell us about the random variable X?

● $P(X = 0) = 0.1^4$

○ $P(X = 3) = 0.0009$

○ $P(X = 1) = 0.0729$

○ $P(X = 2) = 0.0081$

○ $P(X = 0) = 0.001$

496. A die is tossed before the first landing “six” aces. Find the probability that the first appearance of “six” will take place at the n-th tossing the die?

● $P(n = 2) = \frac{5}{36}$

○ $P(n = 5) = \frac{1}{6} * \left(\frac{5}{6}\right)^3$

○ $P(n = 3) = \frac{1}{6} * \left(\frac{5}{6}\right)^3$

○ $P(n = 2) = \frac{1}{6} * \left(\frac{5}{6}\right)^2$

○ $P(n=7)=\left(\frac{1}{6}\right)^4*\left(\frac{5}{6}\right)^3$

ProbabilityTheoryMathematicalStatistics_Maksat/18

497. A random variable X is distributed under an exponential law with parameter λ. Find the probability of hit of the random variable X into the interval $(a;b)$.

○ $\lambda=2, a=1, b=3, P=\Phi\left(\frac{3-2}{1}\right)-\Phi\left(\frac{1-2}{1}\right)$

● $\lambda=2, a=1, b=3,\ P=\int_1^3 2e^{-2x}dx$

○ $\lambda=2, a=1, b=3,\ P=\frac{\int_{-\infty}^{3} 2e^{-2x}dx}{\int_{-\infty}^{1} 2e^{-2x}dx}$

○ $\lambda=3, a=1, b=3,\ \ P=\frac{1}{\sqrt{3\cdot 0.5\cdot 0.5}}\varphi\left(\frac{3-3\cdot 1}{\sqrt{3\cdot 0.5\cdot 0.5}}\right)$

○ $\lambda=2, a=1, b=4, P=\Phi\left(\frac{4-2}{2}\right)-\Phi\left(\frac{1-2}{2}\right)$

498. The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter λ. Find the correctly calculated probabilities of the events.

○ $\lambda=2, P(2<X<3)=\Phi\left(\frac{3-2}{1}\right)-\Phi\left(\frac{1-2}{1}\right)$

● $\lambda=2, P(1<X<3)=\int_1^3 2e^{-2x}dx$

○ $\lambda=2, P(1<X<3)=\frac{\int_{-\infty}^{3} 2e^{-2x}dx}{\int_{-\infty}^{1} 2e^{-2x}dx}$

○ $\lambda=3, P(1<X<3)=\frac{1}{\sqrt{3\cdot 0.5\cdot 0.5}}\varphi\left(\frac{3-3\cdot 1}{\sqrt{3\cdot 0.5\cdot 0.5}}\right)$

○ $\lambda=2, P(1<X<4)=\Phi\left(\frac{4-2}{2}\right)-\Phi\left(\frac{1-2}{2}\right)$

499. A random variable X is distributed under a normal law with mathematical expectation $a=20$. The probability of hit of the random variable X into the interval $(10;30)$ is 0.6826. Find the correctly calculated probabilities of the events.

○ $P(10;25)=\Phi\left(\frac{25-20}{10}\right)-\Phi(1)$

● $D(X)=100$

○ $P(20;30)=\frac{\int_{-\infty}^{30}\frac{1}{20}dx}{\int_{-\infty}^{20}\frac{1}{20}dx}$

○ $P(-1;3)=\int_{-1}^{3}\frac{1}{20}dx$

○ $P(10;50)=\Phi\left(\frac{5-2}{2}\right)-\Phi\left(\frac{1-2}{2}\right)$

500. A normally distributed random variable X is given by the differential function: $f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$. Find the probability of hit of the random variable X into the interval $(a; b)$.

- ○ $a = 2$
- ● $\sigma = 1$
- ○ $D(X) = 2$
- ○ $P(-1; 3) = \int_{-1}^{3} e^{-\frac{x^2}{2}} dx$
- ○ $P(1; 5) = \Phi\left(\frac{5}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

501. Suppose that X is a normal law with mathematical expectation $a = 5$. The probability of hit of the random variable X into the interval $(9; +\infty)$ is 0.1587. Find the correctly calculated probabilities of the events.

- ○ $P(10; 25) = \Phi\left(\frac{25-5}{4}\right) - \Phi(1)$
- ● $D(X) = 16$
- ○ $P(20; 30) = \frac{10}{30}$
- ○ $P(-1; 3) = \int_{-1}^{3} \frac{1}{20} dx$
- ○ $P(10; 50) = \Phi\left(\frac{5-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

502. Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $a = 173$, $\sigma^2 = 36$. Find the correctly calculated probabilities of the events.

- ○ $P(176; 182) = 0.1348$
- ● $\sigma = 6$
- ○ $P(20; 30) = \frac{10}{30}$
- ○ $P(-1; 3) = \int_{-1}^{3} \frac{1}{20} dx$
- ○ $P(10; 50) = 0.2417$

503. Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $a = 173$, $\sigma^2 = 36$. Find the correctly calculated probabilities of the events.

- ○ $P(176; 182) = 0.1348$
- ○ $P(20; 30) = \frac{10}{30}$
- ○ $P(-1; 3) = \int_{-1}^{3} \frac{1}{20} dx$
- ● $P(|X - 173| \leq 3) = 2\Phi\left(\frac{1}{2}\right)$
- ○ $P(10; 50) = 0.2417$

504. Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(0;10)$. Find the correctly calculated probabilities of the events.

- ○ $P(3 < X < 8) = 0.18$
- ● $P(X < 3) = 0.3$
- ○ $P(5 < X < 10) = \frac{1}{3}$
- ○ $P(0;10) = \frac{1}{4}$
- ○ $P(1;5) = 0.17$

505. Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(0;10)$. Find the correctly calculated probabilities of the events.

- ○ $P(3 < X < 8) = 0.18$
- ○ $P(5 < X < 10) = \frac{1}{3}$
- ○ $P(0;10) = \frac{1}{4}$
- ● $P(X > 6) = 0.4$
- ○ $P(1;5) = 0.17$

506. A normally distributed random variable X is given by the differential function: $f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x+1)^2}{32}}$. Find the probability of hit of the random variable X into the interval $(a;b)$.

- ○ $a = 1$
- ○ $D(X) = 4$
- ○ $P(-1;3) = 0.32$
- ● $a = -1$
- ○ $P(1;5) = \Phi\left(\frac{5}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

507. The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter λ. Find the correctly calculated probabilities of the events.

- ○ $\lambda = 2, P(2 < X < 3) = \Phi\left(\frac{3-2}{1}\right) - \Phi\left(\frac{1-2}{1}\right)$
- ● $\lambda = 2, P(1 < X < 3) = \frac{e^4 - 1}{e^6}$
- ○ $\lambda = 2, P(1 < X < 3) = \frac{\int_{-\infty}^{3} 2e^{-2x}dx}{\int_{-\infty}^{1} 2e^{-2x}dx}$
- ○ $\lambda = 3, P(-1 < X < 3) = \int_{-1}^{3} 3e^{-3x}dx$
- ○ $\lambda = 2, P(1 < X < 4) = \Phi\left(\frac{4-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

508. A random variable X is distributed under an exponential law with parameter λ. Find the probability of hit of the random variable X into the interval $(a;b)$.

- ○ $\lambda = 2, a = 1, b = 3, P = \Phi\left(\frac{3-2}{1}\right) - \Phi\left(\frac{1-2}{1}\right)$
- ○ $\lambda = 2, a = 1, b = 3,\ P = \frac{\int_{-\infty}^{3} 2e^{-2x}dx}{\int_{-\infty}^{1} 2e^{-2x}dx}$
- ● $\lambda = 3, a = -1, b = 3,\ P = \int_{0}^{3} 3e^{-3x}dx$
- ○ $\lambda = 3, a = -1, b = 3,\ P = \int_{-1}^{3} 3e^{-3x}dx$
- ○ $\lambda = 2, a = 1, b = 4, P = \Phi\left(\frac{4-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

ProbabilityTheoryMathematicalStatistics_Maksat/19

509. The number of all possible allocations

- ● $A_n^m = \frac{n!}{(n-m)!}$
- ○ $A_n^m = \frac{n!}{m!(n-m)!}$
- ○ $A_n^m = n - m!$
- ○ $A_n^m = m - n!$
- ○ $A_n^m = 1$

510. The number of all possible combinations

- ● $C_n^m = \frac{n!}{m!(n-m)!}$
- ○ $C_n^m = \frac{n!}{(n-m)!}$
- ○ $C_n^m = \frac{m!}{n!}$
- ○ $C_n^m = \frac{n!}{m!}$
- ○ $C_n^m = n!$

511. How many ways are there to choose 2 details from a box containing 9 details?

- ○ 12
- ○ 4
- ○ 22
- ○ 11
- ● 36

512. The numbers of allocations, permutations and combinations are connected by the equality

- ● $A_n^m = P_m C_n^m$
- ○ $A_n^m = P_n C_n^m$
- ○ $A_n^m = P_m$
- ○ $A_n^m = P_m C_m^n$
- ○ $A_n^m = n!\, C_n^m$

513. If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by … ways.

● m+n

○ m-n

○ n-m

○ n!

○ C_n^m

514. Events are *equally possible* if …

○ none of them will necessarily happen as a result of a trial

● there is reason to consider that none of them is more possible (probable) than other

○ there is reason to consider that one of them is more possible (probable) than other

○ at least one of them will necessarily happen as a result of a trial

○ one of them will necessarily happen as a result of a trial

515. The probability of the event *A* is determined by the formula

○ $P(A) = \frac{|\Omega|}{|A|}$, where Ω is the space of elementary outcomes

○ $P(A|B) = \frac{|A|}{|B|}$, where Ω is the space of elementary outcomes

● $P(A) = \frac{|A|}{|\Omega|}$, where Ω is the space of elementary outcomes

○ $P(A) = \frac{\lambda^m}{m!} e^{-\lambda}$, where λ is the space of elementary outcomes

○ $P(B|A) = \frac{\lambda^m}{m!}$, where Ω is the space of elementary outcomes

516. The probability of a reliable event is equal to …

● 1

○ 0

○ ½

○ 1/3

○ 1/5

517. The probability of an impossible event is equal to …

● 0

○ 1

○ ½

○ 1/3

○ 1/5

518. The probability of a random event is …

- the positive number between 0 and 1
- the positive number between 0 and ½
- the positive number between 0 and 10
- the positive number between 0 and 1/3
- the positive number between 0 and 1/5

519. The relative frequency of the event *A* is defined by the formula:

- $W(A) = \frac{m}{n}$, where *m* is the number of appearances of the event, *n* is the total number of trials.
- $W(A) = \frac{m}{n}$, where *n* is the number of appearances of the event, m+1 is the total number of trials.
- $W(A) = \frac{m}{n}$, where *m+1* is the number of appearances of the event, *n* is the total number of trials.
- $W(A) = \frac{m+1}{n}$, where *m* is the number of appearances of the event, *n* is the total number of trials.
- $W(A) = \frac{m}{n+1}$, where *m* is the number of appearances of the event, *n* is the total number of trials.

ProbabilityTheoryMathematicalStatistics_Maksat/21

520. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,4. Find the number of hits if 20 shots were made.

- 8
- 3
- 20
- 1
- 6

521. Two dice are tossed. Find the probability that different number of aces will appear on dices

- 1/6
- 5/6
- ½
- 1/3
- 1

522. Two dice are tossed. Find the probability that the sum of aces will exceed 10.

- 1/12
- 5/12
- 5/18
- 1/18

- 0

ProbabilityTheoryMathematicalStatistics_Maksat/22

523. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,5; by the second – 0,2; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by only one student?

- ● 0,42
- ○ 0,48
- ○ 0,92
- ○ 0,28
- ○ 0,99

524. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,5; by the second – 0,3; and by the third – 0,7. What is the probability that the exam will be passed on "excellent" by exactly two students?

- ○ 0,464
- ● 0,395
- ○ 0,12
- ○ 0,192
- ○ 0,48

525. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by at least one student?

- ● 0,958
- ○ 0,93
- ○ 0,465
- ○ 0,15
- ○ 0,848

526. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by neither of the students?

- ● 0,042
- ○ 0,95
- ○ 0,46
- ○ 0,07
- ○ 0,84

527. A bag contains 4 white, 6 red and 10 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?

○ $1-\left(\frac{1}{4}\right)^4$

● $1-\left(\frac{4}{5}\right)^4$

○ $\left(\frac{1}{5}\right)^4$

○ 0.7182

○ $\left(\frac{1}{4}\right)^4$

528. How would it change the expected value of a random variable X if we multiply the X by a number k.

● $M[kX]=k\cdot M[X]$

○ $M[kX]=|k|\cdot M[X]$

○ $M[kX]=M[X]$

○ $M[kX]=M[X]+k$

○ $M[kX]=k^2\cdot M[X]$

529. Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?

○ $A+B+C$

○ $A\cdot B\cdot C$

● $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$

- $(A+B+C)^c$
- $AB + AC + BC$

ProbabilityTheoryMathematicalStatistics_Maksat/24

530. There are 100 identical details (and 20 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted.

- 1/20
- 1/5
- ½
- 1/10
- 1/9

531. A die is tossed. Find the probability that an even number of aces will appear.

- ½
- 1
- 0
- 1/5
- 1/9

532. Participants of a toss-up pull a ticket with numbers from 1 up to 30 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 2.

- 1/30
- 1/3
- ½
- 2/5
- 1/5

533. In a batch of 8 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to?

- ½
- 1
- 3/11
- 3/8
- 3/5

ProbabilityTheoryMathematicalStatistics_Maksat/25

534. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

- ● 0.93
- ○ 0.25
- ○ 0.49
- ○ 0.45
- ○ 0.01

535. For a continuous random variable X, the probability density function f(x) represents

- ○ the probability at a fixed value of X
- ● the area under the curve at X
- ○ the area under the curve to the right of X
- ○ the height of the function at X
- ○ the integral of the cumulative distribution function

536. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is

- ● 0.49
- ○ 0.51
- ○ 0.3
- ○ 0.6
- ○ none of the given answers

537. If the probability density function of a continuous random variable X is

$$f(x) = \begin{cases} kx^2 & 0 \le x \le 3 \\ 0 & otherwise \end{cases}$$ **then the value of k is**

- ○ 1/2
- ○ 0,25
- ● 1/9
- ○ 0,3
- ○ Any positive value greater than 2

538. A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value of *X* is

- ○ 16
- ● 18
- ○ 10
- ○ 3
- ○ 6

ProbabilityTheoryMathematicalStatistics_Maksat/27

539. Four buyers went in a shop. The probability that each buyer makes purchases is equal to 0,5. Find the probability that three of them will make purchases.

- ● 0,25
- ○ 0,096
- ○ 0,95
- ○ 0,125
- ○ 0,712

540. Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that two of them will make purchases.

- ● 0,384
- ○ 0,7
- ○ 0,189
- ○ 0,96
- ○ 0,904

ProbabilityTheoryMathematicalStatistics_Maksat/28

541. If D(X)=3, find D(-3X+4).

- ○ 12
- ○ -5
- ○ 19
- ● 27
- ○ -9

542. If D(X)=3, find D(2X-3).

- ○ 10
- ○ 9
- ○ 3
- ● 12
- ○ -9

543. The table below shows the distribution of a random variable X. Find M[x] and D(X).

X	-2	0	1
P	0.1	0.5	0.4

- ○ M[X]= 0,2; D(X) =0.8
- ○ M[X]= 0,3; D(X) =0.27
- ● M[X]= 0,2; D(X) =0.76
- ○ M[X]= 0,2; D(X) =0.21
- ○ M[X]= 0,8; D(X) =0.24

544. The table below shows the distribution of a random variable X. What is the D(X)?

X	-2	1	2
P	0,2	0,5	0,3

- ● 2,01
- ○ 1,67
- ○ 4,71
- ○ 0,7
- ○ 4,7

545. The table below shows the distribution of a random variable X. What is the M(X)?

X	-2	1	2
P	0,2	0,5	0,3

- ● 0,7
- ○ 0,5
- ○ 4
- ○ 0,34
- ○ 4,7

546. The table below shows the distribution of a random variable X. What is the D(X)?

X	-2	1	2
P	0,1	0,6	0,3

- ● 0,7
- ○ 0,5
- ○ 4
- ○ 0,34
- ○ 4,7

547. The table below shows the distribution of a random variable X. What is the M(X)?

X	-2	1	2
P	0,3	0,5	0,2

- ● 0,7
- ○ 0,5
- ○ 4
- ○ 0,34
- ○ 4,7

548. The table below shows the distribution of a random variable X. What is the M(X)?

X	-2	1	2
P	0,2	0,5	0,3

- 0,7
- 0,5
- 4
- 0,34
- 4,7

ProbabilityTheoryMathematicalStatistics_Maksat/30

549. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.5 & if\ \ 2<x\le 5\\ 0.8 & if\ \ 5<x\le 8\\ 1 & if\ \ x>8\end{cases}$$

Find $P(3\le X<8)$.

- 0,4
- 0,3
- 0,6
- 0,9
- 0,5

550. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.5 & if\ \ 2<x\le 5\\ 0.8 & if\ \ 5<x\le 8\\ 1 & if\ \ x>8\end{cases}$$

Find $P(2\le X<8)$.

- 0,4
- 0,3
- 0,6
- 0,9
- 0,5

551. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.5 & if\ \ 2<x\le 5\\ 0.8 & if\ \ 5<x\le 8\\ 1 & if\ \ x>8\end{cases}$$

Find $P(5 \le X < 10)$.

○ 0,4

● 0,3

○ 0,6

○ 0,9

○ 0,5

552. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.5 & if\ \ 2<x\le 5\\ 0.8 & if\ \ 5<x\le 8\\ 1 & if\ \ x>8\end{cases}$$

Find $P(3 \le X < 9)$.

○ 0,4

● 0,3

○ 0,6

○ 0,9

○ 0,5

553. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.3 & if\ \ 2<x\le 5\\ 0.9 & if\ \ 5<x\le 8\\ 1 & if\ \ x>8\end{cases}$$

Find $P(2 \le X < 5)$.

○ 0,4

● 0,3

○ 0,6

○ 1

○ 0,5

554. You are interested in knowing what percent of all households in a large city have a single woman as the head of the household. To estimate this percentage, you conduct a survey with 200 households and determine how many of these 200 are headed by a single woman.

- ● all households in the city
- ○ the 200 households selected
- ○ the percent of households headed by single women in the city
- ○ the percent of households headed by single women among the 200 selected households

555. You are interested in knowing what percent of all households in a large city have a single woman as the head of the household. To estimate this percentage, you conduct a survey with 200 households and determine how many of these 200 are headed by a single woman.In this example, what is the sample?

- ● the 200 households selected
- ○ the percent ofhouseholds headed by single women in the city
- ○ the percent of households headed by single women among the 200 selected households
- ○ all households in the city

556. You are interested in knowing what percent of all households in a large city have a single woman as the head of the household. To estimate this percentage, you conduct a survey with 200 households and determine how many of these 200 are headed by a single woman.In this example, what is the parameter?

- ○ the 200 households selected
- ● the percent ofhouseholds headed by single women in the city
- ○ the percent of households headed by single women among the 200 selected households
- ○ all households in the city

557. You are interested in knowing what percent of all households in a large city have a single woman as the head of the household. To estimate this percentage, you conduct a survey with 200 households and determine how many of these 200 are headed by a single woman.In this example, what is the statistic?

- ○ the 200 households selected
- ○ the percent ofhouseholds headed by single women in the city
- ● the percent of households headed by single women among the 200 selected households
- ○ all households in the city

558. Which of the following is an example of a quantitative variable (also known as a numerical variable)?

- ○ the color of an automobile
- ○ a person's state of residence

- ○ a person’s zip code
- ● a person’s height, recorded in inches

Describing Data Sets_Maksat/32

559. The Lakers scored the following numbers of goals in their last twenty matches: 3, 0, 1, 5, 4, 3, 2, 6, 4, 2, 3, 3, 0, 7, 1, 1, 2, 3, 4, 3. **Which number had the highest frequency?**

- ● 3
- ○ 4
- ○ 6
- ○ 7

560. Which letter occurs the most frequently in the following sentence? THE SUN ALWAYS SETS IN THE WEST.

- ○ E
- ● S
- ○ T
- ○ W

561. Pi is a special number that is used to find the area of a circle. The following number gives the first 100 digits of the number pi: 3.141 592 653 589 793 238 462 643 383 279 502 884 197 169 399 375 105 820 974 944 592 307 816 406 286 208 998 628 034 825 342 117 067. **Which of the digits 0 to 9 occurs most frequently in this number?**

- ○ 2
- ○ 3
- ○ 8
- ● 9

562. A fair die was thrown 100 times. The frequency distribution is shown in the following table:

Score	Frequency
1	16
2	18
3	11
4	15
5	19
6	21

How many throws scored less than 3?

- ○ 11
- ● 34
- ○ 45
- ○ 56

563. 60 students sat a test. The frequency distribution is shown in the following table:

Mark	Frequency
0	1
1	3
2	6
3	9
4	8
5	11
6	8
7	7
8	4
9	1
10	2

How many students scored 5 or more?

- ○ 11
- ○ 22
- ● 33
- ○ 38

564. A fair die was thrown 100 times. The frequency distribution is shown in the following table:

Score	Frequency
1	16
2	18
3	11
4	15
5	19
6	21

How many throws scored greater than 2, but less than or equal to 5?

- ○ 26
- ○ 44
- ● 45
- ○ 63

565. 60 students sat a test. The frequency distribution is shown in the following table:

Mark	Frequency
0	1
1	3
2	6
3	9
4	8
5	11
6	8
7	7
8	4
9	1
10	2

How many students scored greater than or equal to 4, but less than or equal to 7?

- ○ 19
- ○ 26
- ○ 27
- ● 34

566. Ramiro did a survey of the number of pets owned by his classmates, with the following results:

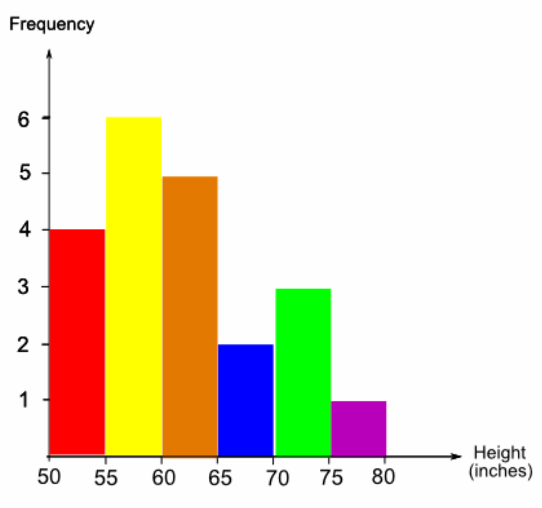
Number of pets	Frequency
0	4
1	12
2	8
3	2
4	1
5	2
6	1

How many of his classmates had less than 3 pets?

- ○ 16
- ○ 20
- ● 24
- ○ 26

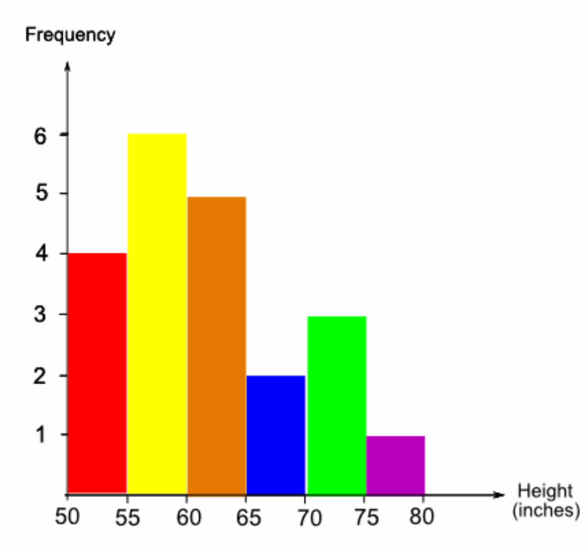
567. The histogram shows the heights of 21 students in a class, grouped into 5-inch groups. How many students were greater than or equal to 60 inches tall?

- ○ 21
- ○ 17
- ● 11
- ○ 6



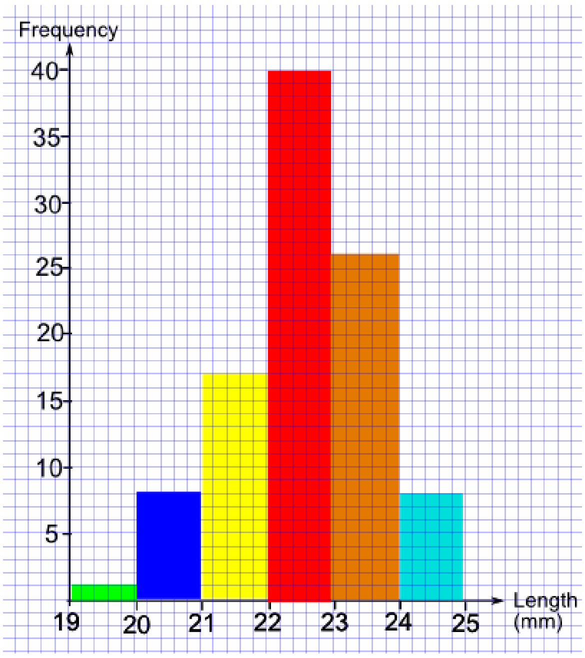
568. The histogram shows the heights of 21 students in a class, grouped into 5-inch groups. How many students were greater than or equal to 60 inches tall but less than 70 inches tall?

- ● 13
- ○ 15
- ○ 16
- ○ 17



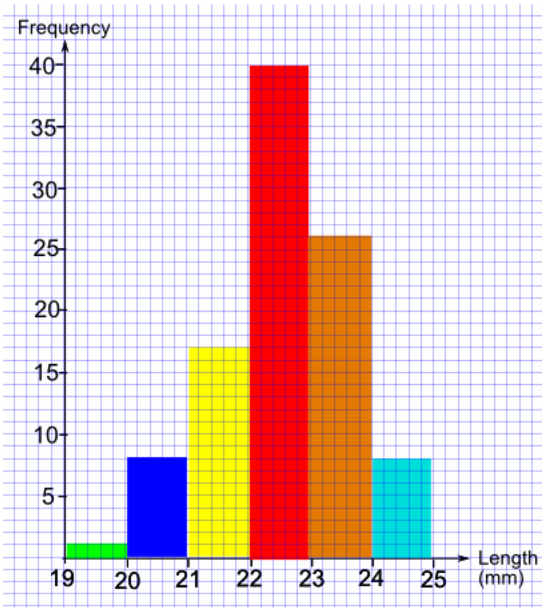
569. A class carried out an experiment to measure the lengths of cuckoo eggs. The length of each egg was measured to the nearest mm. The results are shown in the following histogram: How many eggs were measured altogether in the experiment

- ○ 25
- ○ 40
- ○ 90
- ● 100



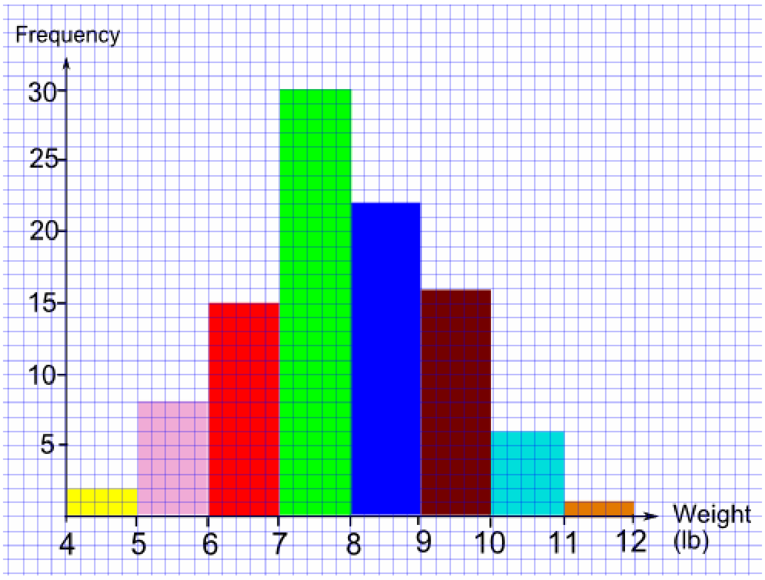
570. A class carried out an experiment to measure the lengths of cuckoo eggs. The length of each egg was measured to the nearest mm. The results are shown in the following histogram: How many eggs were less than 23 mm in length?

- ○ 26
- ○ 40
- ● 66
- ○ 92



571. **The histogram shows the birth weights of 100 new born babies. The histogram shows the birth weights of 100 new born babies. How many babies weighted 8lb or more?**

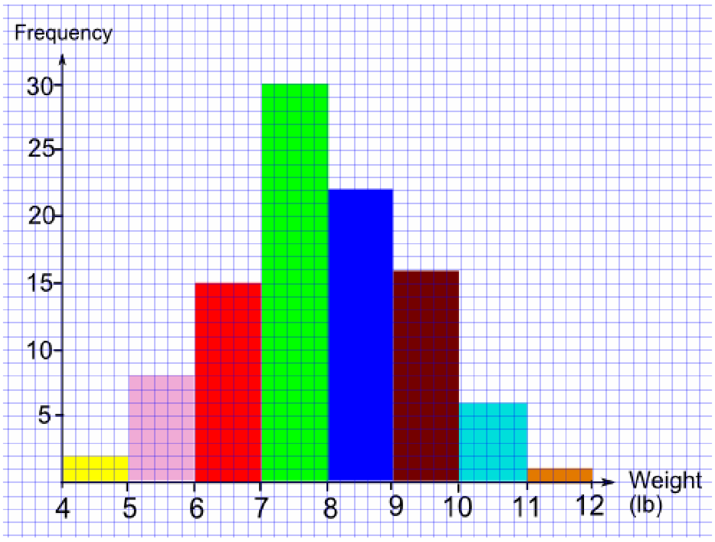
- ○ 22
- ○ 23
- ○ 30
- ● 45



572. **The histogram shows the birth weights of 100 new born babies. Babies who weigh less than 5 lb are considered to have a low birth weight. Babies who weigh 10lb or more are considered to have a high birth weight. What percent of the babies had neither a low or a high birth weight?**

- ○ 97
- ● 91
- ○ 85

○ 83



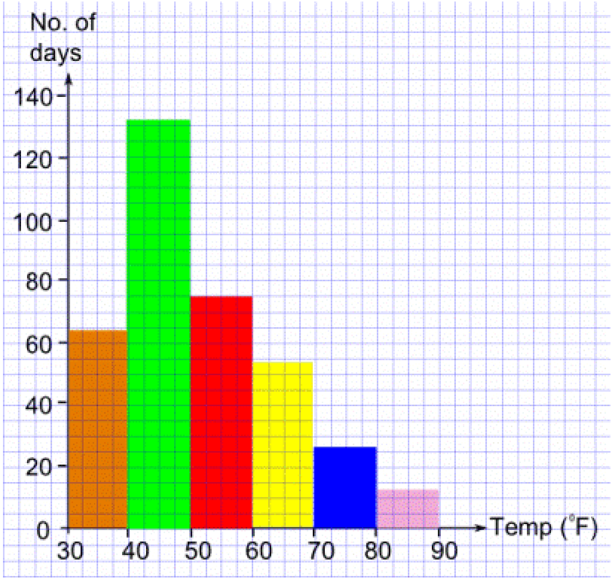
573. **Jim measured the temperature at 2 p.m. at the same spot in his garden and recorded his results to the nearest degree (°F) for each day in the year. The results are shown in the following histogram: on approximately how many days was the 2 p.m temperature above 70°F?**

○ Approximately 12

● Approximately 39

○ Approximately 54

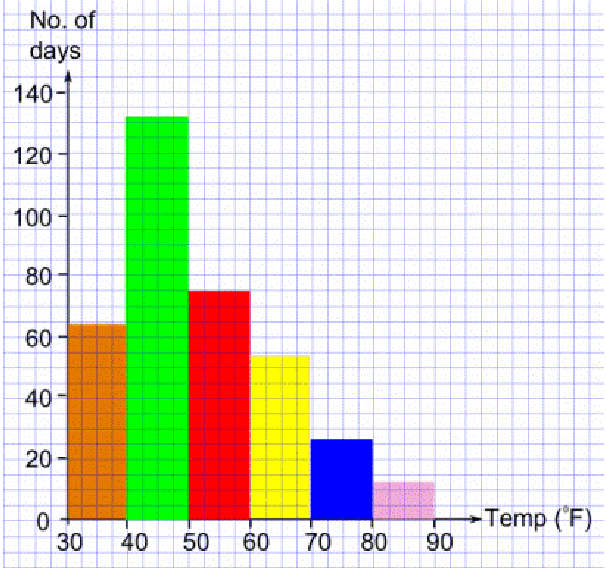
○ Approximately 93



574. **Jim measured the temperature at 2 p.m. at the same spot in his garden and recorded his results to the nearest degree (°F) for each day in the year. The results are shown in the following histogram: on approximately how many days was the 2 p.m temperature above 40°F but less than 70°F?**

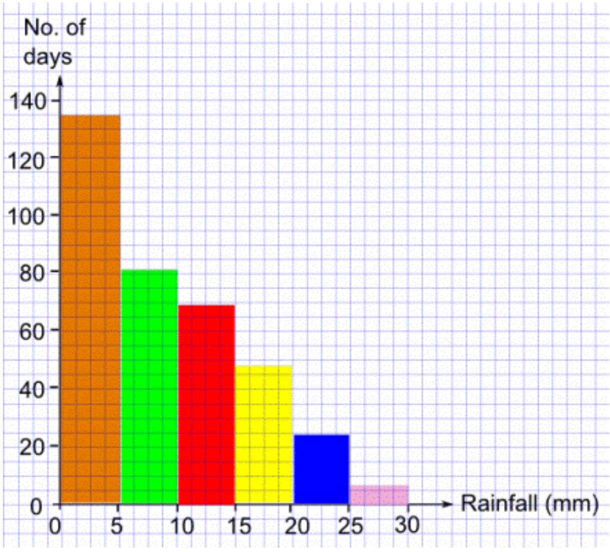
○ approximately 50%

- approximately 60%
- approximately 70%
- approximately 80%



575. Jim measured the daily rainfall in mm at the same spot in his garden for each day in the year (365 days). He recorded his results to the nearest millimeter. The results are shown in the following histogram: on approximately how many days was the rainfall less than 10 mm?

- approximately 81
- approximately 135
- approximately 149
- approximately 216



576. Jim measured the daily rainfall in mm at the same spot in his garden for each day in the year (365 days). He recorded his results to the nearest millimeter. The results are

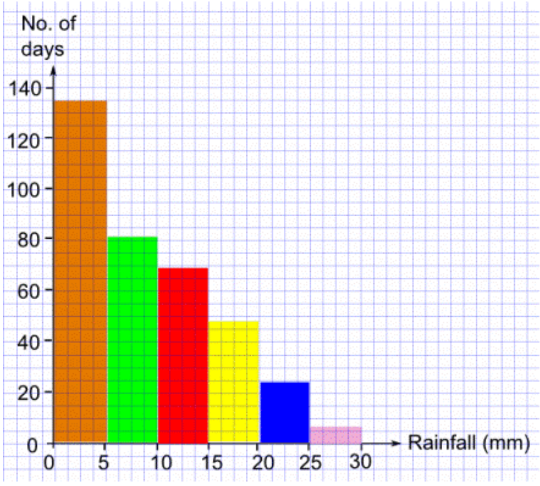
shown in the following histogram: on approximately what percent of the days was the rainfall more than 15 mm?

○ Approximately 10%

● Approximately 20%

○ Approximately 30%

○ Approximately 40%



Stem-and-Leaf Plot _Maksat/33

577. What is the range for the above stem and leaf plot?

○ 39

○ 40

○ 56

● 45

Stem	Leaf
1	1 2 5 7
2	0 1 3 4 8
3	2 9
4	3 3 5 6 8
5	0 1 6

578. For the above stem and leaf plot, what is the median value?

○ 28

- ● 32
- ○ 35.5
- ○ 39

Stem	Leaf
1	1 2 5 7
2	0 1 3 4 8
3	2 9
4	3 3 5 6 8
5	0 1 6

579. What is the range for the above stem and leaf plot?

- ○ 98
- ○ 97
- ● 86
- ○ 85

Stem	Leaf
1	2 3
2	0 1 5 5 8
3	4 6 9
5	3 4 4 4 6
6	2 5 6 6 7 8
8	0 3 5
9	8

580. What is the mode for the above stem and leaf plot?

- ○ 25
- ● 54
- ○ 60
- ○ 66

Stem	Leaf
1	2 3
2	0 1 5 5 8
3	4 6 9
5	3 4 4 4 6
6	2 5 6 6 7 8
8	0 3 5
9	8

581. What is the mean for the above stem and leaf plot?

- ● 50.56
- ○ 50.96
- ○ 53.13
- ○ 54.56

Stem	Leaf
1	2 3
2	0 1 5 5 8
3	4 6 9
5	3 4 4 4 6
6	2 5 6 6 7 8
8	0 3 5
9	8

582. What is the mode for the above stem and leaf plot?

○ 11

● 33

○ 34.5

○ 45

Stem	Leaf
1	0 1 1 5 9
2	1 3 6 7 8
3	0 1 3 3 3 6 7
4	2 3 5 5 7 9
5	3 4 8
7	1 7 9
8	4

583. For the above stem and leaf plot, what is the median value?

○ 29.5

○ 33

● 34.5

○ 36

Stem	Leaf
1	0 1 1 5 9
2	1 3 6 7 8
3	0 1 3 3 3 6 7
4	2 3 5 5 7 9
5	3 4 8
7	1 7 9
8	4

584. What is the mode for the above stem and leaf plot?

○ 28

○ 32

○ 34

● 43

Stem	Leaf
1	1 2 5 7
2	0 1 3 4 8
3	2 9
4	3 3 5 6 8
5	0 1 6

585. What is the median for the above stem and leaf plot?

- ○ 53
- ● 54
- ○ 56
- ○ 83

586. Sammy caught ten rainbow trout, measured their lengths to the nearest inch, and recorded his results in groups as follows: Use the midpoints of the groups to estimate the mean length of the trout Sammy caught.

- ○ 21 inches
- ● 21.5 inches
- ○ 22 inches
- ○ 22.5 inches

Length (in)	Number
15 – 19	2
20 – 24	7
25 – 29	1

587. Sammy caught ten rainbow trout, measured their lengths to the nearest inch, and recorded his results in groups as follows: Use the midpoints of the groups to estimate the mean weight of the rabbits Tommy trapped.

- ○ 11.5lb
- ○ 12lb
- ● 12.5lb
- ○ 13lb

Weight (lb)	Number
5 – 9	2
10 – 14	5
15 – 19	3

588. What is the population standard deviation for the numbers: 75, 83, 96, 100, 121 and 125?

- ○ 16.9
- ○ 17.1
- ○ 17.6
- ● 18.2

589. Ten friends scored the following marks in their end-of-year math exam:23%, 37%, 45%, 49%, 56%, 63%, 63%, 70%, 72% and 82%. What was the standard deviation of their marks?

- ○ 15.1%
- ○ 15.5%
- ● 16.9%
- ○ 18.6%

590. A booklet has 12 pages with the following numbers of words: 271, 354, 296, 301, 333, 326, 285, 298, 327, 316, 287 and 314. What is the standard deviation number of words per page?

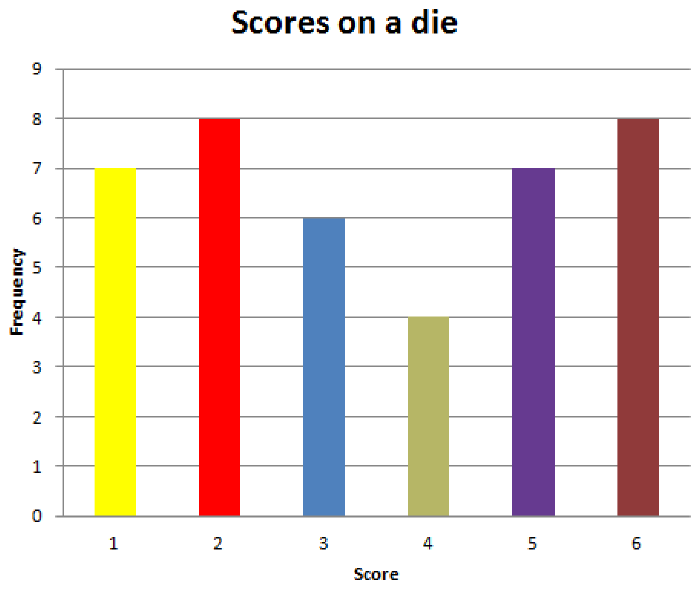
- ● 22.6
- ○ 22.0
- ○ 21.9
- ○ 21.4

591. Nine friends each guessed the number of marbles in a jar. When the answer was revealed they found they had guessed well (and one was the winner!). Here is how close they each got: -9, -7, -4, -1, 0, 2, 7, 9, 12. What was the standard deviation of their errors?

- ○ 3.9
- ○ 5.5
- ○ 6.2
- ● 6.8

592. Emma rolled a die a number of times and recorded her results in a bar graph, as follows: What was the variance?

- ● 3.25
- ○ 2.92
- ○ 1.89
- ○ 1.80



Using Statistics to summarize data sets_Maksat/34

593. What is the standard deviation of the first 10 natural numbers (1 to 10)?

- ○ 2.45
- ● 2.87
- ○ 3.16
- ○ 8.25

594. What is the variance of the first 10 numbers of the Fibonacci sequence {0, 1, 1, 2, 3, 5, 8, 13, 21, 34}?

- ○ 10.47
- ○ 16.88
- ● 109.56
- ○ 285.01

595. The standard deviation of the numbers 3, 8, 12, 17 and 25 is 7.56 correct to 2 decimal places. What happens if each of the five numbers is increased by 2?

- ○ The standard deviation is increased by 2
- ○ The standard deviation is decreased by 2
- ○ The standard deviation is multiplied by 2
- ● The standard deviation stays the same

596. The population standard deviation of the numbers 3, 8, 12, 17, and 25 is 7.563 correct to 3 decimal places. What happens if each of the five numbers is multiplied by 3?

- ○ The standard deviation is increased by 3
- ○ The standard deviation is decreased by 3

- The standard deviation is multiplied by 3
- The standard deviation stays the same

597. Ramiro did a survey of the number of pets owned by his classmates, with the following results: What was the standard deviation?

- 1.38
- 1.49
- 1.60
- 2.27

Number of pets	Frequency
0	4
1	12
2	8
3	2
4	1
5	2
6	1

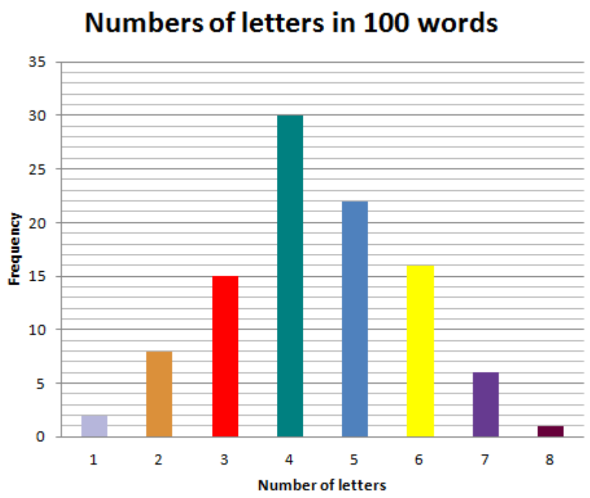
598. Rachel rolled a die forty five times with the following results: What was her mean score?

- 3.4
- 3.5
- 3.62
- 7.5

Score	Frequency
1	8
2	11
3	4
4	8
5	5
6	9

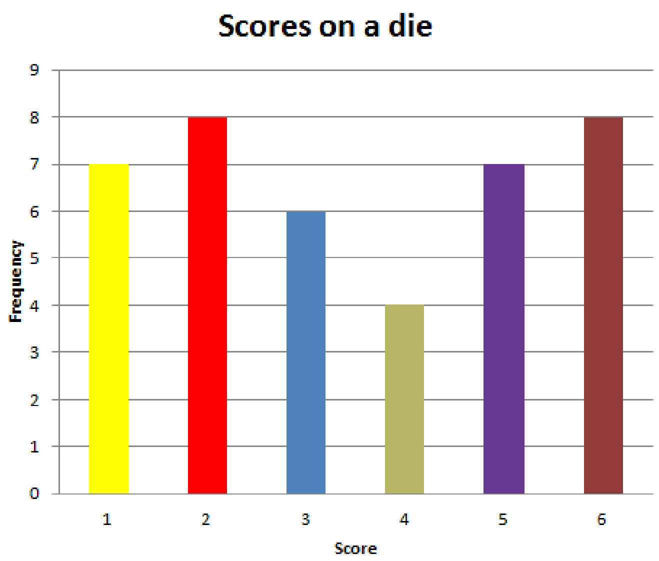
599. Olivia chose a 100 word passage and recorded the number of letters in each word. Her results are shown in the following bar graph:

- 4.29
- 4.39
- 4.49
- 4.5



600. Emma rolled a die a number of times and recorded her results in a bar graph, as follows: Calculate the mean score

- ○ 3
- ● 3.5
- ○ 4
- ○ 6.67



601. Miss Jones has 30 students in her math class. In the recent exam, her students averaged 67%. But Miss Jones told Principal Schultz that her students had averaged 71%. In order to impress Principal Schultz, Miss Jones had excluded the two outliers in her class who had scored very low marks. What was the mean mark of those two poor students?

- ○ 6%
- ○ 12%
- ○ 9%
- ● 11%

602. 50 children guessed the number of marbles in a jar and the average guess was 627. However three of the guesses were way too high and so were excluded from the

competition. When these three outliers were excluded, the average guess was reduced by 114. What was the mean of the three outliers?

- ○ 513
- ○ 1.539
- ● 2.413
- ○ 5.7

603. The following table gives the heights of 10 friends, each measured to the nearest centimeter: If the height of the outlier is not included, which one of the nine remaining friends has the mean height?

- ○ Beth
- ○ Emily
- ● Helen
- ○ Jeremy

Name	Height (cm)
Albert	181
Beth	176
Cindy	154
David	185
Emily	169
Frank	185
Gary	166
Helen	173
Ida	129
Jeremy	168

604. The following table gives the math scores of 10 friends: If the score of the outlier is not included, what is the mean score?

- ○ 35.1%
- ● 39%
- ○ 44.4%
- ○ 49.3%

605. The times taken for 20 people to complete a puzzle were recorded to the nearest minute as follows: 23, 27, 24, 18, 20, 25, 58, 23, 27, 19, 20, 25, 23, 22, 26, 26, 23, 19, 21, 26. By how much is the mean decreased if the outlier is not included?

- ● 1.75 minutes
- ○ 2.25 minutes
- ○ 2.9 minutes
- ○ 5.8 minutes

Normal Data Sets and the Empirical Rule. Sample Correlation Coefficient _Maksat/34

606. The following table gives the heights and weights of 10 friends: Which one of the following best describes the correlation between their heights and weights?

- ○ High positive correlation
- ● Low positive correlation
- ○ No correlation
- ○ Low negative correlation

Name	Height (cm)	Weight (kg)
Albert	180	87
Beth	176	55
Cindy	144	52
David	195	94
Emily	159	87
Frank	185	79
Gary	166	59
Helen	173	64
Ida	149	45
Jeremy	168	77

607. Calculate the correlation coefficient for the following data:

- ● -0.120
- ○ -0.2
- ○ -0.220
- ○ -0.320

x	y
12	1
8	7
5	4
3	6
2	4
0	2

608. Calculate the correlation coefficient for the following data:

- ○ -0.168
- ○ -0.2
- ● -0.268
- ○ -0.368

x	y
1	9
2	6
4	4
6	12
7	8
10	3

609. Calculate the correlation coefficient for the following data:

- ○ 0.9
- ○ 0.932
- ○ 0.952
- ● 0.972

x	y
1	4
2	6
3	5
4	7
5	9
6	11
7	12
8	17
9	19
10	20

610. Calculate the correlation coefficient for the following data:

- ○ -0.822
- ○ -0.9
- ○ -0.902
- ● -0.922

x	y
18	1
16	3
15	5
11	6
12	9
10	11
8	10
4	12
2	11
0	15

611. The following table gives the heights and weights of 10 friends:

- ○ -0.9362
- ○ -0.7294
- ● 0.7294
- ○ 0.9362

Name	Height (cm)	Weight (kg)
Albert	180	87
Beth	176	65
Cindy	144	52
David	195	94
Emily	159	87
Frank	185	79
Gary	166	59
Helen	173	64
Ida	149	45
Jeremy	168	77

612. The following table gives the math scores and times taken to run 100 m for 10 friends. Calculate the correlation coefficient

- ○ -0.9716
- ● -0.9602
- ○ 0.9602
- ○ 0.9716

Name	Math score (%)	Time taken to run 100 m (secs)
Albert	56	11.3
Beth	29	12.9
Cindy	45	11.9
David	93	10.2
Emily	67	11.1
Frank	38	12.5
Gary	85	10.8
Helen	77	10.5
Ida	56	12.0
Jeremy	71	10.9

613. 95% of students at school weigh between 62 kg and 90 kg. Assuming this data is normally distributed, what are the mean and standard deviation?

- ○ Mean = 66 kg S.D. = 7 kg
- ● Mean = 76 kg S.D. = 7 kg
- ○ C) Mean = 86 kg S.D. = 7 kg
- ○ D) Mean = 76 kg S.D. = 14 kg

614. A machine produces electrical components. 99.7% of the components have lengths between 1.176 cm and 1.224 cm. Assuming this data is normally distributed, what are the mean and standard deviation?

- ○ Mean = 1.210 cm S.D. = 0.008 cm
- ○ Mean = 1.190 cm S.D. = 0.008 cm
- ○ Mean = 1.200 cm S.D. = 0.004 cm
- ● Mean = 1.200 cm S.D. = 0.008 cm

615. 68% of the marks in a test are between 51 and 64. Assuming this data is normally distributed, what are the mean and standard deviation?

- ○ Mean = 57 S.D. = 6.5
- ○ Mean = 57 S.D. = 7
- ● Mean = 57.5 S.D. = 6.5

- Mean = 57.5 S.D. = 13

616. The Fresha Tea Company pack tea in bags marked as 250 g. A large number of packs of tea were weighed and the mean and standard deviation were calculated as 255 g and 2.5 g respectively. Assuming this data is normally distributed, what percentage of packs are underweight?

- 2.5%
- 3.5%
- 4%
- 5%

Distributions of Sampling Statistics. Central Limit Theorem _Maksat/35

617. Which of the following features is necessary for something to be considered a sampling distribution?

- Each value in the original populationshould be included in thedistribution.
- The distribution must consist ofproportions.
- The distribution can't consist ofpercentages.
- Each of the observations in the distribution must consist of a statisticthat describes a collection of datapoints.

618. Which of the following would *not* ordinarily be considered a sampling distribution?

- a distribution showing the average weight per person in several hundred groups of three people picked at random at a state fair
- a distribution showing the average proportion of heads coming up in several thousand experiments in which ten coins were flipped each time
- a distribution showing the average percentage daily price change in Dow Jones Industrial Stocks for several hundred days chosen at random from the past 20 years
- a distribution showing the weight of each individual football fan entering a stadium on game day

619. If a researcher wants to study a binomial population where p = 0.1, what is the minimum size n needed to make use of the central limit theorem?

- 100
- 10000

- 1000
- 10

620. Which of the following conditions is enough to ensure that the sampling distribution of the sample means has a normal distribution?

- The population of all possible scoresis very large.
- At least 30 samples are drawn, withreplacement, from the distribution ofpossible scores.
- Individual scores *xi* are normallydistributed.
- None of the above

621. If the population distribution is __________and the sample size is ___________, you need to apply the central limit theorem to assume that the sampling distribution of the sample means is normal.

- normal, 10
- normal, 50
- right-skewed, 60
- Choices (A), (B), and (C)

622. As a *general* rule, approximately what is the smallest sample size that can be safely drawn from a non-normal distribution of observations if someone wants to produce a normal sampling distribution of sample means?

- n=10
- n=50
- n=20
- n=30

33) If two dice are rolled what is the conditional probability that the first one lands on 6 given that the sum of the dice is 11. Ans: 0.5

34) An urn contains 6 white and 9 black balls. if 4 balls are to be randomly selected without replacement, what is the probability that the first 2 selected are white and the last 2 black? Ans: 0.066
35) What is the probability that at tossing three dice 3 aces will appear at least one of the dice? Ans: 0.421
36) 7) What is the probability that the total of two dice will be greater than 9, given that the first die is a 5? Answer :1/3
37) 8) A student looks for one formula necessary to him in three directories. The probability that the formula is contained in the first, second and third directories, equal to 0.6: 0.7 and 0.8 respectively.
   a. A - the formula is contained in all 3 directories Ans: 0.336
   b. B - the formula is contained in at least one directory Ans: 0.976
   c. C - the formula is contained only in one directory Ans: 0.188.
   d. D-formula is contained only in 2 directories Ans: 0.452.
   e. E - the formula is contained in at least 2 directories Ans: 0.788.
38) Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by:

   a) only one student; ANS: 0,3*0,3*0,2+0,7*0,3*0,8+0,7*0,7*0,2 = 0.284

   b) two students; Ans: (p1*p2*q3)+(q1*p2*p3)+(p1*q2*p3) = 0.506

   c) at least one; Ans: 1 – (q1*q2*q3) = 1 – 0.042 = 0.958

   d) neither of the students? Ans: q1*q2*q3 = 0.7 * 0.3 * 0.2 = 0.042

39) Find the probability of a joint appearance of heads at tossing two coins. Ответ:1/4
40) A student looks for one formula necessary to him in three directories. The probability that the formula is contained in the first, is equal to 0,6; 0,7 and 0,8 respectively. Find the probability that the formula is contained in all the directories. Ответ: 0.336
41) The probability of appearance of any of two incompatible events is equal to Ответ: P(A+B)=P(A)+P(B)
42) There are 3 boxes containing 10 details each. There are 8 standard details in the first box, 7 – in the second and 9 – in the third box. One takes at random on one detail from each box. Find the probability that all three taken details will be standard. Answer: 0.504
43) A student looks for one formula necessary to him in three directories. The probability that the formula is contained in the first, second and third directories, is equal to 0,6; 0,7 and 0,8 respectively. Find the probability that the formula is contained in all the directories Answer: 0,336
44) A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,45 and in the second – 0,35. Find the probability that the shooter will hit at one shot either in the first area or in the second area. Answer: 0,80

45) The sum of probabilities of events A1, A2, A3, which form a complete group is equal to Answer: 1
46) A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will not be solved? Answer: 10/29

47) There are 5 white, 4 black and 3 blue balls in an urn. Each trial consists in extracting at random one ball without replacement. Find the probability that a white ball will appear at the first trial

(the event A), a black ball will appear at the second trial (the event B), and a blue ball will appear at the third trial (the event C). Ans: 1/22

48) the fair dice are tossed. how many possible outcomes are there? ans: none of this
49) Four tickets are distributed among 25 students (15 of them are girls). Everyone can take only one ticket. What is the probability that owners of these tickets will be: four girls; ans:0,108
50) 10 persons participate in competitions, and three of them will take the first, second and third places. How many different variants are possible? ans: 720.
51) If two dice are tossed, what is the probability of rolling a sum of 10? ans: 1/12
52) Two dice are tossed. Find the probability that the sum of aces will exceed 10 3/36
53) The sum of the probabilities of opposite events is equal to 1
54) A coin is tossed and a fair six-sided die is thrown. How many possible outcomes are there? 12
55) There are 3 white and 3 black balls in an urn. One takes out twice on one ball from the urn without replacement. Find the probability of appearance of a white ball at the second trial (the event B) if a black ball was extracted at the first trial (the event A). Answer:3/5.
56) There are 30 balls in an urn: 10 red, 5 blue and 15 white. Find the probability of appearance of colour ball Answer:1/2
57) If an object A can be chosen from the set of objects by m ways and after every such choice an object B can be chosen by n ways then the pair of the objects (A, B) in this order can be chosen by ... ways Answer: n*m
58) There are 100 products (including 4 defective) in a batch. The batch is arbitrarily divided into two equal parts which are sent to two consumers. What is the probability that all defective products will be got: a) by one consumer; b) by both consumers fifty-fifty? The answer: a) 0,117; b) 0,383
59) Four tickets are distributed among 25 students (15 of them are girls). Everyone can take only one ticket. What is the probability that owners of these tickets will be: four girls; Ответ: 0.108
60) How many two-place numbers can be made of the digits 1, 4, 5 and 7 if each digit is included into the image of Ответ:24(не точно)
61) How many ways are there to choose two details from a box containing 10 details? Ответ: 45
62) How many ways are there to choose 2 details from a box containing 9 details? Ответ:36
63) There probability of a reliable event is equal to Ответ: 1
64) The are 3 boxes containing 10 details each. There are 8 standard details in the first box, 7-in the second and 9-in the third box. One takes at random on one detail from each box. Find the probability that all three taken details will be standard. ANSWER 0.504

1. A reliable event is: - **event is an event that necessarily will happen if a certain set of conditions S holds**

2. The probability of reliable event is the number: **1**

3. An impossible event is: (null) event is an event that certainly will not happen if the set of conditions S holds.

4. The probability of impossible event is the number: 0

5. A random event is: event is an event that can either take place, or not to take place for holding the set of conditions S.

6. The probability of an arbitrary event A is the number: 0<=P(x)<=1

7. Probabilities of opposite events *A* and $\overline{A}$ satisfy the following condition: *P(A) + P(* $\overline{A}$ *) = 1*

8. For opposite events A and $\overline{A}$ one of the following equalities holds: $P(A \cdot \overline{A}) =$ 0 $P(A + \overline{A}) =$ 1

9. Let A and B be opposite events. Find P(B) if P(A) = 3/5. 2/5

10. Let A and B be events connected with the same trial. Show the event that means simultaneous occurrence of A and B.

P=AB

11. Let A and B be events connected with the same trial. Show the event that means occurrence of only one of events A and B.

A*B s 4ertoi + $\overline{A}$ ***B**

12. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means occurrence only one of events A_1, A_2 and A_3. Express the event A by the events A_1, A_2 and A_3.

$\overline{A}$ **1*** $\overline{A}$ **2*A3 +** $\overline{A}$ **1*A2*** $\overline{A}$ **3+A1*** $\overline{A}$ **2*** $\overline{A}$ **3**

13. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means none of events A_1, A_2 and A_3 have happened. Express the event A by the events A_1, A_2 and A_3

A_3 **vse A s 4ertami**

14. Let *n* be the number of all outcomes, *m* be the number of the outcomes favorable to the event *A.* The classical formula of probability of the event *A* has the following form:

P(A) = m/n

15. The probability of an arbitrary event cannot be: less than 0 or more than 1

16. Let the random variable *X* be given by the law of distribution

x_i	-4	-1	0	1	4
p_i	0,2	0,1	0,3	0,2	0,2

Find mean square deviation σ (X)*:*

M(x) = 0.1

D(x) = 6.69

σ (X) = 2.5865

17. Two events form a complete group if they are:

Some events form a *complete group* if in result of a trial at least one of them will appear.

18. A coin is tossed twice. Find probability that "heads" will land in both times.

1/4

19. A coin is tossed twice. Find probability that "heads" will land at least once.

3/4

20. There are 2000 tickets in a lottery. 1000 of them are winning, and the rest 1000 – non-winning. It was bought two tickets. What is the probability that both tickets are winning?

1000/2000 * 999/1999 = 0.24987

21. Two dice are tossed. Find probability that the sum of aces does not exceed 2.

1/36

22. Two dice are tossed. Find probability that the sum of aces doesn't exceed 5.

10/36

23. Two dice are tossed. Find probability that the product of aces does not exceed 3.

5/36

24. There are 20 white, 25 black, 10 blue and 15 red balls in an urn. One ball is randomly extracted. Find probability that the extracted ball is white or black.

45/70 = 9/14

25. There are 11 white and 2 black balls in an urn. Four balls are randomly extracted. What is the probability that all balls are white?

C(4,11)/C(4,13) = 0.46 or 11/13 * 10/12 * 9/11 * 8/10 = 0.46

26. Calculate C_{14}^{4}: 1001

27. Calculate A_{7}^{3}: 210

28. One chooses randomly one letter of the word "HUNGRY". What is the probability that this letter is "E"? 0

29. The letters T, A, O, B are written on four cards. One mixes the cards and puts them randomly in a row. What is the probability that it is possible to read the word "BOAT"? ¼! = 0.0416

30. There are 5 white and 4 black balls in an urn. One extracts randomly two balls. What is the probability that both balls are white? 5/9*4/8 = 0.2(7)

31. There are 11 white, 9 black, 15 yellow and 25 red balls in a box. Find probability that a randomly taken ball is white. 11/60

32. There are 11 white, 9 black, 15 yellow and 20 red balls in a box. Find probability that a randomly taken ball is black. 9/55

33. How many 6-place telephone numbers are there if the digits “0” and “9” are not used on the first place? 8*10^5

34. 15 shots are made; 9 hits are registered. Find relative frequency of hits in a target. 9/15

35. A point is thrown on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 5/6. (2 – 2*5/6)/2 = 1/6

36. Two dice are tossed. What is the probability that the sum of aces will be more than 8? 7/36

37. A coin is tossed 6 times. Find probability that “heads” will land 4 times. C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

38. There are 6 children in a family. Assuming that probabilities of births of boy and girl are equal, find probability that the family has 4 boys: C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

39. Two shots are made in a target by two shooters. The probability of hit by the first shooter is equal to 0,7, by the second – 0,8. Find probability of at least one hit in the target. 1 – 0.3*0.2 = 0.94

40. The device consists of two independently working elements of which probabilities of non-failure operation are equal 0,8 and 0,7 respectively. Find probability of non-failure operation of two elements. 0.8*0.7 = 0.56

41. There are 5 books on mathematics and 7 books on chemistry on a book shelf. One takes randomly 2 books. Find the probability that these books are on mathematics. 5/12 * 4/11 = 10/66

42. There are 5 standard and 6 non-standard details in a box. One takes out randomly 2 details. Find probability that only one detail is standard. 5*6/C(2,11) = 30/55 = 6/11

43. Three shooters shoot on a target. Probability of hit in the target at one shot for the 1st shooter is 0,85; for the 2nd – 0,9 and for the 3rd – 0,95. Find probability of hit by all the shooters. 0.85*0.9*0.95 = 0,72675

44. A student knows 7 of 12 questions of examination. Find probability that he (or she) knows randomly chosen 3 questions.

7/12*6/11*5/10 = 0.15(90)

45. Two shooters shoot on a target. The probability of hit by the first shooter is 0,7, and the second – 0,8. Find probability that only one of shooters will hit in the target. 0.7*0.2 + 0.8*0.3 = 0.38

46. Three dice are tossed. Find probability that the sum of aces will be 6.

10/216

47. At shooting from a rifle the relative frequency of hit in a target appeared equal to 0,8. Find the number of hits if 200 shots have been made. 200*0.8

48. In a batch of 200 details the checking department has found out 13 non-standard details. What is the relative frequency of occurrence of non-standard details equal to? 13/200 = 0.065

49. If A and B are independent events then for P(AB) one of the following equalities holds: P(AB) = P(A)*P(B)

50. If events A and B are compatible then for P(A + B) one of the following equalities holds: P(A+B) =P(A) + P(B) – P(AB)

51. If events A and B are incompatible then for P(A+ B) one of the following equalities holds: P(A+B) =P(A)+P(B)

52. The probability of joint occurrence of two dependent events is equal: $P(AB) = P(A) \cdot P_A(B)$

53. A point is put on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 4/7. (2 – 2*4/7)/2 = 3/7

54. There are 5 white and 7 black balls in an urn. One takes out randomly 2 balls. What is the probability that both balls are black?

7/12 * 6/11 = 0.318

55. There are 7 identical balls numbered by numbers 1, 2..., 7 in a box. All balls by one are randomly extracted from a box. Find probability that numbers of extracted balls will appear in ascending order. 1/7! = 1.98*10^4

56. There are 25 details in a box, and 20 of them are painted. One extracts randomly 4 details. Find probability that the extracted details are painted. 20/25 * 19/24 * 18/23 * 17/22 = 0.383

57. There are 20 students in a group, and 8 of them are pupils with honor. One randomly selects 10 students. Find probability that there are 6 pupils with honor among the selected students. C(6, 8) * C(4 , 12) / C(10, 20) = 28 * 495/184756 = 0.075

58. There are 4 detective lamps among 12 electric lamps. Find probability that randomly chosen 2 lamps will be defective.

4/12 * 3/11 = 0. (09)

59. A circle of radius *l* is placed in a big circle of radius *L*. Find probability that a randomly thrown point in the big circle will get as well in the small circle.

l^2/L^2

60. There are 6 white and 4 red balls in an urn. The event A consists in that the first taken out ball is white, and the event B – the second taken out ball is white. Find the probability $P(A) \cdot P_A(B)$ = 6/10 * 5/9 = 1/3

61. Probability not to pass exam for the first student is 0,2, for the second - 0,4, for the third - 0,3. What is the probability that only one of them will pass the exam? 0.8*0.4*0.3 + 0.2 * 0.6 *0.3 + 0.2 * 0.4 * 0.7 = 0.188

62. The probability of delay for the train №1 is equal to 0,1, and for the train №2 – 0,2. Find probability that at least one train will be late. 1 – 0.9*0.8 = 0.28

63. The probability of delay for the train №1 is equal to 0,3, and for the train №2 – 0,45. Find probability that both trains will be late. 0.3 * 0.45 = 0.135

64. The events A and B are independent, P(A) = 0,4; P(B) = 0,3. Find $P(\overline{A}B)$.

0.6*0.3 = 0.18

65. The events A and B are compatible, P(A) = 0,4; and P(B) = 0,3. Find P($\overline{A}+\overline{B})$. = 0.6 + 0.7 - 0.42 = 0.88

66. If the probability of a random event A is equal to P(A), the probability of the opposite event $\overline{A}$ is equal: 1 - P(A),

67. Show the formula of total probability:

$$P(A)=P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)$$

68. The formula $P_A(B_i)=\dfrac{P(B_i)\cdot P_{B_i}(A)}{\sum\limits_{i=1}^{n}P(B_i)P_{B_i}(A)}$ is *Bayes's formulas*

69. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3 forming a complete group will occur, P (A) is calculated by the following formula:

$$P(A)=P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)$$

70. Electric lamps are made at two factories, and the first of them delivers 60%, and the second – 40% of all consumed production. 80 of each hundred lamps of the first factory are standard on the average, and 60 – of the second factory. Find probability that a bought lamp will be standard.

0.6*08 + 0.4*0.6 = 0.72

71. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3, B_4 forming a complete group will occur, $P_A(B_2)$ is calculated by the following formula:

$$P_A(B_i)=\frac{P(B_i)\cdot P_{B_i}(A)}{P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)}$$

72. The probability of hit in 10 aces for a given shooter at one shot is 0,9. Find probability that for 10 independent shots the shooter will hit in 10 aces exactly 6 times. C(6, 10) * 0.9^6 * 0.1^4 = 0.0111

73. There are 6 children in a family. Assuming that probabilities of birth of boy and girl are equal, find the probability that there are 4 girls and 2 boys in the family. C(4, 6) * 0.5 ^4 * 0.5^2 = 15/64

74. It is known that 15 % of all radio lamps are non-standard. Find probability that among 5 randomly taken radio lamps appears no more than 1 non-standard. C(0, 5)*0.15^0 * 0.85^5 + C(1, 5)*0.15^1 * 0.85^4 = 0.8355

75. 10 buyers came in a shop. What is the probability that 4 of them will do shopping if the probability to make purchase for each buyer is equal to 0,2?

C (4, 10) * 0.2 ^ 4 * 0.8^6 = 0.088

76. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2
P	1/3	1/3	1/6	1/6

Find mathematical expectation M(X).

-4/3

77. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2
P	1/3	1/3	1/6	1/6

Find dispersion D (X).

M(x) = -4/3

M(x^2) = 5

D(x) = 5 – (4/3)^2 = 3, (2)

78. We say that a discrete random variable X is distributed under the binomial law (binomial distribution) if P (*X* = *k*) =

$$P(X = m) = C_n^m p^m q^{n-m}$$

79. We say that a discrete random variable X is distributed under Poisson law with parameter λ (Poisson distribution) if *P(X = k) =*

$$P(X = m) = \frac{\lambda^m e^{-\lambda}}{m!}$$

80. We say that a discrete random variable X is distributed under the geometric law (geometric distribution) if P*(X=k)* =

$P(X = m) = pq^{m-1}$

81. A random variable X is distributed under Poisson law with parameter λ (Poisson distribution). Find M (X) =λ

82. A random variable X is distributed under the binomial law: P *(X=k)* = $C_n^k p^k q^{n-k}$ (0 <*p* <1, *q* =1-*p*; *k*=*1*, 2, 3, …, *n*). Find M(X) = np

83. Dispersion of a discrete random variable X is D(x) = $D(X) = M[X^2] - (M(X))^2$

84. Dispersion of a constant C is D(C) = 0

85. The law of distribution of a discrete random variable *X* is given. Find *Y*.

X	–2	4	6
P	0.3	0.6	*Y*

Y = 0.1

86. The law of distribution of a discrete random variable *X* is given, M (X) = 5. Find x_1.

X	x_1	4	6
P	0.2	*p2*	0.3

P2 = 0.5

X1 = 11

87. Mathematical expectations $M(X) = 5, M(Y) = 4{,}3$ are given for independent random variables *X* and *Y*. Find $M(X \cdot Y)$ 21.5

88. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	0,1	0,3	p_3	0.2

Then the probability p_3 is equal to: 0.4

89. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	p_1	0.1	0.4	0.3

Then the probability p_1 is equal to: 0.2

90. For an event – dropping two tails at tossing two coins – the opposite event is: 2 heads

91. 4 independent trials are made, and in each of them an event A occurs with probability p. Probability that the event A will occur at least once is: 1 – q*(m);

92. Show the Bernoulli formula

$$P(X = m) = C_n^m p^m q^{n-m}$$

93. Show mathematical expectation of a discrete random variable X:

$$M(X) = \sum_{i=1}^{\infty} x_i p_i$$

94. Show the Chebyshev inequality

$P(|X - a| > \varepsilon) \le D(X)/\varepsilon^2$

95. An improper integral of density of distribution in limits from $-\infty$ till ∞ is equal to **1**

96. The random variable *X* is given by an integral function of distribution: $F(x) = \begin{cases} 0 & if \quad x \le -2, \\ \frac{1}{4}x + \frac{1}{2} & if \ -2 < x \le 2, \\ 1 & if \quad x > 2. \end{cases}$

Find probability of hit of the random variable *X* in an interval (1; 1,5): = 1/8

97. Show one of true properties of mathematical expectation (C is a constant): $M(C) =$ C

98. Let M(X) = 5. Find M(X – 4) = 1

99. Let M(X) = 5. Find M(4X). = 20

100. Let D(X) = 5. Then D(X – 4) is equal to 5

101. Let D(X) = 5. Then D(4X) is equal to 80

102. Random variables *X* and *Y* are independent. Find dispersion of the random variable $Z = 4X - 5Y$ if it is known that D(X) = 1, D(Y) = 2.

*16*1 + 25*2 = 66*

103. A random variable *X* is given by density of distribution of probabilities: $f(x) = \begin{cases} 0 \text{ if } & x \leq 0, \\ 1 \text{ if } & 0 < x \leq 1, \\ 0 \text{ if } & x > 1 \end{cases}$

Find the function of distribution F(x).

F(x) = x   0<x<1…..

104. Let $f(x)$ be a density of distribution of a continuous random variable X. Then function of distribution is:

$$F(x) = \int_{-\infty}^{x} \varphi(t)dt$$

105. Function of distribution of a random variable X is:

F(x) = P(X < x),

106. If dispersion of a random variable D(X) = 5 then D(5X) is equal to 25*5 = 125

107. Differential function f(x) of a continuous random variable X is determined by the equality:

$$\varphi(x) = F'(x)$$

108. If F(x) is an integral function of distribution of probabilities of a random variable X then P(a < X < b) is equal to

$$P(a \leq X \leq b) = \int_{a}^{b} \varphi(x)dx$$

109. Show the formula of dispersion

$$D(X) = \int_{-\infty}^{+\infty} (x-a)^2 \varphi(x)dx$$

110. Which equality is true for dispersion of a random variable? $D(CX) =$ C^2 * D(x)

111. The probability that a continuous random variable X will take on a value belonging to an interval (a, b) is equal to $P(a < X < b) =$ $P(a \leq X \leq b) = \int_{a}^{b} \varphi(x)dx$

112. A random variable X is distributed under an exponential law with parameter λ = 2. Find the dispersion of X:

1/4

113. Show a differential function of the law of uniform distribution of probabilities

$$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \leq x \leq b, \\ 0 & if \quad x < a \ or \ x > b. \end{cases}$$

114. Mathematical expectation of a continuous random variable X of which possible values belong to an interval [a, b] is

(a+b)/2

115. Mean square deviation of a random variable X is determined by the following formula

$$a = M(X) = \int_{-\infty}^{+\infty} x\varphi(x)dx$$

116. Dispersion D(X) of a continuous random variable X is determined by the following equality

$$D(X) = \int_{-\infty}^{+\infty} (x-a)^2 \varphi(x)dx$$

117. Function of distribution of a random variable X is given by the formula $F(x) = \begin{cases} 0 & if \quad x \le 0 \\ \sin 2x \text{ if } 0 < x \le \pi/4 \\ 1 & \text{if} \quad x > \pi/4 \end{cases}$. Find density of distribution f(x).

Тупо производная

118. Distribution of probabilities of a continuous random variable X is exponential if it is described by the density

$$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \ge 0, \\ 0 & for \quad x < 0. \end{cases}$$

119. A random variable X is normally distributed with the parameters *a* and σ^2 if its density $f(x)$ is:

$$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

120. Function of distribution of the exponential law has the following form:

$$F(x) = \begin{cases} 0 & for \ x < 0, \\ 1 - e^{-\lambda x} & for \ x \ge 0. \end{cases}$$

121. Mathematical expectation of a random variable X uniformly distributed in an interval (0, 1) is equal to

1/2

122. A random variable X $\in (-\infty, \infty)$ has normal density of distribution $f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-3)^2}{32}}$ Find the value of paramек σ. 4

123. A random variable X $\in (-\infty, \infty)$ has normal density distribution $f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-2)^2}{8}}$. Find the value of parameter σ. 2

124. Mathematical expectation of a normally distributed random variable X is *a* = 4, and mean square deviation is σ =5. Write the density of distribution X.

$$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

125. It is known that M (X) = - 3 and M (Y) = 5. Find M (3X – 2Y). = 1

126. Random variables X and Y such that Y =4X – 2 and D(X) = 3 are given. Find D(Y). 48

127. The number of allocations of *n* elements on *m* is equal to: $A_n^m = \frac{n!}{(n-m)!}$

128. The number of permutations of *n* elements is equal to: $P_n = n!$

129. How many various 7-place numbers are possible to make of digits 1, 2, 3, 4, 5, 6, 7 if digits are not repeated?

7! = 5040

130. How many ways is there to choose two employees on two various positions from 8 applicants?

A(2 , 8)

131. The number of combinations of *n* elements on *m* is equal to:

$$C_n^m = \frac{n!}{m!(n-m)!}$$

132. 3 dice are tossed. Find probability that each die lands on 5:

1/216

133. 2 dice are tossed. Find probability that the same number of aces will appear on each of the dice: 1/6

134. The pack of 52 cards is carefully hashed. Find probability that a randomly extracted card will be an ace: 4/36

135. The pack of 52 cards is carefully hashed. Find probability that two randomly extracted cards will be aces: C(2 , 4) / C(2,52)

136. How many ways are there to choose 3 books from 6? C(3, 6)

137. There are 60 identical details in a box, and 8 of them are painted. One takes out randomly one detail. Find probability that a randomly taken detail will be painted: 8/60

138. How many 4-place numbers can be composed of digits 1, 3, 9, 5? 4^4

139. Dialing the phone number, the subscriber has forgotten one digit and has typed it at random. Find probability that the necessary digit has been typed: 1/10

140. The urn contains 4 white and 6 black balls. One extracts by one randomly two balls without replacement. What is the probability that both balls will be black: 6/10 * 5/9

141. The urn contains 4 white and 6 black spheres. Two balls are randomly extracted from the urn. What is the probability that these balls will be of different color: 4*6/C(2, 10)

142. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that both of them will have the first sort: 3/ 7 * 2/6

143. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that they have the same sort: 3/7 * 2/6 + 4/7*3/6

144. A student knows 25 of 30 questions of the program. Find probability that the student knows offered by the examiner 3 questions. 25/30 * 24/29 * 23/28

145. A random variable X is distributed under an exponential law with parameter λ = 2. Find the mathematical expectation of X:

M(x) = λ = 2

146. Two shooters shoot on a target. The probability of hit in the target by the first shooter is 0,8, by the second – 0,9. Find probability that only one of shooters will hit in the target: 0.8 * 0.1 + 0.9* 0.2

147. A coin is tossed 5 times. Find probability that heads will land 3 times: C(3, 5) * 0.5 ^ 3 * 0.5 ^2

148. A coin is tossed 5 times. Find probability that heads never will land: C(0.5)*0.5^5

149. A coming up seeds of wheat makes 90 %. Find probability that 4 of 6 sown seeds will come up: C(4,6) * 0.9^4 * 0.1 ^2

150. A coming up seeds of wheat makes 90 %. Find probability that only one of 6 sown seeds will come up: C(6, 6) * 0.9 ^6

151. Identical products of three factories are delivered in a shop. The 1-st factory delivers 60 %, the 2-nd and 3-rd factories deliver 20 % each. 70 % of the 1st factory has the first sort, 80% of both the 2nd and the 3rd factories have the first sort. One product is bought. Find probability that it has the first sort: 0.74

152. The dispersion *D(X)* of a random variable *X* is equal to 1,96. Find σ(X): 1.4

153. Find dispersion *D(X)* of a random variable *X*, knowing the law of its distribution

x_i	1	2	3
p_i	0,2	0,5	0,3

M(x) = 0.2 + 1 + 0.9 = 2.1

M(x^2) = 0.2 + 2 + 2.7 = 4.9

D(x) = 0.49

154. If incompatible events **A**, **B** and **C** form a complete group, and P(**A**) + P(**B**) = 0,6 then P(**C**) is equal to: 0.4

155. Let **A** and **B** be events connected with the same trial. Show the event that means an appearance of **A** and a non-appearance of **B**. P(ABс чертой)

156. Let $\mathbf{A_1}$, $\mathbf{A_2}$, $\mathbf{A_3}$ be events connected with the same trial. Let **A** be the event that means occurrence only two of events $\mathbf{A_1}$, $\mathbf{A_2}$ and $\mathbf{A_3}$. Express the event **A** by the events $\mathbf{A_1}$, $\mathbf{A_2}$ and $\mathbf{A_3}$.

157. Let M be the number of all outcomes, and S be the number of non-favorable to the event **A** outcomes (S < M). Then P(A) is equal to: (M-S)/M

158. Five events form a complete group if they are: Some events form a *complete group* if in result of a trial at least one of them will appear.

159. There are 4000 tickets in a lottery, and 200 of them are winning. Two tickets have been bought. What is the probability that both tickets are winning? 200/4000 * 199/3999

160. If X is uniformly distributed over (0, 7), calculate the probability that X < 2: 2/7

161. If X is uniformly distributed over (0, 7), calculate the probability that X > 6: 1/7

162. There are 23 white, 35 black, 27 yellow and 25 red balls in an urn. One ball has been extracted from the urn. Find the probability that the extracted ball is white or yellow. 27/110

163. There are 15 red and 10 yellow balls in an urn. 6 balls are randomly extracted from the urn.

What is the probability that all these balls are red? C(6, 15)/ C(6, 25)

164. One letter has been randomly chosen from the word "STATISTICS". What is the probability that the chosen letter is "S"? 0.3

165. One letter has been randomly chosen from the word "PROBABILITY". What is the probability that the chosen letter is "I"? 2/11

166. How many 6-place phone numbers are there if only the digits “1”, “3” or “5” are used on the first place? 3*10^5

167. 150 shots have been made, and 25 hits have been registered. Find the relative frequency of hits in a target. 1/6

168. A point is thrown on an interval of length 3. Find the probability that the distance from the point to the ends of the interval is more than 1. 1/3

169. Two dice are tossed. What is the probability that the sum of aces will be more than 8?10/36

170. There are 4 children in a family. Assuming that the probabilities of births of boy and girl are equal, find the probability that the family has four boys: C(0, 4)*0.5^4

171. An urn contains 3 yellow and 6 red balls. Two balls have been randomly extracted from the urn. What is the probability that these balls will be of different color: 3*6/C(2, 9)

172. There are 5 books on mathematics and 8 books on biology in a book shelf. 3 books have been randomly taken. Find the probability that these books are on mathematics. 5/13 *4/12 *3 /11

173. There are 7 standard and 3 non-standard details in a box. 3 details have been randomly taken. Find the probability that only one of them is standard. C(1, 3) * C(2, 7)/ C(2, 10)

174. Three shooters shoot in a target. The probability of hit in the target at one shot by the 1st shooter is 0,8; by the 2nd – 0,75 and by the 3rd – 0,7. Find the probability of hit by all the shooters. 0.8*0.75*0.7 = 0.42

175. A student knows 17 of 25 questions of examination. Find the probability that he (or she) knows 3 randomly chosen questions. 17/25 * 16/24 * 15/23

176. One die is tossed. Find the probability that the number of aces doesn't exceed 3. 1/2

177. Show the Markov inequality:

$$P(X > A) \leq M(X)/A$$

178. Two shooters shoot in a target. The probability of hit by the first shooter is 0,85, and by the second – 0,9. Find the probability that only one of the shooters will hit in the target. 0.85*0.1 + 0.9 * 0.15 = 0.22

179. Three dice are tossed. Find the probability that the sum of aces will be 9. 1/9

180. At shooting by a gun the relative frequency of hit in a target is equal to 0,9. Find the number of misses if 300 shots have been made. 300*0.9 = 270

181. A point is put on an interval of length 2. Find the probability that the distance from the point to the ends of the interval is more than 3/4. 2/8

182. There are 6 yellow and 6 red balls in an urn. 2 balls have been randomly taken. What is the probability that both balls are red? 6/12 * 5/11

183. Events A_1, A_2, A_3, A_4, A_5 are called independent in union if: Several events are *independent in union* (or just *independent*) if each two of them are independent and each event and all possible products of the rest events are independent.

184. There are 12 sportsmen in a group, and 8 of them are masters of sport. 6 sportsmen have been randomly selected. Find the probability that there are 2 masters of sport among the selected sportsmen. C(2, 8) * C(4, 12)/ C(2, 20)

185. A pack of 52 cards is carefully shuffled. Find the probability that three randomly extracted cards will be kings:

C(3,4)/ C(3, 52)

186. A circle of radius 4 cm is placed in a big circle of radius 8 cm. Find the probability that a randomly thrown point in the big circle will get as well in the small circle. 16/64 = 1/4

187. There are 7 yellow and 5 black balls in an urn. The event A consists in that the first randomly taken ball is black and the event B – the second randomly taken ball is yellow. Find P(AB). = 5/12 * 7/11

188. The probability to fail exam for the first student is 0,3; for the second – 0,4; for the third – 0,2. What is the probability that only one of them will pass the exam? 0.7 * 0.4 * 0.2 + 0.3 * 0.6 * 0.2 + 0.3 * 0.4 * 0.8

189. The probability of delay for the train №1 is equal to 0,15; and for the train №2 – 0,25. Find the probability that at least one train will be late. 1 – 0.85 * 0.25 = 0.7875

190. The probability of delay for the train №1 is equal to 0,15, and for the train №2 – 0,25. Find the probability that both trains will be late. 0.15 * 0.25 = 0.0375

191. The events A and B are independent, P(A) = 0,6; P(B) = 0,8. Find $P(\overline{A}B)$. 0.4 *0.8 = 0.32

192. Two independent events A and B are compatible, P(A) = 0,6; and P(B) = 0,75. Find $P(\overline{A}+\overline{B})$ = 0.4 + 0.25 – 0.4 * 0.25

193. Details are made at two factories, and the first of them delivers 70%, and the second - 30% of all consumed production. 90 of each hundred details of the first factory are standard on the average, and 80 – of the second factory. Find the probability that a randomly taken detail will be standard. 0.7 * 0.9 + 0.3*0.8 = 0.87

194. The probability of hit in 10 aces for a shooter at one shot is 0,8. Find the probability that for 15 independent shots the shooter will hit in 10 aces exactly 8 times. C(8, 10) * 0.8^8 * 0.2^2

195. It is known that 25 % of all details are non-standard. 8 details have been randomly taken. Find the probability that there is no more than 2 non-standard detail of the taken.

C(0, 8) * 0.25 ^8 + C(1, 8)*0.25^1*0.75^7 + C(2, 8)* 0.25 ^2* 0.75 ^6

196. For an event – appearance of four tails at tossing four coins - the opposite event is:

4 heads

197. A random variable X is given by the integral function of distribution:

$$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \frac{1}{6}x & if \quad 0<x\le 6,\\ 1 & if \quad x>6.\end{cases}$$

Find the probability of hit of the random variable X in the interval (3; 5):

5/6 – 3/6 = 2/6 = 1/3

198. A random variable X is given by the density of distribution of probabilities:

$$f(x)=\begin{cases}0 \text{ if} & \mathrm{x}\le 0,\\ \mathrm{x}/4 \text{ if} & 0<\mathrm{x}\le 2\sqrt{2}\\ 0 \text{ if} & \mathrm{x}>2\sqrt{2}\end{cases}$$

Find the function of distribution F(x). первообразная

199. The function of distribution of a random variable X is given by the formula:

$$F(x)=\begin{cases}0 & if \quad x\le 0\\ \cos^2 4x & \text{if } 0<x\le \pi/4\\ 1 & \text{if} \quad x>\pi/4\end{cases}.$$

Find the density of distribution f(x). производная

200. A die is tossed before the first landing 3 aces. Find the probability that the first appearance of 3 will occur at the fourth tossing the die. 0,096

623. The probability that a day will be rainy is *p = 0,75*. Find the probability that a day will be clear.

0,25

0,3

0,15

0,75

1

624. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,4; and by the third – 0,9. What is the probability that the exam will be passed on "excellent" by only one student?

0,424

0,348

0,192

0,208

0,992

625. If D(X)=3, find D(-3X+4).

12

-5

19

27

-9

626. The table below shows the distribution of a random variable X. Find M[x] and D(X).

X	-2	0	1
P	0.1	0.5	0.4

M[X]= 0,2; D(X) =0.8

M[X]= 0,3; D(X) =0.27

M[X]= 0,2; D(X) =0.76

M[X]= 0,2; D(X) =0.21

M[X]= 0,8; D(X) =0.24

627. Let *X* be a continuous random variable with density function $f(x)=\begin{cases} \frac{|x|}{10} & for -2 \le x \le 4 \\ 0 & otherwise \end{cases}$ Calculate the expected value of *X*.

1/5

3/5

1

28/15

12/15

628. If P(E) is the probability that an event will occur, which of the following must be false?

P(E)=1

P(E)=1/2

P(E)=1/3

P(E)= - 1/3

P(E)=0

629. A movie theatre sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?

1

3

9

27

62

630. The probability is p = 0.85 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

40

20

8

34

124

631. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

0.99

0.25

0.49

0.45

0.01

632. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	Did not pass

Female	**430**	**60**
Male	**410**	**100**

If one person is selected randomly, what is the probability that it did not pass given that it is male.

0.17

0.21

0.42

0.08

0.196

633. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

0.98

0.02

0.28

0.53

None of the shown answers

634. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

0.9995

0,00005

0.15

0.6

0.5220

635. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 3?

1/6

1/5

1/3

5/6

1/18

636. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be Spades?

4/17

1/17

2/17

1/4

4/17

637. In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?

0.2995

0.699

0.23336

1/4

0.4999

638. Table shows the cumulative distribution function of a random variable X. Determine $P(X > 4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

1/8

1

1/2

3/4

0

639. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?

1/3

3/8

5/8

1/8

1

640. A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.

512/3375

28/65

8/15

1856/3375

36/65

641. We are given the probability distribution functions of two random variables X and Y shown in the tables below.

X	1	3	**Y**	2	4
P	0.4	0.6	**P**	0.2	0.8

Find M[X+Y].

5,8

2,2

2

8,8

10

642. In each of the 20 independent trials the probability of success is 0.2. Find the dispersion of the number of successes in these trials.

0

1

10

3.2

0.32

643. A coin tossed three times. What is the probability that head appears three times?

1/8

0

4:1

1

8:1

There are 10 white, 15 black, 20 blue and 25 red balls in an urn. One ball is randomly extracted. Find the probability that the extracted ball is blue or red.

5/14

1/70

1/7

9/14

3/98

A random variable *X* has the following law of distribution:

x_i	0	1	2	3
p_i	1/30	3/10	½	1/6

Find the mathematical expectation of *X*.

1

1,5

2

1,8

2,3

A random variable *X* is given by the integral function of distribution:

$$F(x) = \begin{cases} 0 & if \quad x \le 2, \\ \frac{1}{2}x - 1 & if \;\; 2 < x \le 4, \\ 1 & if \quad x > 4. \end{cases}$$

Find the probability of hit of the random variable *X* into the interval (2; 3).

0,25

0,5

1/3

2/3

1

An urn contains 5 red, 3 white, and 4 blue balls. What is the probability of extracting a black ball from the urn?

1/3

0

0,25

0,5

5/12

644.A class in probability theory consists of 3 men and 12 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores (rankings) are possible?

- Answer: 15!=1 307 674 368 000

645.Ms. Jones has 15 books that she is going to put on her bookshelf. Of these, 4 are math books, 3 are chemistry books, 6 are history books, and 2 are language book. Ms. Jones wants to arrange her books so that all the books dealing with the same subject are together on the shelf. How many different arrangements are possible?

- Answer: 4!4!3!6!2!=4 976 640

646.How many different signals, each consisting of 9 flags hung in a line, can be made from a set of 4 white flags, 3 red flags, and 2 blue flags if all flags of the same color are identical?

- Answer: 9! / 4!3!2!=1260

647.A student has to answer to 10 questions in an examination. How many ways to answer exactly to 4 questions correctly?

- Answer:

648.A bag contains six Scrabble tiles with the letters A-K-T-N-Q-R. You reach into the bag and take out tiles one at a time exactly six times. After you pick a tile from the bag, write down that letter and then return the tile to the bag. How many possible words can be formed?

649.Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one F?

- Answer: 1-(4/5)^4

650.Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

What is the probability that a student, taken at random from teacher's class, would have succeded the course, given that they succeeded the final?

651. **At a certain gas station 40% of the customers request regular gas, 35% request unleaded gas, and 25% request premium gas. Of those customers requesting regular gas, only 30% fill their tanks fully. Of those customers requesting unleaded gas, 60% fill their tanks fully, while of those requesting premium, 50% fill their tanks fully. If the next customer fills the tank, what is the probability that regular gas is requested.**

- Answer: 0.25

652. **Insurance predictions for probability of auto accident.**

	Under 25	25-39	Over 40
P	0.11	0.03	0.02

Table gives an insurance company's prediction for the likelihood that a person in a particular age group will have an auto accident during the next year. The company's policyholders are 25% under the age of 25, 25% between 25 and 39, and 50% over the age of 40. What is the probability that a random policyholder will have an auto accident next year?

653. **A friend who works in a big city owns two cars, one small and one large. Three-quarters of the time he drives the small car to work, and one-quarter of the time he drives the large car. If he takes the small car, he usually has little trouble parking, and so is at work on time with probability 0.8. If he takes the large car, he is at work on time with probability 0.7. What is the probability that he will not be at work on time tomorrow?**

654. **A fair six-sided die is tossed. You win $3 if the result is a «5», you win $2 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the mathematical expectation of *X*?**

655. **A fair six-sided die is tossed. You win $3 if the result is a «1», you win $1 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the dispersion of *X*?**

656. **Two independent random variables X and Y are given by the following tables of distribution:**

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation/ mean square (standard) deviation of X+Y?

- Answer: E[X+Y]=1 Var(X+Y)=1,68 sqrt(Var(X+Y))=1.2961

657. **A set of families has the following distribution on number of children:**

X	x_1	x_2	2	3	4
P(X)	0.1	0.2	0.4	0.2	0.1

Determine x_1, x_2, if it is known that $M(X) = 3, D(X) = 1.5$?

658. **The lifetime of a machine part has a continuous distribution on the interval (0, 30) with probability density function $f(x) = c(10 + x)^{-2}$, $f(x) = 0$ otherwise. Calculate the probability that the lifetime of the machine part is less than 5.**

659.A random variable X is given by the (probability) density function of distribution:

$$f(x)=\begin{cases}0 & if \quad x<1 \text{ or } 7\le x,\\ \dfrac{x-1}{9} & if \quad 1\le x<4,\\ \dfrac{7-x}{9} & if \quad 4\le x<7.\end{cases}$$

Find the cumulative distribution function of the random variable X?

- Answer
- $$F(x)=\begin{cases}0 & if \quad x<1,\\ \dfrac{(x-1)^2}{18} & if \quad 1\le x<4,\\ \dfrac{18-(7-x)^2}{18} & if \quad 4\le x<7,\\ 1 & if \quad 7\le x.\end{cases}$$

660.A random variable X is given by the cumulative distribution function:

$$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \dfrac{Cx^3}{125} & if \quad 0\le x<5,\\ 1 & if \quad 5\le x.\end{cases}$$

Find the mathematical expectation/dispersion of the random variable X?

661.The probability that a shooter will beat out 10 points at one shot is equal to 0.1 and the probability to beat out 9 points is equal to 0.3. Find the probability of the event A – the shooter will beat out 6 or less points.

662.Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «only one student will pass the exam on "excellent"». Here $\overline{A}=A^c$.

- $A_1\overline{A}_2\overline{A}_3+\overline{A}_1A_2\overline{A}_3+\overline{A}_1\overline{A}_2A_3$

663.A random variable *X* is given by the cumulative distribution function:

$$F(x)=\begin{cases}0 & if \quad x<10,\\ \dfrac{x-10}{10} & if \quad 10\le x<20,\\ 1 & if \quad 20\le x.\end{cases}$$

Find P (8 < X < 16).

664.A random variable X is given by the cumulative distribution function:

$$F(x)=\begin{cases}0 & if \quad x\le 2,\\ \dfrac{1}{2}x-1 & if \quad 2<x\le 4,\\ 1 & if \quad x>4.\end{cases}$$

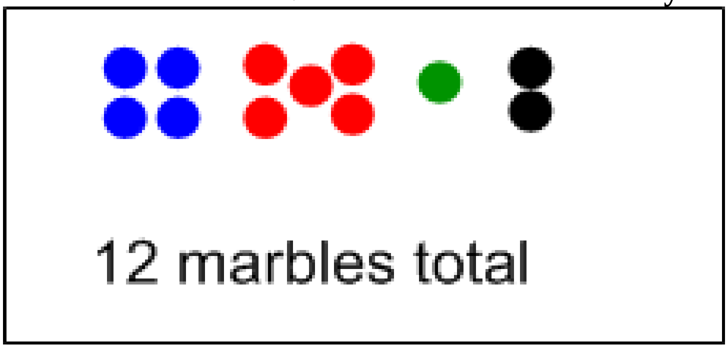
Find the probability of hit of the random variable X into the interval (2.5; 4).

665.The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target at least one time. (exact value)

666.All of the letters that spell STUDENT are put into a bag. Choose the correctly calculated probability of events.

- P(drawing a S, and then drawing a T)=1/21
- P(drawing a T, and then drawing a D)=1/42
- P(selecting a vowel, and then drawing a U)=1/42
- P(selecting a vowel, and then drawing a K)=1/42
- P(selecting a vowel, and then drawing a T)=3/42

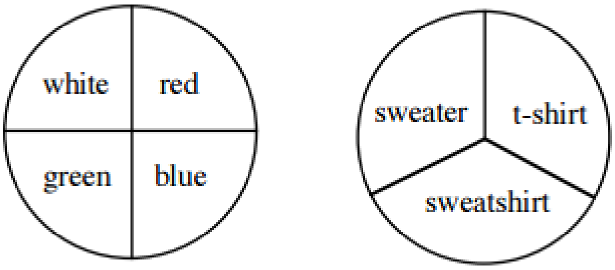
667.A jar of marbles contains 4 blue marbles, 5 red marbles, 1 green marble, and 2 black marbles. A marble is chosen at random from the jar. After returning it again, a second marble is chosen. Choose the correctly calculated probability of events.



- P(green, and then red)=5/144
- P(black, and then black)=1/12
- P(red, and then black)=7/72
- P(green, and then blue)=1/72

- P(blue, and then blue)=1/6

668. If each of the regions in each spinner is the same size.



Choose the correctly calculated probability of spinning each spinner.

- P(getting a red sweater)=1/12
- P(getting a white sweatshirt)=1/6
- P(getting a white sweater)=5/12
- P(getting a blue sweatshirt)=7/12
- P(getting a blue t-shirt)=1/6

669. Find the Bernoulli formula.

- $$P_n(k)=\frac{n!}{k!(n-k)!}\cdot p^k\cdot(1-p)^{n-k}$$
- $$P(B|A)=\frac{P(B)\cdot P(A|B)}{P(A)}$$
- $$P(B|A)=\frac{P(AB)}{P(A)}$$
- $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot e^{-2pq}$$
- $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot \Phi\left(\frac{k-np}{\sqrt{npq}}\right)$$

670. A coming up a grain stored in a warehouse is equal to 50%. What is the probability that the number of came up grains among 100 ones will make from *a* up to *b* pieces?

- $a=5, b=10, P=\Phi\left(\frac{10-100*0,5}{\sqrt{100*0,5*0,5}}\right)-\Phi\left(\frac{5-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

671. Find the right statements.

- ○ $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx$
- ● $M(X) = \int_{-\infty}^{+\infty} xf(x)dx$
- ○ $F(x) = f'(x)$
- ○ $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx - M(X)$
- ○ $P(X > A) > \frac{M(X)}{A}$

672. Find the <u>false</u> statements.

- ○ $0 \leq F(x) \leq 1$
- ○ $F(-\infty) = 0$
- ● $F(+\infty) = 0$
- ○ $F(x) = P(X < x)$
- ○ $\int_{-\infty}^{+\infty} f(x)dx = 1$

673. Let a series of distribution of a random variable be given: $X = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}$. **What does this tell us about the random variable X?**

- ● $F(x) = \begin{cases} 0 & if \quad x \leq 1, \\ 0.1 & if \quad 1 < x \leq 2, \\ 0.3 & if \quad 2 < x \leq 3, \\ 0.6 & if \quad 3 < x \leq 4, \\ 1 & if \quad 4 < x. \end{cases}$
- ○ $F(x) = \begin{cases} 0 & if \quad x \leq 1, \\ 0.1 & if \quad 1 < x \leq 2, \\ 0.2 & if \quad 2 < x \leq 3, \\ 0.3 & if \quad 3 < x \leq 4, \\ 0.4 & if \quad 4 < x. \end{cases}$

- $M(X) = 1$
- $M(X^2) = 9$
- $D(X) = 10$

674. **The probability of working each of four combines without breakages during a certain time is equal to 0,9. The random variable X – the number of combines working trouble-free. What are the possible values of X?**

- 2
- -1
- 5
- 6
- -2

675. **The probability of working each of 3 combines without breakages during a certain time is equal to 0,9. The random variable X – the number of combines working trouble-free. What does this tell us about the random variable X?**

- $P(X = 2) = 0.243$
- $P(X = 3) = 0.001$
- $P(X = 1) = 0.009$
- $P(X = 2) = 0.081$
- $P(X = 0) = 0.1$

676. **Suppose that the random variable X is the number of typographical errors on a single page of book has a Poisson distribution with parameter $\boldsymbol{\lambda} = \frac{1}{4}$. What does this tell us about the random variable X?**

- $M(X) = 0.25$
- $M(X) = 2$
- D(X)= - 8
- M(X) = 1
- $D(X) = 4$

677. **Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $\boldsymbol{a} = 173,\ \boldsymbol{\sigma}^2 = 36$. Find the correctly calculated probabilities of the events.**

- $P(|X - 173| \leq 3) = 2\Phi\left(\frac{1}{2}\right)$

678. **Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(0; 10)$. Find the correctly calculated probabilities of the events.**

679. **The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter $\boldsymbol{\lambda}$. Find the correctly calculated probabilities of the events.**

680. Which of the following is a discrete random variable?

- ○ The time of waiting a train.
- ● The number of boys in family having 4 children.
- ○ A time of repair of TVs.
- ○ The velocity in any direction of a molecule in gas.
- ○ The height of a man.

681. How would it change the expected value of a random variable X if we multiply the X by a number k.

682. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

○ Answer: $f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$

683. Find the density function of random variable $X \sim U[a, b]$

$$\varphi(x) = \begin{cases} \frac{1}{b-a} & if \quad a \le x \le b, \\ 0 \quad if & x < a \text{ or } x > b. \end{cases}$$

684. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

- ○ 1/4, always
- ● 1/4, if A and B are independent
- ○ 1/2, always
- ○ 1/2, if A and B are independent
- ○ None of the given answers

685. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

- ● Φ(1.5)

686. The cumulative distribution function for continuous random variable X is given by

$$F(x) = \begin{cases} 0, \ x < 0 \\ x/2, \ 0 \le x \le 2 \\ 1, \ x > 2 \end{cases}$$ **. Find the variance Var(X).**

Answer: $\frac{1}{3}$

687. If the probability density function of a continuous random variable X is

$$f(x) = \begin{cases} kx^2 & 0 \le x \le 3 \\ 0 & otherwise \end{cases}$$ **then the value of k is**

688. If E(X)=3, E(Y)=2 and X and Y are independent, find E(-3X+2Y-1).

689. The table below shows the distribution of a random variable X. Find E[x^2].

X	-2	0	1
P	0.1	0.5	0.4

100. Events are *equally possible* if … two probability equally

101. The probability of the event *A* is determined by the formula P(A)=m/n

102. The probability of a reliable event is equal to … 1 или universal

103. The probability of an impossible event is equal to … 0 or null

104. The relative frequency of the event *A* is defined by the formula: W(A)=m/n

105. There are 50 identical details (and 5 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted. 1/10

106. A die is tossed. Find the probability that an even number of aces will appear. 1/2

107. Participants of a toss-up pull a ticket with numbers from 1 up to 60 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 3. 1/4

108. In a batch of 10 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to? 0.3

109. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,35. Find the number of hits if 20 shots were made. 7

110. Two dice are tossed. Find the probability that the same number of aces will appear on both dice 1/6

111. An urn contains 15 balls: 4 white, 6 black and 5 red. Find the probability that a randomly taken ball will be white. 4/15

112. 12 seeds have germinated of 36 planted seeds. Find the relative frequency of germination of seeds. 2.1/3

113. A point *C* is randomly appeared in a segment *AB* of the length 3. Determine the probability that the distance between *C* and *B* doesn't exceed 1. 1/3

114. A point *B(x)* is randomly put in a segment *OA* of the length 8 of the numeric axis *Ox*. Find the probability that both the segments *OB* and *BA* have the length which is greater than 3. 1/4

115. The number of all possible permutations Pn=n!

116. How many two-place numbers can be made of the digits 2, 4, 5 and 7 if each digit is included into the image of a number only once? 12

117. The number of all possible allocations An'm=n!/(n-m)!

118. How many signals is it possible to make of 5 flags of different color taken on 3? 60

119. The number of all possible combinations Cnm=n!/m!(n-m)!

120. How many ways are there to choose 2 details from a box containing 13 details? 78

121. The numbers of allocations, permutations and combinations are connected by the equality An"m=Pm*Cn'm

122. 4 films participate in a competition on 3 nominations. How many variants of distribution of prizes are there, if on each nomination are established different prizes. 64

123. If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by … ways. n+m

124. There are 200 details in a box. It is known that 150 of them are details of the first kind, 10 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the second kind from the box are there? 25 (C150"1+C10"1)

125. If an object *A* can be chosen from the set of objects by *m* ways and after every such choice an object *B* can be chosen by *n* ways then the pair of the objects (*A*, *B*) in this order can be chosen by ... ways. n*m

126. There are 15 students in a group. It is necessary to choose a leader, its deputy and head of professional committee. How many ways of choosing them are there? 2730

127. **6 of 30 students have sport categories. What is the probability that 3 randomly chosen students have sport categories? 1/203**

128. **A group consists of 10 students, and 5 of them are pupils with honor. 3 students are randomly selected. Find the probability that 2 pupils with honor will be among the selected. 1/12 это ответ апайки, мой 5/12**

129. **It has been sold 15 of 20 refrigerators of three marks available in quantities of 5, 7 and 8 units in a shop. Assuming that the probability to be sold for a refrigerator of each mark is the same, find the probability that refrigerators of one mark have been unsold. Апайкин: 0,0016, мой: 0,005**

130. **A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the i-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event A – «only two hit».**

F.

G.

H.

I.

J.

131. **A randomly taken phone number consists of 5 digits. What is the probability that all digits of the phone number are different. It is known that any phone number does not begin with the digit zero. Апайкин: 0,0001, мой: 0,3204**

132. **The probability of appearance of any of two incompatible events is equal to the sum of the probabilities of these events: P(A+B)=P(A)+P(B)**

133. **A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,5 and in the second – 0,3. Find the probability that the shooter will hit at one shot either in the first area or in the third area. 0.7**

134. **The sum of the probabilities of events $A_1, A_2, A_3, \dots, A_n$ which form a complete group is equal to … 1**

135. **Two uniquely possible events forming a complete group are …**

F. Opposite

G. Same

H. Identically distributed

I. Sample

J. Density function

136. **The sum of the probabilities of opposite events is equal to … 1**

137. ***The conditional probability* of an event *B* with the condition that an event *A* has already happened is equal to: Pa(B)=P(AB)/P(A)**

138. **There are 4 conic and 8 elliptic cylinders at a collector. The collector has taken one cylinder, and then he has taken the second cylinder. Find the probability that the first taken cylinder is conic, and the second – elliptic. 8/33**

139. **The events *A, B, C* and *D* form a complete group. The probabilities of the events are those: *P(A)* = 0,01; *P(B)* = 0,49; *P(C)* = 0,3. What is the probability of the event *D* equal to? 0.2**

140. **For independent events theorem of multiplication has the following form: P(AB)=P(A)*P(B)**

141. **The probabilities of hit in a target at shooting by three guns are the following: p_1 = *0,6*; p_2 = *0,7*; p_3 = *0,5*. Find the probability of at least one hit at one shot by all three guns. 0.94**

142. **Three shots are made in a target. The probability of hit at each shot is equal to 0,6. Find the probability that only one hit will be in result of these shots. 0.288**

143. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,5; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by neither of the students? 0.07**

144. **10 of 20 savings banks are located behind a city boundary. 5 savings banks are randomly selected for an inspection. What is the probability that among the selected banks appears inside the city 3 savings banks? Апайкин: 9/38, мой: 225/646**

145. **A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will be solved ? 19/29**

146. **An urn contains 10 balls: 3 red and 7 blue. A second urn contains 6 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.54 . Calculate the number of blue balls in the second urn. 9**

147. **A bag contains 7 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue. 4/165**

148. **Find the Bernoulli formula Pn(K)=n!/k!(n-k)!*PkQn-k**

149. **Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?**

F. $A + B + C$

G. $A \cdot B \cdot C$

H. $A \cdot B^c \cdot C^c + A^c \cdot B \cdot C^c + A^c \cdot B^c \cdot C$

I. $(A+B+C)^c$

J. $AB + AC + BC$

○

150. Find the dispersion for the given probability distribution.

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

151.

○

○ 2.85

152. How would it change the dispersion of a random variable X if we add a number a to the X.

F. D(X+a)=D(X)+a

G. D(X+a)=D(X)+a^2

H. D(X+a)=D(X)

I. D(X+a)=$a \cdot$D(X)

J. D(X+a)= a^2D(X)

153. The cumulative distribution function of a discrete random variable X is given by

$$F(x) = \begin{cases} 0 & if\ x \le 2 \\ 0.5 & if\ 2 < x \le 5 \\ 0.8 & if\ 5 < x \le 8 \\ 1 & if\ x > 8 \end{cases}$$

Find P{3<X<9}. 0,5

154. Find the expectation of a random variable X if the cumulative distribution function

$$F(x) = \begin{cases} 1 - e^{-x/4}, x \ge 0 \\ 0, \quad x < 0 \end{cases}$$

. 4

155. If the dispersion of a random variable X is given D(X)=4. Then D(2X) is D(2x)=16

156. Indicate the expectation of a Poisson random variable X with parameter λ. λ

157. The lifetime of a machine part has a continuous distribution on the interval (0, 20) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5. 0.5

158. What kind of distribution is given by the density function $f(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ **(** $-\infty < x < \infty$ **)?**

F. Poisson distribution

G. Normal distribution

H. Uniform distribution

I. Bernoulli distribution

J. Exponential distribution

159. Suppose the test scores of 10000 students are normally distributed with an expectation of 76 and mean square deviation of 8. The number of students scoring between 60 and 82 is: 7065,6 or 71%

160. The distribution of weights in a large group is approximately normally distributed. The expectation is 80 kg. and approximately 68,26% of the weights are between 70 and 90 kg. The mean square deviation of the distribution of weights is equal to: 0,3413

161. A continuous random variable X **is uniformly distributed over the interval [15, 21]. The expected value of** X **is 18**

162. The cumulative distribution function for continuous random variable X is given by

$$F(x)=\begin{cases}0, & x<0\\ x/2, & 0\le x\le 2\\ 1, & x>2\end{cases}$$

. Find the standard deviation $\sigma(X)$**. Апайкин: 1/3, мой: 1/sqrt3**

163. A continuous random variable X is exponentially distributed with the density

$$f(x)=\begin{cases}3e^{-3x}, & x\ge 0\\ 0, & x<0\end{cases}$$

. What is the M[X] and D(X)? MX=1/3 DX=1/9

164. How many different 5-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?6!

165. A fair coin is thrown in the air five times. If the coin lands with the head up on the first four tosses, what is the probability that the coin will land with the head up on the fifth toss? 1/2

166. A random variable Y has the following distribution:

Y	-1	0	1	2
P(Y)	C	4C	0.4	0.1

167.

690. **The value of the constant C is:0.1**

168. Which one of these variables is a continuous random variable?

F. The time it takes a randomly selected student to complete an exam.

G. The number of tattoos a randomly selected person has.

H. The number of women taller than 68 inches in a random sample of 5 women.

I. The number of correct guesses on a multiple choice test.

J. The number of 1's in N rolls of a fair die

169. Heights of college women have a distribution that can be approximated by a normal curve with an expectation of 65 inches and a mean square deviation equal to 3 inches. About what proportion of college women are between 65 and 68 inches tall? 0,34134 Ф(1)-Ф(0)

170. A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...

F. Probability distribution

G. The expected value

H. The standard deviation

I. Coefficient of variation

J. Correlation

171. For a continuous random variable X, the probability density function f(x) represents

F. the probability at a fixed value of X

G. the area under the curve at X

H. the area under the curve to the right of X

I. the height of the function at X

J. the integral of the cumulative distribution function

172. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is Апайкин: 0,51, мой: 0,49

173. Suppose that 10% of people are left handed. If 6 people are selected at random, what is the probability that exactly 2 of them are left handed? 0,0984

174. Which of these has a Geometric model?

F. the number of aces in a five-card Poker hand

G. the number of people we survey until we find two people who have taken Statistics

H. the number of people in a class of 25 who have taken Statistics

I. the number of people we survey until we find someone who has taken Statistics

J. the number of sodas students drink per day

175. In a certain town, 55% of the households own a cellular phone, 40% own a pager, and 25% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is 30%

176. A probability function is a rule of correspondence or equation that:

F. Finds the mean value of the random variable.

G. Assigns values of x to the events of a probability experiment.

H. Assigns probabilities to the various values of x.

I. Defines the variability in the experiment.

J. None of the given answers is correct.

177. Which of the following is an example of a discrete random variable?

F. The distance you can drive in a car with a full tank of gas.

G. The weight of a package at the post office.

H. The amount of rain that falls over a 24-hour period.

I. The number of cows on a cattle ranch.

J. The time that a train arrives at a specified stop.

178. Which of the following is the appropriate definition for the union of two events A and B?

F. The set of all possible outcomes.

G. The set of all basic outcomes contained within both A and B.

H. The set of all basic outcomes in either A or B, or both.

I. None of the given answers

J. The set of all basic outcomes that are not in A and B.

179. What is the probability of drawing a Diamond from a standard deck of 52 cards?

691. What is the probability of drawing a diamond from a standard deck of 52 cards?

- 1/52
- 13/39
- 1/13
- 1/4
- 1/2
-

180. **The probability density function of a random variable X is given by**

$$f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$$

.

692. **What are the values of μ and σ?**

- $\mu = 1, \sigma = 4$
- $\mu = -1, \sigma = 4$
- $\mu = -1, \sigma = 2$
- $\mu = 1, \sigma = 8$
- $\mu = 1, \sigma = 2$

181. **The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=4. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:**

693. **Апайкин: 0.14, мой: 0.24**

182. **Table shows the cumulative distribution function of a random variable X. Determine**

X	1	2	3	4
F(X)	3/8	1/8	3/4	1

183.

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3
- Ответ 5/8 я решила апай подтвердила

184. **Which of the following statements is always true for A and A^C ?**

F. P(AA^c)=1

G. P(A^c)=P(A)

H. P(A+A^c)=0

I. $P(AA^c)=0$

J. None of the given statements is true

185. If P(A)=1/6 and P(B)=1/3 then $P(A \cap B) =$

F. 1/18, always

G. 1/18, if A and B are independent

H. 1/6, always

I. 1/2, if A and B are independent

J. None of the given answers

186. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

- 24/75
- 24/35
- 6/35
- 12/75
- None of the given answers

187. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$ **.**

F. $\lambda = np \sim const$, $n \to \infty,\ p \to 0$

G. $\lambda = \frac{n}{p}$, $n \to \infty$

H. $\lambda = ep$, $n \to \infty$

I. $\lambda = n^p$, p is const

J. None of the given answers is correct

188. The probability density function of a random variable X is given by

$$f(x)=\begin{cases} \frac{1}{\gamma-2,5}, & if\ \ x\in(1,5;3) \\ 0, & otherwise \end{cases}$$

. Calculate the parameter γ **. 4**

189. Probability density function of the normal random variable X is given by

$$f(x)=\frac{1}{5\sqrt{2\pi}}e^{-\frac{(x-3)^2}{50}}$$

. What is the mean square deviation?

- 5
- 3

- 25
- 50
- 9
-

190. The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.

F. p^5

G. $1-(1-p)^5$ correct

H. $(1-p)^5$

I. $1-p^5$

J. None of the given answers is correct

191. Choose the density function of random variable

F. $$\varphi(x)=\begin{cases}\lambda e^{-\lambda x} & for\ x\geq 0,\\ 0 & for\ \ x<0.\end{cases}$$

G. $$\varphi(x)=\begin{cases}\dfrac{1}{b-a} & if\quad a\leq x\leq b,\\ 0 & if\quad x<a\ or\ \ x>b.\end{cases}$$

H. $$F(x)=\begin{cases}0 & for\ x<0,\\ 1-e^{-\lambda x} & for\ x\geq 0.\end{cases}$$

I. $$\varphi_N(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$$

J. $$P(X=m)=\frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$$

192. Choose the probability distribution function of random variable

F. $$P(X=m)=\frac{\lambda^m e^{-\lambda}}{m!}$$

G. $$P(X=m)=\frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$$

H. $$P(X=m)=C_n^m p^m q^{n-m}$$

I. $\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

J. $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for\ x \geq 0, \\ 0 & for\ x < 0. \end{cases}$

193. Choose the probability density function of random variable

F. $\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

G. $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for\ x \geq 0, \\ 0 & for\ x < 0. \end{cases}$

H. $\varphi(x) = \begin{cases} \frac{1}{b-a} & if \quad a \leq x \leq b, \\ 0 & if \quad x < a\ or\ x > b. \end{cases}$

I. $F(x) = \begin{cases} 0 & for\ x < 0, \\ 1 - e^{-\lambda x} & for\ x \geq 0. \end{cases}$

J. $P(X = m) = C_n^m p^m q^{n-m}$

194. The mathematical expectation and dispersion of a random variable *X* distributed under the binomial law are …, respectively.

F.

G.

H.

I.

J.

195. The mathematical expectation and the dispersion of a random variable distributed under the Poisson are …, respectively.

F.

G.

H.

I.

J.

196. The probability distribution function of random variable is

F.

G. $P(X=m)=\dfrac{\lambda^m e^{-\lambda}}{m!}$

H. $P(X=m)=\dfrac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

I. $P(X=m)=C_n^m p^m q^{n-m}$

J. $\varphi_N(x)=\dfrac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$

197. The mathematical expectation and dispersion of a random variable *X* having the geometrical distribution with the parameter *p* are …, respectively.

F.

G.

H.

I.

J.

198. The mathematical expectation and dispersion of a random variable *X* having the uniformly distribution on [a,b] are …, respectively.

F.

G.

H.

I.

J.

199. A normally distributed random variable *X* is given by the differential function: $f(x)=\dfrac{1}{\sqrt{2\pi}}\cdot e^{-\frac{x^2}{2}}$ **. Find the interval in which the random variable *X* will hit in result of trial with the probability 0,9973. (-3,3)**

200. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

F. $f(x)=\dfrac{1}{3\sqrt{2\pi}}e^{-\frac{(x+3)^2}{18}}$

G. $f(x)=\dfrac{1}{4\sqrt{2\pi}}e^{-\frac{(x-5)^2}{32}}$

H. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{8}}$

I. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{16}}$

J. $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-4)^2}{16}}$

x_i	2	3	6	9
p_i	0,1	0,4	0,3	0,2

201. A discrete random variable X is given by the following law of distribution:

○

○

○

○

○ **By using Chebyshev inequality estimate the probability that |X-M(X)|>3.1/3**

694. The probabilities that three men hit a target are respectively 1/6, 1/4 and 1/3. Each man shoots once at the target. What is the probability that exactly one of them hits the target?

1/6*3/4*2/3+5/6*1/4*2/3+5/6*3/4*1/3

- ○ 11/72
- ○ 21/72
- ● 31/72
- ○ 3/4
- ○ 17/72

695. A problem in mathematics is given to three students whose chances of solving it are 1/3, 1/4, 1/5. What is the probability that the problem will be solved?

- ○ 0.2

- 0.8
- 0.4
- 0.6
- 1

696. You are given P[A∪B] = 0.7 and P[A∪B^c] = 0.9 . Determine P[A] .

- 0.2
- 0.3
- 0.4
- 0.6
- 0.8

697. An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.44 . Calculate the number of blue balls in the second urn.

4/10*16/20+6/10*4/20=(64+24)/200=88/200=44/100=0.44

- 4
- 20
- 24
- 44
- 64

698. The probability that a boy will not pass an examination is 3/5 and that a girl will not pass is 4/5. Calculate the probability that at least one of them passes the examination.

3/5*1/5+2/5*4/5+2/5*1/5= (3+8+2)/25=13/25

- 11/25
- 13/25
- 1/2
- 7/25
- 16/25

699. A bag contains 5 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue.

4/9*3/8*2/7=24/504=1/21

- 1/21
- 2/21
- 1/7
- 4/21
- 1/3

700. Find the variance for the given probability distribution.

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

(4*0.17+16*0.43+36*0.35)-(2*0.17+4*0.43+6*0.35)^2

- ○ 1.5636
- ● 2.8544
- ○ 1.6942
- ○ 2.4484
- ○ 1.7222

701. A bag contains 5 white, 7 red and 8 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?

- ○ $1-\left(\frac{1}{4}\right)^4$
- ● $1-\left(\frac{3}{4}\right)^4$
- ○ $\left(\frac{3}{4}\right)^4$
- ○ 0.7182
- ○ $\left(\frac{1}{4}\right)^4$

702. Формулой Бернулли называется формула

- ○ $P_n(k)=\frac{1}{\sqrt{npq}}\cdot\varphi(x)$
- ● $P_n(k)=\binom{n}{k}\cdot p^k\cdot(1-p)^{n-k}$
- ○ $P_n(k)=\frac{\lambda^k e^{-\lambda}}{k!}$
- ○ $P(B|A)=\frac{P(B)\cdot P(A|B)}{P(A)}$
- ○ $P_n(k)=\frac{1}{\sqrt{npq}}\cdot e^{-2p(1-p)}$

703. Indicate the formula of computing variance of a random variable X with expectation μ.

- ● $Var(X)=E(X^2)-\mu^2$
- ○ $Var(X)=E(X-\mu)$

- ○ $Var(X)=(E(X^2)-\mu)^2$
- ○ $Var(X)=E(X^2)-\mu$
- ○ $Var(X)=E(X^2)$

704. How would it change the variance of a random variable X if we add a number a to the X?

- ○ Var(X+a)=Var(X)+a
- ○ Var(X+a)=Var(X)+a²
- ● Var(X+a)=Var(X)
- ○ Var(X+a)= $a^2\cdot$Var(X)
- ○ Var(X+a)=Var(X)+a²

705. How would it change the expected value of a random variable X if we multiply the X by a number k.

- ● $E[kX]=k\cdot E[X]$
- ○ $E[kX]=|k|\cdot E[X]$
- ○ $E[kX]=E[X]$
- ○ $E[kX]=E[X]+k$
- ○ $E[kX]=k^2\cdot E[X]$

706. Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?

- ○ $A+B+C$
- ○ $A\cdot B\cdot C$
- ● $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $AB+AC+BC$

707. Which of the following expressions indicates the occurrence of at least one of the events A, B, C?

- ● $A+B+C$
- ○ $A\cdot B\cdot C$
- ○ $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $A^c\cdot B^c\cdot C^c$

708. Which of the following expressions indicates the occurrence of all three events A, B, C simultaneously?

- ○ $A+B+C$
- ● $A\cdot B\cdot C$
- ○ $A\cdot B\cdot C^c + A^c\cdot B\cdot C + A\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $A^c\cdot B^c\cdot C^c$

709. Which of the following expressions indicates the occurrence of exactly two of events A, B, C?

- ○ $(A+B)\cdot C^c$
- ○ $AB+AC+BC$
- ○ $(A+B)(B+C)(A+C)$
- ● $A\cdot B\cdot C^c + A^c\cdot B\cdot C + A\cdot B^c\cdot C$
- ○ $A\cdot B\cdot C^c$

710. Conditional probability P(A|B) can be defined by

- ○ $P(A|B) = P(A)\cdot P(B)$
- ● $P(A|B) = \frac{P(A\cdot B)}{P(B)}$
- ○ $P(A|B) = \frac{P(A\cdot B)}{P(A)}$
- ○ $P(A|B) = P(A) - P(B)$
- ○ $P(A|B) = P(A) + P(B) - P(A\cdot B)$

711. Urn I contains a white and b black balls, whereas urn II contains c white and d black balls. If a ball is randomly selected from each urn, what is the probability that the balls will be both black?

- ○ $\frac{b}{a}+\frac{d}{c}$
- ● $\frac{b}{a+b}\cdot\frac{d}{c+d}$
- ○ $\frac{b}{a+b}+\frac{d}{c+d}$
- ○ $\frac{b}{a}\cdot\frac{d}{c}$
- ○ $\frac{b+d}{a+b+c+d}$

712. The table below shows the probability mass function of a random variable X.

x_i	0	x_2	5
p_i	0.1	0.2	0.7

If E[X]=5,5 find the value of x_2.

5.5-(5*0.7)=x2*0.2

2=x2*0.2

X2=2/0.2

X2=10

- 3
- 1
- 12
- 0.8

- 10

713. The probability of machine failure in one working day is equal to 0.01. What is the probability that the machine will work without failure for 5 days in a row.

(1-0.01)^5

- 0.99999

- 0.95099

- 1
- 0.05
- 0.55

714. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ x\le 2\\ 0.4 & if\ 2<x\le 5\\ 0.9 & if\ 5<x\le 8\\ 1 & if\ x>8\end{cases}$$

Find P{3<X<9}.

1-0.4

- 0,4
- 0,5

- 0,6

- 0,9
- 1

715. A fair die is rolled three times. A random variable X denotes the number of occurrences of 6's. What is the probability that X will have the value which is not equal to 0.

P(# of 6's is not 0)
= 1 - P(# of 6's is 0)

= 1 - (5/6)^3
= 0.4213=91/216

- 91/216
  - 125/216
  - 25/216
  - 1/216
  - 215/216

716. Find the expectation of a random variable X if the cdf $F(x)=\begin{cases}1-e^{-x/5}, x\geq 0\\ 0, \quad x<0\end{cases}$**.**

  - -5
  - e^{-5}
- 5
  - 6
  - 1/5

717. Compute the mean for continuous random variable X with probability density function $f(x=\begin{cases}2(1-x), & if\ 0\leq x\leq 1\\ 0, & otherwise\end{cases}$**.**

  - 2/3
  - 0
- 1/3
  - 1
  - Mean does not exist

718. If the variance of a random variable X is given Var(X)=3. Then Var(2X) is

2^2*3=12

- 12
  - 6
  - 3
  - 1
  - 9

719. Indicate the expectation of a Poisson random variable X with parameter λ**.**

  - 0
- λ
  - $1/\lambda$
  - $\lambda(1-\lambda)$

- λ^2

720. **Indicate the variance of a Poisson random variable X with parameter λ.**

- λ
- 0
- $\frac{1}{\lambda}$
- $\lambda(1-\lambda)$
- λ^2

721. **Indicate the formula for conditional expectation.**

- $E[E[X\,|\,Y] = E[X\,|\,Y]$
- $E[E[X\,|\,Y] = E[X]$
- $E[E[X\,|\,Y] = \{E[X\,|\,Y]\}^2$
- $E[E[X\,|\,Y] = E[X] \cdot E[Y]$
- $E[E[X\,|\,Y] = E[XY]$

722. **The table below shows the pmf of a random variable X. What is the Var(X)?**

X	-2	1	2
P	0,1	0,6	0,3

4*0.1+1*0.6+4*0.3-(-2*0.1+1*0.6+2*0.3)^2=1.2

- 0.5
- 1.67
- 4.71
- 1.2
- 4.7

723. **The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 6.**

- 0.04
- 0.15
- 0.47
- 0.53
- 0.94

724. The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5.

- ○ 0.03
- ○ 0.13
- ● 0.42
- ○ 0.58
- ○ 0.97

725. If Var(X)=2, find Var(-3X+4).

(-3)^2*2

- ○ 12
- ○ 10
- ○ 9
- ● 18
- ○ 3

726. The table below shows the pmf of a random variable X. Find E[X] and Var(X).

X	-1	0	1
P	0.2	0.3	0.5

0.7-0.09=0.61

- ○ E[X]= 0,7; Var(X) =0.24
- ○ E[X]= 0,3; Var(X) =0.27
- ● E[X]= 0,3; Var(X) =0.61
- ○ E[X]= 0,8; Var(X) =0.21
- ○ E[X]= 0,8; Var(X) =0.24

727. What kind of distribution is given by the density function $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ ($-\infty < x < \infty$)?

- ○ Poisson distribution
- ● Normal distribution
- ○ Uniform distribution
- ○ Bernoulli distribution
- ○ Exponential distribution

728. If a fair die is tossed twice, the probability that the first toss will be a number less than 4 and the second toss will be greater than 4 is

3/6*2/6=6/36=1/6

- 1/3
- 5/6
- 1/6
- 3/4
- 0

729. **A class consists of 490 female and 510 male students. The students are divided according to their marks**

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, the probability that it did not pass given that it is female is:

(60/1000)/(490/1000)=0.12

- 0.06
- 0.12
- 0.41
- 0.81
- none of the shown answers

730. **Marks on a Chemistry test follow a normal distribution with a mean of 65 and a standard deviation of 12. Approximately what percentage of the students have scores below 50?**

(z<50)=z<(50-65)/12=z<-1.25=0.105 == 11%

- 11%
- 89%
- 15%
- 18%
- 39%

731. **Suppose the test scores of 600 students are normally distributed with a mean of 76 and standard deviation of 8. The number of students scoring between 70 and 82 is:**

70<z<82= (82-76)/8-((70-76)/8)=0.77-0.22=0.5

600*0.5

Vrode tak hz primernye cifry vzyalW

- 272
- 164
- 260
- 136
- 328

732. **The distribution of weights in a large group is approximately normally distributed. The mean is 80 kg. and approximately 68% of the weights are between 70 and 90 kg. The standard deviation of the distribution of weights is equal to:**

- 20
- 5
- 40
- 50
- 10

733. The probability density function of a continuous random variable *X* is

$$f(x)=\begin{cases}0.5x & 0\le x\le 2\\ 0 & otherwise\end{cases}.$$ **Find** $P\{0\le x\le 1.5\}$**.**

Интеграл мутим 0,5x

И будет ½ * (x^2)/2 = x^2/4=1.5^2/4=2.25/4=0.56

- 0.5625
- 0.3125
- 0.1250
- 0.4375
- 0.1275

734. Let *X* be a continuous random variable with density function

$$f(x)=\begin{cases}\frac{|x|}{10} & for\ -2\le x\le 4\\ 0 & otherwise\end{cases}$$ **Calculate the expected value of *X*.**

Tak kak zdes abs(x) to berem integral ot 2 do 4 (x*x/10 dx) = x3/30 ot 4 do 2 = 64/30-8/30=56/30=28/15

- 1/5
- 3/5
- 1
- 28/15
- 12/5

735. The probability density function of a continuous random variable X is

$$f(x)=\begin{cases}kx^2 & 0\le x\le 2\\ 0 & otherwise\end{cases}.$$ **Find the value of k.**

K * integral ot 0 do 2 (x^2) =1

k* x^3/3 ot 0 do 2 = 1

8/3=1/k

K=3/8=0.375

- 2
- 0.25
- 0.375
- 2.25

- Any positive value greater than 2

736. **A continuous random variable X is uniformly distributed over the interval [10, 16]. The expected value of X is**

(a+b)/2=(10+16)/2=13

- 16
- 13
- 10
- 7
- 6

737. **If X and Y are independent random variables with $p_X(0) = 0.5$, $p_X(1) = 0.3$, $p_X(2) = 0.2$ and $p_Y(0) = 0.6$, $p_Y(1) = 0.1$, $p_Y(2) = 0.25$, $p_Y(3) = 0.05$. Then $P\{X \le 1 \, and \, Y \le 1\}$ is**

(0.5+0.3)*(0.6+0.1)=0.8*0.7=0.56

- 0.30
- 0.56
- 0.70
- 0.80
- 1

738. **How many different three-member teams can be formed from six students?**

C (3,6) = 6!/(6-3)!3! = 20

- 20
- 120
- 216
- 720
- 6

739. **How many different 6-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?**

6!

- 6
- 36
- 720
- 46.656
- 72

740. **If P(E) is the probability that an event will occur, which of the followings must be false?**

- P(E)=1
- P(E)=1/2

- P(E)=1/3
- P(E)= -1
- P(E)=0

741. A die is rolled. What is the probability that the number rolled is greater than 2 and even? Only 4 and 6

2/6=1/3

- 1/2
- 1/3
- 2/3
- 5/6
- 0

742. A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?

1 4 4 1 3 2 2 3 5 5 4 6 6 4 so 7/36

Complement will be 29/36

- 2/36
- 12/36
- 29/36
- 32/36
- 9/36

743. The cumulative distribution function for continuous random variable X is given by $F(x)=\begin{cases} 0,\ x<0 \\ x,\ 0\le x\le 1 \\ 1,\ x>1 \end{cases}$**. Find the standard deviation** $\sigma(X)$**.**

Expectation : Integral from 0 to 1 xdx= x^2/2 ot 0 do 1= ½

Variance: integral from 0 to 1 (x- 1/2)^2 dx = 1/12

- $\frac{1}{\sqrt{6}}$
- $\frac{1}{6}$
- $\frac{1}{\sqrt{12}}$
- $\frac{1}{4}$
- $\frac{1}{12}$

744. A continuous random variable X uniformly distributed on [-2;6]. Find E[X] and Var(X).

(A+b)/2 = -2+6 / 2 = 2

(b-a)^2 / 12 = 64 / 12= 16/3

- ○ 4 and $\frac{4}{3}$
- ○ $\frac{16}{3}$ and 2
- ● 2 and $\frac{16}{3}$
- ○ $\frac{2}{3}$ and 2
- ○ 2 and $\frac{4}{3}$

745. A continuous random variable X is exponentially distributed with the density $f(x) = \begin{cases} 2e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$**. What is the E[X] and Var(X)?**

Tut lambda = 2

So, mean = 1/lambda

Variance = 1/ lambda^2

- ○ $\frac{1}{6}$ and $\frac{1}{2}$
- ○ $\frac{1}{4}$ and $\frac{1}{2}$
- ● $\frac{1}{2}$ and $\frac{1}{4}$
- ○ $\frac{1}{2}$ and $\frac{1}{6}$
- ○ $\frac{1}{4}$ and $\frac{1}{6}$

746. The expression $\binom{9}{2}$ is equivalent to

- ○ $\frac{9!}{7!}$
- ○ $\frac{9!}{2!}$
- ● $\frac{9!}{7! \cdot 2!}$
- ○ $\frac{9}{14}$
- ○ $\frac{9! \cdot 2!}{7!}$

747. Evaluate 1!+2!+3!

- ○ 5
- ○ 6
- ● 9
- ○ 10
- ○ 12

748. A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?

- ○ 2/36
- ○ 12/36
- ● 29/36
- ○ 32/36
- ○ 1/36

749. Your state issues license plates consisting of letters and numbers. There are 26 letters and the letters may be repeated. There are 10 digits and the digits may be repeated. How many possible license plates can be issued with two letters followed by three numbers?

26*26*10*10*10

- ○ 25000
- ○ 67600
- ○ 250000
- ● 676000

- ○ 2500

750. A random variable *X* has the cumulative distribution function

$$F(x)=\begin{cases}0 & \text{for } x<1\\ \dfrac{x^2-2x+2}{2} & \text{for } 1\le x<2\\ 1 & \text{for } x\ge 2\end{cases}$$

Compute the expectation of X.

- ○ 7/72
- ○ 1/8
- ● 5/6
- ○ 4/3
- ○ 23/12

751. **A fair coin is thrown in the air four times. If the coin lands with the head up on the first three tosses, what is the probability that the coin will land with the head up on the fourth toss?**

- 0
- 1/16
- 1/8
- 1/2
- 1/4

752. **A movie theater sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?**

3*3

- 1
- 3
- 9
- 27
- 62

753. **A random variable Y has the following distribution:**

Y |	**-1**	**0**	**1**	**2**
P(Y)|	**3C**	**2C**	**0.4**	**0.1**

The value of the constant C is:

(1-0.5)=5c

0.5=5c

C=0.1

- 0.1
- 0.15
- 0.20
- 0.25
- 0.75

754. **A random variable X has a probability distribution as follows:**

X |	**0**	**1**	**2**	**3**
P(X) |	**2k**	**3k**	**13k**	**2k**

Then the probability that P(X < 2.0) is equal to

5k/20k=0.25k

- 0.90
- 0.25

○ 0.65

○ 0.15

○ 1

755. Which one of these variables is a continuous random variable?

● The time it takes a randomly selected student to complete an exam.

○ The number of tattoos a randomly selected person has.

○ The number of women taller than 68 inches in a random sample of 5 women.

○ The number of correct guesses on a multiple choice test.

○ The number of 1's in N rolls of a fair die

756. Heights of college women have a distribution that can be approximated by a normal curve with a mean of 65 inches and a standard deviation equal to 3 inches. About what proportion of college women are between 65 and 67 inches tall?

65<z<67

(67-65)/3 – (65-65)/3= 0.74-0.5= 0.25

○ 0.75

○ 0.5

● 0.25

○ 0.17

○ 0.85

757. The probability is p = 0.80 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

40*0.8=32

○ 40

○ 20

○ 8

● 32

○ 124

758. A medical treatment has a success rate of 0.8. Two patients will be treated with this treatment. Assuming the results are independent for the two patients, what is the probability that neither one of them will be successfully cured?

1-0.8=0.2

0.2*0.2=0.04

○ 0.5

○ 0.36

○ 0.2

● 0.04

○ 0.4

759. A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...

- Probability distribution
  - The expected value
  - The standard deviation
  - Coefficient of variation
  - Correlation

760. Given a normal distribution with μ=100 and σ=10, what is the probability that X>75?

1-z<75= 1 – (z<(75-100)/10)=1- z(-2.5)= 1- 0.006=0.99

- 0.99
  - 0.25
  - 0.49
  - 0.45
  - 0

761. Which of the following is not a property of a binomial experiment?

  - the experiment consists of a sequence of n identical trials
  - each outcome can be referred to as a success or a failure
- the probabilities of the two outcomes can change from one trial to the next
  - the trials are independent
  - binomial random variable can be approximated by the Poisson

762. Which of the following random variables would you expect to be discrete?

  - The weights of mechanically produced items
- The number of children at a birthday party
  - The lifetimes of electronic devices
  - The length of time between emergency arrivals at a hospital
  - The times, in seconds, for a 100m sprint

763. Two events each have probability 0.2 of occurring and are independent. The probability that neither occur is

0.8*0.8 = 0.64

- 0.64
  - 0.04
  - 0.2
  - 0.4
  - none of the given answers

764. A smoke-detector system consists of two parts A and B. If smoke occurs then the item A detects it with probability 0.95, the item B detects it with probability 0.98

whereas both of them detect it with probability 0.94. What is the probability that the smoke will not be detected?

- 0.01
  - 0.99
  - 0.04
  - 0.96
  - None of the given answers

765. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, what is the probability that it did not pass given that it is male.

(100/1000)/(510/1000) = 0.196

  - 0.066
  - 0.124
  - 0.414
  - 0.812
- 0.196

766. A company which produces a particular drug has two factories, A and B. 30% of the drug are made in factory A, 70% in factory B. Suppose that 95% of the drugs produced by the factory A meet specifications while only 75% of the drugs produced by the factory B meet specifications. If I buy the drug, what is the probability that it meets specifications?

0.3*0.95+0.7*0.75=0.81

  - 0.95
- 0.81
  - 0.75
  - 0.7
  - 0.995

767. Twelve items are independently sampled from a production line. If the probability any given item is defective is 0.1, the probability of at most two defectives in the sample is closest to …

p(0) + p(1) + p(2)
p(0) = c(12,0) * .1^0 * .9^12 = .2824
p(1) = c(12,1) * .1^1 * .9^11 = .3766
p(2) = c(12,2) * .1^2 * .9^10 = .2301

add them up and you get .8891

- 0.3874
- 0.9872
- 0.7361
- 0.8891
- None of the shown answers

768. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

C(5,6)*c(3,4)/c(8,10)=

Or

C(5,6)/c(8,10)=0.133

- 0.282
- 0.02
- 0.376
- 0.133
- None of the shown answers

769. Suppose that 10% of people are left handed. If 8 people are selected at random, what is the probability that exactly 2 of them are left handed?

8c2*0,1^2*0.9^6

- 0.0331
- 0.0053
- 0.1488
- 0.0100
- 0.2976

770. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

1- 0.15^4

- 0.9995
- 5.06 × 10-4
- 0.15
- 0.6
- 0.5220

771. Which of these has a Geometric model?

- the number of aces in a five-card Poker hand
- the number of people we survey until we find two people who have taken Statistics
- the number of people in a class of 25 who have taken Statistics

- the number of people we survey until we find someone who has taken Statistics
  - the number of sodas students drink per day

772. In a certain town, 50% of the households own a cellular phone, 40% own a pager, and 20% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is

0.5*(1-0.4)

  - 90%
  - 70%
  - 10%
- 30%.
  - 25%

773. Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that the first and third selected are women?

7/12*6/11*5/10+7/12*5/11*6/10= (7*6*5) / (12*11*10)   * 2 =0.3182

- 0.3182
  - 0.5817
  - 0.78
  - 0.916
  - 0.1211

774. Twenty percent of the paintings in a gallery are not originals. A collector buys a painting. He has probability 0.10 of buying a fake for an original but never rejects an original as a fake, What is the (conditional) probability the painting he purchases is an original?

  - 1/41
- 40/41
  - 80/41
  - 1
  - 40/100

775. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{t \le 0\}$.

  - 0.8
- 0.5
  - 0.3
  - 0.2
  - 0.1

776. A probability function is a rule of correspondence or equation that:

- ○ Finds the mean value of the random variable.
- ○ Assigns values of x to the events of a probability experiment.
- ● Assigns probablities to the various values of x.
- ○ Defines the variability in the experiment.
- ○ None of the given answers is correct.

777. Which of the following is an example of a discrete random variable?

- ○ The distance you can drive in a car with a full tank of gas.
- ○ The weight of a package at the post office.
- ○ The amount of rain that falls over a 24-hour period.
- ● The number of cows on a cattle ranch.
- ○ The time that a train arrives at a specified stop.

778. Which of the following is the appropriate definition for the union of two events A and B?

- ○ The set of all possible outcomes.
- ○ The set of all basic outcomes contained within both A and B.
- ● The set of all basic outcomes in either A or B, or both.
- ○ None of the given answers
- ○ The set of all basic outcomes that are not in A and B.

779. Johnson taught a music class for 25 students under the age of ten. He randomly chose one of them. What was the probability that the student was under twelve?

- ● 1
- ○ 0.5
- ○ 1/25
- ○ 0
- ○ 0.25

780. The compact disk Jane bought had 12 songs. The first four were rock music. Tracks number 5 through 12 were ballads. She selected the random function in her CD Player. What is the probability of first listening to a ballad?

8/12=2/3

- ○ 1/3
- ● 2/3
- ○ 1/2
- ○ 1/6
- ○ 1/12

781. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 5?

1 5   5 1   4 2   2 4   3 3   1/5

- 1/6
- 1/5
- 1/3
- 5/6
- 1/18

782. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be hearts?

13/52*12/51

- 4/17
- 1/17
- 2/17
- 1/4
- 4/17
- 33/68

783. What is the probability of drawing a diamond from a standard deck of 52 cards?

13/52=1/4

- 1/52
- 13/39
- 1/13
- 1/4
- 1/2

784. One card is randomly selected from a shuffled deck of 52 cards and then a die is rolled. Find the probability of obtaining an Ace and rolling an odd number.

4/52*3/6=1/26

- 1/104
- 7/13
- 1/39
- 1/26
- 1/36

785. The probability that a particular machine breaks down on any day is 0.2 and is independent of the breakdowns on any other day. The machine can break down only once per day. Calculate the probability that the machine breaks down two or more times in ten days.

Chance of exactly 0 breakdowns in 10 days: 0.8^10 = 0.1073741824
Chance of exactly 1 breakdown in 10 days: 0.8^9 * 0.2^1 * C(10,1) = 0.268435456
Chance of 2 or more breakdowns in 10 days: 1 - 0.1073741824 - 0.268435456 = 0.6241903616

- 0.0175
- 0.0400

- 0.2684
- 0.6242
- 0.9596

786. **Let A, B and C be independent events such that P(A) = 0.5, P(B) = 0.6 and P(C) = 0.1. Calculate** $P(A^c \cup B^c \cup C)$

0.5+0.4-0.5*0.4 = 0.7

0.7+0.1-0.7*0.1=0.73

- 0.69
- 0.71
- 0.73
- 0.98
- 1

787. **The pdf of a random variable X is given by** $f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$.

What are the values of μ and σ?

x-a po formule

2 * sigma^2=8

Sigma=2

- $\mu = 1, \sigma = 4$
- $\mu = -1, \sigma = 4$
- $\mu = -1, \sigma = 2$
- $\mu = 1, \sigma = 8$
- $\mu = 1, \sigma = 2$

788. **What quantity is given by the formula** $\frac{Cov(X,Y)}{\sqrt{Var(X) \cdot Var(Y)}}$ **?**

- Covariance of the random variables X and Y
- Correlation coefficient
- Coefficient of symmetry
- Conditional expectation
- None of the given answers is correct

789. **In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?**

C(4,1)*c(48,4) /   c(52,5) =

- 0.2995
- 0.699

- 0.23336
- 1/4
- 0.4999

790. The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=3. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:

$$P(X = x) = e^{-\lambda}\frac{\lambda^x}{x!} \qquad x = 0, 1, 2, 3, 4, \ldots$$

E^(-3)*3^2/2! +e^(-3)*3+e^-3= 0.42319

- 0.64726
- 0.81521
- 0.42319
- 0.18478
- 0.08391

791. Table shows the cumulative distribution function of a random variable X. Determine $P(X \geq 2)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3

792. Table shows the cumulative distribution function of a random variable X. Determine $P(X > 4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 1
- 1/2
- 3/4
- 0

793. Which of the following statements is always true for A and A^C ?

- $P(AA^c)=1$

- $P(A^c)=P(A)$
- $P(A+A^c)=0$
- $P(AA^c)=0$
- None of the given statements is true

794. Consider the universal set U and two events A and B such that $A \cap B = \emptyset$ and $A \cup B = U$. We know that P(A)=1/3. Find P(B).

- 2/3
- 1/3
- 4/9
- Cannot be determined
- 1

795. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?

- 1/3
- 3/8
- 5/8
- 1/8
- 1

796. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

- 1/4, always
- 1/4, if A and B are independent
- 1/2, always
- 1/2, if A and B are independent
- None of the given answers

797. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

$$\mathbb{P}(A \mid B) = \frac{\mathbb{P}(A \cap B)}{\mathbb{P}(B)},$$

X / (2/7) = 3/5

X= 2/7 * 3/5 = 6/35

6/35 / 1/ 4 = p B | A

6/35* 4/1 = 24/35

- 24/75
- 24/35
- 6/35

- 12/75
- None of the given answers

798. A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.

((c(8,2)*c(7,1) + c(8,3)*c(7,0)))/ (15,3)=

- 512/3375
- 28/65
- 8/15
- 1856/3375
- 36/65

799. If the variance of a random variable X is equal to 3, then Var(3X) is :

3^2*3

- 12
- 6
- 3
- 27
- 9

800. Let X and Y be continuous random variables with joint cumulative distribution function $F(x,y)=\frac{1}{250}\left(20xy-x^2y-xy^2\right)$ for $0\le x\le 5$ and $0\le y\le 5$. Find P(X>2).

- 3/125
- 11/50
- 12/25
- $1-\frac{1}{250}\left(36y-2y^2\right)$
- $\frac{1}{250}\left(39y-3y^2\right)$

801. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$.

- $\lambda = np \sim const$, $n\to\infty,\ p\to 0$
- $\lambda=\frac{n}{p}$, $n\to\infty$
- $\lambda = ep$, $n\to\infty$
- $\lambda = n^p$, p is const
- None of the given answers is correct

802. Let X be a continuous random variable with PDF f(x) = cx ($0 \leq x \leq 1$), where c is a constant. Find the value of constant c.

C * x^2/2 ot 0 do 1 = 1

C=1 / ½

C =2

- ○ 1
- 2
- ○ 1/2
- ○ 3/2
- ○ 4

803. We are given the pmf of two random variables X and Y shown in the tables below.

X	1	3
p_x	0,4	0,6

y	2	4
p_y	0,2	0,8

Find E[X+Y].

0.4+0.6*3+0.2*2+0.8*4

- 5,8
- ○ 2,2
- ○ 2
- ○ 8,8
- ○ 10

804. The pdf of a random variable X is given by $f(x)=\begin{cases}\frac{1}{\gamma-2{,}5}, & if \quad x\in(1{,}5;\,3),\\ 0, & otherwise\end{cases}$.

Calculate the parameter γ.

- ○ 0
- 4
- ○ 1,5
- ○ 2
- ○ 3,5

805. Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that three of those selected are women?

(7/12*6/11*5/10*5/9)* 4

- 0.35
- ○ 0.65
- ○ 0.45
- ○ 0.25
- ○ 0.1211

806. **Suppose that the random variable T has the following probability distribution:**

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{T \geq 0 \; and \; T < 2\}$**.**

0.5+0.3

- 0.8
- 0.5
- 0.3
- 0.2
- 0.1

807. **Suppose that the random variable T has the following probability distribution:**

t	0	1	2
P(T = t)	.5	.3	.2

Compute the mean of the random variable T.

0.3+0.2*2

- 0.8
- 0.5
- 0.7
- 0.1
- 1

808. **Three dice are rolled. What is the probability that the points appeared are distinct.**

- 1
- 5/9
- 2
- 1/3
- 1/2

809. **Probability density function of the normal random variable X is given by** $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-3)^2}{50}}$**. What is the standard deviation?**

50=2*sigma^2

Sigma = 5

- 5
- 3
- 25
- 50

- 9

810. The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.

- p^5
- $1-(1-p)^5$
- $(1-p)^5$
- $1-p^5$
- None of the given answers is correct

811. The cdf of a random variable X is given by $F(x)=\begin{cases} 0 & if \quad x \le 3/2 \\ 2x-3 & if \quad 3/2 < x \le 2 \\ 1 & if \quad x > 2. \end{cases}$ **Find the probability P(1.7<X<1.9).**

Z(1.9)-z(1.7)=1.9*2-3   - (2*1.7-3)

- 0,16
- 0,8
- 1
- 0,4
- 0.6

812. In each of the 20 independent trials the probability of success is 0.2. Find the variance of the number of successes in these trials.

Variance= sigma^2

Sigma= sqrt(npq)

So 20*0.2*0.8

- 0
- 1
- 10
- 3.2
- 0.32

813. A coin tossed twice. What is the probability that head appears in the both tosses.

HH th ht tt

- 1/2
- 1/4
- 0
- 4:1
- 1

814. Continuous random variable X is normally distributed with mean=1 and variance=4. Find P(4≤x≤6).

Z((6-1 / 4) – z((4-1)/ 4)=0.89-0.77=

- 0,0606
- ○ 0,202
- ○ 0,0305
- ○ 0,0484
- ○ 0,0822

815. Random variable X is uniformly distributed on the interval [-2, 2]. Indicate the right values for E[X] and Var(X).

(A+b)/2=mean

(b-a)^2 / 12= 16/12

- ○ E[X]=0 and Var(X)=4
- E[X]=0 and Var(X)=1.33
- ○ E[X]=0.5 and Var(X)=1.33
- ○ E[X]=0 and Var(X)=0
- ○ No right answer

816. Expectation and standard deviation of the normally distributed random variable X are respectively equal to 15 and 5. What is the probability that in the result of an experiment X takes on the value in interval (5, 20)?

- ○ Φ(20) – Φ(5)
- ○ Φ(5) + Φ(10)
- ○ Φ(1) – Φ(0)
- ○ Φ(20) + Φ(5)
- Φ(1) + Φ(2)-1
- ○ Φ(2) – Φ(1)

817. Normally distributed random variable X is given by density $f(x)=\frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$. Find the mean.

- ○ -1/2
- ○ 1/2
- ○ 1/4
- 0
- ○ 1

818. Indicate the density function of the normally distributed random variable X when mean=2 and variance=9.

Variance=sigma^2

- ○ $\varphi(x) = \frac{1}{9\sqrt{2\pi}} e^{-\frac{(x-2)^2}{18}}$
- ○ $\varphi(x) = \frac{1}{2\sqrt{2\pi}} e^{-\frac{(x-9)^2}{8}}$
- ● $\varphi(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x-2)^2}{18}}$
- ○ $\varphi(x) = \frac{1}{6\sqrt{2\pi}} e^{-\frac{(x-a)^2}{72}}$
- ○ $\varphi(x) = -\frac{1}{\sigma\sqrt{2\pi}} e^{\frac{(x-a)^2}{2\sigma^2}}$

819. Indicate the PDF for standard normal random variable.

- ○ $f(x) = \lambda x^{-\lambda x}, \quad x \geq 0$
- ○ $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$
- ○ $f(x) = \frac{1}{b-a}, \quad a \leq x \leq b$
- ● $f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$
- ○ $f(x) = -\lambda e^{-\lambda x}, \quad x \geq 0$

820. Random variable X is uniformly distributed in interval [0, 3]. What is the variance of X?

(b-a)^2 / 12 = 9/12

- ● 0.75
- ○ 1.5
- ○ 3
- ○ 0.25
- ○ 1

821. Random variable X is uniformly distributed in interval [0, 15]. What is the expectation of X?

15/2

- ○ 15
- ○ 3.75
- ● 7.5
- ○ 30
- ○ 0

822. **Random variable X is uniformly distributed in interval [-2, 1]. What is the distribution of the random variable Y=2X+2?**

2*-2+2=-2

2*1+2=4

Просто закидываем А потом Б вместо икса

- ○ Y is normally distributed in the interval [-4, 2]
- ● Y is uniformly distributed in the interval [-2, 4]
- ○ Y is normally distributed in the interval [-2, 4]
- ○ Y is exponentially distributed in the interval [-4, 2]
- ○ Y has other type of distribution

823. **Random variable X is uniformly distributed in interval [-11, 26]. What is the probability P(X> - 4)?**

- ○ 29/38
- ○ 29/37
- ● 30/37
- ○ 15/19
- ○ 0

824. **Random variable X is uniformly distributed in interval [1, 3]. What is the distribution of the random variable Y=3X+1?**

3*1+1=4

3*3+1=10

- ○ Y is normally distributed in the interval [3, 9]
- ● Y is uniformly distributed in the interval [4, 10]
- ○ Y is normally distributed in the interval [4, 10]
- ○ Y is exponentially distributed in the interval [4, 10]
- ○ Y has other type of distribution

825. **Random variable X is uniformly distributed in interval [-11, 20]. What is the probability P(X$\leq$0) ?**

- ○ 11/32
- ○ 5/16
- ○ 10/31
- ● 11/31
- ○ 0

826. **Random variable X is given by density function f(x) in the interval (0, 1) and otherwise is 0. What is the expectation of X?**

- ○ $\int_{-\infty}^{+\infty} x f(x) dx$

- $\int_{-\infty}^{+\infty} f(x)dx$
- $\int_{0}^{1} xf(x)dx$
- $\int_{0}^{1} f(x)dx$
- E[X]=0

827. Random variable X is given by density function f(x) = x/2 in the interval (0, 2) and otherwise is 0. What is the expectation of X?

Integral ot 0 do 2 x * x/2 = x^3 / 6 ot 0 do 2 = 8/6=4/3

- 1/2
- 1
- 4/3
- 2/3
- 0

828. Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the expectation of X?

Integral ot 0 do 1 x * 2x = 2x^3 /3 ot 0 do 1 = 2/3

- 1/2
- 1
- 4/3
- 2/3
- 0

829. Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the probability P(0 < X < 1/2) ?

Integral ot 0 do ½ 2x = x^2 ot 0 do ½ = ½ ^ 2 = ¼

- 1/2
- 1/4
- 0
- 1/8
- 0
- None of these

830. Indicate the function that can be CDF of some random variable.

○ $F(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 0, & x>2\end{cases}$

○ $F(x)=\begin{cases}0, & x\le 1\\ 2-x, & 1<x\le 2\\ 1, & x>2\end{cases}$

● $F(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

○ $F(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 4\\ 0, & x>4\end{cases}$

○ None of these

831. Indicate the function that can be PDF of some random variable.

● $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 0, & x>2\end{cases}$

○ $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

○ $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 4\\ 0, & x>4\end{cases}$

○ $f(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

○ $f(x)=\begin{cases}0, & x\le 1\\ x/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

832. Continuous random variable X has the following CDF:

$F(x)=\begin{cases}0, & x\le 0\\ \frac{x}{2}, & 1<x\le 2\\ 1, & x>2\end{cases}$ **. What is the PDF of X in the interval 1<X≤2?**

2/2 – ½

● 1/2

○ 0

○ 1

○ $X^2/4$

- x

833. Continuous random variable X is given in the interval [0, 100]. What is the probability P(X=50)?

- 0
- 1
- 0.5
- 0.75
- 0.25

834. CDF of discrete random variable X is given by

$$F(x) = \begin{cases} 0, & x \le 1 \\ 0{,}3, & 1 < x \le 2 \\ 0{,}5, & 2 < x \le 3 \\ 1, & x > 3 \end{cases}$$

What is the probability P{1.3<X≤2.3}?

0.5-0.3

- 0.8
- 0.2
- 0
- 0.6
- 0.4

835. PMF of discrete random variable is given by

X	0	2	4
P	0,1	0,5	0,4

Find the value of CDF of X in the interval (2, 4].

- 0.4
- 0.5
- 0.2
- 0.6
- 1

836. PMF of discrete random variable is given by

X	0	2	4
P	0,3	0,1	0,6

Find F(2).

0.3+0.1

- 0.4
  - 0.6
  - 0.3
  - 0.7
  - 0.1

837. PMF of discrete random variable X is given by

X	-1	5
P	0,4	0,6

Find standard deviation of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

Variance = sigma^2

Sigma= 2.93

  - 15.4
  - 8.64
  - 2.6
- 2.9393
  - 3.3333

838. PMF of discrete random variable X is given by

X	-1	5
P	0,4	0,6

Find variance of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

  - 15.4
- 8.64
  - 2.6
  - 2.93
  - 3.33

839. PMF of discrete random variable X is given by

X	0	5	x_3
P	0,6	0,1	0,3

If E[X]=3.5 then find the value of x_3.

5*0.1+x3*0.3=3.5

x3*0.3=3

x3=10

- 10
- 6
- 8
- 12
- 24

840. Probability of success in each of 100 independent trials is constant and equals to 0.8. What is the probability that the number of successes is between 60 and 88?

Mean = 80

Sigma=sqrt(100*0.8*0.2)=4

(88-80 / 4) – (60-80 / 4)= 2 - -5

- $P_{100}(60 \le m \le 88) \approx \Phi(88) - \Phi(60)$
- $P_{100}(60 \le m \le 88) \approx \Phi(2) - \Phi(-5)$
- $P_{100}(60 \le m \le 88) \approx \Phi(88) + \Phi(60)$
- $P_{100}(60 \le m \le 88) \approx \Phi(2) + \Phi(5)$
- $P_{100}(60 \le m \le 88) \approx \Phi(8) + \Phi(20)$

841. A man is made 10 shots on the target. Assume that the probability of hitting the target in one shot is 0,7. What is the most probable number of hits?

- 8
- 7
- 6
- 5
- 9

842. Consider two boxes, one containing 4 white and 6 black balls and the other - 8 white and 2 black balls. A box is selected at random, and a ball is drawn at random from the selected box. If the ball occurs to be white, what is the probability that the first box was selected?

P(B|A)=p(A|B)*p(B)/p(A)

- 0.4
- 0.6
- 0.8
- 1/3
- 2/3

843. Each of two boxes contains 6 white and 4 black balls. A ball is drawn from 1st box and it is replaced to the 2nd box. Then a ball is drawn from the 2nd box. What is the probability that this ball occurs to be white?

(7/11+6/11) * ½

- 0.3
- 0.4
- 0.5
- 0.6
- 0.8

844. **Consider two boxes, one containing 3 white and 7 black balls and the other – 1 white and 9 black balls. A box is selected at random, and a ball is drawn at random from the selected box. What is the probability that the ball selected is black?**

(7/10 + 9/10) * ½ =8/10 =0.8

- 0.8
- 0.2
- 0.4
- 1.6
- 0.9

845. **Urn I contains 4 black and 6 white balls, whereas urn II contains 3 white and 7 black balls. An urn is selected at random and a ball is drawn at random from the selected urn. What is the probability that the ball is white?**

(6/10 + 3/10) * ½ = 9/10* ½ = 0.45

- 0.45
- 0.15
- 0.4
- 0.9
- 1

846. **A coin is tossed twice. Event A={ at least one Head appears}, event B={at least one Tail appears}. Find the conditional probability P(B|A).**

A= HT TH HH=3/4

B= TT HT TH=3/4

2/3 sovpadenie

- 2/3
- 1/3
- 1/2
- 3/4
- 0

847. **A coin is tossed twice. Event A={ Head appears in the first tossing}, event B={at least one Tail appears}. Find the conditional probability P(B|A).**

A=**HT** HH

B=**HT** TH TT

- 1/4

- 1/2

- 1/3
- 2/3
- 3/4

848. Probability that each shot hits a target is 0.9. Total number of shots produced to the target is 5. What is the probability that at least one shot hits the target?

- $1\text{-}0{,}9^5$
- $0{,}9^5$
- 1-5·0,9

- $1\text{-}0{,}1^5$

- $0{,}1^5$
- 1-5·0,1

849. An urn contains 1 white and 9 black balls. Three balls are drawn from the urn without replacement. What is the probability that at least one of the balls is white? *

9/10*8/9*1/8 * 3= 0.3

- 0.7

- 0.3

- 0.4
- 0.2
- 0.6

850. Four independent shots are made to the target. Probability of missing in the first shot is 0.5; in the second shot – 0.3; in the 3rd – 0.2; in the 4th – 0.1. What is the probability that the target is not hit.

0.5*0.3*0.2*0.1=0.003

- 1.1
- 0.03
- 0.275

- 0.003

- 1.01

851. Probability of successful result in the certain experiment is 3/4. Find the most probable number of successful trials, if their total number is 10.

¾*10=7.5

- 6
- 7

- 8

- 5

- 10

852. Let E and F be two mutually exclusive events and P(E)=P(F)=1/3. The probability that none of them will occur is:

- No correct answer
- $\mathrm{P}((E \cup F)^c) = 1 - (\mathrm{P}(E) + \mathrm{P}(F)) = 1 - \frac{1}{3} - \frac{1}{3} = \frac{1}{3}$
- $\mathrm{P}(E \cup F) = \mathrm{P}(E) + \mathrm{P}(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
- $\mathrm{P}(E \cap F) = \mathrm{P}(E) + \mathrm{P}(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
- $\mathrm{P}(E^c \cup F^c) = \mathrm{P}(E^c)\mathrm{P}(F^c) = \frac{2}{3}\frac{2}{3} = \frac{4}{9}$

853. Let E and F be two events. If $\mathrm{P}(E) = \frac{3}{4}$, $\mathrm{P}(F) = \frac{1}{2}$, $\mathrm{P}(E \cup F) = 1$ and $\mathrm{P}(E \cap F) = \frac{1}{4}$, then the conditional probability of E given F is:

¼ / ½ = ½

- $\mathrm{P}(E|F) = \frac{1}{4}$
- $\mathrm{P}(E|F) = \frac{3}{4}$
- $\mathrm{P}(E|F) = \frac{1}{2}$
- $\mathrm{P}(E|F) = \frac{1}{3}$
- No correct answer

854. Given that Z is a standard normal random variable. What is the value of Z if the area to the left of Z is 0.9382?

- 1.8
- 1.54
- 2.1
- 1.77
- 3

855. At a university, 14% of students take math and computer classes, and 67% take math class. What is the probability that a student takes computer class given that the student takes math class?

P(AB)=0.14

P(A)=0.67

P(B|A)=p(BA)/p(A)=0.14/0.67=0.21

- 0.81
- 0.21
- 0.53
- No correct answer
- 0.96

856. Let $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, be the joint p.d.f. of X and Y. Find the marginal PDF of X.

X+y^2/2 ot 0 do 1 dlya Y= x + 1/2

- x
- x+1/2
- y+1/2
- x^2+1
- x^2+y^2

857. If two random variables X and Y have the joint density function, $f_{X,Y}(x,y)=\begin{cases} xy & \text{for } 0<x<1,\ 0<y<2 \\ 0 & \text{elsewhere} \end{cases}$, find the probability P(X+Y<1).

- 1/24
- 1/12
- 5/12
- 1/4
- 0.003

858. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases} \frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1 \\ 0 & \text{elsewhere} \end{cases}$, find the conditional PDF $f_{X|Y}(x|y)$.

- $\dfrac{(x+y^2)}{1+y^2}$
- $\dfrac{2(x+y^2)}{1+2y^2}$
- $\dfrac{5(x+y^2)}{12}$
- $\dfrac{\frac{6}{5}(x+y^2)}{1+y^2}$
- None of these

859. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases} \frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1 \\ 0 & \text{elsewhere} \end{cases}$, find the conditional PDF $f_{Y|X}(y|x)$.

- $\dfrac{(x+y^2)}{1+x}$

- $\dfrac{3(x+y^2)}{x}$
- $\dfrac{3(x+y^2)}{1+3x}$
- $\dfrac{\frac{6}{5}(x+y^2)}{1+3x}$
- None of these

860. A basketball player makes 90% of her free throws. What is the probability that she will miss for the first time on the seventh shot?

0.9^6*0.1

- 0.0001
- 0.053
- 0.002
- 0.001
- 0.01

861. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}2(1-x) & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Then find P(Y>0.5).

- 0.5
- 0.25
- 0.75
- 1
- 1.5

862. Let X be a continuous random variable with probability density given by $f(x)=\begin{cases}\dfrac{x}{12} & for\ 1<x<5\\ 0 & elsewhere\end{cases}$.

Let Y=2X-3. Find P(Y≥4).

- 0.3438
- 0.53125
- 0.0625
- 0.1563
- 0

863. Random variable X has the following PDF $f(x)=\dfrac{3x^2}{2}, -1\le x\le 1.$

Find $P(-0.8\le X\le 0.8)$.

- 0.31
- 0.428

- 0.512
- 0
- 0.78

864. Random variable X has the following PDF $f(x)=\dfrac{3x^2}{2}, -1 \le x \le 1.$

Find E[X].

- 0
- 1
- 2
- 3
- 4

865. Random variable X has the following PDF $f(x)=\dfrac{3x^2}{2}, -1 \le x \le 1.$

Find Var[X].

- 0
- 1
- 0.6
- 0.8
- 0.4

866. Random variable X has the following PDF $f(x)=\dfrac{3x^2}{2}, -1 \le x \le 1.$

Find $E\left[\dfrac{1}{X}\right]$**.**

- 4
- 0
- 2
- 1
- -2

867. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the marginal density function for X.

- 6y
- $6y^2$
- $6x^2$
- $3x^2$

- $3x^3$

868. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the marginal density function for Y.

- $3x^2$
- 6y
- 2y
- $2y^2$-1
- y+6

869. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the E[X].

- 0.25
- 0.75
- 0.5
- 0.95
- None of these

870. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the E[Y].

- 1
- 2/3
- 1/3
- 0.5
- 0.25

871. Assume that Z is standard normal random variable. What is the probability P(|Z|>2.53)?

- 0.9943
- 0.0114
- 0.0057
- 0.9886
- None of these

872. If Z is normal random variable with parameters μ=0, σ^2=1 then the value of c such that P(|Z|<c)=0.7994 is

- 1.28

- 0.84
  - 1.65
  - 2.33
  - None of these

873. The random variable X has the continuous CDF

$$F(x)=\begin{cases}0, & x<0\\ \dfrac{x^2}{9}, & 0\le x<3\\ 1, & 3\le x\end{cases}$$ **. Find P(2≤X≤4).**

  - 16/9
  - 4/3
  - 4/9
- 5/9
  - 2/3

874. Let X be the random variable for the life in hours for a certain electronic device. The probability density function is

$$f(x)=\begin{cases}\dfrac{200{,}000}{x^3} & \text{for } x>100\\ 0 & \text{elsewhere}\end{cases}$$ **. Find the expected life for a component.**

- 2000 hours
  - 1000 hours
  - 100 hours
  - 200 hours
  - None of these

875. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}x+y & \text{if} \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$. Find E[X-Y].

- 0
  - 7/6
  - 2/3
  - 1/6
  - None of these

876. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}x+y & \text{if} \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$. Find E[X+Y].

  - 1/6
  - 6/7

- 7/6
  - 5/6
  - 0

877. The joint density function for the random variables X and Y is given by

$$f_{X,Y}(x,y) = \begin{cases} xe^{-x(1+y)} & if \quad x \geq 0,\ y \geq 0 \\ 0, & otherwise \end{cases}$$

. Find E[X].

  - 0
- 1
  - 1.4142
  - 2
  - None of these

878. A box contains 15 balls, 10 of which are black. If 3 balls are drawn randomly from the box, what is the probability that all of them are black?

10/15*9/14*8/13=0.26

- 0.26
  - 0.52
  - 0.1
  - None of these
  - 0.36

879. The Cov(aX,bY) is equal to

  - $aCov(X,Y)+bCov(X,Y)$
  - $aCov(X,Y)-bCov(X,Y)$
- $abCov(X,Y)$
  - $a^2b^2Cov(X,Y)$
  - $\frac{a}{b}Cov(X,Y)$

880. If A and B are two mutually exclusive events with P(A) = 0.15 and P(B) = 0.4, find the probability P(A and B^c) (i.e. probability of A and B complement).

0.15*0.6

  - 0.4
- 0.15
  - 0.85
  - 0.6
  - 0.65

881. From a group of 5 men and 6 women, how many committees of size 3 are possible with two men and 1 woman if a certain man must be on the committee?

- $\binom{5}{1} \times \binom{6}{1}$
- $\binom{4}{1} \times \binom{1}{1} \times \binom{6}{1}$
- $\binom{1}{1} \times \binom{6}{1}$
- $\binom{5}{2} \times \binom{6}{1}$
- None of these

882. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Find the marginal PDF of Y.

- y+1/2
- y
- 1/2y
- $y^2/2$
- 1/2

883. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Compute E[X].

- 0.2
- 0.823
- 0.583
- 1
- 0

884. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Compute E[Y].

- 0.2
- 0.823
- 0.583
- 1
- 0

885. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Compute E[2X].

- 7/6
- 0
- 1
- 7/12

- ○ 1/6

886. Let X be continuous random variable with probability density function $f(x)=\begin{cases}\frac{x}{6}, & if\ 2<x<4\\ 0, & otherwise\end{cases}$. **Find the expected value of random variable X.**

- ○ 19/3
- ○ 13/3
- ○ 12/7
- ● 28/9
- ○ 27/4

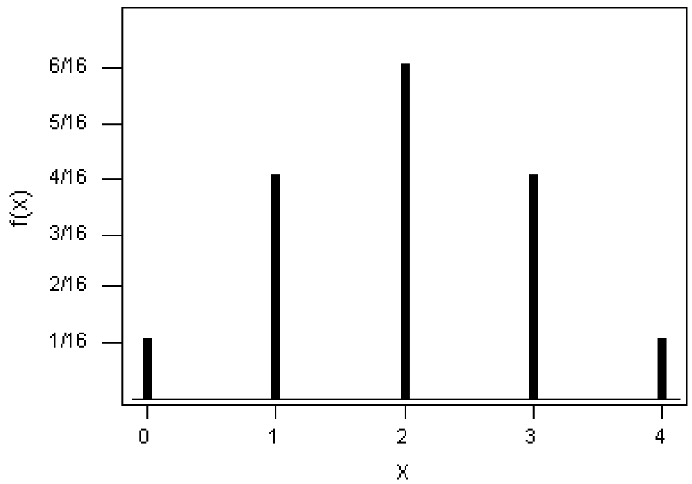
887. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}2(1-x) & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Then find P(X>0.5).

- ○ 0.5
- ● 0.25
- ○ 0.15
- ○ 0.75
- ○ 0.1

888. Probability mass function for discrete random variable X is represented by



the

graph. Find Var(X).

- ● 1
- ○ 4
- ○ 5
- ○ 2
- ○ 6

889. Two dice are rolled, find the probability that the sum is less than 13.

- 1
  - 1.2
  - 0.5
  - 0.6
  - 0.8

890. A bag has six red marbles and six blue marbles. If two marbles are drawn randomly from the bag, what is the probability that they will both be red?

C(2,6)/c(2,12)

- 1/2
- 11/12
- 5/12

- 5/22
  - 1/3

891. A man can hit a target once in 4 shots. If he fires 4 shots in succession, what is the probability that he will hit his target?

$$1-\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)=1-\left(\frac{3}{4}\right)^4=1-\frac{81}{256}=\frac{256}{256}-\frac{81}{256}=\frac{175}{256}$$

- 175/256
  - 1
  - 1/256
  - 81/256
  - 144/256

892. Let random variable *X be normal with parameters mean=5, variance=9.* Which of the following is a standard normal variable?

- Z=(X-5)/5
- Z=(X-3)/5

- Z=(X-5)/3
  - Z=(X-3)/3
  - None of these

893. A coin is tossed 6 times. What is the probability of exactly 2 heads occurring in the 6 tosses.

- $\binom{6}{2}\left(\frac{1}{2}\right)^6$
- $\left(\frac{1}{2}\right)^6$
- $\left(\frac{1}{3}\right)^6$
- $\binom{6}{2}\left(\frac{1}{3}\right)^6$
- None of these

894. **The number of all possible permutations :** ***$P_n = n!$***

895. **How many two-place numbers can be made of the digits 1, 4, 5 and 7 if each digit is included into the image of a number only once? 12**

3 .The number of all possible allocations: $A_n^m = \dfrac{n!}{(n-m)!}$

896. **The number of all possible combinations** $C_n^m = \dfrac{n!}{m!(n-m)!}$

897. **How many ways are there to choose 2 details from a box containing 9 details?: 36**

898. **The numbers of allocations, permutations and combinations are connected by the equality:** $A_n^m = P_m \cdot C_n^m$.

899. **If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by m+n… ways.**

900. **Events are *equally possible* if … there is reason to consider that none of them is more possible (probable) than other.**

901. **The probability of the event *A* is determined by the formula :** $P(A) = \dfrac{m}{n}$

902. **The probability of a reliable event is equal to …** is equal to 1.

903. **The probability of an impossible event is equal to … 0**

12.The probability of a random event is … the positive number between 0 and 1.

The relative frequency of the event *A* is defined by the formula: $W(A) = \dfrac{m}{n}$

904.

905. **There are 100 identical details (and 20 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted. : 20/100 = 1/5=0.2**

906. **A die is tossed. Find the probability that an even number of aces will appear. : 1/2**

907. **Participants of a toss-up pull a ticket with numbers from 1 up to 30 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 2. : 12/30= 0.4**

908. **In a batch of 8 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to? : 3/8**

909. **At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,4. Find the number of hits if 20 shots were made. : 8**

910. **Two dice are tossed. Find the probability that different number of aces will appear on dices : 30/36=5/6**

911. **Two dice are tossed. Find the probability that the sum of aces will exceed 10. : 3/36=1/12**

912. **An urn contains 15 balls: 4 white, 6 black and 5 red. Find the probability that a randomly taken ball will be red or white. : 5/15 + 4/15**

913. **12 seeds have germinated of 60 planted seeds. Find the relative frequency of germination of seeds. = 12/60 = 1/5**

914. **A point *C* is randomly appeared in a segment *AB* of the length 5. Determine the probability that the distance between *C* and *B* doesn't exceed 1. :: 1/5**

915. **A coin is tossed twice. Find the probability that the coin lands on tails in both times. : 1/4**

916. **There are 200 details in a box. It is known that 150 of them are details of the first kind, 10 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the third kind from the box are there? : C 200 150 + C200 40**

917. **If an object *A* can be chosen from the set of objects by *m* ways and after every such choice an object *B* can be chosen by *n* ways then the pair of the objects (*A, B*) in this order can be chosen by ... ways. :: m*n**

918. **There are 12 students in a group. It is necessary to choose a leader, its deputy and head of professional committee. How many ways of choosing them are there? :: C12 1 * C 11 1 = 132**

919. **5 of 20 students have sport categories. What is the probability that 3 randomly chosen students have sport categories? :: C 5 3 / C 20 3 = 10/ 1140**

920. **A box contains 5 red, 6 green and 4 blue pencils. 3 pencils are randomly extracted from the box. Find the probability that all the extracted pencils are different color. :: 0.25**

921. **It has been sold 12 of 15 refrigerators of three marks available in quantities of 5, 7 and 3 units in a shop. Assuming that the probability to be sold for a refrigerator of each mark is the same, find the probability that refrigerators of one mark have been unsold. ???**

922. **A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the *i*-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event *A* – «only two hit».p**

923. **The probability of appearance of any of two incompatible events is equal to: p(A) + p(B)**

924. **There are 20 balls in an urn: 3 red, 2 blue and 15 white. Find the probability of appearance of a color (red or blue) ball. :: 2/20 + 3/20**

925. **A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,5 and in the second – 0,3. Find the probability that the shooter will hit at one shot either in the second area or in the third area. 0,5**

926. **The sum of the probabilities of events A_1, A_2,…, A_n which form a complete group is equal to 1…**

927. **A consulting point of an institute receives packages with control works from the cities *A*, *B* and *C*. The probability of receiving a package from the city *A* is equal 0,2; from the city *B* – 0,2. Find the probability that next package will be received from the city *C*. 1-0.4=0.6**

928. **Two uniquely possible events forming a complete group are … *opposite***

The sum of the probabilities of opposite events is equal to … $P(A) + P(\overline{A}) = 1$

929. **The probability that a day will be rainy is $p = 0,75$. Find the probability that a day will be clear. 0.25**

930. ***The conditional probability* of an event *A* with the condition that an event B has already happened is equal to:Pb (A)= p(AB)/p(b)**

931. **There are 4 conic and 8 elliptic cylinders at a collector. The collector has taken one cylinder, and then he has taken the second cylinder. Find the conditional probability that the second taken cylinder is elliptic given that the first was conic. 8/11**

932. **There are 4 white, 5 black and 6 blue balls in an urn. Each trial consists in extracting at random one ball without replacement. Find the probability that a white ball will appear at the first trial (the event *A*), a black ball will appear at the second trial (the event *B*), and a blue ball will appear at the third trial (the event *C*). 4/15*5/14*6/13**

933. **The events *A*, *B*, *C* and *D* form a complete group. The probabilities of the events are those: $P(A)$ = 0,1; $P(B)$ = 0,49; $P(C)$ = 0,3. What is the probability of the event *D* equal to? D()=0.11**

934. **For independent events theorem of multiplication has the following form: $P(AB) = P(A) \cdot P(B)$**

935. **Find the probability of joint hit in a target by two guns if the probability of hit in the target by the first gun (the event *A*) is equal to 0,3; and by the second gun (the event *B*) – 0,5. 0.15**

936. There are 3 boxes containing 10 details each. There are 5 standard details in the first box, 6 – in the second and 3 – in the third box. One takes at random on one detail from each box. Find the probability that all three taken details will be standard. 0.09

937. The probabilities of hit in a target at shooting by three guns are the following: $p_1 = 0,6$; $p_2 = 0,7$; $p_3 = 0,5$. Find the probability of at least two hits at one shot by all three guns.

1-fneg+secn+thirdneg.

938. There are 3 flat-printing machines at typography. For each machine the probability that it works at the present time is equal to *0,6*. Find the probability that at least one machine works at the present time

(1-0.4^3);

939. What is the probability that at tossing two dice 3 aces will appear at least on one of the dice?

- 1/6 *5/6 +1/6 *1/6 +1/6 *5/6

940. Three shots are made in a target. The probability of hit at each shot is equal to 0,6. Find the probability that only two hits will be in result of these shots.

- 0.432

941. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,5; by the second – 0,2; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by only one student?

- 0.42

942. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,5; by the second – 0,3; and by the third – 0,7. What is the probability that the exam will be passed on "excellent" by exactly two students?

-

943. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by at least one student?

- 1-0.7*0.3*0.2

944. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by neither of the students?

- 0.7*0.3*0.2

945. Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that two of them will make purchases.

(0.64*0.2) *3 =0.384

946. **Four buyers went in a shop. The probability that each buyer makes purchases is equal to 0,5. Find the probability that three of them will make purchases.**

947. **Four buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that only one of them will make purchases.**

948. **There are 5 details made by the factory № 1 and 15 details of the factory № 2 at a collector. Two details are randomly taken. Find the probability that at least one of them has been made by the factory № 1.**

- 85/190

949. **There are 5 details made by the factory № 1 and 15 details of the factory № 2 at a collector. Two details are randomly taken. Find the probability that at least one of them has been made by the factory № 2.**

- 1-C 5 2/C20 2=18/19

950. **10 of 20 savings banks are located behind a city boundary. 4 savings banks are randomly selected for an inspection. What is the probability that among the selected banks appears inside the city 2 savings banks?**

- C10 2 *C10 2/C20 4

951. **The probabilities that three men hit a target are respectively 1/3, 1/4 and 1/2. Each man shoots once at the target. What is the probability that exactly one of them hits the target?**

952. **A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will not be solved?**

953. **A problem in mathematics is given to three students whose chances of solving it are 1/3, 3/4, 3/5. What is the probability that the problem will be solved?**

954. **There are two sets of details. The probability that a detail of the first set is standard is equal to 0,7; and of the second set – 0,4. Find the probability that a randomly taken detail (from a randomly taken set) is standard. 0.4*0.7**

955. **There are two sets of details. The probability that a detail of the first set is standard is equal to 0,7; and of the second set – 0,4. Find the probability that a randomly taken detail (from a randomly taken set) is not standard. 0.3*0.6**

956. **An urn contains 10 balls: 3 red and 7 blue. A second urn contains 6 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.54 . Calculate the number of blue balls in the second urn.**

- 9

957. **The probability that a boy will not pass M.B.A. examination is 1/5 and that a girl will not pass is 3/5. Calculate the probability that at least one of them passes the examination.**

958. The probability that a boy will not pass M.B.A. examination is 1/5 and that a girl will not pass is 3/5. Calculate the probability that exactly one of them passes the examination.

959. A bag contains 6 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the conditional probability that all three will be blue given that one of them is blue.

960. A bag contains 4 white, 6 red and 10 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?

961. Find the Bernoulli formula :

○ P= C m n*p^m* q^n-m

962. How would it change the expected value of a random variable X if we multiply the X by a number k.

○ M(kx)=k*M(x)

963. Find the dispersion for the given probability distribution.

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

964. The table below shows the probability distribution function of a random variable X.

x_i	0	x_2	5
p_i	0.1	0.4	0.5

If M[X]=5,3 find the value of x_2.

○ 7

965. Indicate the formula of computing the dispersion of a random variable X with mathematical expectation μ.

○ D(x)=M(X^2)-(M(X)^2)

966. The cumulative distribution function of a discrete random variable X is given by

967. $F(x)=\begin{cases} 0 & if\ \ x\le 2 \\ 0.5 & if\ \ 2<x\le 5 \\ 0.8 & if\ \ 5<x\le 8 \\ 1 & if\ \ x>8 \end{cases}$ **Find** $\boldsymbol{P(3\le X<8)}$.

○ 0.3

968. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ x\le 2\\ 0.3 & if\ 2<x\le 5\\ 0.9 & if\ 5<x\le 8\\ 1 & if\ x>8\end{cases}$$

Find $P(2 \le X < 5)$.

- **0.3**

969. A fair die is rolled three times. A random variable X denotes the number of occurrences of 6's. What is the probability that X will have the value which is not equal to 3.

- 215/216=1-p^3

Find the expectation of a random variable X if the cumulative distribution function

$$F(x)=\begin{cases}1-e^{-x/5}, x\ge 0\\ 0, \quad x<0\end{cases}.$$

- 5

970. If the dispersion of a random variable X is given D(X)=5. Then D(2X) is 4*5=20

971. The table below shows the distribution of a random variable X. What is the D(X)?

X	-2	1	2
P	0,2	0,5	0,3

972. The table below shows the distribution of a random variable X. What is the M(X)?

X	-2	1	2
P	0,2	0,5	0,3

973. If D(X)=3, find D(-3X+4). =27

974. If D(X)=3, find D(2X-3).=12

975. The table below shows the distribution of a random variable X. Find M[x] and D(X).

X	-2	0	1
P	0.1	0.5	0.4

976. If a fair die is tossed twice, the probability that the first toss will be a number less than 3 and the second toss will be greater than 5 is

- 1/3*1/6=1/18

977. A class consists of 460 female and 540 male students. The students are divided according to their marks

	Passed	Did not pass
Female	400	60

Male	**440**	**100**

If one person is selected randomly, the probability that it did not pass given that it is female is: 60/1000

978. A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value of *X* is

979. How many different two-member teams can be formed from six students? C 6 2

980. How many different 3-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once? C 6 3 *3!

981. If P(E) is the probability that an event will occur, which of the following must be false?

-

982. A die is rolled. What is the probability that the number rolled is greater than 3 and even?

1/3

983. How many different 6-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?

- 6!

984. Evaluate 0!+1!+4!=

985. Evaluate 6!-5!

986. Your state issues license plates consisting of letters and numbers. There are 26 letters and the letters may be repeated. There are 10 digits and the digits may be repeated. How many possible license plates can be issued with two letters followed by two numbers?1

- 26 ^2 *100

987. A fair coin is thrown in the air five times. If the coin lands with the head up on the first four tosses, what is the probability that the coin will land with the head up on the fifth toss?

- 1/2

988. A movie theatre sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?

- 27

989. A random variable Y has the following distribution:

Y	-1	0	1	2
P(Y)	C	4C	0.4	0.1

The value of the constant C is:0.1

990. A random variable X has a probability distribution as follows:

X	**0**	**1**	**2**	**3**
P(X)	**2k**	**4k**	**12k**	**2k**

Then the probability that $P(X < 2)$ is equal to 6K

991. The probability is p = 0.85 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

- Np=34

992. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is 0.49

993. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	**Did not pass**
Female	**430**	**60**
Male	**410**	**100**

If one person is selected randomly, what is the probability that it did not pass given that it is male.

994. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

- C6 5*C4 3/C10 8

995. Suppose that 10% of people are left handed. If 6 people are selected at random, what is the probability that exactly 2 of them are left handed?

- 510/2280= C 18 4*C 2 2/C20 6

996. Suppose that the random variable T has the following probability distribution:

T	**0**	**1**	**2**
P(T=t)	**0.4**	**0.4**	**0.2**

Find $P(X \leq 0)$.

- 0 ili 0.4

997. Which of the following is the appropriate definition for the union of two events A and B?

- P(A+B)=P(a)+P(B)

998. Johnson taught a music class for 20 students under the age of ten. He randomly chose one of them. What was the probability that the student was under eleven?

○

999. The compact disk Jane bought had 12 songs. The first five were rock music. Tracks number 6 through 12 were ballads. She selected the random function in her CD Player. What is the probability of first listening to a ballad?

○ 7/12

1000. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 3?

○ 1/5

1001. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be Spades?

○ C13 2/c52 2

1002. A standard deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. What is the probability of drawing a Diamond from a standard deck of 52 cards?

○ 13/52

1003. One card is randomly selected from a shuffled deck of 52 cards and then a die is rolled. Find the probability of obtaining an Ace and rolling an odd number.

○ 4/52*1/2

1004. In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?

C4 1* C4 48/C5 52

1005. Table shows the cumulative distribution function of a random variable X. Determine $P(X \geq 2)$.

X	1	2	3	4
F(X)	1/8	1/4	3/4	1

1-F(1)=7/8

Table shows the cumulative distribution function of a random variable X. Determine $P(X \geq 3)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

1006. Which of the following statements is always true for A and A^c?

○

1007. **A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?**

4/9

1008. **If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) = 1/4$**

1009. **Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).**

21/40

1010. **A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.**

1011. **If the dispersion of a random variable X is equal to 3, then D(2X) is :12**

1012. **We are given the probability distribution functions of two random variables X and Y shown in the tables below.**

X	1	3	**Y**	2	4
P	0.4	0.6	**P**	0.2	0.8

Find M[X+Y].M(X)+M(Y)

1013. **Suppose that the random variable T has the following probability distribution:**

T	**0**	**1**	**2**
P	**0.5**	**0.3**	**0.2**

Compute the expectation of the random variable T.

1014. **The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.**

1-q^5

1015. **The cumulative distribution function of a random variable X is given by**

$$F(x)=\begin{cases} 0 & if \quad x \le 3/2 \\ 2x-3 & if \quad 3/2 < x \le 2 \\ 1 & if \quad x > 2. \end{cases}$$

Find the probability $P(1.7 \le X < 1.9)$.

1016. **In each of the 20 independent trials the probability of success is 0.2. Find the dispersion of the number of successes in these trials.**

4

1017. **A coin tossed three times. What is the probability that head appears three times?**

- 1/8

1018. There are 10 white, 15 black, 20 blue and 25 red balls in an urn. One ball is randomly extracted. Find the probability that the extracted ball is blue or red.

- 45/70

1019. **A random variable *X* is given by the integral function of distribution:**

$$F(x) = \begin{cases} 0 \quad if \quad x \le -1, \\ \frac{1}{4}x + \frac{1}{4} \quad if \quad -1 < x \le 3, \\ 1 \quad if \quad x > 3. \end{cases}$$

Calculate the probability of hit of the random variable *X* in the interval (0; 2).

1020. A random variable *X* has the following law of distribution:

x_i	0	1	2	3
p_i	1/30	3/10	½	1/6

Find the mathematical expectation of *X*.

1021. **A random variable *X* is given by the integral function of distribution:**

$$F(x) = \begin{cases} 0 \quad if \quad x \le 2, \\ \frac{1}{2}x - 1 \quad if \quad 2 < x \le 4, \\ 1 \quad if \quad x > 4. \end{cases}$$

Find the probability of hit of the random variable *X* into the interval (2; 3).

- 0.5

1022. An urn contains 5 red, 3 white, and 4 blue balls. What is the probability of extracting a black ball from the urn?

- 0

1023. Find the Bernoulli formula

1024. Find the mathematical expectation *M(X)* of a random variable *X*, knowing its law of distribution:

x_i	x_i	2	6	3	3	6	1	9
p_i	p_i	0,1	0,2	0,4	0,3	0,3	0,5	0,2

1025. A group consists of 10 students, and 5 of them are pupils with honor. 3 students are randomly selected. Find the probability that 2 pupils with honor will be among the selected.

1026. The profit for a new product is given by $Z = 3X – Y - 5$. X and Y are independent random variables with $D(X) = 1$ and $D(Y) = 2$. Calculate $D(Z)$. =11

ProbabilityTheoryMathematicalStatistics_Maksat/1

1027. Bob has three bookshelves in his office and 15 books (5 are math books, 10 are novels). If each shelf holds exactly five books and books are placed randomly on the shelves (all orderings are equally likely), how many ways can 15 books be arranged on a bookshelves?

- ○ $\frac{15!}{10!}$
- ● $\frac{15!}{10!5!}$
- ○ $\frac{15!}{(5!)^3}$
- ○ $\frac{15!}{(3!)^3}$
- ○ $\frac{15!3!}{5!10!}$

1028. A class in probability theory consists of 2 men and 8 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores are possible?

- ○ $2!\,8!$
- ● $10!$
- ○ $\frac{10!}{2!}$
- ○ $\frac{10!}{2!8!}$
- ○ $\frac{10!}{(2!)^2}$

1029. A class in probability theory consists of 6 men and 4 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores are possible?

- ○ $6!\,4!$
- ● $10!$
- ○ $\frac{10!}{2!}$
- ○ $\frac{10!}{6!4!}$
- ○ $\frac{10!}{(2!)^2}$

1030. Ms. Jones has 10 books that she is going to put on her bookshelf. Of these, 4 are math books, 3 are chemistry books, 2 are history books, and 1 is a language book. Ms. Jones wants to arrange her books so that all the books dealing with the same subject are together on the shelf. How many different arrangements are possible?

- ○ 288
- ● 6912
- ○ 12600
- ○ 525
- ○ 3456

1031. How many different signals, each consisting of 9 flags hung in a line, can be made from a set of 4 white flags, 3 red flags, and 2 blue flags if all flags of the same color are identical?

- ○ 288
- ○ 6912
- ● 1260
- ○ 525
- ○ 3456

1032. From a group of 5 women and 7 men, how many different committees consisting of 2 women and 3 men can be formed, if 2 of the men are refuse to serve on the committee together?

- ○ 350
- ● 300
- ○ 4200
- ○ 500
- ○ 220

1033. A student answers to 10 questions in an examination. How many choices if she answered at 7 questions?

- ● 120
- ○ 176
- ○ 45
- ○ 10
- ○ 220

1034. A student answers to 10 questions in an examination. How many choices if she answered at least 7 questions?

- ○ 120
- ● 176
- ○ 45

- 10
- 220

1035. An urn contains 30 balls, of which 10 are red and the other 20 blue. Suppose you take out 8 balls from this urn, without replacement. In how many ways among chosen 8 balls in this sample exactly 3 are red and 5 are blue?

- 5852925
- 1860480
- 3720960
- 2480640
- 4961280

1036.A bag contains six Scrabble tiles with the letters A-D-M-N-O-R. You reach into the bag and take out tiles one at a time. After you pick a tile from the bag, write down that letter and then return the tile to the bag. How many possible words can be formed?

- 720
- 6
- 46656
- 120
- 10240

1037. A police department in a small city consists of 10 officers. If the department policy is to have 5 of the officers patrolling the streets, 2 of the officers working full time at the station, and 3 of the officers on reserve at the station, how many different divisions of the 10 officers into the 3 groups are possible?

- 350
- 2520
- 4200
- 300
- 220

1038.Joel has an MP3 player called the Jumble. The Jumble randomly selects a song for the user to listen to. Joel's Jumble has 2 classical songs, 13 rock songs and 5 rap songs on it. What is the probability that the selected song is classical song or rap song?

- 0.9
- $\frac{13}{20}$
- 0.35
- 7
- 0.7

1039. A chess tournament has 10 competitors, of which 4 are Russian, 3 are from the USA, 2 are from Great Britain, and 1 is from Brazil. If the tournament result lists just the nationalities of the players in the order in which they placed, how many outcomes are possible?

- ○ 288
- ○ 6912
- ● 12600
- ○ 525
- ○ 3456

1040.An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.44. Calculate the number of blue balls in the second urn.

- ○ 64
- ○ 16
- ● 4
- ○ 32
- ○ 8

1041.An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the different color is 0.44. Calculate the number of blue balls in the second urn.

- ○ 4
- ○ 16
- ● 64
- ○ 32
- ○ 8

1042.License plates in Minnesota are issued with three letters from A to Z followed by three digits from 0 to 9. If each license plate is equally likely, what is the probability that a random license plate starts with G-Z-N?

- ○ $\frac{10^3}{26^3}$
- ○ 10^3
- ● $\frac{1}{26^3}$
- ○ $\frac{1}{10^3}$
- ○ 26^3

1043.A business man has 4 dress shirts and 7 ties. How many different shirt/tie outfits can he create?

- ○ 4
- ○ 7
- ● 28
- ○ 11
- ○ 8

1044.Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one A?

- ○ 0.3264
- ○ 0.8712
- ● 0.5904
- ○ 0.6124
- ○ 0.9122

1045.Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one B?

- ○ 0.3264
- ○ 0.8712
- ● 0.5904
- ○ 0.6124
- ○ 0.9122

ProbabilityTheoryMathematicalStatistics_Maksat/3

1046.I tell students in my class that, although I use an average to calculate their course grades, I do weigh the final exam grade more heavily. I assure them that if they can perform well on my final, then even if they performed poorly on the other exams, they must have learned the material. For three semesters I kept track of how people did on the final and how they did in the course. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

Total number of students 321. What is the probability that a student, taken at random from my class, would have failed the course, given that they failed the final?

- ● 0.39
- ○ 0.72
- ○ 0.61
- ○ 0.44

- ○ 0.58

1047. I tell students in my class that, although I use an average to calculate their course grades, I do weigh the final exam grade more heavily. I assure them that if they can perform well on my final, then even if they performed poorly on the other exams, they must have learned the material. For three semesters I kept track of how people did on the final and how they did in the course. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

Total number of students 321. What is the probability that a student, taken at random from my class, would have passed the course, given that they failed the final?

- ○ 0.39
- ○ 0.72
- ● 0.61
- ○ 0.44
- ○ 0.58

1048. I tell students in my class that, although I use an average to calculate their course grades, I do weigh the final exam grade more heavily. I assure them that if they can perform well on my final, then even if they performed poorly on the other exams, they must have learned the material. For three semesters I kept track of how people did on the final and how they did in the course. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

Total number of students 321. What is the probability that a student, taken at random from my class, would have passed the course, given that they passed the final?

- ○ 0.39
- ○ 0.72
- ● 0.81
- ○ 0.44
- ○ 0.61

1049. I tell students in my class that, although I use an average to calculate their course grades, I do weigh the final exam grade more heavily. I assure them that if they can perform well on my final, then even if they performed poorly on the other exams, they must have learned the material. For three semesters I kept track of how people did on the final and how they did in the course. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

Total number of students 321. What is the probability that a student, taken at random from my class, would have failed the course, given that they passed the final?

- ● 0.19
- ○ 0.39
- ○ 0.81
- ○ 0.44
- ○ 0.61

ProbabilityTheoryMathematicalStatistics_Maksat/4

1050.Insurance predictions for probability of auto accident.

	Under 25	25-39	Over 40
P	0.11	0.03	0.02

Table gives an insurance company's prediction for the likelihood that a person in a particular age group will have an auto accident during the next year. The company's policyholders are 20% under the age of 25, 30% between 25 and 39, and 50% over the age of 40. What is the probability that a random policyholder will have an auto accident next year?

- ○ 0.145
- ● 0.041
- ○ 0.367
- ○ 0.512
- ○ 0.845

1051.At a certain university, 4% of men are over 6 feet tall and 1% of women are over 6 feet tall. The total student population is divided in the ratio 3:2 in favour of women (the number of women : the number of men). What is the probability that the randomly selected student is over 6 feet tall?

- ○ 0.05
- ● 0.022
- ○ 0.14
- ○ 0.028
- ○ 0.11

1052.You enter a chess tournament where your probability of winning a game is 0.3 against half the players, 0.4 against a quarter of the players, and 0.5 against the remaining quarter of the players. You play a game against a randomly chosen opponent. What is the probability of winning?

- ○ 1.2
- ● 0.375
- ○ 0.12
- ○ 0.028

○ 0.648

1053.If a person has the disease, the test will detect it with probability 0.95. Also, if the person does not have the disease, the test will report that they do not have it with the same probability 0.95. In addition, it is known from previous data that only 1% of the population has this particular disease. What is the probability that a particular person chosen at random will be tested positive?

○ 0.043

● 0.059

○ 0.01

○ 0.95

○ 1.2

1054.Suppose that you have two bags with white and dark chocolates. Bag 1 has two white chocolates and six dark chocolates. Bag 2 has four white chocolates and two dark chocolates. You choose one bag at random, both being equally likely, and you grab one from the chosen bag. Let A be the event that you grab one white chocolate. Find $P(A)$.

○ $\frac{11}{12}$

● $\frac{11}{24}$

○ $\frac{13}{32}$

○ $\frac{1}{3}$

○ $\frac{1}{2}$

1055.Amy has two bags of candy. The first bag contains two packs of M&Ms and three packs of Gummi Bears. The second bag contains four packs of M&Ms and two packs of Gummi Bears. Amy chooses a bag uniformly at random and then picks a pack of candy. What is the probability that the pack chosen is Gummi Bears?

○ $\frac{11}{12}$

● $\frac{7}{15}$

○ $\frac{14}{15}$

○ $\frac{1}{3}$

○ $\frac{1}{2}$

1056.Amy has three bags of candy. The first bag contains one pack of M&Ms and two packs of Gummi Bears. The second bag contains four packs of M&Ms and two packs of Gummi Bears. The third bag contains five packs of M&Ms and three packs of Gummi Bears. Amy chooses a bag uniformly at random and then picks a pack of candy. What is the probability that the pack chosen is M&Ms?

○ $\frac{11}{12}$

● $\frac{13}{24}$

- $\frac{2}{7}$
- $\frac{5}{8}$
- $\frac{1}{2}$

1057.Amy has two bags of candy. The first bag contains two packs of M&Ms and three packs of Gummi Bears. The second bag contains four packs of M&Ms and two packs of Gummi Bears. Amy chooses the first bag with the probability 0.3 and the second – 0.7. Amy chooses a bag at random and then picks a pack of candy. What is the probability that the pack chosen is M&Ms?

- $\frac{13}{24}$
- ● $\frac{44}{75}$
- $\frac{7}{15}$
- $\frac{5}{8}$
- $\frac{1}{2}$

ProbabilityTheoryMathematicalStatistics_Maksat/5

Point value	0	1	2	3	4	5	8	10
Number of tiles	2	68	7	8	10	1	2	2

1058. Tile values in Scrabble. In the game of Scrabble, there are 100 letters tiles with the distribution of point values given in Table. Let X be the point value of a random Scrabble tile. What is the mathematical expectation of X?

- 187
- ● 1.87
- 18.7
- 0.187
- 19

1059.Tile values in Scrabble.

Point value	1	2	3	4	5
Number of tiles	68	7	10	10	5

In the game of Scrabble, there are 100 letters tiles with the distribution of point values given in Table. Let X be the point value of a random Scrabble tile. What is the mathematical expectation of X^2?

- ○ 1.87
- ● 4.71
- ○ 3.26
- ○ 5.2
- ○ 9.1

1060. A fair six-sided die is tossed. You win $2 if the result is a «1», you win $1 if the result is a «6», but otherwise you lose $1. What is the dispersion of X?

- ○ 1.74
- ● 1.47
- ○ -0.17
- ○ 1.5
- ○ 2.12

1061.A fair six-sided die is tossed. You win $2 if the result is a «1», you win $1 if the result is a «6» or «3», but otherwise you lose $1. What is the dispersion of X?

- ○ 1.74
- ● 1.47
- ○ -0.17
- ○ 1.5
- ○ 2.12

1062.Which of the following is a discrete random variable?

- ○ The time of waiting a train.
- ● The number of boys in family having 4 children.
- ○ A time of repair of TVs.
- ○ The velocity in any direction of a molecule in gas.
- ○ The height of a man.

1063.Which of the following is a discrete random variable?

- ○ The time of waiting a train.
- ● The number of people in a community living to 100 years of age.
- ○ The mistake of a rounding off of a number up to the whole number.

- The velocity in any direction of a molecule in gas.
- The amount of time (starting from now) until an earthquake occurs.

1064.Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation of X+Y?

- 2.3
- 3.8
- 1
- 5.2
- 2.4

1065.Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mean square deviation of X+Y?

- 2.13
- 1.296
- 1.457
- 1.795
- 2.4

1066.Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation of XY?

- -3.8
- -3.36
- -1.4
- 4.26
- 2.44

1067.A set of families has the following distribution on number of children:

X	x_1	x_2	2	3	4
P(X)	0.1	0.2	0.4	0.2	0.1

Determine x_1, x_2, if it is known that $M(X) = 2, D(X) = 1.2$?

- $x_1 = \frac{1}{3}, x_2 = \frac{4}{3}$

- $x_1 = 0, x_2 = 1$
- $x_1 = 0, x_2 = \frac{4}{3}$
- $x_1 = 0, x_2 = 10$
- $x_1 = \frac{1}{3}, x_2 = -1$

ProbabilityTheoryMathematicalStatistics_Maksat/6

1068.The lifetime of a machine part has a continuous distribution on the interval (0, 30) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 6.

- $\frac{30}{53}$
- $\frac{1}{2}$
- $\frac{31}{35}$
- $\frac{13}{28}$
- $\frac{1}{17}$

1069. The lifetime of a machine part has a continuous distribution on the interval (0, 11) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5.

- $\frac{1}{17}$
- $\frac{7}{20}$
- $\frac{10}{11}$
- $\frac{19}{35}$
- $\frac{7}{11}$

1070. **A random variable *X* is given by the density function of distribution:**

$$f(x)=\begin{cases}0 \quad if \quad x<1 \ \text{ or } \ 7\le x,\\ \dfrac{x-1}{9} \ if \ 1\le x<4,\\ \dfrac{7-x}{9} \ if \ 4\le x<7.\end{cases}$$

Find the integral function of distribution of the random variable X?

- ● $$F(x)=\begin{cases}0 \quad if \quad x<1,\\ \dfrac{(x-1)^2}{18} \ if \ 1\le x<4,\\ \dfrac{18-(7-x)^2}{18} \ if \ 4\le x<7,\\ 1 \quad if \quad 7\le x.\end{cases}$$

- ○ $$F(x)=\begin{cases}0 \quad if \quad x<1,\\ \dfrac{(x-1)^2}{18} \ if \ 1\le x<4,\\ \dfrac{-(7-x)^2}{18} \ if \ 4\le x<7,\\ 1 \quad if \quad 7\le x.\end{cases}$$

○ $$F(x)=\begin{cases}0 & if \quad x<1 \ \text{ or } \ 7\le x,\\ \dfrac{(x-1)^2}{18} & if \ \ 1\le x<4,\\ \dfrac{-(7-x)^2}{18} & if \ \ 4\le x<7.\end{cases}$$

○ $$F(x)=\begin{cases}0 & if \quad x<1,\\ \dfrac{(x-1)^2}{9} & if \ \ 1\le x<4,\\ \dfrac{(7-x)^2}{18} & if \ \ 4\le x<7,\\ 1 & if \quad 7\le x.\end{cases}$$

○ $$F(x)=\begin{cases}0 & if \quad x<1,\\ \dfrac{(x-1)^2-2}{18} & if \ \ 1\le x<4,\\ \dfrac{(x-7)^2}{9} & if \ \ 4\le x<7,\\ 1 & if \quad 7\le x.\end{cases}$$

1071. **A random variable *X* is given by the density function of distribution:**

$$f(x)=\begin{cases}-x^2+8x-\dfrac{173}{12} & if \ \ 2\le x<6,\\ 0 & otherwise.\end{cases}$$

Find the integral function of distribution of the random variable X?

- $$F(x)=\begin{cases}0 & if \quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}+\dfrac{31}{2} & if \;\; 2\le x<6,\\ 1 & if \quad 6\le x.\end{cases}$$
- $$F(x)=\begin{cases}0 & if \quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12} & if \;\; 2\le x<6,\\ 1 & if \quad 6\le x.\end{cases}$$
- $$F(x)=\begin{cases}0 & if \quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}+\dfrac{173}{12} & if \;\; 2\le x<6,\\ 1 & if \quad 6\le x.\end{cases}$$
- $$F(x)=\begin{cases}0 & if \quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}-\dfrac{31}{2} & if \;\; 2\le x<6,\\ 1 & if \quad 6\le x.\end{cases}$$
- $$F(x)=\begin{cases}0 & if \quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}-\dfrac{31}{2} & if \;\; 2\le x<6,\\ 0 & if \quad 6\le x.\end{cases}$$

1072. **A random variable *X* is given by the density function of distribution:**

$$f(x)=\begin{cases}-x^2+8x-\dfrac{173}{12} & if\ \ 2\le x<6,\\ 0 & otherwise.\end{cases}$$

Find the integral function of distribution of the random variable X?

- $$F(x)=\begin{cases}0 & if\quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}+\dfrac{31}{2} & if\ \ 2\le x<6,\\ 1 & if\quad 6\le x.\end{cases}$$

- $$F(x)=\begin{cases}0 & if\quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12} & if\ \ 2\le x<6,\\ 1 & if\quad 6\le x.\end{cases}$$

- $$F(x)=\begin{cases}0 & if\quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}+\dfrac{173}{12} & if\ \ 2\le x<6,\\ 1 & if\quad 6\le x.\end{cases}$$

- $$F(x)=\begin{cases}0 & if\quad x<2,\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}-\dfrac{31}{2} & if\ \ 2\le x<6,\\ 1 & if\quad 6\le x.\end{cases}$$

○ $$F(x)=\begin{cases}0 & if \quad x<2,\\ -\frac{x^3}{3}+4x^2-\frac{173x}{12}-\frac{31}{2} & if \;\; 2\le x<6,\\ 0 & if \quad 6\le x.\end{cases}$$

1073. A random variable *X* is given by the integral function of distribution:

$$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \frac{Cx^3}{125} & if \;\; 0\le x<5,\\ 1 & if \quad 5\le x.\end{cases}$$

Find the mathematical expectation of the random variable X?

- ● $\frac{15}{4}$
- ○ 5
- ○ $\frac{5}{2}$
- ○ $\frac{3}{4}$
- ○ 1

1074. A random variable *X* is given by the integral function of distribution:

$$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \frac{Cx^3}{125} & if \;\; 0\le x<5,\\ 1 & if \quad 5\le x.\end{cases}$$

Find the mathematical expectation of the random variable X?

- ● $\frac{15}{4}$
- ○ 5
- ○ $\frac{5}{2}$
- ○ $\frac{3}{4}$
- ○ 1

1075. **A random variable X is given by the integral function of distribution:**

$$F(x)=\begin{cases}0 & if \quad x\le -1,\\ \frac{Cx}{4} & if \quad -1\le x<1,\\ 1 & if \quad 1\le x.\end{cases}$$

If $M(X)=0$, then find the dispersion of the random variable X?

- ● $\frac{1}{3}$
- ○ 1
- ○ 0
- ○ $\frac{3}{4}$
- ○ $-\frac{2}{3}$

1076. **A random variable X is given by the integral function of distribution:**

$$F(x)=\begin{cases}0 & if \quad x\le -1,\\ \frac{Cx}{4} & if \quad -1\le x<1,\\ 1 & if \quad 1\le x.\end{cases}$$

If $M(X)=0$, then find the dispersion of the random variable X?

- ● $\frac{1}{3}$
- ○ 1
- ○ 0
- ○ $\frac{3}{4}$
- ○ $-\frac{2}{3}$

1077. **The lifetime in hours of a certain kind of radio tube is a random variable having a probability density function given by:**

$$f(x)=\begin{cases}0 & if \quad x\le 100,\\ \frac{100}{x^2} & if \quad x>100.\end{cases}$$

What is the probability that exactly 1 of 5 such tubes in a radio set will have to be replaced within the first 150 hours of operation?

- $\frac{80}{243}$
- $\frac{40}{243}$
- 0
- $\frac{160}{243}$
- $\frac{1}{3}$

1078. The lifetime in hours of a certain kind of radio tube is a random variable having a probability density function given by:

$$f(x)=\begin{cases}0 & if \quad x\le 100,\\ \dfrac{100}{x^2} & if \quad x>100.\end{cases}$$

What is the probability that exactly 3 of 5 such tubes in a radio set will have to be replaced within the first 150 hours of operation?

- $\frac{80}{243}$
- $\frac{40}{243}$
- 0
- $\frac{160}{243}$
- $\frac{1}{3}$

1079. A random variable *X* is given by the integral function of distribution:

$$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \dfrac{Cx^3}{125} & if \quad 0\le x<5,\\ 1 & if \quad 5\le x.\end{cases}$$

Find the probability that random variable *X* takes the values on $(2,6)$.

- $\frac{117}{125}$
- $\frac{208}{125}$
- $\frac{63}{125}$
- $\frac{113}{125}$
- $\frac{1}{5}$

1080. **A random variable X is given by the density function of distribution:**

$$f(x)=\begin{cases}-x^2+8x-\dfrac{173}{12} & if\ \ C\le x<6\\ 0\ \ , & \text{otherwise.}\end{cases}$$

Find the value of C?

- 2
- -1
- 1
- 3
- -3

1081. **A random variable X is given by the density function of distribution:**

$$f(x)=\begin{cases}-x^2+8x-\dfrac{173}{12} & if\ \ C\le x<6\\ 0\ \ , & \text{otherwise.}\end{cases}$$

Find the value of C?

- 2
- -1
- 1
- 3
- -3

ProbabilityTheoryMathematicalStatistics_Maksat/7

1082.A discrete random variable X is given by the following law of distribution:

X	2	3	6	9
P	0,1	0,4	0,3	0,2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 3$.

- 1
- $\frac{2}{3}$
- $\frac{1}{6}$
- $\frac{1}{4}$
- $-\frac{1}{2}$

1083.A discrete random variable *X* is given by the following law of distribution:

X	2	3	6	9
P	0,2	0,3	0,3	0,2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 3$.

○ 1

● $\frac{2}{3}$

○ $\frac{1}{6}$

○ $\frac{1}{4}$

○ $-\frac{1}{2}$

1084.A discrete random variable *X* is given by the following law of distribution:

X	2	3	6	9
P	0.1	0.4	0.4	0.1

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 3$.

○ 1

● $\frac{2}{3}$

○ $\frac{1}{6}$

○ $\frac{1}{4}$

○ $-\frac{1}{2}$

1085.A discrete random variable *X* is given by the following law of distribution:

X	1	2	3	4
P	0.1	0.4	0.4	0.1

By using the Chebyshev inequality estimate the probability that $|X - M(X)| < 1$.

○ 1

● $\frac{2}{3}$

○ $\frac{1}{6}$

○ $\frac{1}{4}$

○ $-\frac{1}{2}$

1086.A discrete random variable X is given by the following law of distribution:

X	0	1	2	4
P	0.1	0.4	0.4	0.1

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 1$.

○ 1

● $\frac{2}{3}$

○ $\frac{1}{6}$

○ $\frac{1}{4}$

○ $-\frac{1}{2}$

1087.A discrete random variable X is given by the following law of distribution:

X	0	1	2	4
P	0.25	0.25	0.3	0.2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 2$.

○ 1

● $\frac{2}{3}$

○ $\frac{1}{6}$

○ $\frac{1}{4}$

○ $-\frac{1}{2}$

1088.A discrete random variable X is given by the following law of distribution:

X	0	1	2	4
P	0.25	0.25	0.25	0.25

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 3$.

○ 1

● $\frac{2}{3}$

○ $\frac{1}{6}$

○ $\frac{1}{4}$

○ $-\frac{1}{2}$

1089.A discrete random variable *X* is given by the following law of distribution:

X	1	3	6	9
P	0.25	0.25	0.3	0.2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 5$**.**

○ 1

● $\frac{2}{3}$

○ $\frac{1}{6}$

○ $\frac{1}{4}$

○ $-\frac{1}{2}$

1090.A discrete random variable *X* is given by the following law of distribution:

X	1	3	4	6
P	0.25	0.25	0.3	0.2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 4$**.**

○ 1

● $\frac{2}{3}$

○ $\frac{1}{6}$

○ $\frac{1}{4}$

○ $-\frac{1}{2}$

1091.A discrete random variable *X* is given by the following law of distribution:

X	-2	0	2	4
P	0.25	0.25	0.3	0.2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| <4$**.**

○ 1

● $\frac{2}{3}$

○ $\frac{1}{6}$

○ $\frac{1}{4}$

○ $-\frac{1}{2}$

1092.The probability that a shooter will beat out 10 aces at one shot is equal to 0.1 and the probability to beat out 9 aces is equal to 0.3. Choose the correctly calculated probabilities of the events.

- ○ P(beat out more than 8 aces)= 0.5
- ○ P(beat out more than 10 aces)= 0.2
- ● P(beat out 9 or less aces)= 0.9
- ○ P(beat out more than 9 aces)= 0.3
- ○ P(beat out 9 or more aces)= 0.3

1093.The probability that a shooter will beat out 10 aces at one shot is equal to 0.1 and the probability to beat out 9 aces is equal to 0.3. Choose the correctly calculated probabilities of the events.

- ○ P(beat out more than 8 aces)= 0.5
- ○ P(beat out more than 10 aces)= 0.2
- ● P(beat out 9 or less aces)= 0.9
- ○ P(beat out more than 9 aces)= 0.3
- ○ P(beat out 9 or more aces)= 0.3

1094.The probability that a shooter will beat out 10 aces at one shot is equal to 0.1 and the probability to beat out 9 aces is equal to 0.3. Choose the correctly calculated probabilities of the events.

- ○ P(beat out more than 8 aces)= 0.5
- ○ P(beat out more than 10 aces)= 0.2
- ● P(beat out 9 or less aces)= 0.9
- ○ P(beat out more than 9 aces)= 0.3
- ○ P(beat out 9 or more aces)= 0.3

1095.Three students pass an exam. Let A_i be the event «the exam will be passed on “excellent” by the i-th student» (i = 1, 2, 3). Which of the following events correctly expressed by A_1, A_2, A_3 and their negations?

- ● D={exam will not be passed on "excellent" by three students}, $D = \overline{A_1A_2A_3}$.
- ○ A={exam will not be passed on "excellent" by only one student}, $A = A_1A_2\overline{A_3} + A_1\overline{A_2A_3}$.
- ○ B={exam will not be passed on "excellent" by only two students}, $B = \overline{A_1A_2} + \overline{A_1A_3} + \overline{A_2A_3}$.
- ○ C={exam will not be passed on "excellent" by at least two students}, $C = A_1A_2\overline{A_3} + A_1\overline{A_2}A_3 + \overline{A_1}A_2A_3 + A_1A_2A_3$.
- ○ E={exam will not be passed on "excellent" by three students}, $D = A_1 + A_2 + A_3 + A_2A_3A_1$.

1096.Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Which of the following events correctly expressed by A_1, A_2, A_3 and their negations?

- E={exam will not be passed on "excellent" by three students}, $D = \overline{A_1 A_2 A_3}$.
- A={exam will not be passed on "excellent" by only one student}, $A = A_1 A_2 \overline{A_3} + A_1 \overline{A_2 A_3}$.
- B={exam will not be passed on "excellent" by only two students}, $B = \overline{A_1 A_2} + \overline{A_1 A_3} + \overline{A_2 A_3}$.
- C={exam will not be passed on "excellent" by at least two students}, $C = A_1 A_2 \overline{A_3} + A_1 \overline{A_2} A_3 + \overline{A_1} A_2 A_3 + A_1 A_2 A_3$.
- D={exam will not be passed on "excellent" by three students}, $D = A_1 + A_2 + A_3 + A_2 A_3 A_1$.

ProbabilityTheoryMathematicalStatistics_Maksat/10

1097. A random variable *X* is given by the integral function of distribution:

$$F(x) = \begin{cases} 0 \quad if \quad x < 10, \\ \dfrac{x-10}{10} \quad if \;\; 10 \le x < 20, \\ 1 \quad if \quad 20 \le x. \end{cases}$$

What does this tell us about the random variable X? More than one option may be correct.

- $M(X) = 10$
- $D(X) = \frac{1}{2}$
- $P(10 < X < 15) = \frac{1}{2}$
- $P(X < 0) = 0$
- $M(X) = \frac{3}{10}$

1098. A random variable *X* is given by the integral function of distribution:

$$F(x) = \begin{cases} 0 \quad if \quad x < 10, \\ \dfrac{x-10}{10} \quad if \;\; 10 \le x < 20, \\ 1 \quad if \quad 20 \le x. \end{cases}$$

What does this tell us about the random variable X? More than one option may be correct.

- $M(X) = 10$
- $D(X) = \frac{1}{2}$

- ● $P(10 < X < 15) = \frac{1}{2}$
- ○ $P(X < 0) = 0$
- ○ $M(X) = \frac{3}{10}$

1099. A random variable *X* is given by the integral function of distribution:

$$F(x) = \begin{cases} 0 \quad if \quad x < 10, \\ \dfrac{x-10}{10} \quad if \;\; 10 \le x < 20, \\ 1 \quad if \quad 20 \le x. \end{cases}$$

What does this tell us about the random variable X? More than one option may be correct.

- ○ $M(X) = 10$
- ○ $D(X) = \frac{1}{2}$
- ● $P(10 < X < 15) = \frac{1}{2}$
- ○ $P(X < 0) = 0$
- ○ $M(X) = \frac{3}{10}$

ProbabilityTheoryMathematicalStatistics_Maksat/11

1100.The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Choose the correctly calculated probabilities of the events.

- ○ P(at least 1 of 3 shots will strike the target)=0.384
- ● P(at least 1 of 3 shots will strike the target)=0.992
- ○ P(at least 2 of 3 shots will not strike the target)=0.189
- ○ P(at least 2 of 3 shots will strike the target)=0.845
- ○ P(neither of 3 shots will strike the target)=0.8

1101.The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Choose the correctly calculated probabilities of the events.

- ○ P(at least 1 of 3 shots will strike the target)=0.384
- ● P(at least 1 of 3 shots will strike the target)=0.992
- ○ P(at least 2 of 3 shots will not strike the target)=0.189
- ○ P(at least 2 of 3 shots will strike the target)=0.845
- ○ P(neither of 3 shots will strike the target)=0.8

1102.The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Choose the correctly calculated probabilities of the events.

- ○ P(at least 1 of 3 shots will strike the target)=0.384

- P(at least 1 of 3 shots will strike the target)=0.992
- P(at least 2 of 3 shots will not strike the target)=0.189
- P(at least 2 of 3 shots will strike the target)=0.845
- P(neither of 3 shots will strike the target)=0.8

1103.The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Choose the correctly calculated probabilities of the events.

- P(at least 1 of 3 shots will strike the target)=0.384
- P(at least 1 of 3 shots will strike the target)=0.992
- P(at least 2 of 3 shots will not strike the target)=0.189
- P(at least 2 of 3 shots will strike the target)=0.845
- P(neither of 3 shots will strike the target)=0.8

ProbabilityTheoryMathematicalStatistics_Maksat/12

1104.The probability to receive high dividends under shares at the first enterprise – 0.2, on the second – 0.35, on the third – 0.15. Choose the correctly calculated probabilities that a shareholder having shares of all the enterprises will receive high dividends.

- P(at least on two enterprises)= 0.1315
- P(exactly on two enterprises)= 0.4214
- P(only at one enterprise)= 0.7
- P(at least on one enterprise)= 0.4265
- P(exactly on three enterprises)= 0.105

1105.The probability to receive high dividends under shares at the first enterprise – 0.2, on the second – 0.2, on the third – 0.3. Choose the correctly calculated probabilities that a shareholder having shares of all the enterprises will receive high dividends.

- P(only at one enterprise)=0.416
- P(only at one enterprise)=0.7
- P(at least on one enterprise)=0.426
- P(at least on two enterprises)=0.354
- P(exactly on three enterprises)= 0.105

1106.The first brigade has 6 tractors, and the second – 9. One tractor demands repair in each brigade. A tractor is chosen at random from each brigade. Choose the correctly calculated probabilities of events.

- P(both chosen tractors demands repair)=1/54
- P(one of the chosen tractors demands repair)=0.5
- P(both chosen tractors demands repair)=0
- P(both chosen tractors demands repair)=1/27
- P(both chosen tractors are serviceable)=13/15

1107.The first brigade has 5 tractors, and the second – 8. One tractor demands repair in each brigade. A tractor is chosen at random from each brigade. Choose the correctly calculated probabilities of events.

- P(one of the chosen tractors demands repair)=11/40
- P(one of the chosen tractors demands repair)=7/40
- P(both chosen tractors demands repair)=1/20
- P(both chosen tractors demands repair)=1/2
- P(both chosen tractors are serviceable)=1/3

1108. All of the letters that spell STUDENT are put into a bag. Choose the correctly calculated probabilities of events.

- P(drawing a S, and then drawing a T)=1/21
- P(drawing a T, and then drawing a D)=1/42
- P(selecting a vowel, and then drawing a U)=1/42
- P(selecting a vowel, and then drawing a K)=1/42
- P(selecting a vowel, and then drawing a T)=3/42

1109.All of the letters that spell MISSISSIPPI are put into a bag. Choose the correctly calculated probabilities of events.

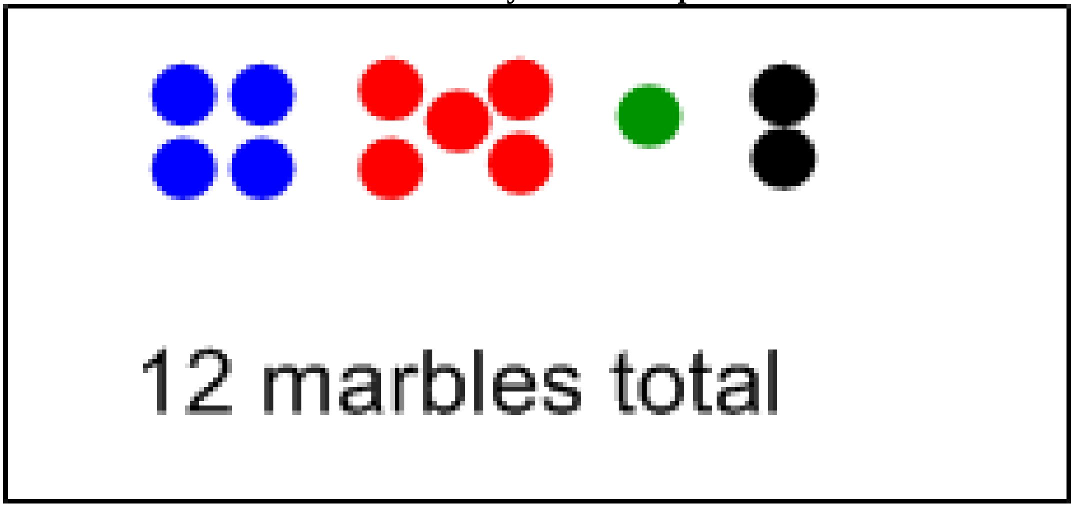
- P(of selecting a vowel, and then after returning the letter also drawing a M)=4/121
- P(of drawing an I, and then after returning the letter also drawing a M)=3/121
- P(of selecting a vowel, and then after returning the letter also drawing an O)=4/121
- P(of selecting a vowel, and then after returning the letter also drawing a P)=6/121
- P(of drawing a M, and then after returning the letter also drawing a S)=1/121

1110.The first brigade has n tractors, and the second – m. One tractor demands repair in each brigade. A tractor is chosen at random from each brigade. Choose the correctly calculated probabilities of events.

- n=3, m=5, P(both chosen tractors demands repair)=1/15
- n=3, m=6, P(one of the chosen tractors demands repair)=7/12
- n=2, m=5, P(both chosen tractors demands repair)=0.3
- n=2, m=3, P(both chosen tractors demands repair)=1/3
- n=5, m=2, P(both chosen tractors are serviceable)=0.2

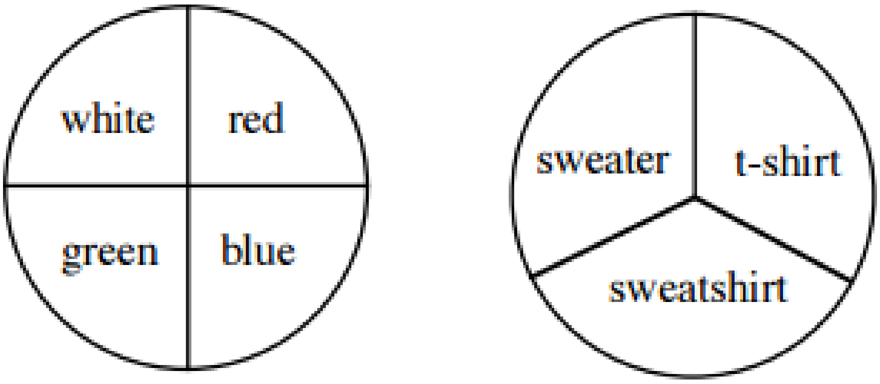
1111.A jar of marbles contains 4 blue marbles, 5 red marbles, 1 green marble, and 2 black marbles. A marble is chosen at random from the jar. After returning it again, a second

marble is chosen. Choose the correctly calculated probabilities of events.



- P(green, and then red)=5/144
- P(black, and then black)=1/12
- P(red, and then black)=7/72
- P(green, and then blue)=1/72
- P(blue, and then blue)=1/6

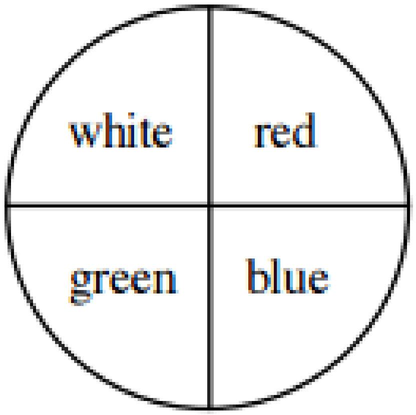
1112.If each of the regions in each spinner is the same size.

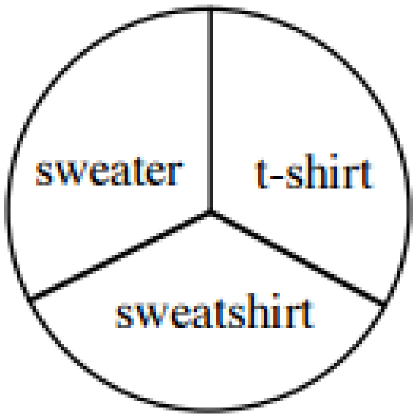


Choose the correctly calculated probabilities of spinning each spinner.

- P(getting a red sweater)=1/12
- P(getting a white sweatshirt)=1/6
- P(getting a white sweater)=5/12
- P(getting a blue sweatshirt)=7/12
- P(getting a blue t-shirt)=1/6

1113 If each of the regions in each spinner is the same size

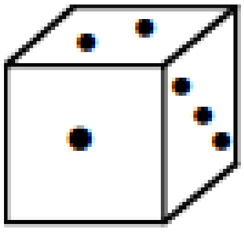


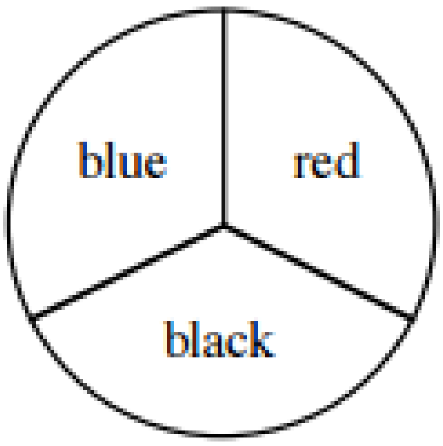


Choose the correctly calculated probabilities of spinning each spinner.

- ● P(getting a red sweater)=1/12
- ○ P(getting a white sweatshirt)=1/6
- ○ P(getting a white sweater)=5/12
- ○ P(getting a blue sweatshirt)=7/12
- ○ P(getting a blue t-shirt)=1/6

1114. Mary is playing a game in which she rolls one die and spins a spinner.

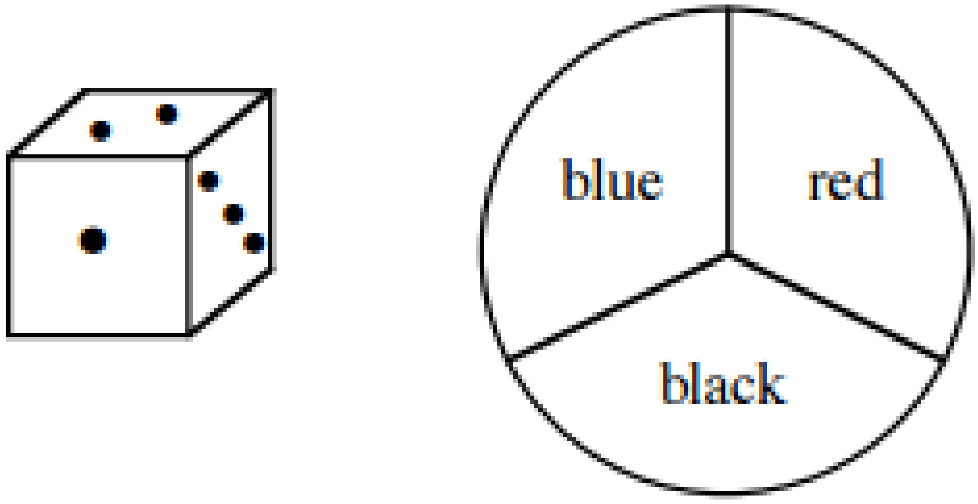




Choose the correctly calculated probabilities of spinning each spinner.

- ● P(get the 1 and green)=0
- ○ P(get the 7 and red)=1/18
- ○ P(get the 3 and green)=1/18
- ○ P(get the 2 and black)=1/4
- ○ P(get the 1 and white)=1

1115 Mary is playing a game in which she rolls one die and spins a spinner.



Choose the correctly calculated probabilities of spinning each spinner.

- ● P(get the 1 and green)=0
- ○ P(get the 7 and red)=1/18
- ○ P(get the 3 and green)=1/18
- ○ P(get the 2 and black)=1/4
- ○ P(get the 1 and white)=1

ProbabilityTheoryMathematicalStatistics_Maksat/13

1116.Find the Bernoulli formula.

- ● $P_n(k) = \frac{n!}{k!(n-k)!} \cdot p^k \cdot (1-p)^{n-k}$
- ○ $P(B|A) = \frac{P(B) \cdot P(A|B)}{P(A)}$
- ○ $P(B|A) = \frac{P(AB)}{P(A)}$
- ○ $P_n(k) = \frac{1}{\sqrt{npq}} \cdot e^{-2pq}$

○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot\Phi\left(\frac{k-np}{\sqrt{npq}}\right)$$

1117.Find the Bernoulli formula.

○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot\varphi\left(\frac{k-np}{\sqrt{npq}}\right)$$

● $$P_n(k)=C_n^k\cdot p^k\cdot q^{n-k}$$

○ $$P(B|A)=\frac{P(AB)}{P(A)}$$

○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot e^{-2pq}$$

○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot\Phi\left(\frac{k-np}{\sqrt{npq}}\right)$$

ProbabilityTheoryMathematicalStatistics_Maksat/14

1118.A coming up a grain stored in a warehouse is equal to 50%. What is the probability that the number of came up grains among 100 ones will make from *a* up to *b* pieces (a grain – зерно)?

● $a=5, b=10, P=\Phi\left(\frac{10-100*0,5}{\sqrt{100*0,5*0,5}}\right)-\Phi\left(\frac{5-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

○ $a=50, b=75, P=\frac{1}{75-50}\varphi\left(\frac{25-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

○ $a=10, b=40, P=\Phi\left(\frac{10-100*0,5}{\sqrt{100*0,5*0,5}}\right)-\Phi\left(\frac{40-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

○ $a=10, b=20, P=\Phi\left(\frac{55-50}{\sqrt{100*0,5*0,5}}\right)$

○ $a=55, b=75, P=2\Phi\left(\frac{75-55}{\sqrt{100*0,5*0,5}}\right)$

1119.The probability of striking a target by a shooter at one shot is equal to $\frac{3}{4}$. Find the probability P that at 100 shots the target will be struck no less than *a* and no more *b* times.

- $a = 70, b = 80, P = \Phi\left(\frac{80-100*0,75}{\sqrt{100*0,75*0,25}}\right) - \Phi\left(\frac{70-100*0,75}{\sqrt{100*0,75*0,25}}\right)$
- $a = 5, b = 75, P = \frac{1}{75-5}\varphi\left(\frac{5-100*0,75}{\sqrt{100*0,75*0,25}}\right)$
- $a = 50, b = 75, P = \Phi\left(\frac{50-100*0,75}{\sqrt{100*0,75*0,25}}\right)$
- $a = 10, b = 20, P = \Phi\left(\frac{20-10}{\sqrt{100*0,75*0,25}}\right)$
- $a = 50, b = 75, P = 2\Phi\left(\frac{75-50}{\sqrt{0.75*0.25}}\right)$

1120.The probability of striking a target by a shooter at one shot is equal to $\frac{1}{4}$. Find the probability P that at 100 shots the target will be struck no less than a and no more b times.

- $a = 50, b = 75, P = -\Phi\left(\frac{50-100*0,25}{\sqrt{100*0,75*0,25}}\right)$
- $a = 50, b = 75, P = \frac{1}{75-50}\varphi\left(\frac{75-100*0,25}{\sqrt{100*0,75*0,25}}\right)$
- $a = 70, b = 80, P = \Phi\left(\frac{80-100*0,25}{\sqrt{100*0,75*0,25}}\right) - \Phi\left(\frac{70-100*0,75}{\sqrt{100*0,75*0,25}}\right)$
- $a = 10, b = 20, P = \Phi\left(\frac{20-10}{\sqrt{100*0,75*0,25}}\right)$
- $a = 50, b = 75, P = \Phi\left(\frac{75-50}{\sqrt{100*0.75*0.25}}\right)$

1121.Find approximately the probability that an event will happen exactly from a to b times at 400 trials if in each trial the probability of its occurrence is equal to 0.2.

- $a = 140, b = 170, P = \Phi\left(\frac{170-400*0,2}{\sqrt{400*0,8*0,2}}\right) - \Phi\left(\frac{140-400*0,2}{\sqrt{400*0,8*0,2}}\right)$
- $a = 80, b = 170, P = \frac{1}{170-80}\varphi\left(\frac{170-400*0,2}{\sqrt{400*0,8*0,2}}\right)$
- $a = 70, b = 80, P = \Phi\left(\frac{80-400*0,2}{\sqrt{400*0,8*0,2}}\right) + \Phi\left(\frac{70-400*0,2}{\sqrt{400*0,8*0,2}}\right)$
- $a = 110, b = 120, P = \Phi\left(\frac{120-110}{\sqrt{400*0,8*0,2}}\right)$
- $a = 50, b = 75, P = \Phi\left(\frac{75-50}{\sqrt{400*0,8*0,2}}\right)$

1122.Find approximately the probability that an event will happen exactly from a to b times at 484 trials if in each trial the probability of its occurrence is equal to 0.5.

- $a = 180, b = 300, P = \Phi\left(\frac{300-242}{11}\right) - \Phi\left(\frac{180-242}{11}\right)$
- $a = 80, b = 240, P = 2\varphi\left(\frac{160}{11}\right)$
- $a = 70, b = 242, P = \Phi\left(\frac{70-484*0,5}{\sqrt{484*0.5*0.5}}\right)$
- $a = 110, b = 120, P = \Phi\left(\frac{10-484*0,5}{\sqrt{484*0.5*0.5}}\right)$
- $a = 50, b = 75, P = 2\Phi\left(\frac{75-484*0,5}{\sqrt{484*0.5*0.5}}\right)$

1123.A factory has sent 2500 good-quality products. The probability that one product has been damaged at a transportation is $\frac{1}{5}$. Find the probability P that at the transportation it will be damaged from a to b products.

- ● $a = 510, b = 525, P = \Phi\left(\frac{25}{20}\right) - \Phi\left(\frac{1}{2}\right)$
- ○ $a = 14, b = 170, P = \frac{1}{170-14}\varphi\left(\frac{156-2500*0.002}{\sqrt{2500*0.2*0.8}}\right)$
- ○ $a = 100, b = 500, P = \Phi\left(\frac{100-2500*0.002}{\sqrt{2500*0.2*0.8}}\right)$
- ○ $a = 110, b = 1000, P = \Phi\left(\frac{1000-2500*0.2}{\sqrt{2500*0.2*0.8}}\right) + \Phi\left(\frac{110-2500*0.2}{\sqrt{2500*0.2*0.8}}\right)$
- ○ $a = 50, b = 75, P = 2\Phi\left(\frac{60-2500*0.2}{\sqrt{2500*0.2*0.8}}\right)$

1124.Find the right inequation.

- ○ $P(|X - M(X)| < \varepsilon) < \frac{D(X)}{\varepsilon^2}$
- ● $P(|X - M(X)| \le \varepsilon) \ge 1 - \frac{D(X)}{\varepsilon^2}$
- ○ $P(|X - M(X)| \le \varepsilon) > \frac{D(X)}{\varepsilon^2}$
- ○ $P(X > A) > \frac{M(X)}{A}$
- ○ $\left|\frac{X_1+X_2+\cdots+X_n}{n} - \frac{M(X_1)+M(X_2)+\cdots+M(X_n)}{n}\right| \ge \varepsilon$

1125.Let $X \sim Binomial(n, p)$. Find the right inequation.

- ○ $p = \frac{1}{3}, P\left(\left|X - \frac{n}{3}\right| < 1\right) \ge \frac{n}{3}$
- ● $p = \frac{1}{3}, P\left(\left|X - \frac{n}{3}\right| > 1\right) \le \frac{2n}{9}$
- ○ $p = \frac{1}{3}, P\left(\left|X - \frac{n}{3}\right| < 2\right) \ge \frac{1}{4}$
- ○ $p = \frac{1}{3}, P\left(\left|X - \frac{n}{3}\right| > 1\right) > \frac{2n}{9}$
- ○ $p = 0.8, P(X < 2n) < 0.3$

1126.From past experience a professor knows that the test score of a student taking her final examination is a random variable with mean 75. Suppose, in addition, the professor knows that a variance of a student's test score is equal to 25. Find the right inequation.

- ○ $P(|X - 75| < 30) > \frac{1}{36}$
- ● $P(65 \le X \le 85) \ge \frac{3}{4}$
- ○ $P(60 \le X \le 90) \ge \frac{1}{9}$
- ○ $P(X > 80) > \frac{75}{80}$

- ○ $P(|X-75| \leq 45) < \frac{80}{81}$

1127.Find the right statements.

- ○ $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx$
- ● $M(X) = \int_{-\infty}^{+\infty} xf(x)dx$
- ○ $F(x) = f'(x)$
- ○ $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx - M(X)$
- ○ $P(X > A) > \frac{M(X)}{A}$

1128.Find the <u>false</u> statements.

- ○ $0 \leq F(x) \leq 1$
- ○ $F(-\infty) = 0$
- ● $F(+\infty) = 0$
- ○ $F(x) = P(X < x)$
- ○ $\int_{-\infty}^{+\infty} f(x)dx = 1$

1129.Find the <u>false</u> statements.

- ○ $\int_{-\infty}^{+\infty} f(x)dx = 1$
- ○ $P(x_1 \leq X \leq x_2) = \int_{x_1}^{x_2} f(x)dx$
- ○ $F(x) = \int_{-\infty}^{x} f(t)dt$
- ○ $P(x_1 \leq X) = \int_{x_1}^{+\infty} f(t)dt$
- ● $P(x_1 \leq X < x_2) = F(x_1) - F(x_2)$

1130.Find the <u>false</u> inequations.

- ○ $P(|X - M(X)| > \varepsilon) \leq \frac{D(X)}{\varepsilon^2}$
- ○ $P(|X - M(X)| > \varepsilon) < \frac{D(X)}{\varepsilon^2}$
- ● $P(|X - M(X)| > \varepsilon) \geq \frac{D(X)}{\varepsilon^2}$
- ○ $P(X > A) \leq \frac{M(X)}{A}$
- ○ $P(X \leq A) > 1 - \frac{M(X)}{A}$

1131.Find the right property of distribution function.

- ● $F(-\infty) = 0$
- ○ $f(-\infty) = \frac{1}{2}$
- ○ $P(x_1 \leq X) = \int_{x_1}^{1} f(x)dx$

- $\int_{-\infty}^{+\infty} f(x)dx = 1$
- $F(+\infty) = +\infty$

1132.Find the right property of probability density.

- $\int_{-\infty}^{+\infty} f(x)dx = 1$
- $f(-\infty) = \frac{1}{2}$
- $P(x_1 \le X) = \int_{x_1}^{1} f(x)dx$
- $F(-\infty) = 1$
- $P(x_1 \le X < x_2) = F(x_1) - F(x_2)$

ProbabilityTheoryMathematicalStatistics_Maksat/16

1133. Let a series of distribution of a random variable be given: $X = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}$. **What does this tell us about the random variable X?**

- $$F(x) = \begin{cases} 0 & if \quad x \le 1, \\ 0.1 & if \quad 1 < x \le 2, \\ 0.3 & if \quad 2 < x \le 3, \\ 0.6 & if \quad 3 < x \le 4, \\ 1 & if \quad 4 < x. \end{cases}$$
- $$F(x) = \begin{cases} 0 & if \quad x \le 1, \\ 0.1 & if \quad 1 < x \le 2, \\ 0.2 & if \quad 2 < x \le 3, \\ 0.3 & if \quad 3 < x \le 4, \\ 0.4 & if \quad 4 < x. \end{cases}$$
- $M(X) = 1$
- $M(X^2) = 9$

- $D(X) = 10$

1134. **Let a series of distribution of a random variable be given:**

$$X = \begin{pmatrix} 0 & 2 & 4 & 8 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}$$. **What does this tell us about the random variable X?**

- $$F(x) = \begin{cases} 0 \quad if \quad x \le 0, \\ 0.1 \; if \;\; 0 < x \le 2, \\ 0.3 \; if \;\; 2 < x \le 4, \\ 0.6 \; if \;\; 4 < x \le 8, \\ 1 \quad if \quad 8 < x. \end{cases}$$
- $$F(x) = \begin{cases} 0 \quad if \quad x \le 0, \\ 0.1 \; if \;\; 0 < x \le 2, \\ 0.2 \; if \;\; 2 < x \le 4, \\ 0.3 \; if \;\; 4 < x \le 8, \\ 0.4 \quad if \quad 8 < x. \end{cases}$$
- $M(X) = 4$
- $D(X) = 22.2$
- $M(X) = 9$

1135. **Let a series of distribution of a random variable be given:**

$$X = \begin{pmatrix} -2 & -1 & 0 & 1 \\ 0.1 & 0.2 & 0.2 & 0.5 \end{pmatrix}$$. **What does this tell us about the random variable X?**

○ $$F(x)=\begin{cases}0 & if \quad x\le -2,\\ 0.1 & if \quad -2<x\le -1,\\ 0.3 & if \quad -1<x\le 1,\\ 1 & if \quad 1<x.\end{cases}$$

● $D(X) = 1.09$

○ $D(X) = 1$

○ $M(X) = 2$

1136. Let a series of distribution of a random variable be given: $X=\begin{pmatrix}-2 & -1 & 0 & 1\\ 0.1 & 0.2 & 0.2 & 0.5\end{pmatrix}$. **What does this tell us about the random variable X?**

○ $$F(x)=\begin{cases}0 & if \quad x\le -2,\\ 0.1 & if \quad -2<x\le -1,\\ 0.2 & if \quad -1<x\le 0,\\ 0.2 & if \quad 0<x\le 1,\\ 0.5 & if \quad 1<x.\end{cases}$$

○ $$F(x)=\begin{cases}0 & if \quad x\le -2,\\ 0.1 & if \quad -2<x\le -1,\\ 0.3 & if \quad -1<x\le 1,\\ 1 & if \quad 1<x.\end{cases}$$

○ $M(X^2) = 1$

○ $D(X) = 1$

● $M(X) = 0.1$

1137. **Let a series of distribution of a random variable be given:**

$$X = \begin{pmatrix} -4 & -2 & 0 & 2 \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{8} & \frac{1}{8} \end{pmatrix}$$

. What does this tell us about the random variable X?

- ○ $$F(x) = \begin{cases} 0 \quad if \quad x \le -4, \\ 0.25 \ if \ -4 < x \le -2, \\ 0.5 \ if \ -2 < x \le 0, \\ 0.125 \ if \ 0 < x \le 2, \\ 0.125 \quad if \quad 2 < x. \end{cases}$$
- ● $M(X) = -\frac{7}{4}$
- ○ $M(X^2) = 4$
- ○ $D(X) = 8$
- ○ $D(X) = 55$

ProbabilityTheoryMathematicalStatistics_Maksat/17

1138. **The probability of working each of four combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What does this tell us about the random variable X?**

- ● $P(X = 0) = 0.1^4$
- ○ $P(X = 3) = 0.0009$
- ○ $P(X = 1) = 0.0729$
- ○ $P(X = 2) = 0.0081$
- ○ $P(X = 0) = 0.001$

1139. **A die is tossed before the first landing “six” aces. Find the probability that the first appearance of “six” will take place at the n-th tossing the die?**

- ● $P(n = 2) = \frac{5}{36}$
- ○ $P(n = 5) = \frac{1}{6} * \left(\frac{5}{6}\right)^3$
- ○ $P(n = 3) = \frac{1}{6} * \left(\frac{5}{6}\right)^3$
- ○ $P(n = 2) = \frac{1}{6} * \left(\frac{5}{6}\right)^2$

- $P(n = 7) = \left(\frac{1}{6}\right)^4 * \left(\frac{5}{6}\right)^3$

ProbabilityTheoryMathematicalStatistics_Maksat/18

1140.A random variable X is distributed under an exponential law with parameter λ. Find the probability of hit of the random variable X into the interval $(a; b)$.

- ○ $\lambda = 2, a = 1, b = 3, P = \Phi\left(\frac{3-2}{1}\right) - \Phi\left(\frac{1-2}{1}\right)$
- ● $\lambda = 2, a = 1, b = 3,\ P = \int_1^3 2e^{-2x}dx$
- ○ $\lambda = 2, a = 1, b = 3,\ P = \frac{\int_{-\infty}^3 2e^{-2x}dx}{\int_{-\infty}^1 2e^{-2x}dx}$
- ○ $\lambda = 3, a = 1, b = 3,\ \ P = \frac{1}{\sqrt{3 \cdot 0.5 \cdot 0.5}}\varphi\left(\frac{3-3\cdot 1}{\sqrt{3\cdot 0.5\cdot 0.5}}\right)$
- ○ $\lambda = 2, a = 1, b = 4, P = \Phi\left(\frac{4-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

1141.The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter λ. Find the correctly calculated probabilities of the events.

- ○ $\lambda = 2, P(2 < X < 3) = \Phi\left(\frac{3-2}{1}\right) - \Phi\left(\frac{1-2}{1}\right)$
- ● $\lambda = 2, P(1 < X < 3) = \int_1^3 2e^{-2x}dx$
- ○ $\lambda = 2, P(1 < X < 3) = \frac{\int_{-\infty}^3 2e^{-2x}dx}{\int_{-\infty}^1 2e^{-2x}dx}$
- ○ $\lambda = 3, P(1 < X < 3) = \frac{1}{\sqrt{3\cdot 0.5\cdot 0.5}}\varphi\left(\frac{3-3\cdot 1}{\sqrt{3\cdot 0.5\cdot 0.5}}\right)$
- ○ $\lambda = 2, P(1 < X < 4) = \Phi\left(\frac{4-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

1142.A random variable X is distributed under a normal law with mathematical expectation $a = 20$. The probability of hit of the random variable X into the interval $(10; 30)$ is 0.6826. Find the correctly calculated probabilities of the events.

- ○ $P(10; 25) = \Phi\left(\frac{25-20}{10}\right) - \Phi(1)$
- ● $D(X) = 100$
- ○ $P(20; 30) = \frac{\int_{-\infty}^{30}\frac{1}{20}dx}{\int_{-\infty}^{20}\frac{1}{20}dx}$
- ○ $P(-1; 3) = \int_{-1}^{3}\frac{1}{20}dx$
- ○ $P(10; 50) = \Phi\left(\frac{5-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

1143.A normally distributed random variable X is given by the differential function: $f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$. Find the probability of hit of the random variable X into the interval $(a; b)$.

- ○ $a = 2$
- ● $\sigma = 1$
- ○ $D(X) = 2$
- ○ $P(-1; 3) = \int_{-1}^{3} e^{-\frac{x^2}{2}} dx$
- ○ $P(1; 5) = \Phi\left(\frac{5}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

1144.Suppose that X is a normal law with mathematical expectation $a = 5$. The probability of hit of the random variable X into the interval $(9; +\infty)$ is 0.1587. Find the correctly calculated probabilities of the events.

- ○ $P(10; 25) = \Phi\left(\frac{25-5}{4}\right) - \Phi(1)$
- ● $D(X) = 16$
- ○ $P(20; 30) = \frac{10}{30}$
- ○ $P(-1; 3) = \int_{-1}^{3} \frac{1}{20} dx$
- ○ $P(10; 50) = \Phi\left(\frac{5-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

1145.Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $a = 173$, $\sigma^2 = 36$. Find the correctly calculated probabilities of the events.

- ○ $P(176; 182) = 0.1348$
- ● $\sigma = 6$
- ○ $P(20; 30) = \frac{10}{30}$
- ○ $P(-1; 3) = \int_{-1}^{3} \frac{1}{20} dx$
- ○ $P(10; 50) = 0.2417$

1146.Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $a = 173$, $\sigma^2 = 36$. Find the correctly calculated probabilities of the events.

- ○ $P(176; 182) = 0.1348$
- ○ $P(20; 30) = \frac{10}{30}$
- ○ $P(-1; 3) = \int_{-1}^{3} \frac{1}{20} dx$
- ● $P(|X - 173| \leq 3) = 2\Phi\left(\frac{1}{2}\right)$
- ○ $P(10; 50) = 0.2417$

1147.Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(\mathbf{0}; \mathbf{10})$. Find the correctly calculated probabilities of the events.

- ○ $P(3 < X < 8) = 0.18$
- ● $P(X < 3) = 0.3$
- ○ $P(5 < X < 10) = \frac{1}{3}$
- ○ $P(0; 10) = \frac{1}{4}$
- ○ $P(1; 5) = 0.17$

1148.Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(\mathbf{0}; \mathbf{10})$. Find the correctly calculated probabilities of the events.

- ○ $P(3 < X < 8) = 0.18$
- ○ $P(5 < X < 10) = \frac{1}{3}$
- ○ $P(0; 10) = \frac{1}{4}$
- ● $P(X > 6) = 0.4$
- ○ $P(1; 5) = 0.17$

1149.A normally distributed random variable X is given by the differential function: $\boldsymbol{f(x)} = \frac{\mathbf{1}}{\mathbf{4}\sqrt{\mathbf{2}\boldsymbol{\pi}}}\boldsymbol{e}^{-\frac{(x+1)^2}{32}}$. Find the probability of hit of the random variable X into the interval $(\boldsymbol{a}; \boldsymbol{b})$.

- ○ $a = 1$
- ○ $D(X) = 4$
- ○ $P(-1; 3) = 0.32$
- ● $a = -1$
- ○ $P(1; 5) = \Phi\left(\frac{5}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

1150.The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter $\boldsymbol{\lambda}$. Find the correctly calculated probabilities of the events.

- ○ $\lambda = 2, P(2 < X < 3) = \Phi\left(\frac{3-2}{1}\right) - \Phi\left(\frac{1-2}{1}\right)$
- ● $\lambda = 2, P(1 < X < 3) = \frac{\mathrm{e}^4 - 1}{\mathrm{e}^6}$
- ○ $\lambda = 2, P(1 < X < 3) = \frac{\int_{-\infty}^{3} 2e^{-2x}dx}{\int_{-\infty}^{1} 2e^{-2x}dx}$
- ○ $\lambda = 3, P(-1 < X < 3) = \int_{-1}^{3} 3e^{-3x}dx$
- ○ $\lambda = 2, P(1 < X < 4) = \Phi\left(\frac{4-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

1151.A random variable X is distributed under an exponential law with parameter $\boldsymbol{\lambda}$. Find the probability of hit of the random variable X into the interval $(\boldsymbol{a}; \boldsymbol{b})$.

- ○ $\lambda = 2, a = 1, b = 3, P = \Phi\left(\frac{3-2}{1}\right) - \Phi\left(\frac{1-2}{1}\right)$
- ○ $\lambda = 2, a = 1, b = 3,\ P = \frac{\int_{-\infty}^{3} 2e^{-2x}dx}{\int_{-\infty}^{1} 2e^{-2x}dx}$
- ● $\lambda = 3, a = -1, b = 3,\ P = \int_{0}^{3} 3e^{-3x}dx$
- ○ $\lambda = 3, a = -1, b = 3,\ P = \int_{-1}^{3} 3e^{-3x}dx$
- ○ $\lambda = 2, a = 1, b = 4, P = \Phi\left(\frac{4-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

ProbabilityTheoryMathematicalStatistics_Maksat/19

1152. The number of all possible allocations

- ● $A_n^m = \frac{n!}{(n-m)!}$
- ○ $A_n^m = \frac{n!}{m!(n-m)!}$
- ○ $A_n^m = n - m!$
- ○ $A_n^m = m - n!$
- ○ $A_n^m = 1$

1153. The number of all possible combinations

- ● $C_n^m = \frac{n!}{m!(n-m)!}$
- ○ $C_n^m = \frac{n!}{(n-m)!}$
- ○ $C_n^m = \frac{m!}{n!}$
- ○ $C_n^m = \frac{n!}{m!}$
- ○ $C_n^m = n!$

1154. How many ways are there to choose 2 details from a box containing 9 details?

- ○ 12
- ○ 4
- ○ 22
- ○ 11
- ● 36

1155. The numbers of allocations, permutations and combinations are connected by the equality

- ● $A_n^m = P_m C_n^m$
- ○ $A_n^m = P_n C_n^m$
- ○ $A_n^m = P_m$
- ○ $A_n^m = P_m C_m^n$
- ○ $A_n^m = n!\, C_n^m$

1156. If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by … ways.

● m+n

○ m-n

○ n-m

○ n!

○ C_n^m

1157. Events are *equally possible* if …

○ none of them will necessarily happen as a result of a trial

● there is reason to consider that none of them is more possible (probable) than other

○ there is reason to consider that one of them is more possible (probable) than other

○ at least one of them will necessarily happen as a result of a trial

○ one of them will necessarily happen as a result of a trial

1158. The probability of the event *A* is determined by the formula

○ $P(A) = \frac{|\Omega|}{|A|}$, where Ω is the space of elementary outcomes

○ $P(A|B) = \frac{|A|}{|B|}$, where Ω is the space of elementary outcomes

● $P(A) = \frac{|A|}{|\Omega|}$, where Ω is the space of elementary outcomes

○ $P(A) = \frac{\lambda^m}{m!}e^{-\lambda}$, where λ is the space of elementary outcomes

○ $P(B|A) = \frac{\lambda^m}{m!}$, where Ω is the space of elementary outcomes

ProbabilityTheoryMathematicalStatistics_Maksat/21

1159. The probability of a reliable event is equal to …

● 1

○ 0

○ ½

○ 1/3

○ 1/5

1160. The probability of an impossible event is equal to …

● 0

○ 1

○ ½

○ 1/3

○ 1/5

1161. The probability of a random event is …

- the positive number between 0 and 1
- the positive number between 0 and ½
- the positive number between 0 and 10
- the positive number between 0 and 1/3
- the positive number between 0 and 1/5

1162. The relative frequency of the event *A* is defined by the formula:

- $W(A) = \frac{m}{n}$, where *m* is the number of appearances of the event, *n* is the total number of trials.
- $W(A) = \frac{m}{n}$, where *n* is the number of appearances of the event, m+1 is the total number of trials.
- $W(A) = \frac{m}{n}$, where *m+1* is the number of appearances of the event, *n* is the total number of trials.
- $W(A) = \frac{m+1}{n}$, where *m* is the number of appearances of the event, *n* is the total number of trials.
- $W(A) = \frac{m}{n+1}$, where *m* is the number of appearances of the event, *n* is the total number of trials.

ProbabilityTheoryMathematicalStatistics_Maksat/21

1163. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,4. Find the number of hits if 20 shots were made.

- 8
- 3
- 20
- 1
- 6

1164. Two dice are tossed. Find the probability that different number of aces will appear on dices

- 1/6
- 5/6
- ½
- 1/3
- 1

1165. Two dice are tossed. Find the probability that the sum of aces will exceed 10.

- 1/12
- 5/12
- 5/18
- 1/18

○ 0

ProbabilityTheoryMathematicalStatistics_Maksat/22

1166. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,5; by the second – 0,2; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by only one student?

- ● 0,42
- ○ 0,48
- ○ 0,92
- ○ 0,28
- ○ 0,99

1167. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,5; by the second – 0,3; and by the third – 0,7. What is the probability that the exam will be passed on "excellent" by exactly two students?

- ○ 0,464
- ● 0,395
- ○ 0,12
- ○ 0,192
- ○ 0,48

1168. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by at least one student?

- ● 0,958
- ○ 0,93
- ○ 0,465
- ○ 0,15
- ○ 0,848

1169. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,7; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by neither of the students?

- ● 0,042
- ○ 0,95
- ○ 0,46
- ○ 0,07
- ○ 0,84

1170. A bag contains 4 white, 6 red and 10 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?

○ $1-\left(\frac{1}{4}\right)^4$

● $1-\left(\frac{4}{5}\right)^4$

○ $\left(\frac{1}{5}\right)^4$

○ 0.7182

○ $\left(\frac{1}{4}\right)^4$

1171. How would it change the expected value of a random variable X if we multiply the X by a number k.

● $M[kX]=k\cdot M[X]$

○ $M[kX]=|k|\cdot M[X]$

○ $M[kX]=M[X]$

○ $M[kX]=M[X]+k$

○ $M[kX]=k^2\cdot M[X]$

1172. Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?

○ $A+B+C$

○ $A\cdot B\cdot C$

● $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$

- $(A+B+C)^c$
- $AB+AC+BC$

ProbabilityTheoryMathematicalStatistics_Maksat/24

1173. There are 100 identical details (and 20 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted.

- 1/20
- 1/5
- ½
- 1/10
- 1/9

1174. A die is tossed. Find the probability that an even number of aces will appear.

- ½
- 1
- 0
- 1/5
- 1/9

1175. Participants of a toss-up pull a ticket with numbers from 1 up to 30 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 2.

- 1/30
- 1/3
- ½
- 2/5
- 1/5

1176. In a batch of 8 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to?

- ½
- 1
- 3/11
- 3/8
- 3/5

ProbabilityTheoryMathematicalStatistics_Maksat/25

1177. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

- 0.93
- 0.25
- 0.49
- 0.45
- 0.01

1178. For a continuous random variable X, the probability density function f(x) represents

- the probability at a fixed value of X
- the area under the curve at X
- the area under the curve to the right of X
- the height of the function at X
- the integral of the cumulative distribution function

1179. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is

- 0.49
- 0.51
- 0.3
- 0.6
- none of the given answers

ProbabilityTheoryMathematicalStatistics_Maksat/26

1180. If the probability density function of a continuous random variable X is

$$f(x) = \begin{cases} kx^2 & 0 \le x \le 3 \\ 0 & otherwise \end{cases}$$ **then the value of k is**

- 1/2
- 0,25
- 1/9
- 0,3
- Any positive value greater than 2

1181. A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value of *X* is

- 16
- 18
- 10
- 3
- 6

ProbabilityTheoryMathematicalStatistics_Maksat/27

1182. Four buyers went in a shop. The probability that each buyer makes purchases is equal to 0,5. Find the probability that three of them will make purchases.

- ● 0,25
- ○ 0,096
- ○ 0,95
- ○ 0,125
- ○ 0,712

1183. Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that two of them will make purchases.

- ● 0,384
- ○ 0,7
- ○ 0,189
- ○ 0,96
- ○ 0,904

ProbabilityTheoryMathematicalStatistics_Maksat/28

1184. If D(X)=3, find D(-3X+4).

- ○ 12
- ○ -5
- ○ 19
- ● 27
- ○ -9

1185. If D(X)=3, find D(2X-3).

- ○ 10
- ○ 9
- ○ 3
- ● 12
- ○ -9

1186. The table below shows the distribution of a random variable X. Find M[x] and D(X).

X	-2	0	1
P	0.1	0.5	0.4

- ○ M[X]= 0,2; D(X) =0.8
- ○ M[X]= 0,3; D(X) =0.27
- ● M[X]= 0,2; D(X) =0.76
- ○ M[X]= 0,2; D(X) =0.21
- ○ M[X]= 0,8; D(X) =0.24

1187. The table below shows the distribution of a random variable X. What is the D(X)?

X	-2	1	2
P	0,2	0,5	0,3

- ● 2,01
- ○ 1,67
- ○ 4,71
- ○ 0,7
- ○ 4,7

1188. The table below shows the distribution of a random variable X. What is the M(X)?

X	-2	1	2
P	0,2	0,5	0,3

- ● 0,7
- ○ 0,5
- ○ 4
- ○ 0,34
- ○ 4,7

1189. The table below shows the distribution of a random variable X. What is the D(X)?

X	-2	1	2
P	0,1	0,6	0,3

- ● 0,7
- ○ 0,5
- ○ 4
- ○ 0,34
- ○ 4,7

1190. The table below shows the distribution of a random variable X. What is the M(X)?

X	-2	1	2
P	0,3	0,5	0,2

- ● 0,7
- ○ 0,5
- ○ 4
- ○ 0,34
- ○ 4,7

1191. The table below shows the distribution of a random variable X. What is the M(X)?

X	-2	1	2
P	0,2	0,5	0,3

- ● 0,7
- ○ 0,5
- ○ 4
- ○ 0,34
- ○ 4,7

ProbabilityTheoryMathematicalStatistics_Maksat/30

1192. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if \ \ x\le 2\\ 0.5 & if \ \ 2<x\le 5\\ 0.8 & if \ \ 5<x\le 8\\ 1 & if \ \ x>8\end{cases}$$

Find $P(3 \le X < 8)$.

- ○ 0,4
- ● 0,3
- ○ 0,6
- ○ 0,9
- ○ 0,5

1193. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if \ \ x\le 2\\ 0.5 & if \ \ 2<x\le 5\\ 0.8 & if \ \ 5<x\le 8\\ 1 & if \ \ x>8\end{cases}$$

Find $P(2 \le X < 8)$.

- ○ 0,4
- ● 0,3
- ○ 0,6
- ○ 0,9
- ○ 0,5

1194. The cumulative distribution function of a discrete random variable X is given by

$$F(x) = \begin{cases} 0 & if \ \ x \le 2 \\ 0.5 & if \ \ 2 < x \le 5 \\ 0.8 & if \ \ 5 < x \le 8 \\ 1 & if \ \ x > 8 \end{cases}$$

Find $P(5 \le X < 10)$.

- ○ 0,4
- ● 0,3
- ○ 0,6
- ○ 0,9
- ○ 0,5

1195. The cumulative distribution function of a discrete random variable X is given by

$$F(x) = \begin{cases} 0 & if \ \ x \le 2 \\ 0.5 & if \ \ 2 < x \le 5 \\ 0.8 & if \ \ 5 < x \le 8 \\ 1 & if \ \ x > 8 \end{cases}$$

Find $P(3 \le X < 9)$.

- ○ 0,4
- ● 0,3
- ○ 0,6
- ○ 0,9
- ○ 0,5

1196. The cumulative distribution function of a discrete random variable X is given by

$$F(x) = \begin{cases} 0 & if \ \ x \le 2 \\ 0.3 & if \ \ 2 < x \le 5 \\ 0.9 & if \ \ 5 < x \le 8 \\ 1 & if \ \ x > 8 \end{cases}$$

Find $P(2 \le X < 5)$.

- ○ 0,4
- ● 0,3
- ○ 0,6
- ○ 1
- ○ 0,5

1197. You are interested in knowing what percent of all households in a large city have a single woman as the head of the household. To estimate this percentage, you conduct a survey with 200 households and determine how many of these 200 are headed by a single woman.

- all households in the city
- the 200 households selected
- the percent of households headed by single women in the city
- the percent of households headed by single women among the 200 selected households

1198. You are interested in knowing what percent of all households in a large city have a single woman as the head of the household. To estimate this percentage, you conduct a survey with 200 households and determine how many of these 200 are headed by a single woman.In this example, what is the sample?

- the 200 households selected
- the percent ofhouseholds headed by single women in the city
- the percent of households headed by single women among the 200 selected households
- all households in the city

1199. You are interested in knowing what percent of all households in a large city have a single woman as the head of the household. To estimate this percentage, you conduct a survey with 200 households and determine how many of these 200 are headed by a single woman.In this example, what is the parameter?

- the 200 households selected
- the percent ofhouseholds headed by single women in the city
- the percent of households headed by single women among the 200 selected households
- all households in the city

1200. You are interested in knowing what percent of all households in a large city have a single woman as the head of the household. To estimate this percentage, you conduct a survey with 200 households and determine how many of these 200 are headed by a single woman.In this example, what is the statistic?

- the 200 households selected
- the percent ofhouseholds headed by single women in the city
- the percent of households headed by single women among the 200 selected households
- all households in the city

1201. Which of the following is an example of a quantitative variable (also known as a numerical variable)?

- the color of an automobile
- a person's state of residence

- ○ a person’s zip code
- ● a person’s height, recorded in inches

Describing Data Sets_Maksat/32

1202. The Lakers scored the following numbers of goals in their last twenty matches: 3, 0, 1, 5, 4, 3, 2, 6, 4, 2, 3, 3, 0, 7, 1, 1, 2, 3, 4, 3. **Which number had the highest frequency?**

- ● 3
- ○ 4
- ○ 6
- ○ 7

1203. Which letter occurs the most frequently in the following sentence? THE SUN ALWAYS SETS IN THE WEST.

- ○ E
- ● S
- ○ T
- ○ W

1204. Pi is a special number that is used to find the area of a circle. The following number gives the first 100 digits of the number pi: 3.141 592 653 589 793 238 462 643 383 279 502 884 197 169 399 375 105 820 974 944 592 307 816 406 286 208 998 628 034 825 342 117 067. **Which of the digits 0 to 9 occurs most frequently in this number?**

- ○ 2
- ○ 3
- ○ 8
- ● 9

1205. A fair die was thrown 100 times. The frequency distribution is shown in the following table:

Score	Frequency
1	16
2	18
3	11
4	15
5	19
6	21

How many throws scored less than 3?

- ○ 11
- ● 34
- ○ 45
- ○ 56

1206. 60 students sat a test. The frequency distribution is shown in the following table:

Mark	Frequency
0	1
1	3
2	6
3	9
4	8
5	11
6	8
7	7
8	4
9	1
10	2

How many students scored 5 or more?

- ○ 11
- ○ 22
- ● 33
- ○ 38

1207. A fair die was thrown 100 times. The frequency distribution is shown in the following table:

Score	Frequency
1	16
2	18
3	11
4	15
5	19
6	21

How many throws scored greater than 2, but less than or equal to 5?

- ○ 26
- ○ 44
- ● 45
- ○ 63

1208. 60 students sat a test. The frequency distribution is shown in the following table:

Mark	Frequency
0	1
1	3
2	6
3	9
4	8
5	11
6	8
7	7
8	4
9	1
10	2

How many students scored greater than or equal to 4, but less than or equal to 7?

- ○ 19
- ○ 26
- ○ 27
- ● 34

1209. Ramiro did a survey of the number of pets owned by his classmates, with the following results:

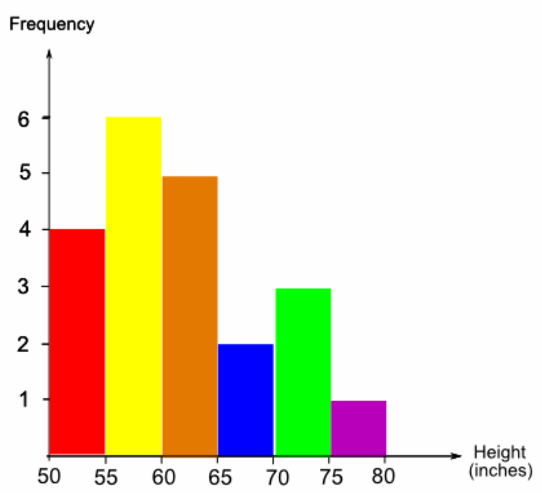
Number of pets	Frequency
0	4
1	12
2	8
3	2
4	1
5	2
6	1

How many of his classmates had less than 3 pets?

- 16
- 20
- 24
- 26

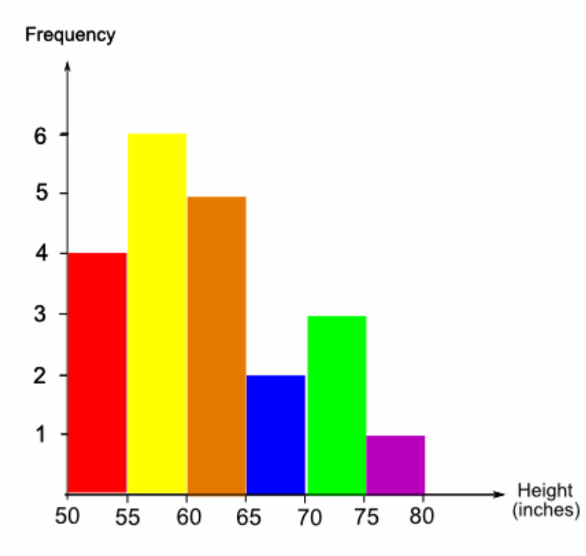
1210. The histogram shows the heights of 21 students in a class, grouped into 5-inch groups. How many students were greater than or equal to 60 inches tall?

- 21
- 17
- 11
- 6



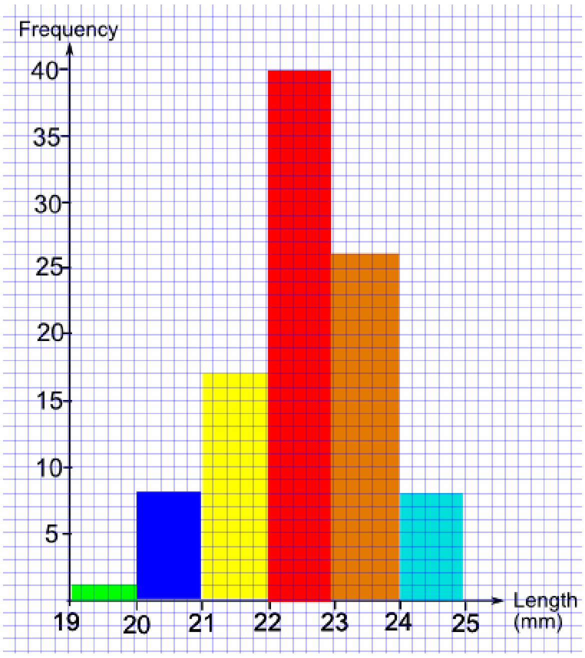
1211. The histogram shows the heights of 21 students in a class, grouped into 5-inch groups. How many students were greater than or equal to 60 inches tall but less than 70 inches tall?

- 13
- 15
- 16
- 17



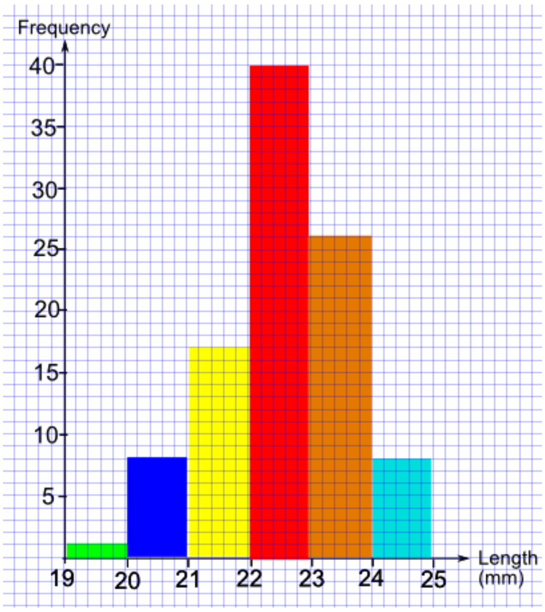
1212. A class carried out an experiment to measure the lengths of cuckoo eggs. The length of each egg was measured to the nearest mm. The results are shown in the following histogram: How many eggs were measured altogether in the experiment

- ○ 25
- ○ 40
- ○ 90
- ● 100



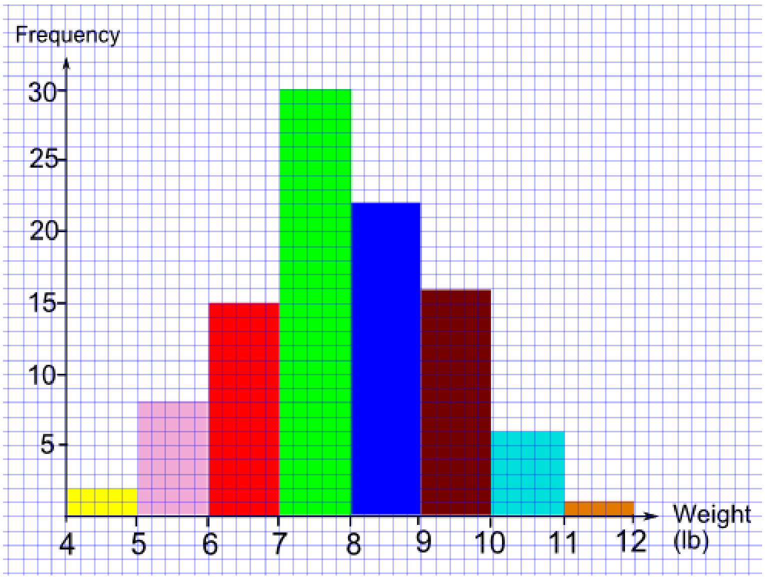
1213. A class carried out an experiment to measure the lengths of cuckoo eggs. The length of each egg was measured to the nearest mm. The results are shown in the following histogram: How many eggs were less than 23 mm in length?

- ○ 26
- ○ 40
- ● 66
- ○ 92



1214. **The histogram shows the birth weights of 100 new born babies. The histogram shows the birth weights of 100 new born babies. How many babies weighted 8lb or more?**

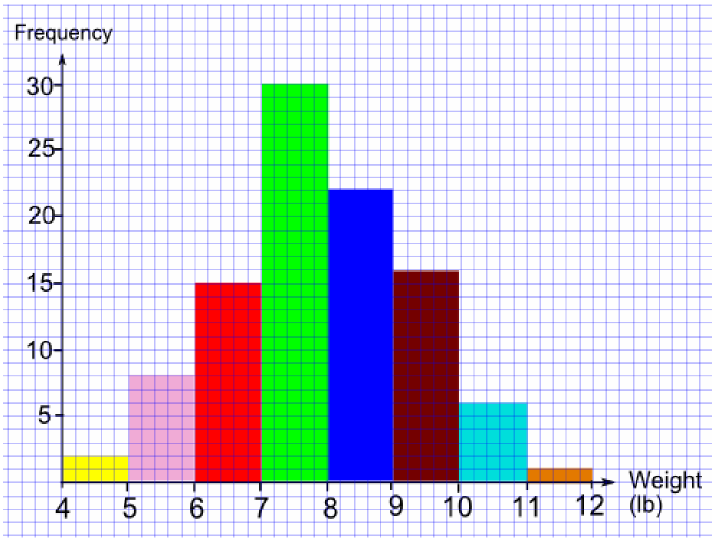
- ○ 22
- ○ 23
- ○ 30
- ● 45



1215. **The histogram shows the birth weights of 100 new born babies. Babies who weigh less than 5 lb are considered to have a low birth weight. Babies who weigh 10lb or more are considered to have a high birth weight. What percent of the babies had neither a low or a high birth weight?**

- ○ 97
- ● 91
- ○ 85

○ 83



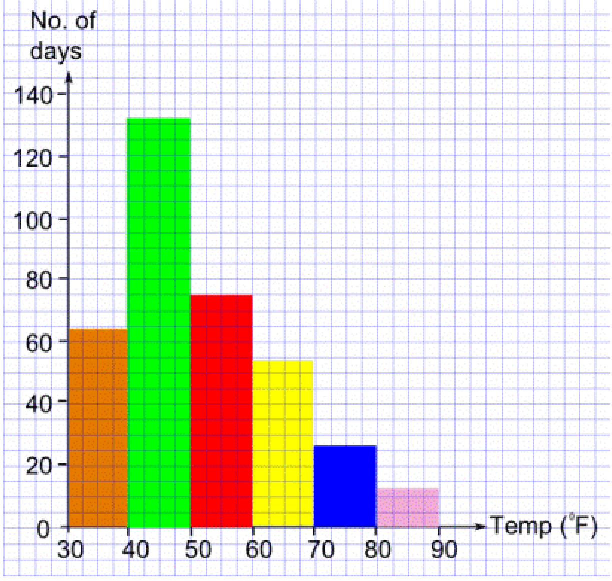
1216. Jim measured the temperature at 2 p.m. at the same spot in his garden and recorded his results to the nearest degree (°F) for each day in the year. The results are shown in the following histogram: on approximately how many days was the 2 p.m temperature above 70°F?

○ Approximately 12

● Approximately 39

○ Approximately 54

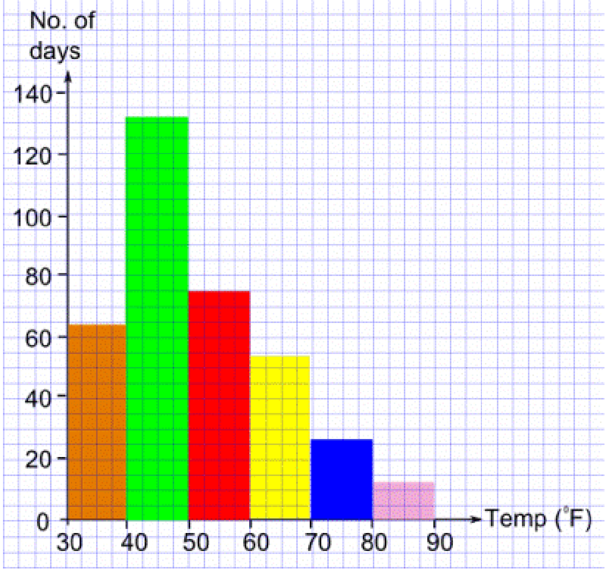
○ Approximately 93



1217. Jim measured the temperature at 2 p.m. at the same spot in his garden and recorded his results to the nearest degree (°F) for each day in the year. The results are shown in the following histogram: on approximately how many days was the 2 p.m temperature above 40°F but less than 70°F?

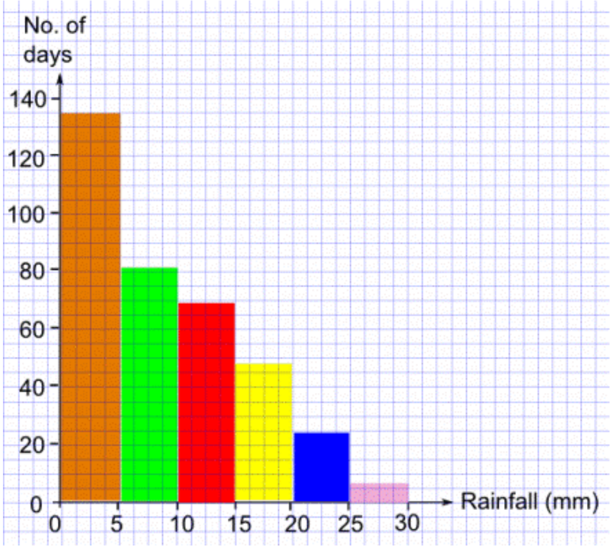
○ approximately 50%

- approximately 60%
- approximately 70%
- approximately 80%



1218. Jim measured the daily rainfall in mm at the same spot in his garden for each day in the year (365 days). He recorded his results to the nearest millimeter. The results are shown in the following histogram: on approximately how many days was the rainfall less than 10 mm?

- approximately 81
- approximately 135
- approximately 149
- approximately 216



1219. Jim measured the daily rainfall in mm at the same spot in his garden for each day in the year (365 days). He recorded his results to the nearest millimeter. The results are

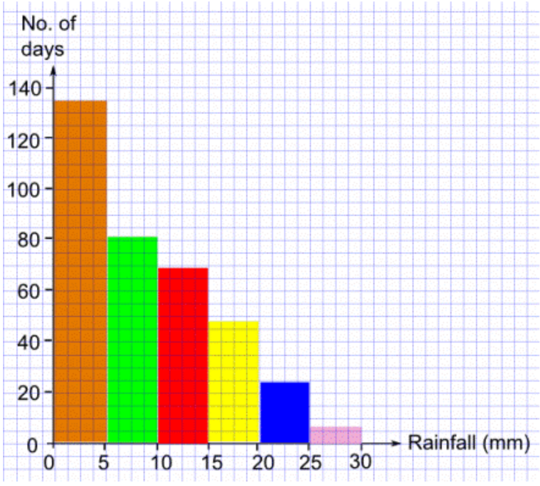
shown in the following histogram: on approximately what percent of the days was the rainfall more than 15 mm?

○ Approximately 10%

● Approximately 20%

○ Approximately 30%

○ Approximately 40%



Stem-and-Leaf Plot _Maksat/33

1220. What is the range for the above stem and leaf plot?

○ 39

○ 40

○ 56

● 45

Stem	Leaf
1	1 2 5 7
2	0 1 3 4 8
3	2 9
4	3 3 5 6 8
5	0 1 6

1221. For the above stem and leaf plot, what is the median value?

○ 28

- 32
- 35.5
- 39

Stem	Leaf
1	1 2 5 7
2	0 1 3 4 8
3	2 9
4	3 3 5 6 8
5	0 1 6

1222. What is the range for the above stem and leaf plot?

- 98
- 97
- 86
- 85

Stem	Leaf
1	2 3
2	0 1 5 5 8
3	4 6 9
5	3 4 4 4 6
6	2 5 6 6 7 8
8	0 3 5
9	8

1223. What is the mode for the above stem and leaf plot?

- 25
- 54
- 60
- 66

Stem	Leaf
1	2 3
2	0 1 5 5 8
3	4 6 9
5	3 4 4 4 6
6	2 5 6 6 7 8
8	0 3 5
9	8

1224. What is the mean for the above stem and leaf plot?

- 50.56
- 50.96
- 53.13
- 54.56

Stem	Leaf
1	2 3
2	0 1 5 5 8
3	4 6 9
5	3 4 4 4 6
6	2 5 6 6 7 8
8	0 3 5
9	8

1225. What is the mode for the above stem and leaf plot?

- ○ 11
- ● 33
- ○ 34.5
- ○ 45

Stem	Leaf
1	0 1 1 5 9
2	1 3 6 7 8
3	0 1 3 3 3 6 7
4	2 3 5 5 7 9
5	3 4 8
7	1 7 9
8	4

1226. For the above stem and leaf plot, what is the median value?

- ○ 29.5
- ○ 33
- ● 34.5
- ○ 36

Stem	Leaf
1	0 1 1 5 9
2	1 3 6 7 8
3	0 1 3 3 3 6 7
4	2 3 5 5 7 9
5	3 4 8
7	1 7 9
8	4

1227. What is the mode for the above stem and leaf plot?

- ○ 28
- ○ 32
- ○ 34
- ● 43

Stem	Leaf
1	1 2 5 7
2	0 1 3 4 8
3	2 9
4	3 3 5 6 8
5	0 1 6

1228. What is the median for the above stem and leaf plot?

○ 53

● 54

○ 56

○ 83

1229. Sammy caught ten rainbow trout, measured their lengths to the nearest inch, and recorded his results in groups as follows: Use the midpoints of the groups to estimate the mean length of the trout Sammy caught.

○ 21 inches

● 21.5 inches

○ 22 inches

○ 22.5 inches

Length (in)	Number
15 – 19	2
20 – 24	7
25 – 29	1

1230. Sammy caught ten rainbow trout, measured their lengths to the nearest inch, and recorded his results in groups as follows: Use the midpoints of the groups to estimate the mean weight of the rabbits Tommy trapped.

○ 11.5lb

○ 12lb

● 12.5lb

○ 13lb

Weight (lb)	Number
5 – 9	2
10 – 14	5
15 – 19	3

1231. What is the population standard deviation for the numbers: 75, 83, 96, 100, 121 and 125?

- ○ 16.9
- ○ 17.1
- ○ 17.6
- ● 18.2

1232. Ten friends scored the following marks in their end-of-year math exam:23%, 37%, 45%, 49%, 56%, 63%, 63%, 70%, 72% and 82%. What was the standard deviation of their marks?

- ○ 15.1%
- ○ 15.5%
- ● 16.9%
- ○ 18.6%

1233. A booklet has 12 pages with the following numbers of words: 271, 354, 296, 301, 333, 326, 285, 298, 327, 316, 287 and 314. What is the standard deviation number of words per page?

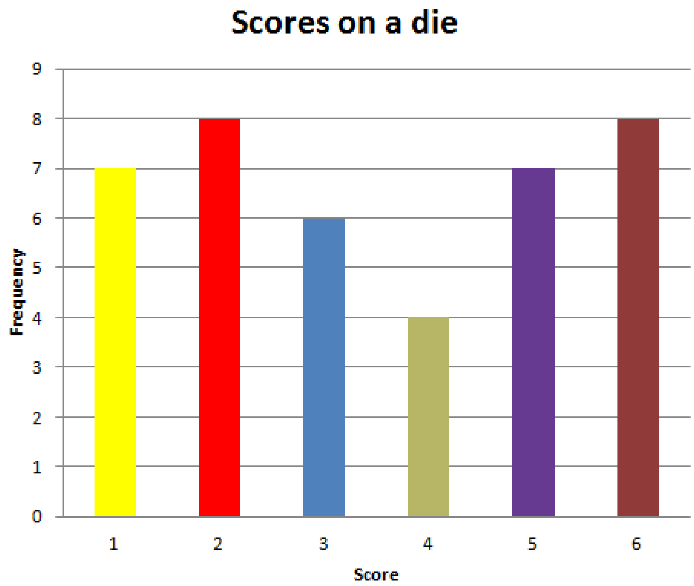
- ● 22.6
- ○ 22.0
- ○ 21.9
- ○ 21.4

1234. Nine friends each guessed the number of marbles in a jar. When the answer was revealed they found they had guessed well (and one was the winner!). Here is how close they each got: -9, -7, -4, -1, 0, 2, 7, 9, 12. What was the standard deviation of their errors?

- ○ 3.9
- ○ 5.5
- ○ 6.2
- ● 6.8

1235. Emma rolled a die a number of times and recorded her results in a bar graph, as follows: What was the variance?

- ● 3.25
- ○ 2.92
- ○ 1.89
- ○ 1.80



Using Statistics to summarize data sets_Maksat/34

1236. What is the standard deviation of the first 10 natural numbers (1 to 10)?

- ○ 2.45
- ● 2.87
- ○ 3.16
- ○ 8.25

1237. What is the variance of the first 10 numbers of the Fibonacci sequence {0, 1, 1, 2, 3, 5, 8, 13, 21, 34}?

- ○ 10.47
- ○ 16.88
- ● 109.56
- ○ 285.01

1238. The standard deviation of the numbers 3, 8, 12, 17 and 25 is 7.56 correct to 2 decimal places. What happens if each of the five numbers is increased by 2?

- ○ The standard deviation is increased by 2
- ○ The standard deviation is decreased by 2
- ○ The standard deviation is multiplied by 2
- ● The standard deviation stays the same

1239. The population standard deviation of the numbers 3, 8, 12, 17, and 25 is 7.563 correct to 3 decimal places. What happens if each of the five numbers is multiplied by 3?

- ○ The standard deviation is increased by 3
- ○ The standard deviation is decreased by 3

- The standard deviation is multiplied by 3
- The standard deviation stays the same

1240. Ramiro did a survey of the number of pets owned by his classmates, with the following results: What was the standard deviation?

- 1.38
- 1.49
- 1.60
- 2.27

Number of pets	Frequency
0	4
1	12
2	8
3	2
4	1
5	2
6	1

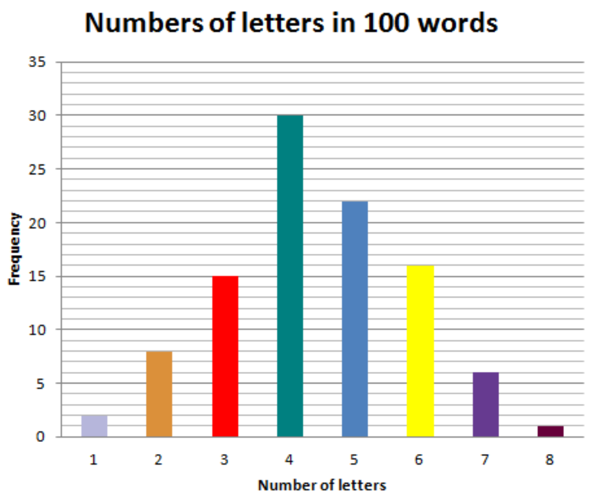
1241. Rachel rolled a die forty five times with the following results: What was her mean score?

- 3.4
- 3.5
- 3.62
- 7.5

Score	Frequency
1	8
2	11
3	4
4	8
5	5
6	9

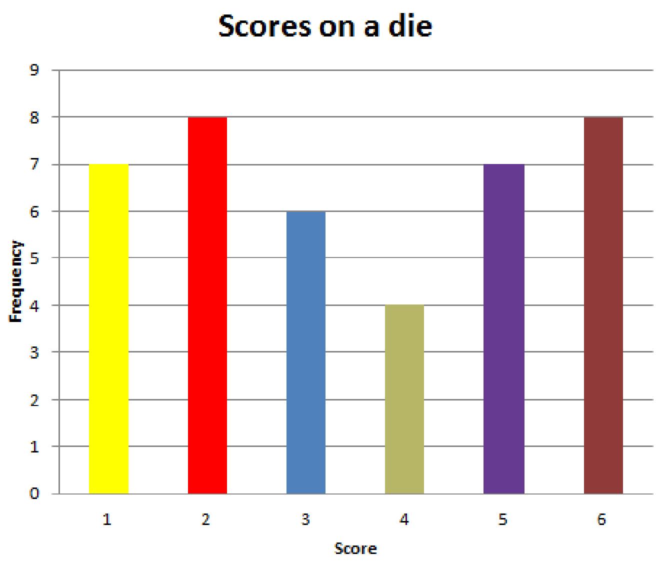
1242. Olivia chose a 100 word passage and recorded the number of letters in each word. Her results are shown in the following bar graph:

- 4.29
- 4.39
- 4.49
- 4.5



1243. **Emma rolled a die a number of times and recorded her results in a bar graph, as follows: Calculate the mean score**

- ○ 3
- ● 3.5
- ○ 4
- ○ 6.67



1244. **Miss Jones has 30 students in her math class. In the recent exam, her students averaged 67%. But Miss Jones told Principal Schultz that her students had averaged 71%. In order to impress Principal Schultz, Miss Jones had excluded the two outliers in her class who had scored very low marks. What was the mean mark of those two poor students?**

- ○ 6%
- ○ 12%
- ○ 9%
- ● 11%

1245. **50 children guessed the number of marbles in a jar and the average guess was 627. However three of the guesses were way too high and so were excluded from the**

competition. When these three outliers were excluded, the average guess was reduced by 114. What was the mean of the three outliers?

- ○ 513
- ○ 1.539
- ● 2.413
- ○ 5.7

1246. The following table gives the heights of 10 friends, each measured to the nearest centimeter: If the height of the outlier is not included, which one of the nine remaining friends has the mean height?

- ○ Beth
- ○ Emily
- ● Helen
- ○ Jeremy

Name	Height (cm)
Albert	181
Beth	176
Cindy	154
David	185
Emily	169
Frank	185
Gary	166
Helen	173
Ida	129
Jeremy	168

1247. The following table gives the math scores of 10 friends: If the score of the outlier is not included, what is the mean score?

- ○ 35.1%
- ● 39%
- ○ 44.4%
- ○ 49.3%

1248. The times taken for 20 people to complete a puzzle were recorded to the nearest minute as follows: 23, 27, 24, 18, 20, 25, 58, 23, 27, 19, 20, 25, 23, 22, 26, 26, 23, 19, 21, 26. By how much is the mean decreased if the outlier is not included?

- ● 1.75 minutes
- ○ 2.25 minutes
- ○ 2.9 minutes
- ○ 5.8 minutes

Normal Data Sets and the Empirical Rule. Sample Correlation Coefficient _Maksat/34

1249. The following table gives the heights and weights of 10 friends: Which one of the following best describes the correlation between their heights and weights?

- ○ High positive correlation
- ● Low positive correlation
- ○ No correlation
- ○ Low negative correlation

Name	Height (cm)	Weight (kg)
Albert	180	87
Beth	176	55
Cindy	144	52
David	195	94
Emily	159	87
Frank	185	79
Gary	166	59
Helen	173	64
Ida	149	45
Jeremy	168	77

1250. Calculate the correlation coefficient for the following data:

- ● -0.120
- ○ -0.2
- ○ -0.220
- ○ -0.320

x	y
12	1
8	7
5	4
3	6
2	4
0	2

1251. Calculate the correlation coefficient for the following data:

- ○ -0.168
- ○ -0.2
- ● -0.268
- ○ -0.368

x	y
1	9
2	6
4	4
6	12
7	8
10	3

1252. Calculate the correlation coefficient for the following data:

- ○ 0.9
- ○ 0.932
- ○ 0.952
- ● 0.972

x	y
1	4
2	6
3	5
4	7
5	9
6	11
7	12
8	17
9	19
10	20

1253. Calculate the correlation coefficient for the following data:

- ○ -0.822
- ○ -0.9
- ○ -0.902
- ● -0.922

x	y
18	1
16	3
15	5
11	6
12	9
10	11
8	10
4	12
2	11
0	15

1254. The following table gives the heights and weights of 10 friends:

- ○ -0.9362
- ○ -0.7294
- ● 0.7294
- ○ 0.9362

Name	Height (cm)	Weight (kg)
Albert	180	87
Beth	176	65
Cindy	144	52
David	195	94
Emily	159	87
Frank	185	79
Gary	166	59
Helen	173	64
Ida	149	45
Jeremy	168	77

1255. The following table gives the math scores and times taken to run 100 m for 10 friends. Calculate the correlation coefficient

- ○ -0.9716
- ● -0.9602
- ○ 0.9602
- ○ 0.9716

Name	Math score (%)	Time taken to run 100 m (secs)
Albert	56	11.3
Beth	29	12.9
Cindy	45	11.9
David	93	10.2
Emily	67	11.1
Frank	38	12.5
Gary	85	10.8
Helen	77	10.5
Ida	56	12.0
Jeremy	71	10.9

1256. 95% of students at school weigh between 62 kg and 90 kg. Assuming this data is normally distributed, what are the mean and standard deviation?

- ○ Mean = 66 kg S.D. = 7 kg
- ● Mean = 76 kg S.D. = 7 kg
- ○ C) Mean = 86 kg S.D. = 7 kg
- ○ D) Mean = 76 kg S.D. = 14 kg

1257. A machine produces electrical components. 99.7% of the components have lengths between 1.176 cm and 1.224 cm. Assuming this data is normally distributed, what are the mean and standard deviation?

- ○ Mean = 1.210 cm S.D. = 0.008 cm
- ○ Mean = 1.190 cm S.D. = 0.008 cm
- ○ Mean = 1.200 cm S.D. = 0.004 cm
- ● Mean = 1.200 cm S.D. = 0.008 cm

1258. 68% of the marks in a test are between 51 and 64. Assuming this data is normally distributed, what are the mean and standard deviation?

- ○ Mean = 57 S.D. = 6.5
- ○ Mean = 57 S.D. = 7
- ● Mean = 57.5 S.D. = 6.5

- Mean = 57.5 S.D. = 13

1259. The Fresha Tea Company pack tea in bags marked as 250 g. A large number of packs of tea were weighed and the mean and standard deviation were calculated as 255 g and 2.5 g respectively. Assuming this data is normally distributed, what percentage of packs are underweight?

- 2.5%
- 3.5%
- 4%
- 5%

Distributions of Sampling Statistics. Central Limit Theorem _Maksat/35

1260. Which of the following features is necessary for something to be considered a sampling distribution?

- Each value in the original populationshould be included in thedistribution.
- The distribution must consist ofproportions.
- The distribution can't consist ofpercentages.
- Each of the observations in the distribution must consist of a statisticthat describes a collection of datapoints.

1261. Which of the following would *not* ordinarily be considered a sampling distribution?

- a distribution showing the average weight per person in several hundred groups of three people picked at random at a state fair
- a distribution showing the average proportion of heads coming up in several thousand experiments in which ten coins were flipped each time
- a distribution showing the average percentage daily price change in Dow Jones Industrial Stocks for several hundred days chosen at random from the past 20 years
- a distribution showing the weight of each individual football fan entering a stadium on game day

1262. If a researcher wants to study a binomial population where p = 0.1, what is the minimum size n needed to make use of the central limit theorem?

- 100
- 10000

- 1000
- 10

1263. Which of the following conditions is enough to ensure that the sampling distribution of the sample means has a normal distribution?

- The population of all possible scoresis very large.
- At least 30 samples are drawn, withreplacement, from the distribution ofpossible scores.
- Individual scores *xi* are normallydistributed.
- None of the above

1264. If the population distribution is __________and the sample size is ___________, you need to apply the central limit theorem to assume that the sampling distribution of the sample means is normal.

- normal, 10
- normal, 50
- right-skewed, 60
- Choices (A), (B), and (C)

1265. As a *general* rule, approximately what is the smallest sample size that can be safely drawn from a non-normal distribution of observations if someone wants to produce a normal sampling distribution of sample means?

- n=10
- n=50
- n=20
- n=30

1. A reliable event is: - **event is an event that necessarily will happen if a certain set of conditions S holds**

2. The probability of reliable event is the number: **1**

3. An impossible event is: (null) event is an event that certainly will not happen if the set of conditions S holds.

4. The probability of impossible event is the number: 0

5. A random event is: event is an event that can either take place, or not to take place for holding the set of conditions S.

6. The probability of an arbitrary event A is the number: 0<=P(x)<=1

7. Probabilities of opposite events *A* and $\overline{A}$ satisfy the following condition: *P(A) + P(* $\overline{A}$ *) = 1*

8. For opposite events A and $\overline{A}$ one of the following equalities holds: $P(A \cdot \overline{A}) =$ 0 $P(A + \overline{A}) =$ 1

9. Let A and B be opposite events. Find P(B) if P(A) = 3/5. 2/5

10. Let A and B be events connected with the same trial. Show the event that means simultaneous occurrence of A and B.

P=AB

11. Let A and B be events connected with the same trial. Show the event that means occurrence of only one of events A and B.

A*B s 4ertoi + $\overline{A}$ ***B**

12. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means occurrence only one of events A_1, A_2 and A_3. Express the event A by the events A_1, A_2 and A_3.

$\overline{A}$ **1*** $\overline{A}$ **2*A3 +** $\overline{A}$ **1*A2*** $\overline{A}$ **3+A1*** $\overline{A}$ **2*** $\overline{A}$ **3**

13. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means none of events A_1, A_2 and A_3 have happened. Express the event A by the events A_1, A_2 and A_3

A_3 **vse A s 4ertami**

14. Let *n* be the number of all outcomes, *m* be the number of the outcomes favorable to the event *A.* The classical formula of probability of the event *A* has the following form:

P(A) = m/n

15. The probability of an arbitrary event cannot be: less than 0 or more than 1

16. Let the random variable *X* be given by the law of distribution

x_i	-4	-1	0	1	4
p_i	0,2	0,1	0,3	0,2	0,2

Find mean square deviation σ (X):

M(x) = 0.1

D(x) = 6.69

σ (X) = 2.5865

17. Two events form a complete group if they are:

Some events form a *complete group* if in result of a trial at least one of them will appear.

18. A coin is tossed twice. Find probability that "heads" will land in both times.

1/4

19. A coin is tossed twice. Find probability that "heads" will land at least once.

3/4

20. There are 2000 tickets in a lottery. 1000 of them are winning, and the rest 1000 – non-winning. It was bought two tickets. What is the probability that both tickets are winning?

1000/2000 * 999/1999 = 0.24987

21. Two dice are tossed. Find probability that the sum of aces does not exceed 2.

1/36

22. Two dice are tossed. Find probability that the sum of aces doesn't exceed 5.

10/36

23. Two dice are tossed. Find probability that the product of aces does not exceed 3.

5/36

24. There are 20 white, 25 black, 10 blue and 15 red balls in an urn. One ball is randomly extracted. Find probability that the extracted ball is white or black.

45/70 = 9/14

25. There are 11 white and 2 black balls in an urn. Four balls are randomly extracted. What is the probability that all balls are white?

C(4,11)/C(4,13) = 0.46 or 11/13 * 10/12 * 9/11 * 8/10 = 0.46

26. Calculate C_{14}^{4}: 1001

27. Calculate A_{7}^{3}: 210

28. One chooses randomly one letter of the word "HUNGRY". What is the probability that this letter is "E"? 0

29. The letters T, A, O, B are written on four cards. One mixes the cards and puts them randomly in a row. What is the probability that it is possible to read the word "BOAT"? ¼! = 0.0416

30. There are 5 white and 4 black balls in an urn. One extracts randomly two balls. What is the probability that both balls are white? 5/9*4/8 = 0.2(7)

31. There are 11 white, 9 black, 15 yellow and 25 red balls in a box. Find probability that a randomly taken ball is white. 11/60

32. There are 11 white, 9 black, 15 yellow and 20 red balls in a box. Find probability that a randomly taken ball is black. 9/55

33. How many 6-place telephone numbers are there if the digits "0" and "9" are not used on the first place? 8*10^5

34. 15 shots are made; 9 hits are registered. Find relative frequency of hits in a target. 9/15

35. A point is thrown on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 5/6. (2 – 2*5/6)/2 = 1/6

36. Two dice are tossed. What is the probability that the sum of aces will be more than 8? 7/36

37. A coin is tossed 6 times. Find probability that "heads" will land 4 times. C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

38. There are 6 children in a family. Assuming that probabilities of births of boy and girl are equal, find probability that the family has 4 boys: C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

39. Two shots are made in a target by two shooters. The probability of hit by the first shooter is equal to 0,7, by the second – 0,8. Find probability of at least one hit in the target. 1 – 0.3*0.2 = 0.94

40. The device consists of two independently working elements of which probabilities of non-failure operation are equal 0,8 and 0,7 respectively. Find probability of non-failure operation of two elements. 0.8*0.7 = 0.56

41. There are 5 books on mathematics and 7 books on chemistry on a book shelf. One takes randomly 2 books. Find the probability that these books are on mathematics. 5/12 * 4/11 = 10/66

42. There are 5 standard and 6 non-standard details in a box. One takes out randomly 2 details. Find probability that only one detail is standard. 5*6/C(2,11) = 30/55 = 6/11

43. Three shooters shoot on a target. Probability of hit in the target at one shot for the 1st shooter is 0,85; for the 2^{nd} – 0,9 and for the 3^{rd} – 0,95. Find probability of hit by all the shooters. 0.85*0.9*0.95 = 0,72675

44. A student knows 7 of 12 questions of examination. Find probability that he (or she) knows randomly chosen 3 questions.

7/12*6/11*5/10 = 0.15(90)

45. Two shooters shoot on a target. The probability of hit by the first shooter is 0,7, and the second – 0,8. Find probability that only one of shooters will hit in the target. 0.7*0.2 + 0.8*0.3 = 0.38

46. Three dice are tossed. Find probability that the sum of aces will be 6.

10/216

47. At shooting from a rifle the relative frequency of hit in a target appeared equal to 0,8. Find the number of hits if 200 shots have been made. 200*0.8

48. In a batch of 200 details the checking department has found out 13 non-standard details. What is the relative frequency of occurrence of non-standard details equal to? 13/200 = 0.065

49. If A and B are independent events then for P(AB) one of the following equalities holds: P(AB) = P(A)*P(B)

50. If events A and B are compatible then for P(A + B) one of the following equalities holds: P(A+B) =P(A) + P(B) – P(AB)

51. If events A and B are incompatible then for P(A+ B) one of the following equalities holds: P(A+B) =P(A)+P(B)

52. The probability of joint occurrence of two dependent events is equal: $P(AB) = P(A) \cdot P_A(B)$

53. A point is put on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 4/7. (2 – 2*4/7)/2 = 3/7

54. There are 5 white and 7 black balls in an urn. One takes out randomly 2 balls. What is the probability that both balls are black?

7/12 * 6/11 = 0.318

55. There are 7 identical balls numbered by numbers 1, 2..., 7 in a box. All balls by one are randomly extracted from a box. Find probability that numbers of extracted balls will appear in ascending order. 1/7! = 1.98*10^4

56. There are 25 details in a box, and 20 of them are painted. One extracts randomly 4 details. Find probability that the extracted details are painted. 20/25 * 19/24 * 18/23 * 17/22 = 0.383

57. There are 20 students in a group, and 8 of them are pupils with honor. One randomly selects 10 students. Find probability that there are 6 pupils with honor among the selected students. C(6, 8) * C(4 , 12) / C(10, 20) = 28 * 495/184756 = 0.075

58. There are 4 detective lamps among 12 electric lamps. Find probability that randomly chosen 2 lamps will be defective.

4/12 * 3/11 = 0. (09)

59. A circle of radius *l* is placed in a big circle of radius *L*. Find probability that a randomly thrown point in the big circle will get as well in the small circle.

l^2/L^2

60. There are 6 white and 4 red balls in an urn. The event A consists in that the first taken out ball is white, and the event B – the second taken out ball is white. Find the probability $P(A)\cdot P_A(B)$ = 6/10 * 5/9 = 1/3

61. Probability not to pass exam for the first student is 0,2, for the second - 0,4, for the third - 0,3. What is the probability that only one of them will pass the exam? 0.8*0.4*0.3 + 0.2 * 0.6 *0.3 + 0.2 * 0.4 * 0.7 = 0.188

62. The probability of delay for the train №1 is equal to 0,1, and for the train №2 – 0,2. Find probability that at least one train will be late. 1 – 0.9*0.8 = 0.28

63. The probability of delay for the train №1 is equal to 0,3, and for the train №2 – 0,45. Find probability that both trains will be late. 0.3 * 0.45 = 0.135

64. The events A and B are independent, P(A) = 0,4; P(B) = 0,3. Find $P(\overline{A}B)$.

0.6*0.3 = 0.18

65. The events A and B are compatible, P(A) = 0,4; and P(B) = 0,3. Find P($\overline{A}+\overline{B})$. = 0.6 + 0.7 - 0.42 = 0.88

66. If the probability of a random event A is equal to P(A), the probability of the opposite event $\overline{A}$ is equal: 1 - P(A),

67. Show the formula of total probability:

$$P(A)=P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)$$

68. The formula $P_A(B_i)=\dfrac{P(B_i)\cdot P_{B_i}(A)}{\sum_{i=1}^{n}P(B_i)P_{B_i}(A)}$ is *Bayes's formulas*

69. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3 forming a complete group will occur, P (A) is calculated by the following formula: $P(A)=P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)$

70. Electric lamps are made at two factories, and the first of them delivers 60%, and the second – 40% of all consumed production. 80 of each hundred lamps of the first factory are standard on the average, and 60 – of the second factory. Find probability that a bought lamp will be standard.

0.6*08 + 0.4*0.6 = 0.72

71. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3, B_4 forming a complete group will occur, $P_A(B_2)$ is calculated by the following formula:

$$P_A(B_i)=\frac{P(B_i)\cdot P_{B_i}(A)}{P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)}$$

72. The probability of hit in 10 aces for a given shooter at one shot is 0,9. Find probability that for 10 independent shots the shooter will hit in 10 aces exactly 6 times. C(6, 10) * 0.9^6 * 0.1^4 = 0.0111

73. There are 6 children in a family. Assuming that probabilities of birth of boy and girl are equal, find the probability that there are 4 girls and 2 boys in the family. C(4, 6) * 0.5 ^4 * 0.5^2 = 15/64

74. It is known that 15 % of all radio lamps are non-standard. Find probability that among 5 randomly taken radio lamps appears no more than 1 non-standard. C(0, 5)*0.15^0 * 0.85^5 + C(1, 5)*0.15^1 * 0.85^4 = 0.8355

75. 10 buyers came in a shop. What is the probability that 4 of them will do shopping if the probability to make purchase for each buyer is equal to 0,2?

C (4, 10) * 0.2 ^ 4 * 0.8^6 = 0.088

76. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2
P	1/3	1/3	1/6	1/6

Find mathematical expectation M(X).

-4/3

77. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2
P	1/3	1/3	1/6	1/6

Find dispersion D (X).

M(x) = -4/3

M(x^2) = 5

D(x) = 5 – (4/3)^2 = 3, (2)

78. We say that a discrete random variable X is distributed under the binomial law (binomial distribution) if P (*X* = *k*) =

$$P(X=m)=C_n^m p^m q^{n-m}$$

79. We say that a discrete random variable X is distributed under Poisson law with parameter λ (Poisson distribution) if *P(X = k) =*

$$P(X=m)=\frac{\lambda^m e^{-\lambda}}{m!}$$

80. We say that a discrete random variable X is distributed under the geometric law (geometric distribution) if P*(X=k)* =

$P(X = m) = pq^{m-1}$

81. A random variable X is distributed under Poisson law with parameter λ (Poisson distribution). Find M (X) =λ

82. A random variable X is distributed under the binomial law: P *(X=k)* = $C_n^k p^k q^{n-k}$ (0 <*p* <1, *q* =1-*p*; *k*=*1*, 2, 3, …, *n*). Find M(X) = np

83. Dispersion of a discrete random variable X is D(x) = $D(X)=M[X^2]-(M(X))^2$

84. Dispersion of a constant C is D(C) = 0

85. The law of distribution of a discrete random variable *X* is given. Find *Y*.

X	–2	4	6
P	0.3	0.6	*Y*

Y = 0.1

86. The law of distribution of a discrete random variable *X* is given, M (X) = 5. Find x_1.

X	x_1	4	6
P	0.2	p_2	0.3

P2 = 0.5

X1 = 11

87. Mathematical expectations $M(X) = 5, M(Y) = 4{,}3$ are given for independent random variables *X* and *Y*. Find $M(X \cdot Y)$ 21.5

88. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	0,1	0,3	p_3	0.2

Then the probability p_3 is equal to: 0.4

89. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	p_1	0.1	0.4	0.3

Then the probability p_1 is equal to: 0.2

90. For an event – dropping two tails at tossing two coins – the opposite event is: 2 heads

91. 4 independent trials are made, and in each of them an event A occurs with probability p. Probability that the event A will occur at least once is: 1 – q*(m);

92. Show the Bernoulli formula

$$P(X = m) = C_n^m p^m q^{n-m}$$

93. Show mathematical expectation of a discrete random variable X:

$$M(X) = \sum_{i=1}^{\infty} x_i p_i$$

94. Show the Chebyshev inequality

$P(|X - a| > \varepsilon) \leq D(X)/\varepsilon^2$

95. An improper integral of density of distribution in limits from $-\infty$ till ∞ is equal to **1**

96. The random variable *X* is given by an integral function of distribution: $F(x) = \begin{cases} 0 \quad if \quad x \leq -2, \\ \frac{1}{4}x + \frac{1}{2} \quad if \ -2 < x \leq 2, \\ 1 \quad if \quad x > 2. \end{cases}$

Find probability of hit of the random variable *X* in an interval (1; 1,5): = 1/8

97. Show one of true properties of mathematical expectation (C is a constant): $M(C) =$ C

98. Let M(X) = 5. Find M(X – 4) = 1

99. Let M(X) = 5. Find M(4X). = 20

100. Let D(X) = 5. Then D(X – 4) is equal to 5

101. Let D(X) = 5. Then D(4X) is equal to 80

102. Random variables *X* and *Y* are independent. Find dispersion of the random variable $Z = 4X - 5Y$ if it is known that D(X) = 1, D(Y) = 2.

*16*1 + 25*2 = 66*

103. A random variable *X* is given by density of distribution of probabilities: $f(x) = \begin{cases} 0 \text{ if } & x \le 0, \\ 1 \text{ if } & 0 < x \le 1, \\ 0 \text{ if } & x > 1 \end{cases}$

Find the function of distribution F(x).

F(x) = x 0<x<1.....

104. Let $f(x)$ be a density of distribution of a continuous random variable X. Then function of distribution is:

$$F(x) = \int_{-\infty}^{x} \varphi(t)dt$$

105. Function of distribution of a random variable X is:

F(x) = P(X < x),

106. If dispersion of a random variable D(X) = 5 then D(5X) is equal to 25*5 = 125

107. Differential function f(x) of a continuous random variable X is determined by the equality:

$$\varphi(x) = F'(x)$$

108. If F(x) is an integral function of distribution of probabilities of a random variable X then P(a < X < b) is equal to

$$P(a \le X \le b) = \int_{a}^{b} \varphi(x)dx$$

109. Show the formula of dispersion

$$D(X) = \int_{-\infty}^{+\infty} (x-a)^2 \varphi(x)dx$$

110. Which equality is true for dispersion of a random variable? $D(CX) =$ C^2 * D(x)

111. The probability that a continuous random variable X will take on a value belonging to an interval (a, b) is equal to $P(a < X < b) =$ $P(a \le X \le b) = \int_{a}^{b} \varphi(x)dx$

112. A random variable X is distributed under an exponential law with parameter λ = 2. Find the dispersion of X:

1/4

113. Show a differential function of the law of uniform distribution of probabilities

$$\varphi(x)=\begin{cases}\dfrac{1}{b-a} & if \quad a\le x\le b,\\ 0 \quad if & x<a \ or \ x>b.\end{cases}$$

114. Mathematical expectation of a continuous random variable X of which possible values belong to an interval [a, b] is

(a+b)/2

115. Mean square deviation of a random variable X is determined by the following formula

$$a=M(X)=\int_{-\infty}^{+\infty}x\varphi(x)dx$$

116. Dispersion D(X) of a continuous random variable X is determined by the following equality

$$D(X)=\int_{-\infty}^{+\infty}(x-a)^2\varphi(x)dx$$

117. Function of distribution of a random variable X is given by the formula $F(x)=\begin{cases}0 & if \quad x\le 0\\ \sin 2x \text{ if } 0<x\le\pi/4\\ 1 & \text{if} \quad x>\pi/4\end{cases}$. Find density of distribution f(x).

Тупо производная

118. Distribution of probabilities of a continuous random variable X is exponential if it is described by the density

$$\varphi(x)=\begin{cases}\lambda e^{-\lambda x} & for \ x\ge 0,\\ 0 \quad for & x<0.\end{cases}$$

119. A random variable X is normally distributed with the parameters *a* and σ^2 if its density $f(x)$ is:

$$\varphi_N(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$$

120. Function of distribution of the exponential law has the following form:

$$F(x)=\begin{cases}0 & for \ x<0,\\ 1-e^{-\lambda x} & for \ x\ge 0.\end{cases}$$

121. Mathematical expectation of a random variable X uniformly distributed in an interval (0, 1) is equal to

1/2

122. A random variable X $\in(-\infty,\infty)$ has normal density of distribution $f(x)=\dfrac{1}{\sqrt{2\pi}\sigma}e^{-\frac{(x-3)^2}{32}}$ Find the value of parameк σ. 4

123. A random variable X $\in(-\infty,\infty)$ has normal density distribution $f(x)=\frac{1}{\sqrt{2\pi}\sigma}e^{-\frac{(x-2)^2}{8}}$. Find the value of parameter σ.   2

124. Mathematical expectation of a normally distributed random variable X is *a* = 4, and mean square deviation is σ =5. Write the density of distribution X.

$$\varphi_N(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$$

125. It is known that M (X) = - 3 and M (Y) = 5. Find M (3X – 2Y). = 1

126. Random variables X and Y such that Y =4X – 2 and D(X) = 3 are given. Find D(Y). 48

127. The number of allocations of *n* elements on *m* is equal to: $A_n^m=\frac{n!}{(n-m)!}$

128. The number of permutations of *n* elements is equal to: $P_n = n!$

129. How many various 7-place numbers are possible to make of digits 1, 2, 3, 4, 5, 6, 7 if digits are not repeated?

7! = 5040

130. How many ways is there to choose two employees on two various positions from 8 applicants?

A(2 , 8)

131. The number of combinations of *n* elements on *m* is equal to:

$$C_n^m=\frac{n!}{m!(n-m)!}$$

132. 3 dice are tossed. Find probability that each die lands on 5:

1/216

133. 2 dice are tossed. Find probability that the same number of aces will appear on each of the dice: 1/6

134. The pack of 52 cards is carefully hashed. Find probability that a randomly extracted card will be an ace: 4/36

135. The pack of 52 cards is carefully hashed. Find probability that two randomly extracted cards will be aces: C(2 , 4) / C(2,52)

136. How many ways are there to choose 3 books from 6? C(3, 6)

137. There are 60 identical details in a box, and 8 of them are painted. One takes out randomly one detail. Find probability that a randomly taken detail will be painted: 8/60

138. How many 4-place numbers can be composed of digits 1, 3, 9, 5? 4^4

139. Dialing the phone number, the subscriber has forgotten one digit and has typed it at random. Find probability that the necessary digit has been typed: 1/10

140. The urn contains 4 white and 6 black balls. One extracts by one randomly two balls without replacement. What is the probability that both balls will be black: 6/10 * 5/9

141. The urn contains 4 white and 6 black spheres. Two balls are randomly extracted from the urn. What is the probability that these balls will be of different color: 4*6/C(2, 10)

142. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that both of them will have the first sort: 3/ 7 * 2/6

143. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that they have the same sort: 3/7 * 2/6 + 4/7*3/6

144. A student knows 25 of 30 questions of the program. Find probability that the student knows offered by the examiner 3 questions. 25/30 * 24/29 * 23/28

145. A random variable X is distributed under an exponential law with parameter λ = 2. Find the mathematical expectation of X:

M(x) = λ = 2

146. Two shooters shoot on a target. The probability of hit in the target by the first shooter is 0,8, by the second – 0,9. Find probability that only one of shooters will hit in the target: 0.8 * 0.1 + 0.9* 0.2

147. A coin is tossed 5 times. Find probability that heads will land 3 times: C(3, 5) * 0.5 ^ 3 * 0.5 ^2

148. A coin is tossed 5 times. Find probability that heads never will land: C(0.5)*0.5^5

149. A coming up seeds of wheat makes 90 %. Find probability that 4 of 6 sown seeds will come up: C(4,6) * 0.9^4 * 0.1 ^2

150. A coming up seeds of wheat makes 90 %. Find probability that only one of 6 sown seeds will come up: C(6, 6) * 0.9 ^6

151. Identical products of three factories are delivered in a shop. The 1-st factory delivers 60 %, the 2-nd and 3-rd factories deliver 20 % each. 70 % of the 1st factory has the first sort, 80% of both the 2nd and the 3rd factories have the first sort. One product is bought. Find probability that it has the first sort: 0.74

152. The dispersion *D(X)* of a random variable *X* is equal to 1,96. Find σ(X): 1.4

153. Find dispersion *D(X)* of a random variable *X*, knowing the law of its distribution

x_i	1	2	3
p_i	0,2	0,5	0,3

M(x) = 0.2 + 1 + 0.9 = 2.1

M(x^2) = 0.2 + 2 + 2.7 = 4.9

D(x) = 0.49

154. If incompatible events **A**, **B** and **C** form a complete group, and P(**A**) + P(**B**) = 0,6 then P(**C**) is equal to: 0.4

155. Let **A** and **B** be events connected with the same trial. Show the event that means an appearance of **A** and a non-appearance of **B**. P(ABс чертой)

156. Let $\mathbf{A_1}$**,** $\mathbf{A_2}$**,** $\mathbf{A_3}$ be events connected with the same trial. Let **A** be the event that means occurrence only two of events $\mathbf{A_1}$**,** $\mathbf{A_2}$ and $\mathbf{A_3}$**.** Express the event **A** by the events $\mathbf{A_1}$**,** $\mathbf{A_2}$ and $\mathbf{A_3}$.

157. Let M be the number of all outcomes, and S be the number of non-favorable to the event **A** outcomes (S < M). Then P(A) is equal to: (M-S)/M

158. Five events form a complete group if they are: Some events form a *complete group* if in result of a trial at least one of them will appear.

159. There are 4000 tickets in a lottery, and 200 of them are winning. Two tickets have been bought. What is the probability that both tickets are winning? 200/4000 * 199/3999

160. If X is uniformly distributed over (0, 7), calculate the probability that X < 2: 2/7

161. If X is uniformly distributed over (0, 7), calculate the probability that X > 6: 1/7

162. There are 23 white, 35 black, 27 yellow and 25 red balls in an urn. One ball has been extracted from the urn. Find the probability that the extracted ball is white or yellow. 27/110

163. There are 15 red and 10 yellow balls in an urn. 6 balls are randomly extracted from the urn.

What is the probability that all these balls are red? C(6, 15)/ C(6, 25)

164. One letter has been randomly chosen from the word "STATISTICS". What is the probability that the chosen letter is "S"? 0.3

165. One letter has been randomly chosen from the word "PROBABILITY". What is the probability that the chosen letter is "I"? 2/11

166. How many 6-place phone numbers are there if only the digits “1”, “3” or “5” are used on the first place? 3*10^5

167. 150 shots have been made, and 25 hits have been registered. Find the relative frequency of hits in a target. 1/6

168. A point is thrown on an interval of length 3. Find the probability that the distance from the point to the ends of the interval is more than 1. 1/3

169. Two dice are tossed. What is the probability that the sum of aces will be more than 8?10/36

170. There are 4 children in a family. Assuming that the probabilities of births of boy and girl are equal, find the probability that the family has four boys: C(0, 4)*0.5^4

171. An urn contains 3 yellow and 6 red balls. Two balls have been randomly extracted from the urn. What is the probability that these balls will be of different color: 3*6/C(2, 9)

172. There are 5 books on mathematics and 8 books on biology in a book shelf. 3 books have been randomly taken. Find the probability that these books are on mathematics. 5/13 *4/12 *3 /11

173. There are 7 standard and 3 non-standard details in a box. 3 details have been randomly taken. Find the probability that only one of them is standard. C(1, 3) * C(2, 7)/ C(2, 10)

174. Three shooters shoot in a target. The probability of hit in the target at one shot by the 1st shooter is 0,8; by the 2^{nd} – 0,75 and by the 3^{rd} – 0,7. Find the probability of hit by all the shooters. 0.8*0.75*0.7 = 0.42

175. A student knows 17 of 25 questions of examination. Find the probability that he (or she) knows 3 randomly chosen questions. 17/25 * 16/24 * 15/23

176. One die is tossed. Find the probability that the number of aces doesn’t exceed 3. 1/2

177. Show the Markov inequality:

$$P(X > A) \leq M(X)/A$$

178. Two shooters shoot in a target. The probability of hit by the first shooter is 0,85, and by the second – 0,9. Find the probability that only one of the shooters will hit in the target. 0.85*0.1 + 0.9 * 0.15 = 0.22

179. Three dice are tossed. Find the probability that the sum of aces will be 9. 1/9

180. At shooting by a gun the relative frequency of hit in a target is equal to 0,9. Find the number of misses if 300 shots have been made. 300*0.9 = 270

181. A point is put on an interval of length 2. Find the probability that the distance from the point to the ends of the interval is more than 3/4. 2/8

182. There are 6 yellow and 6 red balls in an urn. 2 balls have been randomly taken. What is the probability that both balls are red? 6/12 * 5/11

183. Events A_1, A_2, A_3, A_4, A_5 are called independent in union if: Several events are *independent in union* (or just *independent*) if each two of them are independent and each event and all possible products of the rest events are independent.

184. There are 12 sportsmen in a group, and 8 of them are masters of sport. 6 sportsmen have been randomly selected. Find the probability that there are 2 masters of sport among the selected sportsmen. C(2, 8) * C(4, 12)/ C(2, 20)

185. A pack of 52 cards is carefully shuffled. Find the probability that three randomly extracted cards will be kings:

C(3,4)/ C(3, 52)

186. A circle of radius 4 cm is placed in a big circle of radius 8 cm. Find the probability that a randomly thrown point in the big circle will get as well in the small circle. 16/64 = 1/4

187. There are 7 yellow and 5 black balls in an urn. The event A consists in that the first randomly taken ball is black and the event B – the second randomly taken ball is yellow. Find P(AB). = 5/12 * 7/11

188. The probability to fail exam for the first student is 0,3; for the second – 0,4; for the third – 0,2. What is the probability that only one of them will pass the exam? 0.7 * 0.4 * 0.2 + 0.3 * 0.6 * 0.2 + 0.3 * 0.4 * 0.8

189. The probability of delay for the train №1 is equal to 0,15; and for the train №2 – 0,25. Find the probability that at least one train will be late. 1 – 0.85 * 0.25 = 0.7875

190. The probability of delay for the train №1 is equal to 0,15, and for the train №2 – 0,25. Find the probability that both trains will be late. 0.15 * 0.25 = 0.0375

191. The events A and B are independent, P(A) = 0,6; P(B) = 0,8. Find $P(\overline{A}B)$. 0.4 *0.8 = 0.32

192. Two independent events A and B are compatible, P(A) = 0,6; and P(B) = 0,75. Find $P(\overline{A}+\overline{B})$ = 0.4 + 0.25 – 0.4 * 0.25

193. Details are made at two factories, and the first of them delivers 70%, and the second - 30% of all consumed production. 90 of each hundred details of the first factory are standard on the average, and 80 – of the second factory. Find the probability that a randomly taken detail will be standard. 0.7 * 0.9 + 0.3*0.8 = 0.87

194. The probability of hit in 10 aces for a shooter at one shot is 0,8. Find the probability that for 15 independent shots the shooter will hit in 10 aces exactly 8 times. C(8, 10) * 0.8^8 * 0.2^2

195. It is known that 25 % of all details are non-standard. 8 details have been randomly taken. Find the probability that there is no more than 2 non-standard detail of the taken.

C(0, 8) * 0.25 ^8 + C(1, 8)*0.25^1*0.75^7 + C(2, 8)* 0.25 ^2* 0.75 ^6

196. For an event – appearance of four tails at tossing four coins - the opposite event is:

4 heads

197. A random variable X is given by the integral function of distribution:

$$F(x)=\begin{cases}0 \quad if \quad x\le 0,\\ \frac{1}{6}x \quad if \quad 0<x\le 6,\\ 1 \quad if \quad x>6.\end{cases}$$

Find the probability of hit of the random variable X in the interval (3; 5):

5/6 – 3/6 = 2/6 = 1/3

198. A random variable X is given by the density of distribution of probabilities:

$$f(x) = \begin{cases} 0 \text{ if } & x \le 0, \\ x/4 \text{ if } & 0 < x \le 2\sqrt{2} \\ 0 \text{ if } & x > 2\sqrt{2} \end{cases}$$

Find the function of distribution F(x). первообразная

199. The function of distribution of a random variable X is given by the formula:

$$F(x) = \begin{cases} 0 & \text{if} \quad x \le 0 \\ \cos^2 4x & \text{if } 0 < x \le \pi/4 \\ 1 & \text{if} \quad x > \pi/4 \end{cases}.$$

Find the density of distribution f(x). производная

200. A die is tossed before the first landing 3 aces. Find the probability that the first appearance of 3 will occur at the fourth tossing the die. 0,096

1266. **The probability that a day will be rainy is *p = 0,75*. Find the probability that a day will be clear.**

0,25

0,3

0,15

0,75

1

1267. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,4; and by the third – 0,9. What is the probability that the exam will be passed on "excellent" by only one student?**

0,424

0,348

0,192

0,208

0,992

1268. **If D(X)=3, find D(-3X+4).**

12

-5

19

27

-9

1269. **The table below shows the distribution of a random variable X. Find M[x] and D(X).**

X	-2	0	1
P	0.1	0.5	0.4

M[X]= 0,2; D(X) =0.8

M[X]= 0,3; D(X) =0.27

M[X]= 0,2; D(X) =0.76

M[X]= 0,2; D(X) =0.21

M[X]= 0,8; D(X) =0.24

1270. **Let *X* be a continuous random variable with density function** $f(x)=\begin{cases}\dfrac{|x|}{10} & for\ -2\le x\le 4\\ 0 & otherwise\end{cases}$ **Calculate the expected value of *X*.**

1/5

3/5

1

28/15

12/15

1271. **If P(E) is the probability that an event will occur, which of the following must be false?**

P(E)=1

P(E)=1/2

P(E)=1/3

P(E)= - 1/3

P(E)=0

1272. **A movie theatre sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?**

1

3

9

27

62

1273. **The probability is p = 0.85 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?**

40

20

8

34

124

1274. **Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?**

0.99

0.25

0.49

0.45

0.01

1275. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, what is the probability that it did not pass given that it is male.

0.17

0.21

0.42

0.08

0.196

1276. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

0.98

0.02

0.28

0.53

None of the shown answers

1277. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

0.9995

0,00005

0.15

0.6

0.5220

1278. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 3?

1/6

1/5

1/3

5/6

1/18

1279. **A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be Spades?**

4/17

1/17

2/17

1/4

4/17

1280. **In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?**

0.2995

0.699

0.23336

1/4

0.4999

1281. **Table shows the cumulative distribution function of a random variable X. Determine** $P(X > 4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

1/8

1

1/2

3/4

0

1282. **A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?**

1/3

3/8

5/8

1/8

1

1283. A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.

512/3375

28/65

8/15

1856/3375

36/65

1284. We are given the probability distribution functions of two random variables X and Y shown in the tables below.

X	1	3	**Y**	2	4
P	0.4	0.6	**P**	0.2	0.8

Find M[X+Y].

5,8

2,2

2

8,8

10

1285. In each of the 20 independent trials the probability of success is 0.2. Find the dispersion of the number of successes in these trials.

0

1

10

3.2

0.32

1286. A coin tossed three times. What is the probability that head appears three times?

1/8

0

4:1

1

8:1

There are 10 white, 15 black, 20 blue and 25 red balls in an urn. One ball is randomly extracted. Find the probability that the extracted ball is blue or red.

5/14

1/70

1/7

9/14

3/98

A random variable *X* has the following law of distribution:

x_i	0	1	2	3
p_i	1/30	3/10	½	1/6

Find the mathematical expectation of *X*.

1

1,5

2

1,8

2,3

A random variable *X* is given by the integral function of distribution:

$$F(x) = \begin{cases} 0 \quad if \quad x \le 2, \\ \frac{1}{2}x - 1 \quad if \;\; 2 < x \le 4, \\ 1 \quad if \quad x > 4. \end{cases}$$

Find the probability of hit of the random variable *X* into the interval (2; 3).

0,25

0,5

1/3

2/3

1

An urn contains 5 red, 3 white, and 4 blue balls. What is the probability of extracting a black ball from the urn?

1/3

0

0,25

0,5

5/12

1287. A class in probability theory consists of 3 men and 12 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores (rankings) are possible?

- Answer: 15!=1 307 674 368 000

1288. Ms. Jones has 15 books that she is going to put on her bookshelf. Of these, 4 are math books, 3 are chemistry books, 6 are history books, and 2 are language book. Ms. Jones wants to arrange her books so that all the books dealing with the same subject are together on the shelf. How many different arrangements are possible?

- Answer: 4!4!3!6!2!=4 976 640

1289. How many different signals, each consisting of 9 flags hung in a line, can be made from a set of 4 white flags, 3 red flags, and 2 blue flags if all flags of the same color are identical?

- Answer: 9! / 4!3!2!=1260

1290. A student has to answer to 10 questions in an examination. How many ways to answer exactly to 4 questions correctly?

- Answer:

1291. A bag contains six Scrabble tiles with the letters A-K-T-N-Q-R. You reach into the bag and take out tiles one at a time exactly six times. After you pick a tile from the bag, write

down that letter and then return the tile to the bag. How many possible words can be formed?

1292. Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one F?

- Answer: 1-(4/5)^4

1293. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

What is the probability that a student, taken at random from teacher's class, would have succeded the course, given that they succeeded the final?

1294. At a certain gas station 40% of the customers request regular gas, 35% request unleaded gas, and 25% request premium gas. Of those customers requesting regular gas, only 30% fill their tanks fully. Of those customers requesting unleaded gas, 60% fill their tanks fully, while of those requesting premium, 50% fill their tanks fully. If the next customer fills the tank, what is the probability that regular gas is requested.

- Answer: 0.25

1295. Insurance predictions for probability of auto accident.

	Under 25	25-39	Over 40
P	0.11	0.03	0.02

Table gives an insurance company's prediction for the likelihood that a person in a particular age group will have an auto accident during the next year. The company's policyholders are 25% under the age of 25, 25% between 25 and 39, and 50% over the age of 40. What is the probability that a random policyholder will have an auto accident next year?

1296. A friend who works in a big city owns two cars, one small and one large. Three-quarters of the time he drives the small car to work, and one-quarter of the time he drives the large car. If he takes the small car, he usually has little trouble parking, and so is at work on time with probability 0.8. If he takes the large car, he is at work on time with probability 0.7. What is the probability that he will not be at work on time tomorrow?

1297. A fair six-sided die is tossed. You win $3 if the result is a «5», you win $2 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the mathematical expectation of *X*?

1298. A fair six-sided die is tossed. You win $3 if the result is a «1», you win $1 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the dispersion of *X*?

1299. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation/ mean square (standard) deviation of X+Y?

- Answer: E[X+Y]=1 Var(X+Y)=1,68 sqrt(Var(X+Y))=1.2961

1300. A set of families has the following distribution on number of children:

X	x_1	x_2	2	3	4
P(X)	0.1	0.2	0.4	0.2	0.1

Determine x_1, x_2, if it is known that $M(X) = 3, D(X) = 1.5$?

1301. The lifetime of a machine part has a continuous distribution on the interval (0, 30) with probability density function $f(x) = c(10 + x)^{-2}$, $f(x) = 0$ otherwise. Calculate the probability that the lifetime of the machine part is less than 5.

1302. A random variable X is given by the (probability) density function of distribution:

$$f(x) = \begin{cases} 0 \quad if \quad x < 1 \text{ or } 7 \le x, \\ \dfrac{x-1}{9} \; if \; 1 \le x < 4, \\ \dfrac{7-x}{9} \; if \; 4 \le x < 7. \end{cases}$$

Find the cumulative distribution function of the random variable X?

- Answer
- $$F(x) = \begin{cases} 0 \quad if \quad x < 1, \\ \dfrac{(x-1)^2}{18} \; if \; 1 \le x < 4, \\ \dfrac{18-(7-x)^2}{18} \; if \; 4 \le x < 7, \\ 1 \quad if \quad 7 \le x. \end{cases}$$

1303. **A random variable *X* is given by the cumulative distribution function:**

$$F(x)=\begin{cases}0 & if \quad x\le 0,\\ \dfrac{Cx^3}{125} & if \;\; 0\le x<5,\\ 1 & if \quad 5\le x.\end{cases}$$

Find the mathematical expectation/dispersion of the random variable X?

1304. **The probability that a shooter will beat out 10 points at one shot is equal to 0.1 and the probability to beat out 9 points is equal to 0.3. Find the probability of the event A – the shooter will beat out 6 or less points.**

1305. **Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «only one student will pass the exam on "excellent"». Here $\overline{A}=A^c$.**

- $A_1\overline{A}_2\overline{A}_3+\overline{A}_1A_2\overline{A}_3+\overline{A}_1\overline{A}_2A_3$

1306. **A random variable *X* is given by the cumulative distribution function:**

$$F(x)=\begin{cases}0 & if \quad x<10,\\ \dfrac{x-10}{10} & if \;\; 10\le x<20,\\ 1 & if \quad 20\le x.\end{cases}$$

Find P (8 < X < 16).

1307. **A random variable X is given by the cumulative distribution function:**

$$F(x)=\begin{cases}0 & if \quad x\le 2,\\ \dfrac{1}{2}x-1 & if \;\; 2<x\le 4,\\ 1 & if \quad x>4.\end{cases}$$

Find the probability of hit of the random variable X into the interval (2.5; 4).

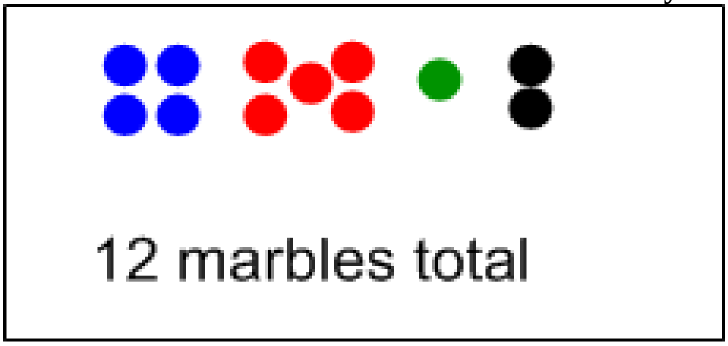
1308. **The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target at least one time. (exact value)**

1309. **All of the letters that spell STUDENT are put into a bag. Choose the correctly calculated probability of events.**

- P(drawing a S, and then drawing a T)=1/21
- P(drawing a T, and then drawing a D)=1/42

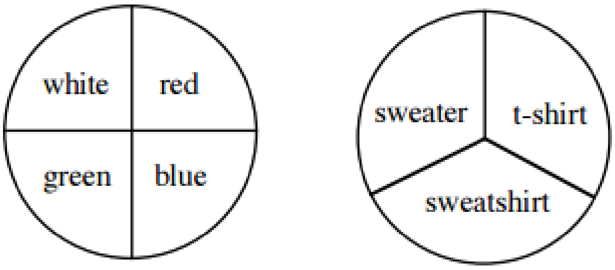
- P(selecting a vowel, and then drawing a U)=1/42
- P(selecting a vowel, and then drawing a K)=1/42
- P(selecting a vowel, and then drawing a T)=3/42

1310. A jar of marbles contains 4 blue marbles, 5 red marbles, 1 green marble, and 2 black marbles. A marble is chosen at random from the jar. After returning it again, a second marble is chosen. Choose the correctly calculated probability of events.



- P(green, and then red)=5/144
- P(black, and then black)=1/12
- P(red, and then black)=7/72
- P(green, and then blue)=1/72
- P(blue, and then blue)=1/6

1311.If each of the regions in each spinner is the same size.



Choose the correctly calculated probability of spinning each spinner.

- P(getting a red sweater)=1/12
- P(getting a white sweatshirt)=1/6
- P(getting a white sweater)=5/12
- P(getting a blue sweatshirt)=7/12
- P(getting a blue t-shirt)=1/6

1312.Find the Bernoulli formula.

- $$P_n(k) = \frac{n!}{k!(n-k)!} \cdot p^k \cdot (1-p)^{n-k}$$

- $P\left(B|A\right) = \frac{P(B)\cdot P(A|B)}{P(A)}$
- $P\left(B|A\right) = \frac{P(AB)}{P(A)}$
- $P_n\left(k\right) = \frac{1}{\sqrt{npq}}\cdot e^{-2pq}$
- $P_n\left(k\right) = \frac{1}{\sqrt{npq}}\cdot \Phi\left(\frac{k-np}{\sqrt{npq}}\right)$

1313.A coming up a grain stored in a warehouse is equal to 50%. What is the probability that the number of came up grains among 100 ones will make from a up to b pieces?

- $a = 5, b = 10, P = \Phi\left(\frac{10-100*0,5}{\sqrt{100*0,5*0,5}}\right) - \Phi\left(\frac{5-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

1314.Find the right statements.

- $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx$
- $M(X) = \int_{-\infty}^{+\infty} xf(x)dx$
- $F(x) = f'(x)$
- $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx - M(X)$
- $P(X > A) > \frac{M(X)}{A}$

1315.Find the <u>false</u> statements.

- $0 \le F(x) \le 1$
- $F(-\infty) = 0$
- $F(+\infty) = 0$
- $F(x) = P(X < x)$
- $\int_{-\infty}^{+\infty} f(x)dx = 1$

1316. Let a series of distribution of a random variable be given:

$$X = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}.$$ What does this tell us about the random variable X?

- $$F(x) = \begin{cases} 0 \quad if \quad x \le 1, \\ 0.1 \; if \; 1 < x \le 2, \\ 0.3 \; if \; 2 < x \le 3, \\ 0.6 \; if \; 3 < x \le 4, \\ 1 \quad if \quad 4 < x. \end{cases}$$
- $$F(x) = \begin{cases} 0 \quad if \quad x \le 1, \\ 0.1 \; if \; 1 < x \le 2, \\ 0.2 \; if \; 2 < x \le 3, \\ 0.3 \; if \; 3 < x \le 4, \\ 0.4 \quad if \quad 4 < x. \end{cases}$$
- $M(X) = 1$
- $M(X^2) = 9$
- $D(X) = 10$

1317. The probability of working each of four combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What are the possible values of X?

- 2
- -1
- 5
- 6
- -2

1318. The probability of working each of 3 combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What does this tell us about the random variable X?

- $P(X = 2) = 0.243$

- $P(X = 3) = 0.001$
- $P(X = 1) = 0.009$
- $P(X = 2) = 0.081$
- $P(X = 0) = 0.1$

1319. Suppose that the random variable X is the number of typographical errors on a single page of book has a Poisson distribution with parameter $\lambda = \frac{1}{4}$. What does this tell us about the random variable X?

- $M(X) = 0.25$
- $M(X) = 2$
- D(X)= - 8
- M(X) = 1
- $D(X) = 4$

1320. Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $a = 173,\ \sigma^2 = 36$. Find the correctly calculated probabilities of the events.

- $P(|X - 173| \leq 3) = 2\Phi\left(\frac{1}{2}\right)$

1321. Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(0; 10)$. Find the correctly calculated probabilities of the events.

1322. The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter λ. Find the correctly calculated probabilities of the events.

1323. Which of the following is a discrete random variable?

- The time of waiting a train.
- The number of boys in family having 4 children.
- A time of repair of TVs.
- The velocity in any direction of a molecule in gas.
- The height of a man.

1324. How would it change the expected value of a random variable X if we multiply the X by a number k.

1325. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

- Answer: $$f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$$

1326. Find the density function of random variable $X \sim U[a, b]$

$$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 \quad if & x < a \ or \ \ x > b. \end{cases}$$

1327. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

- ○ 1/4, always
- ● 1/4, if A and B are independent
- ○ 1/2, always
- ○ 1/2, if A and B are independent
- ○ None of the given answers

1328. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

- ● Φ(1.5)

1329. The cumulative distribution function for continuous random variable X is given by

$$F(x) = \begin{cases} 0, \ x < 0 \\ x/2, \ 0 \le x \le 2 \\ 1, \ x > 2 \end{cases}$$ **. Find the variance Var(X).**

Answer: $\frac{1}{3}$

1330. If the probability density function of a continuous random variable X is

$$f(x) = \begin{cases} kx^2 & 0 \le x \le 3 \\ 0 & otherwise \end{cases}$$ **then the value of k is**

1331. If E(X)=3, E(Y)=2 and X and Y are independent, find E(-3X+2Y-1).

1332. The table below shows the distribution of a random variable X. Find E[x^2].

X	-2	0	1
P	0.1	0.5	0.4

202. Events are *equally possible* if … two probability equally

203. The probability of the event *A* is determined by the formula P(A)=m/n

204. The probability of a reliable event is equal to … 1 или universal

205. The probability of an impossible event is equal to … 0 or null

206. The relative frequency of the event *A* is defined by the formula: W(A)=m/n

207. There are 50 identical details (and 5 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted. 1/10

208. A die is tossed. Find the probability that an even number of aces will appear. 1/2

209. Participants of a toss-up pull a ticket with numbers from 1 up to 60 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 3. 1/4

210. In a batch of 10 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to? 0.3

211. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,35. Find the number of hits if 20 shots were made. 7

212. Two dice are tossed. Find the probability that the same number of aces will appear on both dice 1/6

213. An urn contains 15 balls: 4 white, 6 black and 5 red. Find the probability that a randomly taken ball will be white. 4/15

214. 12 seeds have germinated of 36 planted seeds. Find the relative frequency of germination of seeds. 2.1/3

215. A point *C* is randomly appeared in a segment *AB* of the length 3. Determine the probability that the distance between *C* and *B* doesn't exceed 1. 1/3

216. A point *B(x)* is randomly put in a segment *OA* of the length 8 of the numeric axis *Ox*. Find the probability that both the segments *OB* and *BA* have the length which is greater than 3. 1/4

217. The number of all possible permutations Pn=n!

218. How many two-place numbers can be made of the digits 2, 4, 5 and 7 if each digit is included into the image of a number only once? 12

219. **The number of all possible allocations An'm=n!/(n-m)!**

220. **How many signals is it possible to make of 5 flags of different color taken on 3? 60**

221. **The number of all possible combinations Cnm=n!/m!(n-m)!**

222. **How many ways are there to choose 2 details from a box containing 13 details? 78**

223. **The numbers of allocations, permutations and combinations are connected by the equality An"m=Pm*Cn'm**

224. **4 films participate in a competition on 3 nominations. How many variants of distribution of prizes are there, if on each nomination are established different prizes. 64**

225. **If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by … ways. n+m**

226. **There are 200 details in a box. It is known that 150 of them are details of the first kind, 10 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the second kind from the box are there? 25 (C150"1+C10"1)**

227. **If an object *A* can be chosen from the set of objects by *m* ways and after every such choice an object *B* can be chosen by *n* ways then the pair of the objects (*A, B*) in this order can be chosen by ... ways. n*m**

228. **There are 15 students in a group. It is necessary to choose a leader, its deputy and head of professional committee. How many ways of choosing them are there? 2730**

229. **6 of 30 students have sport categories. What is the probability that 3 randomly chosen students have sport categories? 1/203**

230. **A group consists of 10 students, and 5 of them are pupils with honor. 3 students are randomly selected. Find the probability that 2 pupils with honor will be among the selected. 1/12 это ответ апайки, мой 5/12**

231. **It has been sold 15 of 20 refrigerators of three marks available in quantities of 5, 7 and 8 units in a shop. Assuming that the probability to be sold for a refrigerator of each mark is the same, find the probability that refrigerators of one mark have been unsold. Апайкин: 0,0016, мой: 0,005**

232. **A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the *i*-th shot» (*i* = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event *A* – «only two hit».**

K.

L.

M.

N.

O.

233. **A randomly taken phone number consists of 5 digits. What is the probability that all digits of the phone number are different. It is known that any phone number does not begin with the digit zero. Апайкин: 0,0001, мой: 0,3204**

234. **The probability of appearance of any of two incompatible events is equal to the sum of the probabilities of these events: P(A+B)=P(A)+P(B)**

235. **A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,5 and in the second – 0,3. Find the probability that the shooter will hit at one shot either in the first area or in the third area. 0.7**

236. **The sum of the probabilities of events $A_1, A_2, A_3, \ldots, A_n$ which form a complete group is equal to … 1**

237. **Two uniquely possible events forming a complete group are …**

K. Opposite

L. Same

M. Identically distributed

N. Sample

O. Density function

238. **The sum of the probabilities of opposite events is equal to … 1**

239. ***The conditional probability* of an event *B* with the condition that an event *A* has already happened is equal to: Pa(B)=P(AB)/P(A)**

240. **There are 4 conic and 8 elliptic cylinders at a collector. The collector has taken one cylinder, and then he has taken the second cylinder. Find the probability that the first taken cylinder is conic, and the second – elliptic. 8/33**

241. **The events *A, B, C* and *D* form a complete group. The probabilities of the events are those: $P(A)$ = 0,01; $P(B)$ = 0,49; $P(C)$ = 0,3. What is the probability of the event *D* equal to? 0.2**

242. **For independent events theorem of multiplication has the following form: P(AB)=P(A)*P(B)**

243. **The probabilities of hit in a target at shooting by three guns are the following: $p_1 = 0,6; p_2 = 0,7; p_3 = 0,5$. Find the probability of at least one hit at one shot by all three guns. 0.94**

244. **Three shots are made in a target. The probability of hit at each shot is equal to 0,6. Find the probability that only one hit will be in result of these shots. 0.288**

245. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,5; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by neither of the students? 0.07**

246. **10 of 20 savings banks are located behind a city boundary. 5 savings banks are randomly selected for an inspection. What is the probability that among the selected banks appears inside the city 3 savings banks? Апайкин: 9/38, мой: 225/646**

247. **A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will be solved ? 19/29**

248. **An urn contains 10 balls: 3 red and 7 blue. A second urn contains 6 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.54 . Calculate the number of blue balls in the second urn. 9**

249. **A bag contains 7 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue. 4/165**

250. **Find the Bernoulli formula Pn(K)=n!/k!(n-k)!*PkQn-k**

251. **Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?**

K. $A+B+C$

L. $A \cdot B \cdot C$

M. $A \cdot B^c \cdot C^c + A^c \cdot B \cdot C^c + A^c \cdot B^c \cdot C$

N. $(A+B+C)^c$

O. $AB+AC+BC$

○

252. **Find the dispersion for the given probability distribution.**

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

253.

○

○ 2.85

254. **How would it change the dispersion of a random variable X if we add a number a to the X.**

K. D(X+a)=D(X)+a

L. D(X+a)=D(X)+a^2

M. D(X+a)=D(X)

N. D(X+a)=$a \cdot$D(X)

O. D(X+a)= a^{2}D(X)

255. **The cumulative distribution function of a discrete random variable X is given by**

$$F(x) = \begin{cases} 0 & if\ x \le 2 \\ 0.5 & if\ 2 < x \le 5 \\ 0.8 & if\ 5 < x \le 8 \\ 1 & if\ x > 8 \end{cases}$$

Find P{3<X<9}. 0,5

256. **Find the expectation of a random variable X if the cumulative distribution function**

$$F(x) = \begin{cases} 1 - e^{-x/4}, x \ge 0 \\ 0, \quad x < 0 \end{cases}$$

. 4

257. **If the dispersion of a random variable X is given D(X)=4. Then D(2X) is D(2x)=16**

258. **Indicate the expectation of a Poisson random variable X with parameter λ. λ**

259. **The lifetime of a machine part has a continuous distribution on the interval (0, 20) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5. 0.5**

260. **What kind of distribution is given by the density function** $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{(x-\mu)^2}{2\sigma^2}}$ **(** $-\infty < x < \infty$ **)?**

K. Poisson distribution

L. Normal distribution

M. Uniform distribution

N. Bernoulli distribution

O. Exponential distribution

261. **Suppose the test scores of 10000 students are normally distributed with an expectation of 76 and mean square deviation of 8. The number of students scoring between 60 and 82 is: 7065,6 or 71%**

262. **The distribution of weights in a large group is approximately normally distributed. The expectation is 80 kg. and approximately 68,26% of the weights are between 70 and 90 kg. The mean square deviation of the distribution of weights is equal to: 0,3413**

263. **A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value of *X* is 18**

264. **The cumulative distribution function for continuous random variable X is given by** $F(x)=\begin{cases}0, & x<0\\ x/2, & 0\le x\le 2\\ 1, & x>2\end{cases}$. **Find the standard deviation** $\sigma(X)$. **Апайкин: 1/3, мой: 1/sqrt3**

265. **A continuous random variable X is exponentially distributed with the density** $f(x)=\begin{cases}3e^{-3x}, & x\ge 0\\ 0, & x<0\end{cases}$. **What is the M[X] and D(X)? MX=1/3 DX=1/9**

266. **How many different 5-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?6!**

267. **A fair coin is thrown in the air five times. If the coin lands with the head up on the first four tosses, what is the probability that the coin will land with the head up on the fifth toss? 1/2**

268. **A random variable Y has the following distribution:**

○ Y	○ -1	○ 0	○ 1	○ 2
○ P(Y)	○ C	○ 4C	○ 0.4	○ 0.1

269.

1333. **The value of the constant C is:0.1**

270. **Which one of these variables is a continuous random variable?**

K. The time it takes a randomly selected student to complete an exam.

L. The number of tattoos a randomly selected person has.

M. The number of women taller than 68 inches in a random sample of 5 women.

N. The number of correct guesses on a multiple choice test.

O. The number of 1's in N rolls of a fair die

271. **Heights of college women have a distribution that can be approximated by a normal curve with an expectation of 65 inches and a mean square deviation equal to 3 inches. About what proportion of college women are between 65 and 68 inches tall? 0,34134 Φ(1)-Φ(0)**

272. **A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...**

K. Probability distribution

L. The expected value

M. The standard deviation

N. Coefficient of variation

O. Correlation

273. For a continuous random variable X, the probability density function f(x) represents

K. the probability at a fixed value of X

L. the area under the curve at X

M. the area under the curve to the right of X

N. the height of the function at X

O. the integral of the cumulative distribution function

274. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is Апайкин: 0,51, мой: 0,49

275. Suppose that 10% of people are left handed. If 6 people are selected at random, what is the probability that exactly 2 of them are left handed? 0,0984

276. Which of these has a Geometric model?

K. the number of aces in a five-card Poker hand
L. the number of people we survey until we find two people who have taken Statistics
M. the number of people in a class of 25 who have taken Statistics
N. the number of people we survey until we find someone who has taken Statistics
O. the number of sodas students drink per day

277. In a certain town, 55% of the households own a cellular phone, 40% own a pager, and 25% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is 30%

278. A probability function is a rule of correspondence or equation that:

K. Finds the mean value of the random variable.

L. Assigns values of x to the events of a probability experiment.

M. Assigns probabilities to the various values of x.

N. Defines the variability in the experiment.

O. None of the given answers is correct.

279. Which of the following is an example of a discrete random variable?

K. The distance you can drive in a car with a full tank of gas.

L. The weight of a package at the post office.

M. The amount of rain that falls over a 24-hour period.

N. The number of cows on a cattle ranch.

O. The time that a train arrives at a specified stop.

280. Which of the following is the appropriate definition for the union of two events A and B?

K. The set of all possible outcomes.

L. The set of all basic outcomes contained within both A and B.

M. The set of all basic outcomes in either A or B, or both.

N. None of the given answers

O. The set of all basic outcomes that are not in A and B.

281. What is the probability of drawing a Diamond from a standard deck of 52 cards?

1334. What is the probability of drawing a diamond from a standard deck of 52 cards?

- 1/52
- 13/39
- 1/13
- 1/4
- 1/2

282. The probability density function of a random variable X is given by

$$f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$$

.

1335. What are the values of μ and σ?

- $\mu = 1, \sigma = 4$
- $\mu = -1, \sigma = 4$
- $\mu = -1, \sigma = 2$
- $\mu = 1, \sigma = 8$
- $\mu = 1, \sigma = 2$

283. The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=4. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:

1336. Апайкин: 0.14, мой: 0.24

284. Table shows the cumulative distribution function of a random variable X. Determine

X	1	2	3	4
F(X)	3/8	1/8	3/4	1

285.

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3
- Ответ 5/8 я решила апай подтвердила

286. Which of the following statements is always true for A and A^C ?

K. $P(AA^c)=1$

L. $P(A^c)=P(A)$

M. $P(A+A^c)=0$

N. $P(AA^c)=0$

O. None of the given statements is true

287. If P(A)=1/6 and P(B)=1/3 then $P(A \cap B)$ =

K. 1/18, always

L. 1/18, if A and B are independent

M. 1/6, always

N. 1/2, if A and B are independent

O. None of the given answers

288. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

- 24/75
- 24/35
- 6/35
- 12/75
- None of the given answers

289. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$.

K. $\lambda = np \sim const$, $n \to \infty,\ p \to 0$

L. $\lambda = \frac{n}{p}$, $n \to \infty$

M. $\lambda = ep$, $n \to \infty$

N. $\lambda = n^p$, p is const

O. None of the given answers is correct

290. **The probability density function of a random variable X is given by**

$$f(x) = \begin{cases} \frac{1}{\gamma - 2{,}5}, & if\ \ x \in (1{,}5;\,3) \\ 0, & otherwise \end{cases}$$

. Calculate the parameter γ **. 4**

291. **Probability density function of the normal random variable X is given by**

$$f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-3)^2}{50}}$$

. What is the mean square deviation?

- 5
- 3
- 25
- 50
- 9

292. **The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.**

K. p^5

L. $1-(1-p)^5$ correct

M. $(1-p)^5$

N. $1-p^5$

O. None of the given answers is correct

293. **Choose the density function of random variable**

K. $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for\ x \ge 0, \\ 0 & for\ \ x < 0. \end{cases}$

L. $$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 \quad if & x < a \ or \ x > b. \end{cases}$$

M. $$F(x) = \begin{cases} 0 & for \ x < 0, \\ 1 - e^{-\lambda x} & for \ x \ge 0. \end{cases}$$

N. $$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

O. $$P(X = m) = \frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$$

294. Choose the probability distribution function of random variable

K. $$P(X = m) = \frac{\lambda^m e^{-\lambda}}{m!}$$

L. $$P(X = m) = \frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$$

M. $$P(X = m) = C_n^m p^m q^{n-m}$$

N. $$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

O. $$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \ge 0, \\ 0 & for \quad x < 0. \end{cases}$$

295. Choose the probability density function of random variable

K. $$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

L. $$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \ge 0, \\ 0 & for \quad x < 0. \end{cases}$$

M. $$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 \quad if & x < a \ or \ x > b. \end{cases}$$

N. $$F(x) = \begin{cases} 0 & for \ x < 0, \\ 1 - e^{-\lambda x} & for \ x \ge 0. \end{cases}$$

O. $P(X = m) = C_n^m p^m q^{n-m}$

296. The mathematical expectation and dispersion of a random variable *X* distributed under the binomial law are …, respectively.

K.

L.

M.

N.

O.

297. The mathematical expectation and the dispersion of a random variable distributed under the Poisson are …, respectively.

K.

L.

M.

N.

O.

298. The probability distribution function of random variable is

K.

L. $P(X = m) = \dfrac{\lambda^m e^{-\lambda}}{m!}$

M. $P(X = m) = \dfrac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

N. $P(X = m) = C_n^m p^m q^{n-m}$

O. $\varphi_N(x) = \dfrac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

299. The mathematical expectation and dispersion of a random variable *X* having the geometrical distribution with the parameter *p* are …, respectively.

K.

L.

M.

N.

O.

300. **The mathematical expectation and dispersion of a random variable *X* having the uniformly distribution on [a,b] are …, respectively.**

K.

L.

M.

N.

O.

301. **A normally distributed random variable *X* is given by the differential function:**

$$f(x)=\frac{1}{\sqrt{2\pi}}\cdot e^{-\frac{x^2}{2}}$$

. Find the interval in which the random variable *X* will hit in result of trial with the probability 0,9973. (-3,3)

302. **Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.**

K. $f(x)=\frac{1}{3\sqrt{2\pi}}e^{-\frac{(x+3)^2}{18}}$

L. $f(x)=\frac{1}{4\sqrt{2\pi}}e^{-\frac{(x-5)^2}{32}}$

M. $f(x)=\frac{1}{3\sqrt{2\pi}}e^{-\frac{(x+5)^2}{8}}$

N. $f(x)=\frac{1}{3\sqrt{2\pi}}e^{-\frac{(x+5)^2}{16}}$

O. $f(x)=\frac{1}{5\sqrt{2\pi}}e^{-\frac{(x-4)^2}{16}}$

x_i	2	3	6	9
p_i	0,1	0,4	0,3	0,2

303. **A discrete random variable X is given by the following law of distribution:**

○

○

○

-
- **By using Chebyshev inequality estimate the probability that |X-M(X)|>3.1/3**

1337. **The probabilities that three men hit a target are respectively 1/6, 1/4 and 1/3. Each man shoots once at the target. What is the probability that exactly one of them hits the target?**

1/6*3/4*2/3+5/6*1/4*2/3+5/6*3/4*1/3

- ○ 11/72
- ○ 21/72
- ● 31/72
- ○ 3/4
- ○ 17/72

1338. **A problem in mathematics is given to three students whose chances of solving it are 1/3, 1/4, 1/5. What is the probability that the problem will be solved?**

- ○ 0.2
- ○ 0.8
- ○ 0.4
- ● 0.6
- ○ 1

1339. **You are given $P[A \cup B] = 0.7$ and $P[A \cup B^c] = 0.9$. Determine $P[A]$.**

- ○ 0.2
- ● 0.3
- ○ 0.4
- ○ 0.6
- ○ 0.8

1340. **An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.44 . Calculate the number of blue balls in the second urn.**

4/10*16/20+6/10*4/20=(64+24)/200=88/200=44/100=0.44

- ● 4
- ○ 20
- ○ 24

- 44
- 64

1341. **The probability that a boy will not pass an examination is 3/5 and that a girl will not pass is 4/5. Calculate the probability that at least one of them passes the examination.**

3/5*1/5+2/5*4/5+2/5*1/5= (3+8+2)/25=13/25

- 11/25
- 13/25
- 1/2
- 7/25
- 16/25

1342. **A bag contains 5 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue.**

4/9*3/8*2/7=24/504=1/21

- 1/21
- 2/21
- 1/7
- 4/21
- 1/3

1343. **Find the variance for the given probability distribution.**

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

(4*0.17+16*0.43+36*0.35)-(2*0.17+4*0.43+6*0.35)^2

- 1.5636
- 2.8544
- 1.6942
- 2.4484
- 1.7222

1344. **A bag contains 5 white, 7 red and 8 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?**

- $1-\left(\frac{1}{4}\right)^4$
- $1-\left(\frac{3}{4}\right)^4$
- $\left(\frac{3}{4}\right)^4$
- 0.7182

- $\left(\frac{1}{4}\right)^4$

1345. Формулой Бернулли называется формула

- $P_n(k)=\frac{1}{\sqrt{npq}}\cdot\varphi(x)$
- $P_n(k)=\binom{n}{k}\cdot p^k\cdot(1-p)^{n-k}$
- $P_n(k)=\frac{\lambda^k e^{-\lambda}}{k!}$
- $P(B|A)=\frac{P(B)\cdot P(A|B)}{P(A)}$
- $P_n(k)=\frac{1}{\sqrt{npq}}\cdot e^{-2p(1-p)}$

1346. Indicate the formula of computing variance of a random variable X with expectation μ.

- $Var(X)=E(X^2)-\mu^2$
- $Var(X)=E(X-\mu)$
- $Var(X)=(E(X^2)-\mu)^2$
- $Var(X)=E(X^2)-\mu$
- $Var(X)=E(X^2)$

1347. How would it change the variance of a random variable X if we add a number a to the X?

- Var(X+a)=Var(X)+a
- Var(X+a)=Var(X)+a²
- Var(X+a)=Var(X)
- Var(X+a)= $a^2\cdot$ Var(X)
- Var(X+a)=Var(X)+a²

1348. How would it change the expected value of a random variable X if we multiply the X by a number k.

- $E[kX]=k\cdot E[X]$
- $E[kX]=|k|\cdot E[X]$
- $E[kX]=E[X]$
- $E[kX]=E[X]+k$

- ○ $E[kX]=k^2\cdot E[X]$

1349. Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?

- ○ $A+B+C$
- ○ $A\cdot B\cdot C$
- ● $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $AB+AC+BC$

1350. Which of the following expressions indicates the occurrence of at least one of the events A, B, C?

- ● $A+B+C$
- ○ $A\cdot B\cdot C$
- ○ $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $A^c\cdot B^c\cdot C^c$

1351. Which of the following expressions indicates the occurrence of all three events A, B, C simultaneously?

- ○ $A+B+C$
- ● $A\cdot B\cdot C$
- ○ $A\cdot B\cdot C^c+A^c\cdot B\cdot C+A\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $A^c\cdot B^c\cdot C^c$

1352. Which of the following expressions indicates the occurrence of exactly two of events A, B, C?

- ○ $(A+B)\cdot C^c$
- ○ $AB+AC+BC$
- ○ $(A+B)(B+C)(A+C)$
- ● $A\cdot B\cdot C^c+A^c\cdot B\cdot C+A\cdot B^c\cdot C$
- ○ $A\cdot B\cdot C^c$

1353. Conditional probability P(A|B) can be defined by

- ○ $P(A|B)=P(A)\cdot P(B)$
- ● $P(A|B)=\dfrac{P(A\cdot B)}{P(B)}$

- ○ $P(A|B)=\frac{P(A\cdot B)}{P(A)}$
- ○ $P(A|B)=P(A)-P(B)$
- ○ $P(A|B)=P(A)+P(B)-P(A\cdot B)$

1354. Urn I contains a white and b black balls, whereas urn II contains c white and d black balls. If a ball is randomly selected from each urn, what is the probability that the balls will be both black?

- ○ $\frac{b}{a}+\frac{d}{c}$
- ● $\frac{b}{a+b}\cdot\frac{d}{c+d}$
- ○ $\frac{b}{a+b}+\frac{d}{c+d}$
- ○ $\frac{b}{a}\cdot\frac{d}{c}$
- ○ $\frac{b+d}{a+b+c+d}$

1355. The table below shows the probability mass function of a random variable X.

x_i	0	x_2	5
p_i	0.1	0.2	0.7

If E[X]=5,5 find the value of x_2.

5.5-(5*0.7)=x2*0.2

2=x2*0.2

X2=2/0.2

X2=10

- ○ 3
- ○ 1
- ○ 12
- ○ 0.8
- ● 10

1356. The probability of machine failure in one working day is equal to 0.01. What is the probability that the machine will work without failure for 5 days in a row.

(1-0.01)^5

- ○ 0.99999
- ● 0.95099

- 1
- 0.05
- 0.55

1357. **The cumulative distribution function of a discrete random variable X is given by**

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.4 & if\ \ 2<x\le 5\\ 0.9 & if\ \ 5<x\le 8\\ 1 & if\ \ x>8\end{cases}$$

Find P{3<X<9}.

1-0.4

- 0,4
- 0,5
- 0,6
- 0,9
- 1

1358. **A fair die is rolled three times. A random variable X denotes the number of occurrences of 6's. What is the probability that X will have the value which is not equal to 0.**

P(# of 6's is not 0)
= 1 - P(# of 6's is 0)

= 1 - (5/6)^3
= 0.4213=91/216

- 91/216
- 125/216
- 25/216
- 1/216
- 215/216

1359. **Find the expectation of a random variable X if the cdf** $F(x)=\begin{cases}1-e^{-x/5}, x\ge 0\\ 0, \quad x<0\end{cases}$**.**

- -5
- e^{-5}
- 5
- 6
- 1/5

1360. **Compute the mean for continuous random variable X with probability density function** $f(x=\begin{cases}2(1-x), & if\ \ 0\le x\le 1\\ 0, & otherwise\end{cases}$**.**

- 2/3
- 0
- 1/3
- 1
- Mean does not exist

1361. If the variance of a random variable X is given Var(X)=3. Then Var(2X) is

2^2*3=12

- 12
- 6
- 3
- 1
- 9

1362. Indicate the expectation of a Poisson random variable X with parameter λ.

- 0
- λ
- $1/\lambda$
- $\lambda(1-\lambda)$
- λ^2

1363. Indicate the variance of a Poisson random variable X with parameter λ.

- λ
- 0
- $\frac{1}{\lambda}$
- $\lambda(1-\lambda)$
- λ^2

1364. Indicate the formula for conditional expectation.

- $E[E[X\,|\,Y] = E[X\,|\,Y]$
- $E[E[X\,|\,Y] = E[X]$
- $E[E[X\,|\,Y] = \{E[X\,|\,Y]\}^2$
- $E[E[X\,|\,Y] = E[X]\cdot E[Y]$
- $E[E[X\,|\,Y] = E[XY]$

1365. The table below shows the pmf of a random variable X. What is the Var(X)?

X	-2	1	2
P	0,1	0,6	0,3

4*0.1+1*0.6+4*0.3-(-2*0.1+1*0.6+2*0.3)^2=1.2

- 0.5
- 1.67
- 4.71
- 1.2
- 4.7

1366. The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 6.

- 0.04
- 0.15
- 0.47
- 0.53
- 0.94

1367. The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5.

- 0.03
- 0.13
- 0.42
- 0.58
- 0.97

1368. If Var(X)=2, find Var(-3X+4).

(-3)^2*2

- 12
- 10
- 9
- 18
- 3

1369. The table below shows the pmf of a random variable X. Find E[X] and Var(X).

X	-1	0	1
P	0.2	0.3	0.5

0.7-0.09=0.61

- E[X]= 0,7; Var(X) =0.24

- E[X]= 0,3; Var(X) =0.27
- E[X]= 0,3; Var(X) =0.61
- E[X]= 0,8; Var(X) =0.21
- E[X]= 0,8; Var(X) =0.24

1370. What kind of distribution is given by the density function $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ **(** $-\infty < x < \infty$ **)?**

- Poisson distribution
- Normal distribution
- Uniform distribution
- Bernoulli distribution
- Exponential distribution

1371. If a fair die is tossed twice, the probability that the first toss will be a number less than 4 and the second toss will be greater than 4 is

3/6*2/6=6/36=1/6

- 1/3
- 5/6
- 1/6
- 3/4
- 0

1372. A class consists of 490 female and 510 male students. The students are divided according to their marks

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, the probability that it did not pass given that it is female is:

(60/1000)/(490/1000)=0.12

- 0.06
- 0.12
- 0.41
- 0.81
- none of the shown answers

1373. Marks on a Chemistry test follow a normal distribution with a mean of 65 and a standard deviation of 12. Approximately what percentage of the students have scores below 50?

(z<50)=z<(50-65)/12=z<-1.25=0.105 == 11%

- 11%
  - 89%
  - 15%
  - 18%
  - 39%

1374. Suppose the test scores of 600 students are normally distributed with a mean of 76 and standard deviation of 8. The number of students scoring between 70 and 82 is:

70<z<82= (82-76)/8-((70-76)/8)=0.77-0.22=0.5

600*0.5

Vrode tak hz primernye cifry vzyalW

  - 272
  - 164
  - 260
  - 136
- 328

1375. The distribution of weights in a large group is approximately normally distributed. The mean is 80 kg. and approximately 68% of the weights are between 70 and 90 kg. The standard deviation of the distribution of weights is equal to:

  - 20
  - 5
  - 40
  - 50
- 10

1376. The probability density function of a continuous random variable *X* is

$$f(x) = \begin{cases} 0.5x & 0 \le x \le 2 \\ 0 & otherwise \end{cases}$$ **Find** $P\{0 \le x \le 1.5\}$.

Интеграл мутим 0,5x

И будет ½ * (x^2)/2 = x^2/4=1.5^2/4=2.25/4=0.56

- 0.5625
  - 0.3125
  - 0.1250
  - 0.4375
  - 0.1275

1377. Let *X* be a continuous random variable with density function

$$f(x) = \begin{cases} \frac{|x|}{10} & for -2 \le x \le 4 \\ 0 & otherwise \end{cases}$$ **Calculate the expected value of *X*.**

Tak kak zdes abs(x) to berem integral ot 2 do 4 (x*x/10 dx) = x3/30 ot 4 do 2 = 64/30-8/30=56/30=28/15

- ○ 1/5
- ○ 3/5
- ○ 1
- ● 28/15
- ○ 12/5

1378. The probability density function of a continuous random variable X is

$$f(x)=\begin{cases} kx^2 & 0\le x\le 2 \\ 0 & otherwise \end{cases}.$$ **Find the value of k.**

K * integral ot 0 do 2 (x^2) =1

k* x^3/3 ot 0 do 2 = 1

8/3=1/k

K=3/8=0.375

- ○ 2
- ○ 0.25
- ● 0.375
- ○ 2.25
- ○ Any positive value greater than 2

1379. A continuous random variable *X* is uniformly distributed over the interval [10, 16]. The expected value of *X* is

(a+b)/2=(10+16)/2=13

- ○ 16
- ● 13
- ○ 10
- ○ 7
- ○ 6

1380. If X and Y are independent random variables with $p_X(0)=0.5$, $p_X(1)=0.3$, $p_X(2)=0.2$ **and** $p_Y(0)=0.6$, $p_Y(1)=0.1$, $p_Y(2)=0.25$, $p_Y(3)=0.05$. **Then** $P\{X\le 1\; and\; Y\le 1\}$ **is**

(0.5+0.3)*(0.6+0.1)=0.8*0.7=0.56

- ○ 0.30
- ● 0.56
- ○ 0.70
- ○ 0.80
- ○ 1

1381. How many different three-member teams can be formed from six students?

C (3,6) = 6!/(6-3)!3! = 20

- 20
  - 120
  - 216
  - 720
  - 6

1382. **How many different 6-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?**

6!

- 6
- 36

- 720
  - 46.656
  - 72

1383. **If P(E) is the probability that an event will occur, which of the followings must be false?**

- P(E)=1
- P(E)=1/2
- P(E)=1/3

- P(E)= -1
  - P(E)=0

1384. **A die is rolled. What is the probability that the number rolled is greater than 2 and even? Only 4 and 6**

2/6=1/3

- 1/2

- 1/3
  - 2/3
  - 5/6
  - 0

1385. **A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?**

1 4   4 1   3 2   2 3   5 5   4 6   6 4   so 7/36

Complement will be 29/36

- 2/36
- 12/36

- 29/36
  - 32/36
  - 9/36

1386. The cumulative distribution function for continuous random variable X is given by

$$F(x) = \begin{cases} 0, \ x < 0 \\ x, \ 0 \le x \le 1 \\ 1, \ x > 1 \end{cases}$$ **. Find the standard deviation** $\sigma(X)$**.**

Expectation : Integral from 0 to 1 xdx= x^2/2 ot 0 do 1= ½

Variance: integral from 0 to 1 (x- 1/2)^2 dx = 1/12

- ○ $\frac{1}{\sqrt{6}}$
- ○ $\frac{1}{6}$
- ● $\frac{1}{\sqrt{12}}$
- ○ $\frac{1}{4}$
- ○ $\frac{1}{12}$

1387. A continuous random variable X uniformly distributed on [-2;6]. Find E[X] and Var(X).

(A+b)/2 = -2+6 / 2 = 2

(b-a)^2 / 12 = 64 / 12= 16/3

- ○ 4 and $\frac{4}{3}$
- ○ $\frac{16}{3}$ and 2
- ● 2 and $\frac{16}{3}$
- ○ $\frac{2}{3}$ and 2
- ○ 2 and $\frac{4}{3}$

1388. A continuous random variable X is exponentially distributed with the density

$$f(x) = \begin{cases} 2e^{-2x}, & x \ge 0 \\ 0, & x < 0 \end{cases}$$ **. What is the E[X] and Var(X)?**

Tut lambda = 2

So, mean = 1/lambda

Variance = 1/ lambda^2

- ○ $\frac{1}{6}$ and $\frac{1}{2}$
- ○ $\frac{1}{4}$ and $\frac{1}{2}$

- ● $\frac{1}{2}$ and $\frac{1}{4}$
- ○ $\frac{1}{2}$ and $\frac{1}{6}$
- ○ $\frac{1}{4}$ and $\frac{1}{6}$

1389. The expression $\binom{9}{2}$ is equivalent to

- ○ $\frac{9!}{7!}$
- ○ $\frac{9!}{2!}$
- ● $\frac{9!}{7! \cdot 2!}$
- ○ $\frac{9}{14}$
- ○ $\frac{9! \cdot 2!}{7!}$

1390. Evaluate 1!+2!+3!

- ○ 5
- ○ 6
- ● 9
- ○ 10
- ○ 12

1391. A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?

- ○ 2/36
- ○ 12/36
- ● 29/36
- ○ 32/36
- ○ 1/36

1392. Your state issues license plates consisting of letters and numbers. There are 26 letters and the letters may be repeated. There are 10 digits and the digits may be repeated. How many possible license plates can be issued with two letters followed by three numbers?

26*26*10*10*10

- ○ 25000
- ○ 67600

- 250000
- 676000

- 2500

1393. A random variable *X* has the cumulative distribution function

$$F(x) = \begin{cases} 0 & for\ x < 1 \\ \dfrac{x^2 - 2x + 2}{2} & for\ 1 \le x < 2 \\ 1 & for\ x \ge 2 \end{cases}$$

Compute the expectation of X.

- 7/72
- 1/8
- 5/6
- 4/3
- 23/12

1394. A fair coin is thrown in the air four times. If the coin lands with the head up on the first three tosses, what is the probability that the coin will land with the head up on the fourth toss?

- 0
- 1/16
- 1/8
- 1/2
- 1/4

1395. A movie theater sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?

3*3

- 1
- 3
- 9
- 27
- 62

1396. A random variable Y has the following distribution:

Y | -1 0 1 2

P(Y)| 3C 2C 0.4 0.1
The value of the constant C is:

(1-0.5)=5c

0.5=5c

C=0.1

- 0.1
  - 0.15
  - 0.20
  - 0.25
  - 0.75

1397. A random variable X has a probability distribution as follows:

X	0	1	2	3
P(X)	2k	3k	13k	2k

Then the probability that P(X < 2.0) is equal to

5k/20k=0.25k

  - 0.90
- 0.25
  - 0.65
  - 0.15
  - 1

1398. Which one of these variables is a continuous random variable?

- The time it takes a randomly selected student to complete an exam.
  - The number of tattoos a randomly selected person has.
  - The number of women taller than 68 inches in a random sample of 5 women.
  - The number of correct guesses on a multiple choice test.
  - The number of 1's in N rolls of a fair die

1399. Heights of college women have a distribution that can be approximated by a normal curve with a mean of 65 inches and a standard deviation equal to 3 inches. About what proportion of college women are between 65 and 67 inches tall?

65<z<67

(67-65)/3 – (65-65)/3= 0.74-0.5= 0.25

  - 0.75
  - 0.5
- 0.25
  - 0.17
  - 0.85

1400. The probability is p = 0.80 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

40*0.8=32

- ○ 40
- ○ 20
- ○ 8
- ● 32
- ○ 124

1401. A medical treatment has a success rate of 0.8. Two patients will be treated with this treatment. Assuming the results are independent for the two patients, what is the probability that neither one of them will be successfully cured?

1-0.8=0.2

0.2*0.2=0.04

- ○ 0.5
- ○ 0.36
- ○ 0.2
- ● 0.04
- ○ 0.4

1402. A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...

- ● Probability distribution
- ○ The expected value
- ○ The standard deviation
- ○ Coefficient of variation
- ○ Correlation

1403. Given a normal distribution with μ=100 and σ=10, what is the probability that X>75?

1-z<75= 1 – (z<(75-100)/10)=1- z(-2.5)= 1- 0.006=0.99

- ● 0.99
- ○ 0.25
- ○ 0.49
- ○ 0.45
- ○ 0

1404. Which of the following is not a property of a binomial experiment?

- ○ the experiment consists of a sequence of n identical trials
- ○ each outcome can be referred to as a success or a failure
- ● the probabilities of the two outcomes can change from one trial to the next
- ○ the trials are independent

- binomial random variable can be approximated by the Poisson

1405. Which of the following random variables would you expect to be discrete?

- The weights of mechanically produced items
- The number of children at a birthday party
- The lifetimes of electronic devices
- The length of time between emergency arrivals at a hospital
- The times, in seconds, for a 100m sprint

1406. Two events each have probability 0.2 of occurring and are independent. The probability that neither occur is

0.8*0.8 = 0.64

- 0.64
- 0.04
- 0.2
- 0.4
- none of the given answers

1407. A smoke-detector system consists of two parts A and B. If smoke occurs then the item A detects it with probability 0.95, the item B detects it with probability 0.98 whereas both of them detect it with probability 0.94. What is the probability that the smoke will not be detected?

- 0.01
- 0.99
- 0.04
- 0.96
- None of the given answers

1408. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	**Did not pass**
Female	**430**	**60**
Male	**410**	**100**

If one person is selected randomly, what is the probability that it did not pass given that it is male.

(100/1000)/(510/1000) = 0.196

- 0.066
- 0.124
- 0.414
- 0.812

- 0.196

1409. A company which produces a particular drug has two factories, A and B. 30% of the drug are made in factory A, 70% in factory B. Suppose that 95% of the drugs produced by the factory A meet specifications while only 75% of the drugs produced by the factory B meet specifications. If I buy the drug, what is the probability that it meets specifications?

0.3*0.95+0.7*0.75=0.81

- 0.95
- 0.81
- 0.75
- 0.7
- 0.995

1410. Twelve items are independently sampled from a production line. If the probability any given item is defective is 0.1, the probability of at most two defectives in the sample is closest to …

p(0) + p(1) + p(2)
p(0) = c(12,0) * .1^0 * .9^12 = .2824
p(1) = c(12,1) * .1^1 * .9^11 = .3766
p(2) = c(12,2) * .1^2 * .9^10 = .2301

add them up and you get .8891

- 0.3874
- 0.9872
- 0.7361
- 0.8891
- None of the shown answers

1411. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

C(5,6)*c(3,4)/c(8,10)=

Or

C(5,6)/c(8,10)=0.133

- 0.282
- 0.02
- 0.376
- 0.133
- None of the shown answers

1412. Suppose that 10% of people are left handed. If 8 people are selected at random, what is the probability that exactly 2 of them are left handed?

8c2*0,1^2*0.9^6

- ○ 0.0331
- ○ 0.0053
- ● 0.1488
- ○ 0.0100
- ○ 0.2976

1413. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

1- 0.15^4

- ● 0.9995
- ○ 5.06 × 10-4
- ○ 0.15
- ○ 0.6
- ○ 0.5220

1414. Which of these has a Geometric model?

- ○ the number of aces in a five-card Poker hand
- ○ the number of people we survey until we find two people who have taken Statistics
- ○ the number of people in a class of 25 who have taken Statistics
- ● the number of people we survey until we find someone who has taken Statistics
- ○ the number of sodas students drink per day

1415. In a certain town, 50% of the households own a cellular phone, 40% own a pager, and 20% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is

0.5*(1-0.4)

- ○ 90%
- ○ 70%
- ○ 10%
- ● 30%.
- ○ 25%

1416. Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that the first and third selected are women?

7/12*6/11*5/10+7/12*5/11*6/10= (7*6*5) / (12*11*10) * 2 =0.3182

- ● 0.3182
- ○ 0.5817
- ○ 0.78
- ○ 0.916
- ○ 0.1211

1417. Twenty percent of the paintings in a gallery are not originals. A collector buys a painting. He has probability 0.10 of buying a fake for an original but never rejects an original as a fake, What is the (conditional) probability the painting he purchases is an original?

- 1/41
- 40/41
- 80/41
- 1
- 40/100

1418. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{t \le 0\}$.

- 0.8
- 0.5
- 0.3
- 0.2
- 0.1

1419. A probability function is a rule of correspondence or equation that:

- Finds the mean value of the random variable.
- Assigns values of x to the events of a probability experiment.
- Assigns probablities to the various values of x.
- Defines the variability in the experiment.
- None of the given answers is correct.

1420. Which of the following is an example of a discrete random variable?

- The distance you can drive in a car with a full tank of gas.
- The weight of a package at the post office.
- The amount of rain that falls over a 24-hour period.
- The number of cows on a cattle ranch.
- The time that a train arrives at a specified stop.

1421. Which of the following is the appropriate definition for the union of two events A and B?

- The set of all possible outcomes.
- The set of all basic outcomes contained within both A and B.
- The set of all basic outcomes in either A or B, or both.
- None of the given answers
- The set of all basic outcomes that are not in A and B.

1422. Johnson taught a music class for 25 students under the age of ten. He randomly chose one of them. What was the probability that the student was under twelve?

- 1
  - 0.5
  - 1/25
  - 0
  - 0.25

1423. The compact disk Jane bought had 12 songs. The first four were rock music. Tracks number 5 through 12 were ballads. She selected the random function in her CD Player. What is the probability of first listening to a ballad?

8/12=2/3

  - 1/3
- 2/3
  - 1/2
  - 1/6
  - 1/12

1424. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 5?

1 5 5 1 4 2 2 4 3 3 1/5

  - 1/6
- 1/5
  - 1/3
  - 5/6
  - 1/18

1425. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be hearts?

13/52*12/51

  - 4/17
- 1/17
  - 2/17
  - 1/4
  - 4/17
  - 33/68

1426. What is the probability of drawing a diamond from a standard deck of 52 cards?

13/52=1/4

  - 1/52
  - 13/39
  - 1/13
- 1/4

- 1/2

1427. **One card is randomly selected from a shuffled deck of 52 cards and then a die is rolled. Find the probability of obtaining an Ace and rolling an odd number.**

4/52*3/6=1/26

- 1/104
- 7/13
- 1/39
- 1/26
- 1/36

1428. **The probability that a particular machine breaks down on any day is 0.2 and is independent of the breakdowns on any other day. The machine can break down only once per day. Calculate the probability that the machine breaks down two or more times in ten days.**

Chance of exactly 0 breakdowns in 10 days: 0.8^10 = 0.1073741824
Chance of exactly 1 breakdown in 10 days: 0.8^9 * 0.2^1 * C(10,1) = 0.268435456
Chance of 2 or more breakdowns in 10 days: 1 - 0.1073741824 - 0.268435456 = 0.6241903616

- 0.0175
- 0.0400
- 0.2684
- 0.6242
- 0.9596

1429. **Let A, B and C be independent events such that P(A) = 0.5, P(B) = 0.6 and P(C) = 0.1. Calculate** $P(A^c \cup B^c \cup C)$

0.5+0.4-0.5*0.4 = 0.7

0.7+0.1-0.7*0.1=0.73

- 0.69
- 0.71
- 0.73
- 0.98
- 1

1430. **The pdf of a random variable X is given by** $f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$.

What are the values of μ and σ?

x-a po formule

2 * sigma^2=8

Sigma=2

- $\mu = 1, \sigma = 4$

○ $\mu = -1, \sigma = 4$

● $\mu = -1, \sigma = 2$

○ $\mu = 1, \sigma = 8$

○ $\mu = 1, \sigma = 2$

1431. What quantity is given by the formula $\frac{Cov(X,Y)}{\sqrt{Var(X) \cdot Var(Y)}}$?

○ Covariance of the random variables X and Y

● Correlation coefficient

○ Coefficient of symmetry

○ Conditional expectation

○ None of the given answers is correct

1432. In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?

C(4,1)*c(48,4) /   c(52,5) =

● 0.2995

○ 0.699

○ 0.23336

○ 1/4

○ 0.4999

1433. The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=3. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:

$$P(X = x) \quad = \quad e^{-\lambda}\frac{\lambda^x}{x!} \qquad x = 0, 1, 2, 3, 4, \ldots$$

E^(-3)*3^2/2! +e^(-3)*3+e^-3= 0.42319

○ 0.64726

○ 0.81521

● 0.42319

○ 0.18478

○ 0.08391

1434. Table shows the cumulative distribution function of a random variable X. Determine $P(X \geq 2)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3

1435. Table shows the cumulative distribution function of a random variable X. Determine $P(X > 4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 1
- 1/2
- 3/4
- 0

1436. Which of the following statements is always true for A and A^C ?

- $P(AA^c)=1$
- $P(A^c)=P(A)$
- $P(A+A^c)=0$
- $P(AA^c)=0$
- None of the given statements is true

1437. Consider the universal set U and two events A and B such that $A \cap B = \varnothing$ and $A \cup B = U$. We know that P(A)=1/3. Find P(B).

- 2/3
- 1/3
- 4/9
- Cannot be determined
- 1

1438. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?

- 1/3
- 3/8
- 5/8
- 1/8
- 1

1439. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

○ 1/4, always

● 1/4, if A and B are independent

○ 1/2, always

○ 1/2, if A and B are independent

○ None of the given answers

1440. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

$$\mathbb{P}(A \mid B) = \frac{\mathbb{P}(A \cap B)}{\mathbb{P}(B)},$$

X / (2/7) = 3/5

X= 2/7 * 3/5 = 6/35

6/35 / 1/ 4 = p B | A

6/35* 4/1 = 24/35

○ 24/75

● 24/35

○ 6/35

○ 12/75

○ None of the given answers

1441. A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.

((c(8,2)*c(7,1) + c(8,3)*c(7,0)))/ (15,3)=

○ 512/3375

● 28/65

○ 8/15

○ 1856/3375

○ 36/65

1442. If the variance of a random variable X is equal to 3, then Var(3X) is :

3^2*3

○ 12

○ 6

○ 3

● 27

○ 9

1443. Let X and Y be continuous random variables with joint cumulative distribution function $F(x,y)=\frac{1}{250}\left(20xy-x^2y-xy^2\right)$ **for** $0\le x\le 5$ **and** $0\le y\le 5$. **Find P(X>2).**

- ○ 3/125
- ○ 11/50
- ● 12/25
- ○ $1-\frac{1}{250}\left(36y-2y^2\right)$
- ○ $\frac{1}{250}\left(39y-3y^2\right)$

1444. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$ **.**

- ● $\lambda=np\sim const$, $n\to\infty,\ p\to 0$
- ○ $\lambda=\frac{n}{p}$, $n\to\infty$
- ○ $\lambda=ep$, $n\to\infty$
- ○ $\lambda=n^p$, p is const
- ○ None of the given answers is correct

1445. Let X be a continuous random variable with PDF f(x) = cx (0 ≤ x ≤ 1), where c is a constant. Find the value of constant c.

C * x^2/2 ot 0 do 1 = 1

C=1 / ½

C =2

- ○ 1
- ● 2
- ○ 1/2
- ○ 3/2
- ○ 4

1446. We are given the pmf of two random variables X and Y shown in the tables below.

X	1	3
p_x	0,4	0,6

y	2	4
p_y	0,2	0,8

Find E[X+Y].

0.4+0.6*3+0.2*2+0.8*4

- ● 5,8
- ○ 2,2

- 2
- 8,8
- 10

1447. The pdf of a random variable X is given by $f(x)=\begin{cases}\frac{1}{\gamma-2{,}5}, & if \quad x\in(1{,}5;3),\\ 0, & otherwise\end{cases}$.

Calculate the parameter γ**.**

- 0
- 4
- 1,5
- 2
- 3,5

1448. Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that three of those selected are women?

(7/12*6/11*5/10*5/9)* 4

- 0.35
- 0.65
- 0.45
- 0.25
- 0.1211

1449. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{T\geq 0 \; and \; T<2\}$**.**

0.5+0.3

- 0.8
- 0.5
- 0.3
- 0.2
- 0.1

1450. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Compute the mean of the random variable T.

0.3+0.2*2

- 0.8

- 0.5
- 0.7
- 0.1
- 1

1451. Three dice are rolled. What is the probability that the points appeared are distinct.

- 1
- 5/9
- 2
- 1/3
- 1/2

1452. Probability density function of the normal random variable X is given by $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-3)^2}{50}}$ **. What is the standard deviation?**

50=2*sigma^2

Sigma = 5

- 5
- 3
- 25
- 50
- 9

1453. The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.

- p^5
- $1-(1-p)^5$
- $(1-p)^5$
- $1-p^5$
- None of the given answers is correct

1454. The cdf of a random variable X is given by $F(x) = \begin{cases} 0 & if \quad x \le 3/2 \\ 2x-3 & if \quad 3/2 < x \le 2 \\ 1 & if \quad x > 2. \end{cases}$ **Find the probability P(1.7<X<1.9).**

Z(1.9)-z(1.7)=1.9*2-3 - (2*1.7-3)

- 0,16
- 0,8

- 1
- 0,4
- 0.6

1455. In each of the 20 independent trials the probability of success is 0.2. Find the variance of the number of successes in these trials.

Variance= sigma^2

Sigma= sqrt(npq)

So 20*0.2*0.8

- 0
- 1
- 10
- 3.2
- 0.32

1456. A coin tossed twice. What is the probability that head appears in the both tosses.

HH th ht tt

- 1/2
- 1/4
- 0
- 4:1
- 1

1457. Continuous random variable X is normally distributed with mean=1 and variance=4. Find P(4≤x≤6).

Z((6-1 / 4) – z((4-1)/ 4)=0.89-0.77=

- 0,0606
- 0,202
- 0,0305
- 0,0484
- 0,0822

1458. Random variable X is uniformly distributed on the interval [-2, 2]. Indicate the right values for E[X] and Var(X).

(A+b)/2=mean

(b-a)^2 / 12= 16/12

- E[X]=0 and Var(X)=4
- E[X]=0 and Var(X)=1.33
- E[X]=0.5 and Var(X)=1.33
- E[X]=0 and Var(X)=0
- No right answer

1459. **Expectation and standard deviation of the normally distributed random variable X are respectively equal to 15 and 5. What is the probability that in the result of an experiment X takes on the value in interval (5, 20)?**

- ○ Φ(20) – Φ(5)
- ○ Φ(5) + Φ(10)
- ○ Φ(1) – Φ(0)
- ○ Φ(20) + Φ(5)
- ● Φ(1) + Φ(2)-1
- ○ Φ(2) – Φ(1)

1460. **Normally distributed random variable X is given by density** $f(x)=\frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$ **. Find the mean.**

- ○ -1/2
- ○ 1/2
- ○ 1/4
- ● 0
- ○ 1

1461. **Indicate the density function of the normally distributed random variable X when mean=2 and variance=9.**

Variance=sigma^2

- ○ $\varphi(x)=\frac{1}{9\sqrt{2\pi}}e^{-\frac{(x-2)^2}{18}}$
- ○ $\varphi(x)=\frac{1}{2\sqrt{2\pi}}e^{-\frac{(x-9)^2}{8}}$
- ● $\varphi(x)=\frac{1}{3\sqrt{2\pi}}e^{-\frac{(x-2)^2}{18}}$
- ○ $\varphi(x)=\frac{1}{6\sqrt{2\pi}}e^{-\frac{(x-a)^2}{72}}$
- ○ $\varphi(x)=-\frac{1}{\sigma\sqrt{2\pi}}e^{\frac{(x-a)^2}{2\sigma^2}}$

1462. **Indicate the PDF for standard normal random variable.**

- ○ $f(x)=\lambda x^{-\lambda x}$, $x\geq 0$
- ○ $f(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$
- ○ $f(x)=\frac{1}{b-a}$, $a\leq x\leq b$

- $f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$
    - $f(x) = -\lambda e^{-\lambda x}$, $x \geq 0$

1463. Random variable X is uniformly distributed in interval [0, 3]. What is the variance of X?

(b-a)^2 / 12 = 9/12

- 0.75
    - 1.5
    - 3
    - 0.25
    - 1

1464. Random variable X is uniformly distributed in interval [0, 15]. What is the expectation of X?

15/2

- 15
- 3.75
- 7.5
- 30
- 0

1465. Random variable X is uniformly distributed in interval [-2, 1]. What is the distribution of the random variable Y=2X+2?

2*-2+2=-2

2*1+2=4

Просто закидываем А потом Б вместо икса

- Y is normally distributed in the interval [-4, 2]
- Y is uniformly distributed in the interval [-2, 4]
- Y is normally distributed in the interval [-2, 4]
- Y is exponentially distributed in the interval [-4, 2]
- Y has other type of distribution

1466. Random variable X is uniformly distributed in interval [-11, 26]. What is the probability P(X> - 4)?

- 29/38
- 29/37
- 30/37
- 15/19
- 0

1467. Random variable X is uniformly distributed in interval [1, 3]. What is the distribution of the random variable Y=3X+1?

3*1+1=4

3*3+1=10

- ○ Y is normally distributed in the interval [3, 9]
- ● Y is uniformly distributed in the interval [4, 10]
- ○ Y is normally distributed in the interval [4, 10]
- ○ Y is exponentially distributed in the interval [4, 10]
- ○ Y has other type of distribution

1468. Random variable X is uniformly distributed in interval [-11, 20]. What is the probability $P(X \leq 0)$?

- ○ 11/32
- ○ 5/16
- ○ 10/31
- ● 11/31
- ○ 0

1469. Random variable X is given by density function f(x) in the interval (0, 1) and otherwise is 0. What is the expectation of X?

- ○ $\int_{-\infty}^{+\infty} xf(x)dx$
- ○ $\int_{-\infty}^{+\infty} f(x)dx$
- ● $\int_{0}^{1} xf(x)dx$
- ○ $\int_{0}^{1} f(x)dx$
- ○ E[X]=0

1470. Random variable X is given by density function f(x) = x/2 in the interval (0, 2) and otherwise is 0. What is the expectation of X?

Integral ot 0 do 2 x * x/2 = x^3 / 6 ot 0 do 2 = 8/6=4/3

- ○ 1/2
- ○ 1
- ● 4/3
- ○ 2/3
- ○ 0

1471. Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the expectation of X?

Integral ot 0 do 1 x * 2x = 2x^3 /3 ot 0 do 1 = 2/3

- ○ 1/2

- ○ 1
- ○ 4/3
- ● 2/3
- ○ 0

1472. Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the probability P(0 < X < 1/2) ?

Integral ot 0 do ½ 2x = x^2 ot 0 do ½ = ½ ^ 2 = ¼

- ○ 1/2
- ● 1/4
- ○ 0
- ○ 1/8
- ○ 0
- ○ None of these

1473. Indicate the function that can be CDF of some random variable.

- ○ $F(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 0, & x>2\end{cases}$
- ○ $F(x)=\begin{cases}0, & x\le 1\\ 2-x, & 1<x\le 2\\ 1, & x>2\end{cases}$
- ● $F(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$
- ○ $F(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 4\\ 0, & x>4\end{cases}$
- ○ None of these

1474. Indicate the function that can be PDF of some random variable.

- ● $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 0, & x>2\end{cases}$
- ○ $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

- $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 4\\ 0, & x>4\end{cases}$
- $f(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$
- $f(x)=\begin{cases}0, & x\le 1\\ x/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

1475. Continuous random variable X has the following CDF:

$$F(x)=\begin{cases}0, & x\le 0\\ \frac{x}{2}, & 1<x\le 2\\ 1, & x>2\end{cases}$$

. What is the PDF of X in the interval 1<X≤2?

2/2 – ½

- 1/2
- 0
- 1
- $X^2/4$
- x

1476. Continuous random variable X is given in the interval [0, 100]. What is the probability P(X=50)?

- 0
- 1
- 0.5
- 0.75
- 0.25

1477. CDF of discrete random variable X is given by

$$F(x)=\begin{cases}0, & x\le 1\\ 0{,}3, & 1<x\le 2\\ 0{,}5, & 2<x\le 3\\ 1, & x>3\end{cases}$$

What is the probability P{1.3<X≤2.3}?

0.5-0.3

- 0.8
- 0.2
- 0
- 0.6
- 0.4

1478. PMF of discrete random variable is given by

X	0	2	4
P	0,1	0,5	0,4

Find the value of CDF of X in the interval (2, 4].

- 0.4
  - 0.5
  - 0.2
- 0.6
  - 1

1479. PMF of discrete random variable is given by

X	0	2	4
P	0,3	0,1	0,6

Find F(2).

0.3+0.1

- 0.4
  - 0.6
  - 0.3
  - 0.7
  - 0.1

1480. PMF of discrete random variable X is given by

X	-1	5
P	0,4	0,6

Find standard deviation of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

Variance = sigma^2

Sigma= 2.93

  - 15.4
  - 8.64
  - 2.6
- 2.9393
  - 3.3333

1481. **PMF of discrete random variable X is given by**

X	-1	5
P	0,4	0,6

Find variance of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

- ○ 15.4
- ● 8.64
- ○ 2.6
- ○ 2.93
- ○ 3.33

1482. **PMF of discrete random variable X is given by**

X	0	5	x_3
P	0,6	0,1	0,3

If E[X]=3.5 then find the value of x_3.

5*0.1+x3*0.3=3.5

x3*0.3=3

x3=10

- ● 10
- ○ 6
- ○ 8
- ○ 12
- ○ 24

1483. **Probability of success in each of 100 independent trials is constant and equals to 0.8. What is the probability that the number of successes is between 60 and 88?**

Mean = 80

Sigma=sqrt(100*0.8*0.2)=4

(88-80 / 4) – (60-80 / 4)= 2 - -5

- ○ $P_{100}(60 \le m \le 88) \approx \Phi(88) - \Phi(60)$
- ● $P_{100}(60 \le m \le 88) \approx \Phi(2) - \Phi(-5)$
- ○ $P_{100}(60 \le m \le 88) \approx \Phi(88) + \Phi(60)$
- ○ $P_{100}(60 \le m \le 88) \approx \Phi(2) + \Phi(5)$
- ○ $P_{100}(60 \le m \le 88) \approx \Phi(8) + \Phi(20)$

1484. A man is made 10 shots on the target. Assume that the probability of hitting the target in one shot is 0,7. What is the most probable number of hits?

- ○ 8
- ● 7
- ○ 6
- ○ 5
- ○ 9

1485. Consider two boxes, one containing 4 white and 6 black balls and the other - 8 white and 2 black balls. A box is selected at random, and a ball is drawn at random from the selected box. If the ball occurs to be white, what is the probability that the first box was selected?

P(B|A)=p(A|B)*p(B)/p(A)

- ○ 0.4
- ○ 0.6
- ○ 0.8
- ● 1/3
- ○ 2/3

1486. Each of two boxes contains 6 white and 4 black balls. A ball is drawn from 1st box and it is replaced to the 2nd box. Then a ball is drawn from the 2nd box. What is the probability that this ball occurs to be white?

(7/11+6/11) * ½

- ○ 0.3
- ○ 0.4
- ○ 0.5
- ● 0.6
- ○ 0.8

1487. Consider two boxes, one containing 3 white and 7 black balls and the other – 1 white and 9 black balls. A box is selected at random, and a ball is drawn at random from the selected box. What is the probability that the ball selected is black?

(7/10 + 9/10) * ½ =8/10 =0.8

- ● 0.8
- ○ 0.2
- ○ 0.4
- ○ 1.6
- ○ 0.9

1488. Urn I contains 4 black and 6 white balls, whereas urn II contains 3 white and 7 black balls. An urn is selected at random and a ball is drawn at random from the selected urn. What is the probability that the ball is white?

(6/10 + 3/10) * ½ = 9/10* ½ = 0.45

- 0.45
  - 0.15
  - 0.4
  - 0.9
  - 1

1489. A coin is tossed twice. Event A={ at least one Head appears}, event B={at least one Tail appears}. Find the conditional probability P(B|A).

A= HT TH HH=3/4

B= TT HT TH=3/4

2/3 sovpadenie

- 2/3
  - 1/3
  - 1/2
  - 3/4
  - 0

1490. A coin is tossed twice. Event A={ Head appears in the first tossing}, event B={at least one Tail appears}. Find the conditional probability P(B|A).

A=**HT** HH

B=**HT** TH TT

  - 1/4
- 1/2
  - 1/3
  - 2/3
  - 3/4

1491. Probability that each shot hits a target is 0.9. Total number of shots produced to the target is 5. What is the probability that at least one shot hits the target?

  - $1\text{-}0{,}9^5$
  - $0{,}9^5$
  - 1-5·0,9
- $1\text{-}0{,}1^5$
  - $0{,}1^5$
  - 1-5·0,1

1492. An urn contains 1 white and 9 black balls. Three balls are drawn from the urn without replacement. What is the probability that at least one of the balls is white? *

9/10*8/9*1/8 * 3= 0.3

  - 0.7
- 0.3

- 0.4
- 0.2
- 0.6

1493. Four independent shots are made to the target. Probability of missing in the first shot is 0.5; in the second shot – 0.3; in the 3rd – 0.2; in the 4th – 0.1. What is the probability that the target is not hit.

0.5*0.3*0.2*0.1=0.003

- 1.1
- 0.03
- 0.275
- 0.003
- 1.01

1494. Probability of successful result in the certain experiment is 3/4. Find the most probable number of successful trials, if their total number is 10.

¾*10=7.5

- 6
- 7
- 8
- 5
- 10

1495. Let E and F be two mutually exclusive events and P(E)=P(F)=1/3. The probability that none of them will occur is:

- No correct answer
- $P((E\cup F)^c) = 1 - (P(E)+P(F)) = 1 - \frac{1}{3} - \frac{1}{3} = \frac{1}{3}$
- $P(E\cup F) = P(E)+P(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
- $P(E\cap F) = P(E)+P(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
- $P(E^c\cup F^c) = P(E^c)P(F^c) = \frac{2}{3}\frac{2}{3} = \frac{4}{9}$

1496. Let E and F be two events. If $P(E) = \frac{3}{4}$, $P(F) = \frac{1}{2}$, $P(E\cup F) = 1$ and $P(E\cap F) = \frac{1}{4}$, then the conditional probability of E given F is:

¼ / ½ = ½

- $P(E|F) = \frac{1}{4}$
- $P(E|F) = \frac{3}{4}$
- $P(E|F) = \frac{1}{2}$
- $P(E|F) = \frac{1}{3}$
- No correct answer

1497. Given that Z is a standard normal random variable. What is the value of Z if the area to the left of Z is 0.9382?

- ○ 1.8
- ● 1.54
- ○ 2.1
- ○ 1.77
- ○ 3

1498. At a university, 14% of students take math and computer classes, and 67% take math class. What is the probability that a student takes computer class given that the student takes math class?

P(AB)=0.14

P(A)=0.67

P(B|A)=p(BA)/p(A)=0.14/0.67=0.21

- ○ 0.81
- ● 0.21
- ○ 0.53
- ○ No correct answer
- ○ 0.96

1499. Let $f(x,y)=x+y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint p.d.f. of X and Y. Find the marginal PDF of X.

X+y^2/2 ot 0 do 1 dlya Y= x + 1/2

- ○ x
- ● x+1/2
- ○ y+1/2
- ○ x^2+1
- ○ x^2+y^2

1500. If two random variables X and Y have the joint density function, $f_{X,Y}(x,y)=\begin{cases} xy & \text{for } 0<x<1,\ 0<y<2 \\ 0 & \text{elsewhere} \end{cases}$, find the probability P(X+Y<1).

- ● 1/24
- ○ 1/12
- ○ 5/12
- ○ 1/4
- ○ 0.003

1501. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases}\frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1\\ 0 & \text{elsewhere}\end{cases}$**, find the conditional PDF** $f_{X|Y}(x\mid y)$**.**

- ○ $\dfrac{(x+y^2)}{1+y^2}$
- ● $\dfrac{2(x+y^2)}{1+2y^2}$
- ○ $\dfrac{5(x+y^2)}{12}$
- ○ $\dfrac{\frac{6}{5}(x+y^2)}{1+y^2}$
- ○ None of these

1502. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases}\frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1\\ 0 & \text{elsewhere}\end{cases}$**, find the conditional PDF** $f_{Y|X}(y\mid x)$**.**

- ○ $\dfrac{(x+y^2)}{1+x}$
- ○ $\dfrac{3(x+y^2)}{x}$
- ● $\dfrac{3(x+y^2)}{1+3x}$
- ○ $\dfrac{\frac{6}{5}(x+y^2)}{1+3x}$
- ○ None of these

1503. A basketball player makes 90% of her free throws. What is the probability that she will miss for the first time on the seventh shot?

0.9^6*0.1

- ○ 0.0001
- ● 0.053
- ○ 0.002
- ○ 0.001
- ○ 0.01

1504. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}2(1-x) & \text{if } \quad 0\le x\le 1,\ 0\le y\le 1\\ 0, & \text{otherwise}\end{cases}$$

. Then find P(Y>0.5).

- 0.5
- 0.25
- 0.75
- 1
- 1.5

1505. Let X be a continuous random variable with probability density given by $f(x)=\begin{cases}\frac{x}{12} & \text{for } 1<x<5\\ 0 & \text{elsewhere}\end{cases}$.

Let Y=2X-3. Find P(Y≥4).

- 0.3438
- 0.53125
- 0.0625
- 0.1563
- 0

1506. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find $P(-0.8\le X\le 0.8)$**.**

- 0.31
- 0.428
- 0.512
- 0
- 0.78

1507. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find E[X].

- 0
- 1
- 2
- 3
- 4

1508. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find Var[X].

- 0
- 1
- 0.6

- 0.8
- 0.4

1509. Random variable X has the following PDF $f(x)=\dfrac{3x^2}{2}, -1\le x\le 1.$

Find $E\left[\dfrac{1}{X}\right]$**.**

- 4
- 0
- 2
- 1
- -2

1510. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the marginal density function for X.

- 6y
- $6y^2$
- $6x^2$
- $3x^2$
- $3x^3$

1511. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the marginal density function for Y.

- $3x^2$
- 6y
- 2y
- $2y^2$-1
- y+6

1512. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the E[X].

- 0.25
- 0.75
- 0.5
- 0.95

- None of these

1513. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the E[Y].

- 1
- 2/3
- 1/3
- 0.5
- 0.25

1514. Assume that Z is standard normal random variable. What is the probability P(|Z|>2.53)?

- 0.9943
- 0.0114
- 0.0057
- 0.9886
- None of these

1515. If Z is normal random variable with parameters μ=0, σ^2=1 then the value of c such that P(|Z|<c)=0.7994 is

- 1.28
- 0.84
- 1.65
- 2.33
- None of these

1516. The random variable X has the continuous CDF

$$F(x)=\begin{cases}0, & x<0\\ \frac{x^2}{9}, & 0\le x<3\\ 1, & 3\le x\end{cases}$$

. Find P(2≤X≤4).

- 16/9
- 4/3
- 4/9
- 5/9
- 2/3

1517. Let X be the random variable for the life in hours for a certain electronic device. The probability density function is

$$f(x)=\begin{cases}\dfrac{200{,}000}{x^3} & \text{for } x>100\\ 0 & \text{elsewhere}\end{cases}$$. **Find the expected life for a component.**

- 2000 hours
  - 1000 hours
  - 100 hours
  - 200 hours
  - None of these

1518. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}x+y & \text{if} \quad 0\le x\le 1, 0\le y\le 1\\ 0, & \text{otherwise}\end{cases}$$. Find E[X-Y].

- 0
  - 7/6
  - 2/3
  - 1/6
  - None of these

1519. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}x+y & \text{if} \quad 0\le x\le 1, 0\le y\le 1\\ 0, & \text{otherwise}\end{cases}$$. Find E[X+Y].

  - 1/6
  - 6/7
- 7/6
  - 5/6
  - 0

1520. The joint density function for the random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}xe^{-x(1+y)} & \text{if} \quad x\ge 0,\ y\ge 0\\ 0, & \text{otherwise}\end{cases}$$. Find E[X].

  - 0
- 1
  - 1.4142
  - 2
  - None of these

1521. A box contains 15 balls, 10 of which are black. If 3 balls are drawn randomly from the box, what is the probability that all of them are black?

10/15*9/14*8/13=0.26

- 0.26
  - 0.52

- 0.1
- None of these
- 0.36

1522. The Cov(aX,bY) is equal to

- $aCov(X,Y) + bCov(X,Y)$
- $aCov(X,Y) - bCov(X,Y)$
- $abCov(X,Y)$
- $a^2 b^2 Cov(X,Y)$
- $\frac{a}{b} Cov(X,Y)$

1523. If A and B are two mutually exclusive events with P(A) = 0.15 and P(B) = 0.4, find the probability P(A and B^c) (i.e. probability of A and B complement).

0.15*0.6

- 0.4
- 0.15
- 0.85
- 0.6
- 0.65

1524. From a group of 5 men and 6 women, how many committees of size 3 are possible with two men and 1 woman if a certain man must be on the committee?

- $\binom{5}{1} \times \binom{6}{1}$
- $\binom{4}{1} \times \binom{1}{1} \times \binom{6}{1}$
- $\binom{1}{1} \times \binom{6}{1}$
- $\binom{5}{2} \times \binom{6}{1}$
- None of these

1525. Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Find the marginal PDF of Y.

- y+1/2
- y
- 1/2y
- $y^2/2$
- 1/2

1526. **Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Compute E[X].**

- ○ 0.2
- ● 0.823
- ○ 0.583
- ○ 1
- ○ 0

1527. **Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Compute E[Y].**

- ○ 0.2
- ● 0.823
- ○ 0.583
- ○ 1
- ○ 0

1528. **Let $f(x,y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$, be the joint PDF of X and Y. Compute E[2X].**

- ● 7/6
- ○ 0
- ○ 1
- ○ 7/12
- ○ 1/6

1529. **Let X be continuous random variable with probability density function** $f(x) = \begin{cases} \frac{x}{6}, & if\ 2 < x < 4 \\ 0, & otherwise \end{cases}$. **Find the expected value of random variable X.**

- ○ 19/3
- ○ 13/3
- ○ 12/7
- ● 28/9
- ○ 27/4

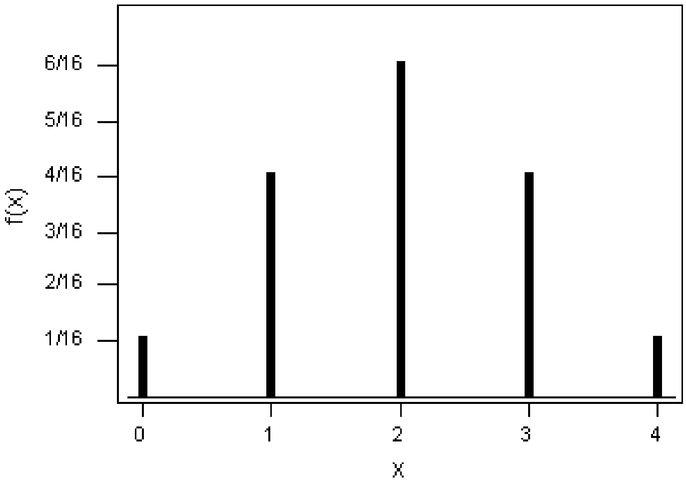
1530. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y) = \begin{cases} 2(1-x) & if \quad 0 \le x \le 1, 0 \le y \le 1 \\ 0, & otherwise \end{cases}$$

. Then find P(X>0.5).

- ○ 0.5
- ● 0.25
- ○ 0.15
- ○ 0.75
- ○ 0.1

1531. **Probability mass function for discrete random variable X is represented by**



the

graph. Find Var(X).

- 1
  - 4
  - 5
  - 2
  - 6

1532. **Two dice are rolled, find the probability that the sum is less than 13.**

- 1
  - 1.2
  - 0.5
  - 0.6
  - 0.8

1533. **A bag has six red marbles and six blue marbles. If two marbles are drawn randomly from the bag, what is the probability that they will both be red?**

C(2,6)/c(2,12)

  - 1/2
  - 11/12
  - 5/12
- 5/22
  - 1/3

1534. **A man can hit a target once in 4 shots. If he fires 4 shots in succession, what is the probability that he will hit his target?**

$$1-\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)=1-\left(\frac{3}{4}\right)^4=1-\frac{81}{256}=\frac{256}{256}-\frac{81}{256}=\frac{175}{256}$$

- 175/256
  - 1
  - 1/256
  - 81/256
  - 144/256

1535. Let random variable *X be normal with parameters mean=5, variance=9*. Which of the following is a standard normal variable?

  - Z=(X-5)/5
  - Z=(X-3)/5
- Z=(X-5)/3
  - Z=(X-3)/3
  - None of these

1536. A coin is tossed 6 times. What is the probability of exactly 2 heads occurring in the 6 tosses.

- $\binom{6}{2}\left(\frac{1}{2}\right)^6$
  - $\left(\frac{1}{2}\right)^6$
  - $\left(\frac{1}{3}\right)^6$
  - $\binom{6}{2}\left(\frac{1}{3}\right)^6$
  - None of these

1. A reliable event is: - **event is an event that necessarily will happen if a certain set of conditions S holds**

2. The probability of reliable event is the number: **1**

3. An impossible event is: (null) event is an event that certainly will not happen if the set of conditions S holds.

4. The probability of impossible event is the number: 0

5. A random event is: event is an event that can either take place, or not to take place for holding the set of conditions S.

6. The probability of an arbitrary event A is the number: 0<=P(x)<=1

7. Probabilities of opposite events *A* and $\overline{A}$ satisfy the following condition: *P(A) + P(* $\overline{A}$ *) = 1*

8. For opposite events A and $\overline{A}$ one of the following equalities holds: $P(A \cdot \overline{A}) =$ 0 $P(A + \overline{A}) =$ 1

9. Let A and B be opposite events. Find P(B) if P(A) = 3/5. 2/5

10. Let A and B be events connected with the same trial. Show the event that means simultaneous occurrence of A and B.

P=AB

11. Let A and B be events connected with the same trial. Show the event that means occurrence of only one of events A and B.

A*B s 4ertoi + $\overline{A}$ ***B**

12. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means occurrence only one of events A_1, A_2 and A_3. Express the event A by the events A_1, A_2 and A_3.

$\overline{A}$ **1*** $\overline{A}$ **2*A3 +** $\overline{A}$ **1*A2*** $\overline{A}$ **3+A1*** $\overline{A}$ **2*** $\overline{A}$ **3**

13. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means none of events A_1, A_2 and A_3 have happened. Express the event A by the events A_1, A_2 and A_3

A_3 **vse A s 4ertami**

14. Let *n* be the number of all outcomes, *m* be the number of the outcomes favorable to the event *A.* The classical formula of probability of the event *A* has the following form:

P(A) = m/n

15. The probability of an arbitrary event cannot be: less than 0 or more than 1

16. Let the random variable *X* be given by the law of distribution

x_i	-4	-1	0	1	4
p_i	0,2	0,1	0,3	0,2	0,2

Find mean square deviation σ (X)*:*

M(x) = 0.1

D(x) = 6.69

σ (X) = 2.5865

17. Two events form a complete group if they are:

Some events form a *complete group* if in result of a trial at least one of them will appear.

18. A coin is tossed twice. Find probability that "heads" will land in both times.

1/4

19. A coin is tossed twice. Find probability that "heads" will land at least once.

3/4

20. There are 2000 tickets in a lottery. 1000 of them are winning, and the rest 1000 – non-winning. It was bought two tickets. What is the probability that both tickets are winning?

1000/2000 * 999/1999 = 0.24987

21. Two dice are tossed. Find probability that the sum of aces does not exceed 2.

1/36

22. Two dice are tossed. Find probability that the sum of aces doesn't exceed 5.

10/36

23. Two dice are tossed. Find probability that the product of aces does not exceed 3.

5/36

24. There are 20 white, 25 black, 10 blue and 15 red balls in an urn. One ball is randomly extracted. Find probability that the extracted ball is white or black.

45/70 = 9/14

25. There are 11 white and 2 black balls in an urn. Four balls are randomly extracted. What is the probability that all balls are white?

C(4,11)/C(4,13) = 0.46 or 11/13 * 10/12 * 9/11 * 8/10 = 0.46

26. Calculate C_{14}^{4}: 1001

27. Calculate A_{7}^{3}: 210

28. One chooses randomly one letter of the word "HUNGRY". What is the probability that this letter is "E"? 0

29. The letters T, A, O, B are written on four cards. One mixes the cards and puts them randomly in a row. What is the probability that it is possible to read the word "BOAT"? ¼! = 0.0416

30. There are 5 white and 4 black balls in an urn. One extracts randomly two balls. What is the probability that both balls are white? 5/9*4/8 = 0.2(7)

31. There are 11 white, 9 black, 15 yellow and 25 red balls in a box. Find probability that a randomly taken ball is white. 11/60

32. There are 11 white, 9 black, 15 yellow and 20 red balls in a box. Find probability that a randomly taken ball is black. 9/55

33. How many 6-place telephone numbers are there if the digits "0" and "9" are not used on the first place? 8*10^5

34. 15 shots are made; 9 hits are registered. Find relative frequency of hits in a target. 9/15

35. A point is thrown on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 5/6. (2 – 2*5/6)/2 = 1/6

36. Two dice are tossed. What is the probability that the sum of aces will be more than 8? 7/36

37. A coin is tossed 6 times. Find probability that "heads" will land 4 times. C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

38. There are 6 children in a family. Assuming that probabilities of births of boy and girl are equal, find probability that the family has 4 boys: C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

39. Two shots are made in a target by two shooters. The probability of hit by the first shooter is equal to 0,7, by the second – 0,8. Find probability of at least one hit in the target. 1 – 0.3*0.2 = 0.94

40. The device consists of two independently working elements of which probabilities of non-failure operation are equal 0,8 and 0,7 respectively. Find probability of non-failure operation of two elements. 0.8*0.7 = 0.56

41. There are 5 books on mathematics and 7 books on chemistry on a book shelf. One takes randomly 2 books. Find the probability that these books are on mathematics. 5/12 * 4/11 = 10/66

42. There are 5 standard and 6 non-standard details in a box. One takes out randomly 2 details. Find probability that only one detail is standard. 5*6/C(2,11) = 30/55 = 6/11

43. Three shooters shoot on a target. Probability of hit in the target at one shot for the 1st shooter is 0,85; for the 2nd – 0,9 and for the 3rd – 0,95. Find probability of hit by all the shooters. 0.85*0.9*0.95 = 0,72675

44. A student knows 7 of 12 questions of examination. Find probability that he (or she) knows randomly chosen 3 questions.

7/12*6/11*5/10 = 0.15(90)

45. Two shooters shoot on a target. The probability of hit by the first shooter is 0,7, and the second – 0,8. Find probability that only one of shooters will hit in the target. 0.7*0.2 + 0.8*0.3 = 0.38

46. Three dice are tossed. Find probability that the sum of aces will be 6.

10/216

47. At shooting from a rifle the relative frequency of hit in a target appeared equal to 0,8. Find the number of hits if 200 shots have been made. 200*0.8

48. In a batch of 200 details the checking department has found out 13 non-standard details. What is the relative frequency of occurrence of non-standard details equal to? 13/200 = 0.065

49. If A and B are independent events then for P(AB) one of the following equalities holds: P(AB) = P(A)*P(B)

50. If events A and B are compatible then for P(A + B) one of the following equalities holds: P(A+B) =P(A) + P(B) – P(AB)

51. If events A and B are incompatible then for P(A+ B) one of the following equalities holds: P(A+B) =P(A)+P(B)

52. The probability of joint occurrence of two dependent events is equal: $P(AB) = P(A) \cdot P_A(B)$

53. A point is put on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 4/7. (2 – 2*4/7)/2 = 3/7

54. There are 5 white and 7 black balls in an urn. One takes out randomly 2 balls. What is the probability that both balls are black?

7/12 * 6/11 = 0.318

55. There are 7 identical balls numbered by numbers 1, 2..., 7 in a box. All balls by one are randomly extracted from a box. Find probability that numbers of extracted balls will appear in ascending order. 1/7! = 1.98*10^4

56. There are 25 details in a box, and 20 of them are painted. One extracts randomly 4 details. Find probability that the extracted details are painted. 20/25 * 19/24 * 18/23 * 17/22 = 0.383

57. There are 20 students in a group, and 8 of them are pupils with honor. One randomly selects 10 students. Find probability that there are 6 pupils with honor among the selected students. C(6, 8) * C(4 , 12) / C(10, 20) = 28 * 495/184756 = 0.075

58. There are 4 detective lamps among 12 electric lamps. Find probability that randomly chosen 2 lamps will be defective.

4/12 * 3/11 = 0. (09)

59. A circle of radius *l* is placed in a big circle of radius *L*. Find probability that a randomly thrown point in the big circle will get as well in the small circle.

l^2/L^2

60. There are 6 white and 4 red balls in an urn. The event A consists in that the first taken out ball is white, and the event B – the second taken out ball is white. Find the probability $P(A) \cdot P_A(B)$ = 6/10 * 5/9 = 1/3

61. Probability not to pass exam for the first student is 0,2, for the second - 0,4, for the third - 0,3. What is the probability that only one of them will pass the exam? 0.8*0.4*0.3 + 0.2 * 0.6 *0.3 + 0.2 * 0.4 * 0.7 = 0.188

62. The probability of delay for the train №1 is equal to 0,1, and for the train №2 – 0,2. Find probability that at least one train will be late. 1 – 0.9*0.8 = 0.28

63. The probability of delay for the train №1 is equal to 0,3, and for the train №2 – 0,45. Find probability that both trains will be late. 0.3 * 0.45 = 0.135

64. The events A and B are independent, P(A) = 0,4; P(B) = 0,3. Find $P(\overline{A}B)$.

0.6*0.3 = 0.18

65. The events A and B are compatible, P(A) = 0,4; and P(B) = 0,3. Find P($\overline{A} + \overline{B}$). = 0.6 + 0.7 - 0.42 = 0.88

66. If the probability of a random event A is equal to P(A), the probability of the opposite event $\overline{A}$ is equal: 1 - P(A),

67. Show the formula of total probability:

$$P(A) = P(B_1) \cdot P_{B_1}(A) + P(B_2) \cdot P_{B_2}(A) + \ldots + P(B_n) \cdot P_{B_n}(A)$$

68. The formula $P_A(B_i) = \dfrac{P(B_i) \cdot P_{B_i}(A)}{\sum_{i=1}^{n} P(B_i) P_{B_i}(A)}$ is *Bayes's formulas*

69. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3 forming a complete group will occur, P (A) is calculated by the following formula:

$$P(A) = P(B_1) \cdot P_{B_1}(A) + P(B_2) \cdot P_{B_2}(A) + \ldots + P(B_n) \cdot P_{B_n}(A)$$

70. Electric lamps are made at two factories, and the first of them delivers 60%, and the second – 40% of all consumed production. 80 of each hundred lamps of the first factory are standard on the average, and 60 – of the second factory. Find probability that a bought lamp will be standard.

0.6*08 + 0.4*0.6 = 0.72

71. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3, B_4 forming a complete group will occur, $P_A(B_2)$ is calculated by the following formula:

$$P_A(B_i) = \frac{P(B_i) \cdot P_{B_i}(A)}{P(B_1) \cdot P_{B_1}(A) + P(B_2) \cdot P_{B_2}(A) + \ldots + P(B_n) \cdot P_{B_n}(A)}$$

72. The probability of hit in 10 aces for a given shooter at one shot is 0,9. Find probability that for 10 independent shots the shooter will hit in 10 aces exactly 6 times. C(6, 10) * 0.9^6 * 0.1^4 = 0.0111

73. There are 6 children in a family. Assuming that probabilities of birth of boy and girl are equal, find the probability that there are 4 girls and 2 boys in the family. C(4, 6) * 0.5 ^4 * 0.5^2 = 15/64

74. It is known that 15 % of all radio lamps are non-standard. Find probability that among 5 randomly taken radio lamps appears no more than 1 non-standard. C(0, 5)*0.15^0 * 0.85^5 + C(1, 5)*0.15^1 * 0.85^4 = 0.8355

75. 10 buyers came in a shop. What is the probability that 4 of them will do shopping if the probability to make purchase for each buyer is equal to 0,2?

C (4, 10) * 0.2 ^ 4 * 0.8^6 = 0.088

76. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2

P	1/3	1/3	1/6	1/6

Find mathematical expectation M(X).

-4/3

77. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2
P	1/3	1/3	1/6	1/6

Find dispersion D (X).

M(x) = -4/3

M(x^2) = 5

D(x) = 5 – (4/3)^2 = 3, (2)

78. We say that a discrete random variable X is distributed under the binomial law (binomial distribution) if P (*X* = *k*) =

$$P(X = m) = C_n^m p^m q^{n-m}$$

79. We say that a discrete random variable X is distributed under Poisson law with parameter λ (Poisson distribution) if *P(X = k)* =

$$P(X = m) = \frac{\lambda^m e^{-\lambda}}{m!}$$

80. We say that a discrete random variable X is distributed under the geometric law (geometric distribution) if P*(X=k)* =

$P(X = m) = pq^{m-1}$

81. A random variable X is distributed under Poisson law with parameter λ (Poisson distribution). Find M (X) =λ

82. A random variable X is distributed under the binomial law: P *(X=k)* = $C_n^k p^k q^{n-k}$ (0 <*p* <1, *q* =1-*p*; *k*=*1*, 2, 3, ..., *n*). Find M(X) = np

83. Dispersion of a discrete random variable X is D(x) = $D(X) = M[X^2] - (M(X))^2$

84. Dispersion of a constant C is D(C) = 0

85. The law of distribution of a discrete random variable *X* is given. Find *Y*.

X	–2	4	6
P	0.3	0.6	*Y*

Y = 0.1

86. The law of distribution of a discrete random variable *X* is given, M (X) = 5. Find x_1.

X	x_1	4	6
P	0.2	p_2	0.3

P2 = 0.5

X1 = 11

87. Mathematical expectations $M(X)=5, M(Y)=4{,}3$ are given for independent random variables *X* and *Y*. Find $M(X \cdot Y)$ 21.5

88. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	0,1	0,3	p_3	0.2

Then the probability p_3 is equal to: 0.4

89. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	p_1	0.1	0.4	0.3

Then the probability p_1 is equal to: 0.2

90. For an event – dropping two tails at tossing two coins – the opposite event is: 2 heads

91. 4 independent trials are made, and in each of them an event A occurs with probability p. Probability that the event A will occur at least once is: 1 – q*(m);

92. Show the Bernoulli formula

$$P(X=m)=C_n^m p^m q^{n-m}$$

93. Show mathematical expectation of a discrete random variable X:

$$M(X)=\sum_{i=1}^{\infty} x_i p_i$$

94. Show the Chebyshev inequality

P(|X – a| > ε) ≤ D(X)/ε²

95. An improper integral of density of distribution in limits from $-\infty$ till ∞ is equal to **1**

96. The random variable *X* is given by an integral function of distribution: $F(x)=\begin{cases} 0 \quad if \quad x \le -2, \\ \frac{1}{4}x+\frac{1}{2} \quad if \ -2 < x \le 2, \\ 1 \quad if \quad x > 2. \end{cases}$

Find probability of hit of the random variable *X* in an interval (1; 1,5): = 1/8

97. Show one of true properties of mathematical expectation (C is a constant): $M(C)=$ C

98. Let M(X) = 5. Find M(X – 4) = 1

99. Let M(X) = 5. Find M(4X). = 20

100. Let D(X) = 5. Then D(X – 4) is equal to 5

101. Let D(X) = 5. Then D(4X) is equal to 80

102. Random variables *X* and *Y* are independent. Find dispersion of the random variable $Z = 4X - 5Y$ if it is known that D(X) = 1, D(Y) = 2.

*16*1 + 25*2 = 66*

103. A random variable *X* is given by density of distribution of probabilities: $f(x) = \begin{cases} 0 \text{ if } & x \le 0, \\ 1 \text{ if } & 0 < x \le 1, \\ 0 \text{ if } & x > 1 \end{cases}$

Find the function of distribution F(x).

F(x) = x   0<x<1…..

104. Let $f(x)$ be a density of distribution of a continuous random variable X. Then function of distribution is:

$$F(x) = \int_{-\infty}^{x} \varphi(t)dt$$

105. Function of distribution of a random variable X is:

F(x) = P(X < x),

106. If dispersion of a random variable D(X) = 5 then D(5X) is equal to 25*5 = 125

107. Differential function f(x) of a continuous random variable X is determined by the equality:

$$\varphi(x) = F'(x)$$

108. If F(x) is an integral function of distribution of probabilities of a random variable X then P(a < X < b) is equal to

$$P(a \le X \le b) = \int_{a}^{b} \varphi(x)dx$$

109. Show the formula of dispersion

$$D(X) = \int_{-\infty}^{+\infty} (x-a)^2 \varphi(x)dx$$

110. Which equality is true for dispersion of a random variable? $D(CX) =$ C^2 * D(x)

111. The probability that a continuous random variable X will take on a value belonging to an interval (a, b) is equal to $P(a < X < b) =$ $P(a \le X \le b) = \int_{a}^{b} \varphi(x)dx$

112. A random variable X is distributed under an exponential law with parameter λ = 2. Find the dispersion of X:

1/4

113. Show a differential function of the law of uniform distribution of probabilities

$$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 & if \quad x < a \text{ or } x > b. \end{cases}$$

114. Mathematical expectation of a continuous random variable X of which possible values belong to an interval [a, b] is

(a+b)/2

115. Mean square deviation of a random variable X is determined by the following formula

$$a = M(X) = \int_{-\infty}^{+\infty} x\varphi(x)dx$$

116. Dispersion D(X) of a continuous random variable X is determined by the following equality

$$D(X) = \int_{-\infty}^{+\infty} (x-a)^2 \varphi(x)dx$$

117. Function of distribution of a random variable X is given by the formula $F(x) = \begin{cases} 0 & if \quad x \le 0 \\ \sin 2x \text{ if } 0 < x \le \pi/4 \\ 1 & \text{if} \quad x > \pi/4 \end{cases}$. Find density of distribution f(x).

Тупо производная

118. Distribution of probabilities of a continuous random variable X is exponential if it is described by the density

$$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \ge 0, \\ 0 & for \quad x < 0. \end{cases}$$

119. A random variable X is normally distributed with the parameters *a* and σ^2 if its density $f(x)$ is:

$$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

120. Function of distribution of the exponential law has the following form:

$$F(x) = \begin{cases} 0 & for \ x < 0, \\ 1 - e^{-\lambda x} & for \ x \ge 0. \end{cases}$$

121. Mathematical expectation of a random variable X uniformly distributed in an interval (0, 1) is equal to

1/2

122. A random variable X $\in (-\infty, \infty)$ has normal density of distribution $f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-3)^2}{32}}$ Find the value of paramек σ. 4

123. A random variable X $\in (-\infty, \infty)$ has normal density distribution $f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-2)^2}{8}}$. Find the value of parameter σ. 2

124. Mathematical expectation of a normally distributed random variable X is *a* = 4, and mean square deviation is σ =5. Write the density of distribution X.

$$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

125. It is known that M (X) = - 3 and M (Y) = 5. Find M (3X – 2Y). = 1

126. Random variables X and Y such that Y =4X – 2 and D(X) = 3 are given. Find D(Y). 48

127. The number of allocations of *n* elements on *m* is equal to: $A_n^m = \dfrac{n!}{(n-m)!}$

128. The number of permutations of *n* elements is equal to: $P_n = n!$

129. How many various 7-place numbers are possible to make of digits 1, 2, 3, 4, 5, 6, 7 if digits are not repeated?

7! = 5040

130. How many ways is there to choose two employees on two various positions from 8 applicants?

A(2 , 8)

131. The number of combinations of *n* elements on *m* is equal to:

$$C_n^m = \frac{n!}{m!(n-m)!}$$

132. 3 dice are tossed. Find probability that each die lands on 5:

1/216

133. 2 dice are tossed. Find probability that the same number of aces will appear on each of the dice: 1/6

134. The pack of 52 cards is carefully hashed. Find probability that a randomly extracted card will be an ace: 4/36

135. The pack of 52 cards is carefully hashed. Find probability that two randomly extracted cards will be aces: C(2 , 4) / C(2,52)

136. How many ways are there to choose 3 books from 6? C(3, 6)

137. There are 60 identical details in a box, and 8 of them are painted. One takes out randomly one detail. Find probability that a randomly taken detail will be painted: 8/60

138. How many 4-place numbers can be composed of digits 1, 3, 9, 5? 4^4

139. Dialing the phone number, the subscriber has forgotten one digit and has typed it at random. Find probability that the necessary digit has been typed: 1/10

140. The urn contains 4 white and 6 black balls. One extracts by one randomly two balls without replacement. What is the probability that both balls will be black: 6/10 * 5/9

141. The urn contains 4 white and 6 black spheres. Two balls are randomly extracted from the urn. What is the probability that these balls will be of different color: 4*6/C(2, 10)

142. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that both of them will have the first sort: 3/ 7 * 2/6

143. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that they have the same sort: 3/7 * 2/6 + 4/7*3/6

144. A student knows 25 of 30 questions of the program. Find probability that the student knows offered by the examiner 3 questions. 25/30 * 24/29 * 23/28

145. A random variable X is distributed under an exponential law with parameter λ = 2. Find the mathematical expectation of X:

M(x) = λ = 2

146. Two shooters shoot on a target. The probability of hit in the target by the first shooter is 0,8, by the second – 0,9. Find probability that only one of shooters will hit in the target: 0.8 * 0.1 + 0.9* 0.2

147. A coin is tossed 5 times. Find probability that heads will land 3 times: C(3, 5) * 0.5 ^ 3 * 0.5 ^2

148. A coin is tossed 5 times. Find probability that heads never will land: C(0.5)*0.5^5

149. A coming up seeds of wheat makes 90 %. Find probability that 4 of 6 sown seeds will come up: C(4,6) * 0.9^4 * 0.1 ^2

150. A coming up seeds of wheat makes 90 %. Find probability that only one of 6 sown seeds will come up: C(6, 6) * 0.9 ^6

151. Identical products of three factories are delivered in a shop. The 1-st factory delivers 60 %, the 2-nd and 3-rd factories deliver 20 % each. 70 % of the 1st factory has the first sort, 80% of both the 2nd and the 3rd factories have the first sort. One product is bought. Find probability that it has the first sort: 0.74

152. The dispersion *D(X)* of a random variable *X* is equal to 1,96. Find σ(X): 1.4

153. Find dispersion *D(X)* of a random variable *X*, knowing the law of its distribution

x_i	1	2	3
p_i	0,2	0,5	0,3

M(x) = 0.2 + 1 + 0.9 = 2.1

M(x^2) = 0.2 + 2 + 2.7 = 4.9

D(x) = 0.49

154. If incompatible events **A**, **B** and **C** form a complete group, and P(**A**) + P(**B**) = 0,6 then P(**C**) is equal to: 0.4

155. Let **A** and **B** be events connected with the same trial. Show the event that means an appearance of **A** and a non-appearance of **B**. P(ABс чертой)

156. Let $\mathbf{A_1}, \mathbf{A_2}, \mathbf{A_3}$ be events connected with the same trial. Let **A** be the event that means occurrence only two of events $\mathbf{A_1}, \mathbf{A_2}$ and $\mathbf{A_3}$. Express the event **A** by the events $\mathbf{A_1}, \mathbf{A_2}$ and $\mathbf{A_3}$.

157. Let M be the number of all outcomes, and S be the number of non-favorable to the event **A** outcomes (S < M). Then P(A) is equal to: (M-S)/M

158. Five events form a complete group if they are: Some events form a *complete group* if in result of a trial at least one of them will appear.

159. There are 4000 tickets in a lottery, and 200 of them are winning. Two tickets have been bought. What is the probability that both tickets are winning? 200/4000 * 199/3999

160. If X is uniformly distributed over (0, 7), calculate the probability that X < 2: 2/7

161. If X is uniformly distributed over (0, 7), calculate the probability that X > 6: 1/7

162. There are 23 white, 35 black, 27 yellow and 25 red balls in an urn. One ball has been extracted from the urn. Find the probability that the extracted ball is white or yellow. 27/110

163. There are 15 red and 10 yellow balls in an urn. 6 balls are randomly extracted from the urn.

What is the probability that all these balls are red? C(6, 15)/ C(6, 25)

164. One letter has been randomly chosen from the word "STATISTICS". What is the probability that the chosen letter is "S"? 0.3

165. One letter has been randomly chosen from the word "PROBABILITY". What is the probability that the chosen letter is "I"? 2/11

166. How many 6-place phone numbers are there if only the digits “1”, “3” or “5” are used on the first place? 3*10^5

167. 150 shots have been made, and 25 hits have been registered. Find the relative frequency of hits in a target. 1/6

168. A point is thrown on an interval of length 3. Find the probability that the distance from the point to the ends of the interval is more than 1. 1/3

169. Two dice are tossed. What is the probability that the sum of aces will be more than 8?10/36

170. There are 4 children in a family. Assuming that the probabilities of births of boy and girl are equal, find the probability that the family has four boys: C(0, 4)*0.5^4

171. An urn contains 3 yellow and 6 red balls. Two balls have been randomly extracted from the urn. What is the probability that these balls will be of different color: 3*6/C(2, 9)

172. There are 5 books on mathematics and 8 books on biology in a book shelf. 3 books have been randomly taken. Find the probability that these books are on mathematics. 5/13 *4/12 *3 /11

173. There are 7 standard and 3 non-standard details in a box. 3 details have been randomly taken. Find the probability that only one of them is standard. C(1, 3) * C(2, 7)/ C(2, 10)

174. Three shooters shoot in a target. The probability of hit in the target at one shot by the 1st shooter is 0,8; by the 2^{nd} – 0,75 and by the 3^{rd} – 0,7. Find the probability of hit by all the shooters. 0.8*0.75*0.7 = 0.42

175. A student knows 17 of 25 questions of examination. Find the probability that he (or she) knows 3 randomly chosen questions. 17/25 * 16/24 * 15/23

176. One die is tossed. Find the probability that the number of aces doesn’t exceed 3. 1/2

177. Show the Markov inequality:

$$P(X > A) \leq M(X)/A$$

178. Two shooters shoot in a target. The probability of hit by the first shooter is 0,85, and by the second – 0,9. Find the probability that only one of the shooters will hit in the target. 0.85*0.1 + 0.9 * 0.15 = 0.22

179. Three dice are tossed. Find the probability that the sum of aces will be 9. 1/9

180. At shooting by a gun the relative frequency of hit in a target is equal to 0,9. Find the number of misses if 300 shots have been made. 300*0.9 = 270

181. A point is put on an interval of length 2. Find the probability that the distance from the point to the ends of the interval is more than 3/4. 2/8

182. There are 6 yellow and 6 red balls in an urn. 2 balls have been randomly taken. What is the probability that both balls are red? 6/12 * 5/11

183. Events A_1, A_2, A_3, A_4, A_5 are called independent in union if: Several events are *independent in union* (or just *independent*) if each two of them are independent and each event and all possible products of the rest events are independent.

184. There are 12 sportsmen in a group, and 8 of them are masters of sport. 6 sportsmen have been randomly selected. Find the probability that there are 2 masters of sport among the selected sportsmen. C(2, 8) * C(4, 12)/ C(2, 20)

185. A pack of 52 cards is carefully shuffled. Find the probability that three randomly extracted cards will be kings:

C(3,4)/ C(3, 52)

186. A circle of radius 4 cm is placed in a big circle of radius 8 cm. Find the probability that a randomly thrown point in the big circle will get as well in the small circle. 16/64 = 1/4

187. There are 7 yellow and 5 black balls in an urn. The event A consists in that the first randomly taken ball is black and the event B – the second randomly taken ball is yellow. Find P(AB). = 5/12 * 7/11

188. The probability to fail exam for the first student is 0,3; for the second – 0,4; for the third – 0,2. What is the probability that only one of them will pass the exam? 0.7 * 0.4 * 0.2 + 0.3 * 0.6 * 0.2 + 0.3 * 0.4 * 0.8

189. The probability of delay for the train №1 is equal to 0,15; and for the train №2 – 0,25. Find the probability that at least one train will be late. 1 – 0.85 * 0.25 = 0.7875

190. The probability of delay for the train №1 is equal to 0,15, and for the train №2 – 0,25. Find the probability that both trains will be late. 0.15 * 0.25 = 0.0375

191. The events A and B are independent, P(A) = 0,6; P(B) = 0,8. Find $P(\overline{A}B)$. 0.4 *0.8 = 0.32

192. Two independent events A and B are compatible, P(A) = 0,6; and P(B) = 0,75. Find $P(\overline{A}+\overline{B})$ = 0.4 + 0.25 – 0.4 * 0.25

193. Details are made at two factories, and the first of them delivers 70%, and the second - 30% of all consumed production. 90 of each hundred details of the first factory are standard on the average, and 80 – of the second factory. Find the probability that a randomly taken detail will be standard. 0.7 * 0.9 + 0.3*0.8 = 0.87

194. The probability of hit in 10 aces for a shooter at one shot is 0,8. Find the probability that for 15 independent shots the shooter will hit in 10 aces exactly 8 times. C(8, 10) * 0.8^8 * 0.2^2

195. It is known that 25 % of all details are non-standard. 8 details have been randomly taken. Find the probability that there is no more than 2 non-standard detail of the taken.

C(0, 8) * 0.25 ^8 + C(1, 8)*0.25^1*0.75^7 + C(2, 8)* 0.25 ^2* 0.75 ^6

196. For an event – appearance of four tails at tossing four coins - the opposite event is:

4 heads

197. A random variable X is given by the integral function of distribution:

$$F(x)=\begin{cases}0 \quad if \quad x\le 0,\\ \frac{1}{6}x \quad if \quad 0<x\le 6,\\ 1 \quad if \quad x>6.\end{cases}$$

Find the probability of hit of the random variable X in the interval (3; 5):

5/6 – 3/6 = 2/6 = 1/3

198. A random variable X is given by the density of distribution of probabilities:

$$f(x)=\begin{cases}0 \text{ if } \quad \mathrm{x}\le 0,\\ \mathrm{x}/4 \text{ if } 0<\mathrm{x}\le 2\sqrt{2}\\ 0 \text{ if } \quad \mathrm{x}>2\sqrt{2}\end{cases}$$

Find the function of distribution F(x). первообразная

199. The function of distribution of a random variable X is given by the formula:

$$F(x)=\begin{cases}0 & \text{if} \quad x\le 0\\ \cos^2 4x & \text{if } 0<x\le \pi/4\\ 1 & \text{if} \quad x>\pi/4\end{cases}.$$

Find the density of distribution f(x). производная

200. A die is tossed before the first landing 3 aces. Find the probability that the first appearance of 3 will occur at the fourth tossing the die. 0,096

1537. The probability that a day will be rainy is *p = 0,75*. Find the probability that a day will be clear.

0,25

0,3

0,15

0,75

1

1538. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,4; and by the third – 0,9. What is the probability that the exam will be passed on "excellent" by only one student?

0,424

0,348

0,192

0,208

0,992

1539. If D(X)=3, find D(-3X+4).

12

-5

19

27

-9

1540. The table below shows the distribution of a random variable X. Find M[x] and D(X).

X	-2	0	1
P	0.1	0.5	0.4

M[X]= 0,2; D(X) =0.8

M[X]= 0,3; D(X) =0.27

M[X]= 0,2; D(X) =0.76

M[X]= 0,2; D(X) =0.21

M[X]= 0,8; D(X) =0.24

1541. Let *X* be a continuous random variable with density function $f(x)=\begin{cases}\frac{|x|}{10} & for -2\le x\le 4\\ 0 & otherwise\end{cases}$ **Calculate the expected value of *X*.**

1/5

3/5

1

28/15

12/15

1542. If P(E) is the probability that an event will occur, which of the following must be false?

P(E)=1

P(E)=1/2

P(E)=1/3

P(E)= - 1/3

P(E)=0

1543. A movie theatre sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?

1

3

9

27

62

1544. The probability is p = 0.85 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

40

20

8

34

124

1545. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

0.99

0.25

0.49

0.45

0.01

1546. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, what is the probability that it did not pass given that it is male.

0.17

0.21

0.42

0.08

0.196

1547. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

0.98

0.02

0.28

0.53

None of the shown answers

1548. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

0.9995

0,00005

0.15

0.6

0.5220

1549. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 3?

1/6

1/5

1/3

5/6

1/18

1550. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be Spades?

4/17

1/17

2/17

1/4

4/17

1551. In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?

0.2995

0.699

0.23336

1/4

0.4999

1552. Table shows the cumulative distribution function of a random variable X. Determine $P(X > 4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

1/8

1

1/2

3/4

0

1553. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?

1/3

3/8

5/8

1/8

1

1554. A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.

512/3375

28/65

8/15

1856/3375

36/65

1555. We are given the probability distribution functions of two random variables X and Y shown in the tables below.

X	1	3	**Y**	2	4
P	0.4	0.6	**P**	0.2	0.8

Find M[X+Y].

5,8

2,2

2

8,8

10

1556. In each of the 20 independent trials the probability of success is 0.2. Find the dispersion of the number of successes in these trials.

0

1

10

3.2

0.32

1557. A coin tossed three times. What is the probability that head appears three times?

1/8

0

4:1

1

8:1

There are 10 white, 15 black, 20 blue and 25 red balls in an urn. One ball is randomly extracted. Find the probability that the extracted ball is blue or red.

5/14

1/70

1/7

9/14

3/98

A random variable *X* has the following law of distribution:

x_i	0	1	2	3
p_i	1/30	3/10	½	1/6

Find the mathematical expectation of *X*.

1

1,5

2

1,8

2,3

A random variable *X* is given by the integral function of distribution:

$$F(x)=\begin{cases}0 \quad if \quad x\le 2,\\ \dfrac{1}{2}x-1 \quad if \;\; 2<x\le 4,\\ 1 \quad if \quad x>4.\end{cases}$$

Find the probability of hit of the random variable *X* into the interval (2; 3).

0,25

0,5

1/3

2/3

1

An urn contains 5 red, 3 white, and 4 blue balls. What is the probability of extracting a black ball from the urn?

1/3

0

0,25

0,5

5/12

1558. A class in probability theory consists of 3 men and 12 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores (rankings) are possible?

- Answer: 15!=1 307 674 368 000

1559. Ms. Jones has 15 books that she is going to put on her bookshelf. Of these, 4 are math books, 3 are chemistry books, 6 are history books, and 2 are language book. Ms. Jones wants to arrange her books so that all the books dealing with the same subject are together on the shelf. How many different arrangements are possible?

- Answer: 4!4!3!6!2!=4 976 640

1560. How many different signals, each consisting of 9 flags hung in a line, can be made from a set of 4 white flags, 3 red flags, and 2 blue flags if all flags of the same color are identical?

- Answer: 9! / 4!3!2!=1260

1561. A student has to answer to 10 questions in an examination. How many ways to answer exactly to 4 questions correctly?

- Answer:

1562. A bag contains six Scrabble tiles with the letters A-K-T-N-Q-R. You reach into the bag and take out tiles one at a time exactly six times. After you pick a tile from the bag, write down that letter and then return the tile to the bag. How many possible words can be formed?

1563. Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one F?

- Answer: 1-(4/5)^4

1564. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

What is the probability that a student, taken at random from teacher's class, would have succeded the course, given that they succeeded the final?

1565. At a certain gas station 40% of the customers request regular gas, 35% request unleaded gas, and 25% request premium gas. Of those customers requesting regular gas, only 30% fill their tanks fully. Of those customers requesting unleaded gas, 60% fill their tanks fully, while of those requesting premium, 50% fill their tanks fully. If the next customer fills the tank, what is the probability that regular gas is requested.

- Answer: 0.25

1566. Insurance predictions for probability of auto accident.

	Under 25	25-39	Over 40
P	0.11	0.03	0.02

Table gives an insurance company's prediction for the likelihood that a person in a particular age group will have an auto accident during the next year. The company's policyholders are 25% under the age of 25, 25% between 25 and 39, and 50% over the age of 40. What is the probability that a random policyholder will have an auto accident next year?

1567. A friend who works in a big city owns two cars, one small and one large. Three-quarters of the time he drives the small car to work, and one-quarter of the time he drives the large car. If he takes the small car, he usually has little trouble parking, and so is at work on time with probability 0.8. If he takes the large car, he is at work on time with probability 0.7. What is the probability that he will not be at work on time tomorrow?

1568. A fair six-sided die is tossed. You win $3 if the result is a «5», you win $2 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the mathematical expectation of X?

1569. A fair six-sided die is tossed. You win $3 if the result is a «1», you win $1 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the dispersion of X?

1570. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation/ mean square (standard) deviation of X+Y?

- Answer: E[X+Y]=1 Var(X+Y)=1,68 sqrt(Var(X+Y))=1.2961

1571. A set of families has the following distribution on number of children:

X	x_1	x_2	2	3	4
P(X)	0.1	0.2	0.4	0.2	0.1

Determine x_1, x_2, if it is known that $M(X) = 3, D(X) = 1.5$?

1572. **The lifetime of a machine part has a continuous distribution on the interval (0, 30) with probability density function** $f(x) = c(10+x)^{-2}$, $f(x)=0$ **otherwise. Calculate the probability that the lifetime of the machine part is less than 5.**

1573. **A random variable** ***X*** **is given by the (probability) density function of distribution:**

$$f(x) = \begin{cases} 0 \quad if \quad x < 1 \ \text{ or } \ 7 \le x, \\ \dfrac{x-1}{9} \ if \ 1 \le x < 4, \\ \dfrac{7-x}{9} \ if \ 4 \le x < 7. \end{cases}$$

Find the cumulative distribution function of the random variable X?

- Answer
- $$F(x) = \begin{cases} 0 \quad if \quad x < 1, \\ \dfrac{(x-1)^2}{18} \ if \ 1 \le x < 4, \\ \dfrac{18-(7-x)^2}{18} \ if \ 4 \le x < 7, \\ 1 \quad if \quad 7 \le x. \end{cases}$$

1574. **A random variable** ***X*** **is given by the cumulative distribution function:**

$$F(x) = \begin{cases} 0 \quad if \quad x \le 0, \\ \dfrac{Cx^3}{125} \ if \ 0 \le x < 5, \\ 1 \quad if \quad 5 \le x. \end{cases}$$

Find the mathematical expectation/dispersion of the random variable X?

1575. **The probability that a shooter will beat out 10 points at one shot is equal to 0.1 and the probability to beat out 9 points is equal to 0.3. Find the probability of the event A – the shooter will beat out 6 or less points.**

1576. Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «only one student will pass the exam on "excellent"». Here $\overline{A} = A^c$.

- $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1 A_2 \overline{A}_3 + \overline{A}_1\overline{A}_2 A_3$

1577. A random variable X is given by the cumulative distribution function:

$$F(x) = \begin{cases} 0 \quad if \quad x < 10, \\ \dfrac{x-10}{10} \; if \;\; 10 \le x < 20, \\ 1 \quad if \quad 20 \le x. \end{cases}$$

Find P (8 < X < 16).

1578. A random variable X is given by the cumulative distribution function:

$$F(x) = \begin{cases} 0 \quad if \quad x \le 2, \\ \dfrac{1}{2}x - 1 \;\; if \;\; 2 < x \le 4, \\ 1 \quad if \quad x > 4. \end{cases}$$

Find the probability of hit of the random variable X into the interval (2.5; 4).

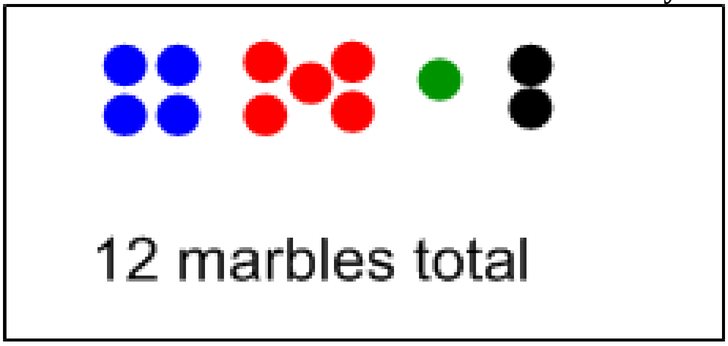
1579. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target at least one time. (exact value)

1580. All of the letters that spell STUDENT are put into a bag. Choose the correctly calculated probability of events.

- P(drawing a S, and then drawing a T)=1/21
- P(drawing a T, and then drawing a D)=1/42
- P(selecting a vowel, and then drawing a U)=1/42
- P(selecting a vowel, and then drawing a K)=1/42
- P(selecting a vowel, and then drawing a T)=3/42

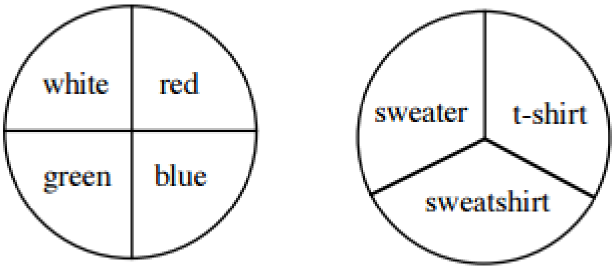
1581. A jar of marbles contains 4 blue marbles, 5 red marbles, 1 green marble, and 2 black marbles. A marble is chosen at random from the jar. After returning it again, a second

marble is chosen. Choose the correctly calculated probability of events.



- P(green, and then red)=5/144
- P(black, and then black)=1/12
- P(red, and then black)=7/72
- P(green, and then blue)=1/72
- P(blue, and then blue)=1/6

1582.If each of the regions in each spinner is the same size.



Choose the correctly calculated probability of spinning each spinner.

- P(getting a red sweater)=1/12
- P(getting a white sweatshirt)=1/6
- P(getting a white sweater)=5/12
- P(getting a blue sweatshirt)=7/12
- P(getting a blue t-shirt)=1/6

1583.Find the Bernoulli formula.

- $$P_n(k)=\frac{n!}{k!(n-k)!}\cdot p^k\cdot(1-p)^{n-k}$$
- $$P(B|A)=\frac{P(B)\cdot P(A|B)}{P(A)}$$

- $P(B|A) = \dfrac{P(AB)}{P(A)}$
- $P_n(k) = \dfrac{1}{\sqrt{npq}} \cdot e^{-2pq}$
- $P_n(k) = \dfrac{1}{\sqrt{npq}} \cdot \Phi\left(\dfrac{k-np}{\sqrt{npq}}\right)$

1584.A coming up a grain stored in a warehouse is equal to 50%. What is the probability that the number of came up grains among 100 ones will make from a up to b pieces?

- $a = 5, b = 10, P = \Phi\left(\frac{10-100*0,5}{\sqrt{100*0,5*0,5}}\right) - \Phi\left(\frac{5-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

1585.Find the right statements.

- $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx$
- $M(X) = \int_{-\infty}^{+\infty} xf(x)dx$
- $F(x) = f'(x)$
- $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx - M(X)$
- $P(X > A) > \frac{M(X)}{A}$

1586.Find the false statements.

- $0 \leq F(x) \leq 1$
- $F(-\infty) = 0$
- $F(+\infty) = 0$
- $F(x) = P(X < x)$
- $\int_{-\infty}^{+\infty} f(x)dx = 1$

1587. Let a series of distribution of a random variable be given:

$$X = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}.$$ **What does this tell us about the random variable X?**

- $$F(x)=\begin{cases}0 & \text{if } x\le 1,\\ 0.1 & \text{if } 1<x\le 2,\\ 0.3 & \text{if } 2<x\le 3,\\ 0.6 & \text{if } 3<x\le 4,\\ 1 & \text{if } 4<x.\end{cases}$$
- $$F(x)=\begin{cases}0 & \text{if } x\le 1,\\ 0.1 & \text{if } 1<x\le 2,\\ 0.2 & \text{if } 2<x\le 3,\\ 0.3 & \text{if } 3<x\le 4,\\ 0.4 & \text{if } 4<x.\end{cases}$$
- $M(X)=1$
- $M(X^2)=9$
- $D(X)=10$

1588. The probability of working each of four combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What are the possible values of X?

- 2
- -1
- 5
- 6
- -2

1589. The probability of working each of 3 combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What does this tell us about the random variable X?

- $P(X=2)=0.243$
- $P(X=3)=0.001$
- $P(X=1)=0.009$
- $P(X=2)=0.081$
- $P(X=0)=0.1$

1590. **Suppose that the random variable X is the number of typographical errors on a single page of book has a Poisson distribution with parameter $\lambda = \frac{1}{4}$. What does this tell us about the random variable X?**

- $M(X) = 0.25$
- $M(X) = 2$
- D(X)= - 8
- M(X) = 1
- $D(X) = 4$

1591.Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $a = 173,\ \sigma^2 = 36$. Find the correctly calculated probabilities of the events.

- $P(|X - 173| \le 3) = 2\Phi\left(\frac{1}{2}\right)$

1592.Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(0; 10)$. Find the correctly calculated probabilities of the events.

1593.The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter λ. Find the correctly calculated probabilities of the events.

1594.Which of the following is a discrete random variable?

- The time of waiting a train.
- The number of boys in family having 4 children.
- A time of repair of TVs.
- The velocity in any direction of a molecule in gas.
- The height of a man.

1595. How would it change the expected value of a random variable X if we multiply the X by a number k.

1596. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

- Answer: $$f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$$

1597. Find the density function of random variable $X \sim U[a, b]$

$$\varphi(x) = \begin{cases} \frac{1}{b-a} & if \quad a \le x \le b, \\ 0 \quad if & x < a \ or \ \ x > b. \end{cases}$$

1598. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

- ○ 1/4, always
- ● 1/4, if A and B are independent
- ○ 1/2, always
- ○ 1/2, if A and B are independent
- ○ None of the given answers

1599. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

- ● Φ(1.5)

1600. The cumulative distribution function for continuous random variable X is given by

$$F(x) = \begin{cases} 0, & x < 0 \\ x/2, & 0 \le x \le 2 \\ 1, & x > 2 \end{cases}$$ **. Find the variance Var(X).**

Answer: $\frac{1}{3}$

1601. If the probability density function of a continuous random variable X is

$$f(x) = \begin{cases} kx^2 & 0 \le x \le 3 \\ 0 & otherwise \end{cases}$$ **then the value of k is**

1602. If E(X)=3, E(Y)=2 and X and Y are independent, find E(-3X+2Y-1).

1603. The table below shows the distribution of a random variable X. Find E[x^2].

X	-2	0	1
P	0.1	0.5	0.4

304. Events are *equally possible* if … **two probability equally**

305. The probability of the event *A* is determined by the formula P(A)=m/n

306. The probability of a reliable event is equal to … 1 или universal

307. The probability of an impossible event is equal to … 0 or null

308. The relative frequency of the event *A* is defined by the formula: W(A)=m/n

309. There are 50 identical details (and 5 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted. 1/10

310. A die is tossed. Find the probability that an even number of aces will appear. 1/2

311. Participants of a toss-up pull a ticket with numbers from 1 up to 60 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 3. 1/4

312. In a batch of 10 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to? 0.3

313. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,35. Find the number of hits if 20 shots were made. 7

314. Two dice are tossed. Find the probability that the same number of aces will appear on both dice 1/6

315. An urn contains 15 balls: 4 white, 6 black and 5 red. Find the probability that a randomly taken ball will be white. 4/15

316. 12 seeds have germinated of 36 planted seeds. Find the relative frequency of germination of seeds. 2.1/3

317. A point *C* is randomly appeared in a segment *AB* of the length 3. Determine the probability that the distance between *C* and *B* doesn't exceed 1. 1/3

318. A point *B(x)* is randomly put in a segment *OA* of the length 8 of the numeric axis *Ox*. Find the probability that both the segments *OB* and *BA* have the length which is greater than 3. 1/4

319. The number of all possible permutations Pn=n!

320. How many two-place numbers can be made of the digits 2, 4, 5 and 7 if each digit is included into the image of a number only once? 12

321. The number of all possible allocations An'm=n!/(n-m)!

322. How many signals is it possible to make of 5 flags of different color taken on 3? 60

323. The number of all possible combinations Cnm=n!/m!(n-m)!

324. **How many ways are there to choose 2 details from a box containing 13 details? 78**

325. **The numbers of allocations, permutations and combinations are connected by the equality An”m=Pm*Cn’m**

326. **4 films participate in a competition on 3 nominations. How many variants of distribution of prizes are there, if on each nomination are established different prizes. 64**

327. **If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by … ways. n+m**

328. **There are 200 details in a box. It is known that 150 of them are details of the first kind, 10 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the second kind from the box are there? 25 (C150”1+C10”1)**

329. **If an object *A* can be chosen from the set of objects by *m* ways and after every such choice an object *B* can be chosen by *n* ways then the pair of the objects (*A*, *B*) in this order can be chosen by ... ways. n*m**

330. **There are 15 students in a group. It is necessary to choose a leader, its deputy and head of professional committee. How many ways of choosing them are there? 2730**

331. **6 of 30 students have sport categories. What is the probability that 3 randomly chosen students have sport categories? 1/203**

332. **A group consists of 10 students, and 5 of them are pupils with honor. 3 students are randomly selected. Find the probability that 2 pupils with honor will be among the selected. 1/12 это ответ апайки, мой 5/12**

333. **It has been sold 15 of 20 refrigerators of three marks available in quantities of 5, 7 and 8 units in a shop. Assuming that the probability to be sold for a refrigerator of each mark is the same, find the probability that refrigerators of one mark have been unsold. Апайкин: 0,0016, мой: 0,005**

334. **A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the *i*-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event *A* – «only two hit».**

P.

Q.

R.

S.

T.

335. A randomly taken phone number consists of 5 digits. What is the probability that all digits of the phone number are different. It is known that any phone number does not begin with the digit zero. **Апайкин: 0,0001, мой: 0,3204**

336. The probability of appearance of any of two incompatible events is equal to the sum of the probabilities of these events: P(A+B)=P(A)+P(B)

337. A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,5 and in the second – 0,3. Find the probability that the shooter will hit at one shot either in the first area or in the third area. 0.7

338. The sum of the probabilities of events A_1, A_2, A_3, …, A_n which form a complete group is equal to … 1

339. **Two uniquely possible events forming a complete group are …**

P. Opposite

Q. Same

R. Identically distributed

S. Sample

T. Density function

340. The sum of the probabilities of opposite events is equal to … 1

341. *The conditional probability* of an event *B* with the condition that an event *A* has already happened is equal to: Pa(B)=P(AB)/P(A)

342. There are 4 conic and 8 elliptic cylinders at a collector. The collector has taken one cylinder, and then he has taken the second cylinder. Find the probability that the first taken cylinder is conic, and the second – elliptic. 8/33

343. The events *A, B, C* and *D* form a complete group. The probabilities of the events are those: *P(A)* = 0,01; *P(B)* = 0,49; *P(C)* = 0,3. What is the probability of the event *D* equal to? 0.2

344. For independent events theorem of multiplication has the following form: P(AB)=P(A)*P(B)

345. The probabilities of hit in a target at shooting by three guns are the following: p_1 = *0,6*; p_2 = *0,7*; p_3 = *0,5*. Find the probability of at least one hit at one shot by all three guns. 0.94

346. Three shots are made in a target. The probability of hit at each shot is equal to 0,6. Find the probability that only one hit will be in result of these shots. 0.288

347. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,5; and by the third –

0,8. What is the probability that the exam will be passed on "excellent" by neither of the students? 0.07

348. 10 of 20 savings banks are located behind a city boundary. 5 savings banks are randomly selected for an inspection. What is the probability that among the selected banks appears inside the city 3 savings banks? Апайкин: 9/38, мой: 225/646

349. A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will be solved ? 19/29

350. An urn contains 10 balls: 3 red and 7 blue. A second urn contains 6 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.54 . Calculate the number of blue balls in the second urn. 9

351. A bag contains 7 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue. 4/165

352. Find the Bernoulli formula Pn(K)=n!/k!(n-k)!*PkQn-k

353. Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?

P. $A+B+C$

Q. $A\cdot B\cdot C$

R. $A\cdot B^c\cdot C^c + A^c\cdot B\cdot C^c + A^c\cdot B^c\cdot C$

S. $(A+B+C)^c$

T. $AB+AC+BC$

○

354. Find the dispersion for the given probability distribution.

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

355.

○

○ 2.85

356. How would it change the dispersion of a random variable X if we add a number a to the X.

P. D(X+a)=D(X)+a

Q. D(X+a)=D(X)+a^2

R. D(X+a)=D(X)

S. D(X+a)=$a \cdot$D(X)

T. D(X+a)= a^2D(X)

357. The cumulative distribution function of a discrete random variable X is given by

$$F(x) = \begin{cases} 0 & if\ x \le 2 \\ 0.5 & if\ 2 < x \le 5 \\ 0.8 & if\ 5 < x \le 8 \\ 1 & if\ x > 8 \end{cases}$$

Find P{3<X<9}. 0,5

358. Find the expectation of a random variable X if the cumulative distribution function

$$F(x) = \begin{cases} 1 - e^{-x/4}, x \ge 0 \\ 0, \quad x < 0 \end{cases}$$

. 4

359. If the dispersion of a random variable X is given D(X)=4. Then D(2X) is D(2x)=16

360. Indicate the expectation of a Poisson random variable X with parameter λ. λ

361. The lifetime of a machine part has a continuous distribution on the interval (0, 20) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5. 0.5

362. What kind of distribution is given by the density function $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{(x-\mu)^2}{2\sigma^2}}$ **(** $-\infty < x < \infty$ **)?**

P. Poisson distribution

Q. Normal distribution

R. Uniform distribution

S. Bernoulli distribution

T. Exponential distribution

363. Suppose the test scores of 10000 students are normally distributed with an expectation of 76 and mean square deviation of 8. The number of students scoring between 60 and 82 is: 7065,6 or 71%

364. The distribution of weights in a large group is approximately normally distributed. The expectation is 80 kg. and approximately 68,26% of the weights are between 70 and 90 kg. The mean square deviation of the distribution of weights is equal to: 0,3413

365. A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value of *X* is 18

366. **The cumulative distribution function for continuous random variable X is given by**

$$F(x)=\begin{cases}0,\ x<0\\ x/2,\ 0\le x\le 2\\ 1,\ x>2\end{cases}$$

. Find the standard deviation $\sigma(X)$ **. Апайкин: 1/3, мой: 1/sqrt3**

367. **A continuous random variable X is exponentially distributed with the density**

$$f(x)=\begin{cases}3e^{-3x},\ x\ge 0\\ 0,\ x<0\end{cases}$$

. What is the M[X] and D(X)? MX=1/3 DX=1/9

368. **How many different 5-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?6!**

369. **A fair coin is thrown in the air five times. If the coin lands with the head up on the first four tosses, what is the probability that the coin will land with the head up on the fifth toss? 1/2**

370. **A random variable Y has the following distribution:**

Y	-1	0	1	2
P(Y)	C	4C	0.4	0.1

371.

1604. **The value of the constant C is:0.1**

372. **Which one of these variables is a continuous random variable?**

P. The time it takes a randomly selected student to complete an exam.

Q. The number of tattoos a randomly selected person has.

R. The number of women taller than 68 inches in a random sample of 5 women.

S. The number of correct guesses on a multiple choice test.

T. The number of 1's in N rolls of a fair die

373. **Heights of college women have a distribution that can be approximated by a normal curve with an expectation of 65 inches and a mean square deviation equal to 3 inches. About what proportion of college women are between 65 and 68 inches tall? 0,34134 Ф(1)-Ф(0)**

374. **A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...**

P. Probability distribution

Q. The expected value

R. The standard deviation

S. Coefficient of variation

T. Correlation

375. **For a continuous random variable X, the probability density function f(x) represents**

P. the probability at a fixed value of X

Q. the area under the curve at X

R. the area under the curve to the right of X

S. the height of the function at X

T. the integral of the cumulative distribution function

376. **Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is Апайкин: 0,51, мой: 0,49**

377. **Suppose that 10% of people are left handed. If 6 people are selected at random, what is the probability that exactly 2 of them are left handed? 0,0984**

378. **Which of these has a Geometric model?**

P. the number of aces in a five-card Poker hand

Q. the number of people we survey until we find two people who have taken Statistics

R. the number of people in a class of 25 who have taken Statistics

S. the number of people we survey until we find someone who has taken Statistics

T. the number of sodas students drink per day

379. **In a certain town, 55% of the households own a cellular phone, 40% own a pager, and 25% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is 30%**

380. **A probability function is a rule of correspondence or equation that:**

P. Finds the mean value of the random variable.

Q. Assigns values of x to the events of a probability experiment.

R. Assigns probabilities to the various values of x.

S. Defines the variability in the experiment.

T. None of the given answers is correct.

381. **Which of the following is an example of a discrete random variable?**

P. The distance you can drive in a car with a full tank of gas.

Q. The weight of a package at the post office.

R. The amount of rain that falls over a 24-hour period.

S. The number of cows on a cattle ranch.

T. The time that a train arrives at a specified stop.

382. **Which of the following is the appropriate definition for the union of two events A and B?**

P. The set of all possible outcomes.

Q. The set of all basic outcomes contained within both A and B.

R. The set of all basic outcomes in either A or B, or both.

S. None of the given answers

T. The set of all basic outcomes that are not in A and B.

383. **What is the probability of drawing a Diamond from a standard deck of 52 cards?**

1605. **What is the probability of drawing a diamond from a standard deck of 52 cards?**

- 1/52
- 13/39
- 1/13
- 1/4
- 1/2

384. **The probability density function of a random variable X is given by**

$$f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$$

.

1606. **What are the values of μ and σ?**

- $\mu = 1, \sigma = 4$
- $\mu = -1, \sigma = 4$
- $\mu = -1, \sigma = 2$
- $\mu = 1, \sigma = 8$
- $\mu = 1, \sigma = 2$

385. **The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=4. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:**

1607. **Апайкин: 0.14, мой: 0.24**

386. Table shows the cumulative distribution function of a random variable X. Determine

X	1	2	3	4
F(X)	3/8	1/8	3/4	1

387.

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3
- Ответ 5/8 я решила апай подтвердила

388. Which of the following statements is always true for A and A^C ?

P. $P(AA^c)=1$

Q. $P(A^c)=P(A)$

R. $P(A+A^c)=0$

S. $P(AA^c)=0$

T. None of the given statements is true

389. If P(A)=1/6 and P(B)=1/3 then $P(A \cap B)$ =

P. 1/18, always

Q. 1/18, if A and B are independent

R. 1/6, always

S. 1/2, if A and B are independent

T. None of the given answers

390. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

- 24/75
- 24/35
- 6/35
- 12/75
- None of the given answers

391. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$.

P. $\lambda = np \sim const$, $n \to \infty,\ p \to 0$

Q. $\lambda = \frac{n}{p}$, $n \to \infty$

R. $\lambda = ep$, $n \to \infty$

S. $\lambda = n^p$, p is const

T. None of the given answers is correct

392. **The probability density function of a random variable X is given by**

$f(x) = \begin{cases} \frac{1}{\gamma - 2{,}5}, & if \ \ x \in (1{,}5;\, 3) \\ 0, & otherwise \end{cases}$ **. Calculate the parameter** γ **. 4**

393. **Probability density function of the normal random variable X is given by**

$f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-3)^2}{50}}$ **. What is the mean square deviation?**

- 5
- 3
- 25
- 50
- 9
-

394. **The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.**

P. p^5

Q. $1-(1-p)^5$ correct

R. $(1-p)^5$

S. $1-p^5$

T. None of the given answers is correct

395. **Choose the density function of random variable**

P. $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \geq 0, \\ 0 & for \ \ x < 0. \end{cases}$

Q. $$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 & if \quad x < a \ or \ \ x > b. \end{cases}$$

R. $$F(x) = \begin{cases} 0 & for \ x < 0, \\ 1 - e^{-\lambda x} & for \ x \ge 0. \end{cases}$$

S. $$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

T. $$P(X = m) = \frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$$

396. Choose the probability distribution function of random variable

P. $$P(X = m) = \frac{\lambda^m e^{-\lambda}}{m!}$$

Q. $$P(X = m) = \frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$$

R. $$P(X = m) = C_n^m p^m q^{n-m}$$

S. $$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

T. $$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \ge 0, \\ 0 & for \quad x < 0. \end{cases}$$

397. Choose the probability density function of random variable

P. $$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

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R. $$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 & if \quad x < a \ or \ \ x > b. \end{cases}$$

S. $$F(x) = \begin{cases} 0 & for \ x < 0, \\ 1 - e^{-\lambda x} & for \ x \ge 0. \end{cases}$$

T. $P(X=m)=C_n^m p^m q^{n-m}$

398. The mathematical expectation and dispersion of a random variable *X* distributed under the binomial law are …, respectively.

P.

Q.

R.

S.

T.

399. The mathematical expectation and the dispersion of a random variable distributed under the Poisson are …, respectively.

P.

Q.

R.

S.

T.

400. The probability distribution function of random variable is

P.

Q. $P(X=m)=\frac{\lambda^m e^{-\lambda}}{m!}$

R. $P(X=m)=\frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

S. $P(X=m)=C_n^m p^m q^{n-m}$

T. $\varphi_N(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$

401. The mathematical expectation and dispersion of a random variable *X* having the geometrical distribution with the parameter *p* are …, respectively.

P.

Q.

R.

S.

T.

402. The mathematical expectation and dispersion of a random variable *X* having the uniformly distribution on [a,b] are …, respectively.

P.

Q.

R.

S.

T.

403. A normally distributed random variable *X* is given by the differential function:

$$f(x) = \frac{1}{\sqrt{2\pi}} \cdot e^{-\frac{x^2}{2}}$$

. Find the interval in which the random variable *X* will hit in result of trial with the probability 0,9973. (-3,3)

404. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

P. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+3)^2}{18}}$

Q. $f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$

R. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{8}}$

S. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{16}}$

T. $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-4)^2}{16}}$

x_i	2	3	6	9
p_i	0,1	0,4	0,3	0,2

405. A discrete random variable X is given by the following law of distribution:

○

○

○

-
- **By using Chebyshev inequality estimate the probability that $|X-M(X)|>3$.1/3**

1608. **The probabilities that three men hit a target are respectively 1/6, 1/4 and 1/3. Each man shoots once at the target. What is the probability that exactly one of them hits the target?**

1/6*3/4*2/3+5/6*1/4*2/3+5/6*3/4*1/3

- ○ 11/72
- ○ 21/72
- ● 31/72
- ○ 3/4
- ○ 17/72

1609. **A problem in mathematics is given to three students whose chances of solving it are 1/3, 1/4, 1/5. What is the probability that the problem will be solved?**

- ○ 0.2
- ○ 0.8
- ○ 0.4
- ● 0.6
- ○ 1

1610. **You are given $P[A\cup B] = 0.7$ and $P[A\cup B^c] = 0.9$. Determine P[A] .**

- ○ 0.2
- ● 0.3
- ○ 0.4
- ○ 0.6
- ○ 0.8

1611. **An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.44 . Calculate the number of blue balls in the second urn.**

4/10*16/20+6/10*4/20=(64+24)/200=88/200=44/100=0.44

- ● 4
- ○ 20
- ○ 24

- 44
- 64

1612. **The probability that a boy will not pass an examination is 3/5 and that a girl will not pass is 4/5. Calculate the probability that at least one of them passes the examination.**

3/5*1/5+2/5*4/5+2/5*1/5= (3+8+2)/25=13/25

- 11/25
- 13/25
- 1/2
- 7/25
- 16/25

1613. **A bag contains 5 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue.**

4/9*3/8*2/7=24/504=1/21

- 1/21
- 2/21
- 1/7
- 4/21
- 1/3

1614. **Find the variance for the given probability distribution.**

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

(4*0.17+16*0.43+36*0.35)-(2*0.17+4*0.43+6*0.35)^2

- 1.5636
- 2.8544
- 1.6942
- 2.4484
- 1.7222

1615. **A bag contains 5 white, 7 red and 8 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?**

- $1-\left(\frac{1}{4}\right)^4$
- $1-\left(\frac{3}{4}\right)^4$
- $\left(\frac{3}{4}\right)^4$
- 0.7182

- ○ $\left(\frac{1}{4}\right)^4$

1616. Формулой Бернулли называется формула

- ○ $P_n(k) = \frac{1}{\sqrt{npq}} \cdot \varphi(x)$
- ● $P_n(k) = \binom{n}{k} \cdot p^k \cdot (1-p)^{n-k}$
- ○ $P_n(k) = \frac{\lambda^k e^{-\lambda}}{k!}$
- ○ $P(B|A) = \frac{P(B) \cdot P(A|B)}{P(A)}$
- ○ $P_n(k) = \frac{1}{\sqrt{npq}} \cdot e^{-2p(1-p)}$

1617. Indicate the formula of computing variance of a random variable X with expectation μ.

- ● $Var(X) = E(X^2) - \mu^2$
- ○ $Var(X) = E(X - \mu)$
- ○ $Var(X) = (E(X^2) - \mu)^2$
- ○ $Var(X) = E(X^2) - \mu$
- ○ $Var(X) = E(X^2)$

1618. How would it change the variance of a random variable X if we add a number a to the X?

- ○ Var(X+a)=Var(X)+a
- ○ Var(X+a)=Var(X)+a²
- ● Var(X+a)=Var(X)
- ○ Var(X+a)= $a^2 \cdot$ Var(X)
- ○ Var(X+a)=Var(X)+a²

1619. How would it change the expected value of a random variable X if we multiply the X by a number k.

- ● $E[kX] = k \cdot E[X]$
- ○ $E[kX] = |k| \cdot E[X]$
- ○ $E[kX] = E[X]$
- ○ $E[kX] = E[X] + k$

- ○ $E[kX] = k^2 \cdot E[X]$

1620. Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?

- ○ $A + B + C$
- ○ $A \cdot B \cdot C$
- ● $A \cdot B^c \cdot C^c + A^c \cdot B \cdot C^c + A^c \cdot B^c \cdot C$
- ○ $(A + B + C)^c$
- ○ $AB + AC + BC$

1621. Which of the following expressions indicates the occurrence of at least one of the events A, B, C?

- ● $A + B + C$
- ○ $A \cdot B \cdot C$
- ○ $A \cdot B^c \cdot C^c + A^c \cdot B \cdot C^c + A^c \cdot B^c \cdot C$
- ○ $(A + B + C)^c$
- ○ $A^c \cdot B^c \cdot C^c$

1622. Which of the following expressions indicates the occurrence of all three events A, B, C simultaneously?

- ○ $A + B + C$
- ● $A \cdot B \cdot C$
- ○ $A \cdot B \cdot C^c + A^c \cdot B \cdot C + A \cdot B^c \cdot C$
- ○ $(A + B + C)^c$
- ○ $A^c \cdot B^c \cdot C^c$

1623. Which of the following expressions indicates the occurrence of exactly two of events A, B, C?

- ○ $(A + B) \cdot C^c$
- ○ $AB + AC + BC$
- ○ $(A + B)(B + C)(A + C)$
- ● $A \cdot B \cdot C^c + A^c \cdot B \cdot C + A \cdot B^c \cdot C$
- ○ $A \cdot B \cdot C^c$

1624. Conditional probability P(A|B) can be defined by

- ○ $P(A|B) = P(A) \cdot P(B)$
- ● $P(A|B) = \frac{P(A \cdot B)}{P(B)}$

- $P(A|B)=\frac{P(A\cdot B)}{P(A)}$
- $P(A|B)=P(A)-P(B)$
- $P(A|B)=P(A)+P(B)-P(A\cdot B)$

1625. Urn I contains a white and b black balls, whereas urn II contains c white and d black balls. If a ball is randomly selected from each urn, what is the probability that the balls will be both black?

- $\frac{b}{a}+\frac{d}{c}$
- ● $\frac{b}{a+b}\cdot\frac{d}{c+d}$
- $\frac{b}{a+b}+\frac{d}{c+d}$
- $\frac{b}{a}\cdot\frac{d}{c}$
- $\frac{b+d}{a+b+c+d}$

1626. The table below shows the probability mass function of a random variable X.

x_i	**0**	**x_2**	**5**
p_i	**0.1**	**0.2**	**0.7**

If E[X]=5,5 find the value of x_2.

5.5-(5*0.7)=x2*0.2

2=x2*0.2

X2=2/0.2

X2=10

- 3
- 1
- 12
- 0.8
- ● 10

1627. The probability of machine failure in one working day is equal to 0.01. What is the probability that the machine will work without failure for 5 days in a row.

(1-0.01)^5

- 0.99999
- ● 0.95099

- 1
- 0.05
- 0.55

1628. The cumulative distribution function of a discrete random variable X is given by $F(x)=\begin{cases}0 & if\ x\le 2\\ 0.4 & if\ 2<x\le 5\\ 0.9 & if\ 5<x\le 8\\ 1 & if\ x>8\end{cases}$

Find P{3<X<9}.

1-0.4

- 0,4
- 0,5
- 0,6
- 0,9
- 1

1629. A fair die is rolled three times. A random variable X denotes the number of occurrences of 6's. What is the probability that X will have the value which is not equal to 0.

P(# of 6's is not 0)
= 1 - P(# of 6's is 0)

= 1 - (5/6)^3
= 0.4213=91/216

- 91/216
- 125/216
- 25/216
- 1/216
- 215/216

1630. Find the expectation of a random variable X if the cdf $F(x)=\begin{cases}1-e^{-x/5}, x\ge 0\\ 0, \quad x<0\end{cases}$**.**

- -5
- e^{-5}
- 5
- 6
- 1/5

1631. Compute the mean for continuous random variable X with probability density function $f(x=\begin{cases}2(1-x), & if\ 0\le x\le 1\\ 0, & otherwise\end{cases}$**.**

- 2/3
- 0
- 1/3
- 1
- Mean does not exist

1632. If the variance of a random variable X is given Var(X)=3. Then Var(2X) is

2^2*3=12

- 12
- 6
- 3
- 1
- 9

1633. Indicate the expectation of a Poisson random variable X with parameter λ.

- 0
- λ
- $1/\lambda$
- $\lambda(1-\lambda)$
- λ^2

1634. Indicate the variance of a Poisson random variable X with parameter λ.

- λ
- 0
- $\frac{1}{\lambda}$
- $\lambda(1-\lambda)$
- λ^2

1635. Indicate the formula for conditional expectation.

- $E[E[X \mid Y] = E[X \mid Y]$
- $E[E[X \mid Y] = E[X]$
- $E[E[X \mid Y] = \{E[X \mid Y]\}^2$
- $E[E[X \mid Y] = E[X] \cdot E[Y]$
- $E[E[X \mid Y] = E[XY]$

1636. The table below shows the pmf of a random variable X. What is the Var(X)?

X	-2	1	2
P	0,1	0,6	0,3

4*0.1+1*0.6+4*0.3-(-2*0.1+1*0.6+2*0.3)^2=1.2

- ○ 0.5
- ○ 1.67
- ○ 4.71
- ● 1.2
- ○ 4.7

1637. The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 6.

- ○ 0.04
- ○ 0.15
- ● 0.47
- ○ 0.53
- ○ 0.94

1638. The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5.

- ○ 0.03
- ○ 0.13
- ● 0.42
- ○ 0.58
- ○ 0.97

1639. If Var(X)=2, find Var(-3X+4).

(-3)^2*2

- ○ 12
- ○ 10
- ○ 9
- ● 18
- ○ 3

1640. The table below shows the pmf of a random variable X. Find E[X] and Var(X).

X	-1	0	1
P	0.2	0.3	0.5

0.7-0.09=0.61

- ○ E[X]= 0,7; Var(X) =0.24

- E[X]= 0,3; Var(X) =0.27
- E[X]= 0,3; Var(X) =0.61
- E[X]= 0,8; Var(X) =0.21
- E[X]= 0,8; Var(X) =0.24

1641. What kind of distribution is given by the density function $f(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ **(** $-\infty<x<\infty$ **)?**

- Poisson distribution
- Normal distribution
- Uniform distribution
- Bernoulli distribution
- Exponential distribution

1642. If a fair die is tossed twice, the probability that the first toss will be a number less than 4 and the second toss will be greater than 4 is

3/6*2/6=6/36=1/6

- 1/3
- 5/6
- 1/6
- 3/4
- 0

1643. A class consists of 490 female and 510 male students. The students are divided according to their marks

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, the probability that it did not pass given that it is female is:

(60/1000)/(490/1000)=0.12

- 0.06
- 0.12
- 0.41
- 0.81
- none of the shown answers

1644. Marks on a Chemistry test follow a normal distribution with a mean of 65 and a standard deviation of 12. Approximately what percentage of the students have scores below 50?

(z<50)=z<(50-65)/12=z<-1.25=0.105 == 11%

- 11%
- 89%
- 15%
- 18%
- 39%

1645. Suppose the test scores of 600 students are normally distributed with a mean of 76 and standard deviation of 8. The number of students scoring between 70 and 82 is:

70<z<82= (82-76)/8-((70-76)/8)=0.77-0.22=0.5

600*0.5

Vrode tak hz primernye cifry vzyalW

- 272
- 164
- 260
- 136
- 328

1646. The distribution of weights in a large group is approximately normally distributed. The mean is 80 kg. and approximately 68% of the weights are between 70 and 90 kg. The standard deviation of the distribution of weights is equal to:

- 20
- 5
- 40
- 50
- 10

1647. The probability density function of a continuous random variable *X* is

$$f(x) = \begin{cases} 0.5x & 0 \le x \le 2 \\ 0 & otherwise \end{cases}$$ **Find** $P\{0 \le x \le 1.5\}$.

Интеграл мутим 0,5x

И будет ½ * (x^2)/2 = x^2/4=1.5^2/4=2.25/4=0.56

- 0.5625
- 0.3125
- 0.1250
- 0.4375
- 0.1275

1648. Let *X* be a continuous random variable with density function $f(x) = \begin{cases} \frac{|x|}{10} & for -2 \le x \le 4 \\ 0 & otherwise \end{cases}$ **Calculate the expected value of *X*.**

Tak kak zdes abs(x) to berem integral ot 2 do 4 (x*x/10 dx) = x3/30 ot 4 do 2 = 64/30-8/30=56/30=28/15

- ○ 1/5
- ○ 3/5
- ○ 1
- ● 28/15
- ○ 12/5

1649. The probability density function of a continuous random variable X is

$$f(x) = \begin{cases} kx^2 & 0 \le x \le 2 \\ 0 & otherwise \end{cases}.$$ **Find the value of k.**

K * integral ot 0 do 2 (x^2) =1

k* x^3/3 ot 0 do 2 = 1

8/3=1/k

K=3/8=0.375

- ○ 2
- ○ 0.25
- ● 0.375
- ○ 2.25
- ○ Any positive value greater than 2

1650. A continuous random variable *X* is uniformly distributed over the interval [10, 16]. The expected value of *X* is

(a+b)/2=(10+16)/2=13

- ○ 16
- ● 13
- ○ 10
- ○ 7
- ○ 6

1651. If X and Y are independent random variables with $p_X(0)=0.5$, $p_X(1)=0.3$, $p_X(2)=0.2$ **and** $p_Y(0)=0.6$, $p_Y(1)=0.1$, $p_Y(2)=0.25$, $p_Y(3)=0.05$. **Then** $P\{X \le 1\, and\, Y \le 1\}$ **is**

(0.5+0.3)*(0.6+0.1)=0.8*0.7=0.56

- ○ 0.30
- ● 0.56
- ○ 0.70
- ○ 0.80
- ○ 1

1652. How many different three-member teams can be formed from six students?

C (3,6) = 6!/(6-3)!3! = 20

- 20
  - 120
  - 216
  - 720
  - 6

1653. **How many different 6-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?**

6!

  - 6
  - 36
- 720
  - 46.656
  - 72

1654. **If P(E) is the probability that an event will occur, which of the followings must be false?**

  - P(E)=1
  - P(E)=1/2
  - P(E)=1/3
- P(E)= -1
  - P(E)=0

1655. **A die is rolled. What is the probability that the number rolled is greater than 2 and even? Only 4 and 6**

2/6=1/3

  - 1/2
- 1/3
  - 2/3
  - 5/6
  - 0

1656. **A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?**

1 4 4 1 3 2 2 3 5 5 4 6 6 4 so 7/36

Complement will be 29/36

  - 2/36
  - 12/36
- 29/36
  - 32/36
  - 9/36

1657. The cumulative distribution function for continuous random variable X is given by $F(x)=\begin{cases}0, & x<0\\ x, & 0\le x\le 1\\ 1, & x>1\end{cases}$**. Find the standard deviation** $\sigma(X)$**.**

Expectation : Integral from 0 to 1 xdx= x^2/2 ot 0 do 1= ½

Variance: integral from 0 to 1 (x- 1/2)^2 dx = 1/12

- ○ $\frac{1}{\sqrt{6}}$
- ○ $\frac{1}{6}$
- ● $\frac{1}{\sqrt{12}}$
- ○ $\frac{1}{4}$
- ○ $\frac{1}{12}$

1658. A continuous random variable X uniformly distributed on [-2;6]. Find E[X] and Var(X).

(A+b)/2 = -2+6 / 2 = 2

(b-a)^2 / 12 = 64 / 12= 16/3

- ○ 4 and $\frac{4}{3}$
- ○ $\frac{16}{3}$ and 2
- ● 2 and $\frac{16}{3}$
- ○ $\frac{2}{3}$ and 2
- ○ 2 and $\frac{4}{3}$

1659. A continuous random variable X is exponentially distributed with the density $f(x)=\begin{cases}2e^{-2x}, & x\ge 0\\ 0, & x<0\end{cases}$**. What is the E[X] and Var(X)?**

Tut lambda = 2

So, mean = 1/lambda

Variance = 1/ lambda^2

- ○ $\frac{1}{6}$ and $\frac{1}{2}$
- ○ $\frac{1}{4}$ and $\frac{1}{2}$

- $\frac{1}{2}$ and $\frac{1}{4}$
- $\frac{1}{2}$ and $\frac{1}{6}$
- $\frac{1}{4}$ and $\frac{1}{6}$

1660. The expression $\binom{9}{2}$ is equivalent to

- $\frac{9!}{7!}$
- $\frac{9!}{2!}$
- $\frac{9!}{7! \cdot 2!}$
- $\frac{9}{14}$
- $\frac{9! \cdot 2!}{7!}$

1661. Evaluate 1!+2!+3!

- 5
- 6
- 9
- 10
- 12

1662. A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?

- 2/36
- 12/36
- 29/36
- 32/36
- 1/36

1663. Your state issues license plates consisting of letters and numbers. There are 26 letters and the letters may be repeated. There are 10 digits and the digits may be repeated. How many possible license plates can be issued with two letters followed by three numbers?

26*26*10*10*10

- 25000
- 67600

- 250000
- 676000

- 2500

1664. A random variable *X* has the cumulative distribution function

$$F(x)=\begin{cases}0 & for\ x<1\\ \dfrac{x^2-2x+2}{2} & for\ 1\le x<2\\ 1 & for\ x\ge 2\end{cases}$$

Compute the expectation of X.

- 7/72
- 1/8
- 5/6
- 4/3
- 23/12

1665. A fair coin is thrown in the air four times. If the coin lands with the head up on the first three tosses, what is the probability that the coin will land with the head up on the fourth toss?

- 0
- 1/16
- 1/8
- 1/2
- 1/4

1666. A movie theater sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?

3*3

- 1
- 3
- 9
- 27
- 62

1667. A random variable Y has the following distribution:

Y | -1 0 1 2

P(Y)| 3C 2C 0.4 0.1

The value of the constant C is:

(1-0.5)=5c

0.5=5c

C=0.1

- 0.1
  - 0.15
  - 0.20
  - 0.25
  - 0.75

1668. A random variable X has a probability distribution as follows:

X |	0	1	2	3
P(X) |	2k	3k	13k	2k

Then the probability that P(X < 2.0) is equal to

5k/20k=0.25k

  - 0.90
- 0.25
  - 0.65
  - 0.15
  - 1

1669. Which one of these variables is a continuous random variable?

- The time it takes a randomly selected student to complete an exam.
  - The number of tattoos a randomly selected person has.
  - The number of women taller than 68 inches in a random sample of 5 women.
  - The number of correct guesses on a multiple choice test.
  - The number of 1's in N rolls of a fair die

1670. Heights of college women have a distribution that can be approximated by a normal curve with a mean of 65 inches and a standard deviation equal to 3 inches. About what proportion of college women are between 65 and 67 inches tall?

65<z<67

(67-65)/3 – (65-65)/3= 0.74-0.5= 0.25

  - 0.75
  - 0.5
- 0.25
  - 0.17
  - 0.85

1671. The probability is p = 0.80 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

40*0.8=32

- ○ 40
- ○ 20
- ○ 8
- ● 32
- ○ 124

1672. A medical treatment has a success rate of 0.8. Two patients will be treated with this treatment. Assuming the results are independent for the two patients, what is the probability that neither one of them will be successfully cured?

1-0.8=0.2

0.2*0.2=0.04

- ○ 0.5
- ○ 0.36
- ○ 0.2
- ● 0.04
- ○ 0.4

1673. A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...

- ● Probability distribution
- ○ The expected value
- ○ The standard deviation
- ○ Coefficient of variation
- ○ Correlation

1674. Given a normal distribution with μ=100 and σ=10, what is the probability that X>75?

1-z<75= 1 – (z<(75-100)/10)=1- z(-2.5)= 1- 0.006=0.99

- ● 0.99
- ○ 0.25
- ○ 0.49
- ○ 0.45
- ○ 0

1675. Which of the following is not a property of a binomial experiment?

- ○ the experiment consists of a sequence of n identical trials
- ○ each outcome can be referred to as a success or a failure
- ● the probabilities of the two outcomes can change from one trial to the next
- ○ the trials are independent

- binomial random variable can be approximated by the Poisson

1676. Which of the following random variables would you expect to be discrete?

- The weights of mechanically produced items
- The number of children at a birthday party
- The lifetimes of electronic devices
- The length of time between emergency arrivals at a hospital
- The times, in seconds, for a 100m sprint

1677. Two events each have probability 0.2 of occurring and are independent. The probability that neither occur is

0.8*0.8 = 0.64

- 0.64
- 0.04
- 0.2
- 0.4
- none of the given answers

1678. A smoke-detector system consists of two parts A and B. If smoke occurs then the item A detects it with probability 0.95, the item B detects it with probability 0.98 whereas both of them detect it with probability 0.94. What is the probability that the smoke will not be detected?

- 0.01
- 0.99
- 0.04
- 0.96
- None of the given answers

1679. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, what is the probability that it did not pass given that it is male.

(100/1000)/(510/1000) = 0.196

- 0.066
- 0.124
- 0.414
- 0.812

- 0.196

1680. A company which produces a particular drug has two factories, A and B. 30% of the drug are made in factory A, 70% in factory B. Suppose that 95% of the drugs produced by the factory A meet specifications while only 75% of the drugs produced by the factory B meet specifications. If I buy the drug, what is the probability that it meets specifications?

0.3*0.95+0.7*0.75=0.81

- ○ 0.95
- 0.81
- ○ 0.75
- ○ 0.7
- ○ 0.995

1681. Twelve items are independently sampled from a production line. If the probability any given item is defective is 0.1, the probability of at most two defectives in the sample is closest to …

p(0) + p(1) + p(2)
p(0) = c(12,0) * .1^0 * .9^12 = .2824
p(1) = c(12,1) * .1^1 * .9^11 = .3766
p(2) = c(12,2) * .1^2 * .9^10 = .2301

add them up and you get .8891

- ○ 0.3874
- ○ 0.9872
- ○ 0.7361
- 0.8891
- ○ None of the shown answers

1682. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

C(5,6)*c(3,4)/c(8,10)=

Or

C(5,6)/c(8,10)=0.133

- ○ 0.282
- ○ 0.02
- ○ 0.376
- 0.133
- ○ None of the shown answers

1683. Suppose that 10% of people are left handed. If 8 people are selected at random, what is the probability that exactly 2 of them are left handed?

8c2*0,1^2*0.9^6

- ○ 0.0331
- ○ 0.0053
- ● 0.1488
- ○ 0.0100
- ○ 0.2976

1684. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

1- 0.15^4

- ● 0.9995
- ○ 5.06 × 10-4
- ○ 0.15
- ○ 0.6
- ○ 0.5220

1685. Which of these has a Geometric model?

- ○ the number of aces in a five-card Poker hand
- ○ the number of people we survey until we find two people who have taken Statistics
- ○ the number of people in a class of 25 who have taken Statistics
- ● the number of people we survey until we find someone who has taken Statistics
- ○ the number of sodas students drink per day

1686. In a certain town, 50% of the households own a cellular phone, 40% own a pager, and 20% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is

0.5*(1-0.4)

- ○ 90%
- ○ 70%
- ○ 10%
- ● 30%.
- ○ 25%

1687. Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that the first and third selected are women?

7/12*6/11*5/10+7/12*5/11*6/10= (7*6*5) / (12*11*10)   * 2 =0.3182

- ● 0.3182
- ○ 0.5817
- ○ 0.78
- ○ 0.916
- ○ 0.1211

1688. Twenty percent of the paintings in a gallery are not originals. A collector buys a painting. He has probability 0.10 of buying a fake for an original but never rejects an original as a fake, What is the (conditional) probability the painting he purchases is an original?

- 1/41
- **40/41**
- 80/41
- 1
- 40/100

1689. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{t \leq 0\}$.

- 0.8
- **0.5**
- 0.3
- 0.2
- 0.1

1690. A probability function is a rule of correspondence or equation that:

- Finds the mean value of the random variable.
- Assigns values of x to the events of a probability experiment.
- **Assigns probablities to the various values of x.**
- Defines the variability in the experiment.
- None of the given answers is correct.

1691. Which of the following is an example of a discrete random variable?

- The distance you can drive in a car with a full tank of gas.
- The weight of a package at the post office.
- The amount of rain that falls over a 24-hour period.
- **The number of cows on a cattle ranch.**
- The time that a train arrives at a specified stop.

1692. Which of the following is the appropriate definition for the union of two events A and B?

- The set of all possible outcomes.
- The set of all basic outcomes contained within both A and B.
- **The set of all basic outcomes in either A or B, or both.**
- None of the given answers
- The set of all basic outcomes that are not in A and B.

1693. Johnson taught a music class for 25 students under the age of ten. He randomly chose one of them. What was the probability that the student was under twelve?

- 1
  - 0.5
  - 1/25
  - 0
  - 0.25

1694. The compact disk Jane bought had 12 songs. The first four were rock music. Tracks number 5 through 12 were ballads. She selected the random function in her CD Player. What is the probability of first listening to a ballad?

8/12=2/3

  - 1/3
- 2/3
  - 1/2
  - 1/6
  - 1/12

1695. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 5?

1 5   5 1   4 2   2 4   3 3   1/5

  - 1/6
- 1/5
  - 1/3
  - 5/6
  - 1/18

1696. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be hearts?

13/52*12/51

  - 4/17
- 1/17
  - 2/17
  - 1/4
  - 4/17
  - 33/68

1697. What is the probability of drawing a diamond from a standard deck of 52 cards?

13/52=1/4

  - 1/52
  - 13/39
  - 1/13
- 1/4

- 1/2

1698. One card is randomly selected from a shuffled deck of 52 cards and then a die is rolled. Find the probability of obtaining an Ace and rolling an odd number.

4/52*3/6=1/26

- 1/104
- 7/13
- 1/39
- 1/26
- 1/36

1699. The probability that a particular machine breaks down on any day is 0.2 and is independent of the breakdowns on any other day. The machine can break down only once per day. Calculate the probability that the machine breaks down two or more times in ten days.

Chance of exactly 0 breakdowns in 10 days: 0.8^10 = 0.1073741824
Chance of exactly 1 breakdown in 10 days: 0.8^9 * 0.2^1 * C(10,1) = 0.268435456
Chance of 2 or more breakdowns in 10 days: 1 - 0.1073741824 - 0.268435456 = 0.6241903616

- 0.0175
- 0.0400
- 0.2684
- 0.6242
- 0.9596

1700. Let A, B and C be independent events such that P(A) = 0.5, P(B) = 0.6 and P(C) = 0.1. Calculate $P(A^c \cup B^c \cup C)$

0.5+0.4-0.5*0.4 = 0.7

0.7+0.1-0.7*0.1=0.73

- 0.69
- 0.71
- 0.73
- 0.98
- 1

1701. The pdf of a random variable X is given by $f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$.

What are the values of μ and σ?

x-a po formule

2 * sigma^2=8

Sigma=2

- $\mu = 1, \sigma = 4$

○ $\mu = -1, \sigma = 4$

• $\mu = -1, \sigma = 2$

○ $\mu = 1, \sigma = 8$

○ $\mu = 1, \sigma = 2$

1702. What quantity is given by the formula $\frac{Cov(X,Y)}{\sqrt{Var(X) \cdot Var(Y)}}$?

○ Covariance of the random variables X and Y

• Correlation coefficient

○ Coefficient of symmetry

○ Conditional expectation

○ None of the given answers is correct

1703. In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?

C(4,1)*c(48,4) /   c(52,5) =

• 0.2995

○ 0.699

○ 0.23336

○ 1/4

○ 0.4999

1704. The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=3. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:

$$P(X = x) = e^{-\lambda}\frac{\lambda^x}{x!} \qquad x = 0, 1, 2, 3, 4, \ldots$$

E^(-3)*3^2/2! +e^(-3)*3+e^-3= 0.42319

○ 0.64726

○ 0.81521

• 0.42319

○ 0.18478

○ 0.08391

1705. Table shows the cumulative distribution function of a random variable X. Determine $P(X \geq 2)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3

1706. Table shows the cumulative distribution function of a random variable X. Determine $P(X > 4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 1
- 1/2
- 3/4
- 0

1707. Which of the following statements is always true for A and A^C ?

- $P(AA^c)=1$
- $P(A^c)=P(A)$
- $P(A+A^c)=0$
- $P(AA^c)=0$
- None of the given statements is true

1708. Consider the universal set U and two events A and B such that $A \cap B = \varnothing$ and $A \cup B = U$. We know that P(A)=1/3. Find P(B).

- 2/3
- 1/3
- 4/9
- Cannot be determined
- 1

1709. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?

- 1/3
- 3/8
- 5/8
- 1/8
- 1

1710. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

- ○ 1/4, always
- ● 1/4, if A and B are independent
- ○ 1/2, always
- ○ 1/2, if A and B are independent
- ○ None of the given answers

1711. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

$$\mathbb{P}(A \mid B) = \frac{\mathbb{P}(A \cap B)}{\mathbb{P}(B)},$$

X / (2/7) = 3/5

X= 2/7 * 3/5 = 6/35

6/35 / 1/ 4 = p B | A

6/35* 4/1 = 24/35

- ○ 24/75
- ● 24/35
- ○ 6/35
- ○ 12/75
- ○ None of the given answers

1712. A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.

((c(8,2)*c(7,1) + c(8,3)*c(7,0)))/ (15,3)=

- ○ 512/3375
- ● 28/65
- ○ 8/15
- ○ 1856/3375
- ○ 36/65

1713. If the variance of a random variable X is equal to 3, then Var(3X) is :

3^2*3

- ○ 12
- ○ 6
- ○ 3
- ● 27
- ○ 9

1714. **Let X and Y be continuous random variables with joint cumulative distribution function** $F(x,y)=\frac{1}{250}\left(20xy-x^2y-xy^2\right)$ **for** $0\le x\le 5$ **and** $0\le y\le 5$. **Find P(X>2).**

- ○ 3/125
- ○ 11/50
- ● 12/25
- ○ $1-\frac{1}{250}\left(36y-2y^2\right)$
- ○ $\frac{1}{250}\left(39y-3y^2\right)$

1715. **Indicate the correct statement related to Poisson random variable** $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$.

- ● $\lambda = np \sim const$, $n\to\infty,\ p\to 0$
- ○ $\lambda=\frac{n}{p}$, $n\to\infty$
- ○ $\lambda=ep$, $n\to\infty$
- ○ $\lambda=n^p$, p is const
- ○ None of the given answers is correct

1716. **Let X be a continuous random variable with PDF f(x) = cx (0 ≤ x ≤ 1), where c is a constant. Find the value of constant c.**

C * x^2/2 ot 0 do 1 = 1

C=1 / ½

C =2

- ○ 1
- ● 2
- ○ 1/2
- ○ 3/2
- ○ 4

1717. **We are given the pmf of two random variables X and Y shown in the tables below.**

X	1	3
p_x	0,4	0,6

y	2	4
p_y	0,2	0,8

Find E[X+Y].

0.4+0.6*3+0.2*2+0.8*4

- ● 5,8
- ○ 2,2

- 2
- 8,8
- 10

1718. **The pdf of a random variable X is given by** $f(x)=\begin{cases} \frac{1}{\gamma-2{,}5}, & if \quad x\in(1{,}5;3), \\ 0, & otherwise \end{cases}$.

Calculate the parameter γ.

- 0
- 4
- 1,5
- 2
- 3,5

1719. **Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that three of those selected are women?**

(7/12*6/11*5/10*5/9)* 4

- 0.35
- 0.65
- 0.45
- 0.25
- 0.1211

1720. **Suppose that the random variable T has the following probability distribution:**

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{T \geq 0 \; and \; T < 2\}$.

0.5+0.3

- 0.8
- 0.5
- 0.3
- 0.2
- 0.1

1721. **Suppose that the random variable T has the following probability distribution:**

t	0	1	2
P(T = t)	.5	.3	.2

Compute the mean of the random variable T.

0.3+0.2*2

- 0.8

- 0.5
- 0.7
- 0.1
- 1

1722. **Three dice are rolled. What is the probability that the points appeared are distinct.**

- 1
- 5/9
- 2
- 1/3
- 1/2

1723. **Probability density function of the normal random variable X is given by** $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-3)^2}{50}}$ **. What is the standard deviation?**

50=2*sigma^2

Sigma = 5

- 5
- 3
- 25
- 50
- 9

1724. **The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.**

- p^5
- $1-(1-p)^5$
- $(1-p)^5$
- $1-p^5$
- None of the given answers is correct

1725. **The cdf of a random variable X is given by** $F(x) = \begin{cases} 0 & if \quad x \le 3/2 \\ 2x-3 & if \quad 3/2 < x \le 2 \\ 1 & if \quad x > 2. \end{cases}$ **Find the probability P(1.7<X<1.9).**

Z(1.9)-z(1.7)=1.9*2-3 - (2*1.7-3)

- 0,16
- 0,8

- 1
- 0,4
- 0.6

1726. In each of the 20 independent trials the probability of success is 0.2. Find the variance of the number of successes in these trials.

Variance= sigma^2

Sigma= sqrt(npq)

So 20*0.2*0.8

- 0
- 1
- 10
- 3.2
- 0.32

1727. A coin tossed twice. What is the probability that head appears in the both tosses.

HH th ht tt

- 1/2
- 1/4
- 0
- 4:1
- 1

1728. Continuous random variable X is normally distributed with mean=1 and variance=4. Find P(4≤x≤6).

Z((6-1 / 4) – z((4-1)/ 4)=0.89-0.77=

- 0,0606
- 0,202
- 0,0305
- 0,0484
- 0,0822

1729. Random variable X is uniformly distributed on the interval [-2, 2]. Indicate the right values for E[X] and Var(X).

(A+b)/2=mean

(b-a)^2 / 12= 16/12

- E[X]=0 and Var(X)=4
- E[X]=0 and Var(X)=1.33
- E[X]=0.5 and Var(X)=1.33
- E[X]=0 and Var(X)=0
- No right answer

1730. **Expectation and standard deviation of the normally distributed random variable X are respectively equal to 15 and 5. What is the probability that in the result of an experiment X takes on the value in interval (5, 20)?**

- ○ Φ(20) – Φ(5)
- ○ Φ(5) + Φ(10)
- ○ Φ(1) – Φ(0)
- ○ Φ(20) + Φ(5)
- ● Φ(1) + Φ(2)-1
- ○ Φ(2) – Φ(1)

1731. **Normally distributed random variable X is given by density** $f(x)=\frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$ **. Find the mean.**

- ○ -1/2
- ○ 1/2
- ○ 1/4
- ● 0
- ○ 1

1732. **Indicate the density function of the normally distributed random variable X when mean=2 and variance=9.**

Variance=sigma^2

- ○ $\varphi(x)=\frac{1}{9\sqrt{2\pi}}e^{-\frac{(x-2)^2}{18}}$
- ○ $\varphi(x)=\frac{1}{2\sqrt{2\pi}}e^{-\frac{(x-9)^2}{8}}$
- ● $\varphi(x)=\frac{1}{3\sqrt{2\pi}}e^{-\frac{(x-2)^2}{18}}$
- ○ $\varphi(x)=\frac{1}{6\sqrt{2\pi}}e^{-\frac{(x-a)^2}{72}}$
- ○ $\varphi(x)=-\frac{1}{\sigma\sqrt{2\pi}}e^{\frac{(x-a)^2}{2\sigma^2}}$

1733. **Indicate the PDF for standard normal random variable.**

- ○ $f(x)=\lambda x^{-\lambda x}$, $x\geq 0$
- ○ $f(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$
- ○ $f(x)=\frac{1}{b-a}$, $a\leq x\leq b$

- $f(x)=\frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$
  - $f(x)=-\lambda e^{-\lambda x}$, $x \geq 0$

1734. Random variable X is uniformly distributed in interval [0, 3]. What is the variance of X?

(b-a)^2 / 12 = 9/12

- 0.75
  - 1.5
  - 3
  - 0.25
  - 1

1735. Random variable X is uniformly distributed in interval [0, 15]. What is the expectation of X?

15/2

  - 15
  - 3.75
- 7.5
  - 30
  - 0

1736. Random variable X is uniformly distributed in interval [-2, 1]. What is the distribution of the random variable Y=2X+2?

2*-2+2=-2

2*1+2=4

Просто закидываем А потом Б вместо икса

  - Y is normally distributed in the interval [-4, 2]
- Y is uniformly distributed in the interval [-2, 4]
  - Y is normally distributed in the interval [-2, 4]
  - Y is exponentially distributed in the interval [-4, 2]
  - Y has other type of distribution

1737. Random variable X is uniformly distributed in interval [-11, 26]. What is the probability P(X> - 4)?

  - 29/38
  - 29/37
- 30/37
  - 15/19
  - 0

1738. Random variable X is uniformly distributed in interval [1, 3]. What is the distribution of the random variable Y=3X+1?

3*1+1=4

3*3+1=10

- ○ Y is normally distributed in the interval [3, 9]
- ● Y is uniformly distributed in the interval [4, 10]
- ○ Y is normally distributed in the interval [4, 10]
- ○ Y is exponentially distributed in the interval [4, 10]
- ○ Y has other type of distribution

1739. Random variable X is uniformly distributed in interval [-11, 20]. What is the probability $P(X \le 0)$?

- ○ 11/32
- ○ 5/16
- ○ 10/31
- ● 11/31
- ○ 0

1740. Random variable X is given by density function f(x) in the interval (0, 1) and otherwise is 0. What is the expectation of X?

- ○ $\int_{-\infty}^{+\infty} xf(x)dx$
- ○ $\int_{-\infty}^{+\infty} f(x)dx$
- ● $\int_{0}^{1} xf(x)dx$
- ○ $\int_{0}^{1} f(x)dx$
- ○ E[X]=0

1741. Random variable X is given by density function f(x) = x/2 in the interval (0, 2) and otherwise is 0. What is the expectation of X?

Integral ot 0 do 2 x * x/2 = x^3 / 6 ot 0 do 2 = 8/6=4/3

- ○ 1/2
- ○ 1
- ● 4/3
- ○ 2/3
- ○ 0

1742. Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the expectation of X?

Integral ot 0 do 1 x * 2x = 2x^3 /3 ot 0 do 1 = 2/3

- ○ 1/2

- 1
- 4/3
- 2/3
- 0

1743. Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the probability P(0 < X < 1/2) ?

Integral ot 0 do ½ 2x = x^2 ot 0 do ½ = ½ ^ 2 = ¼

- 1/2
- 1/4
- 0
- 1/8
- 0
- None of these

1744. Indicate the function that can be CDF of some random variable.

- $F(x)=\begin{cases} 0, & x \le 1 \\ x-1/2, & 1 < x \le 2 \\ 0, & x > 2 \end{cases}$
- $F(x)=\begin{cases} 0, & x \le 1 \\ 2-x, & 1 < x \le 2 \\ 1, & x > 2 \end{cases}$
- $F(x)=\begin{cases} 0, & x \le 1 \\ 1/2, & 1 < x \le 2 \\ 1, & x > 2 \end{cases}$
- $F(x)=\begin{cases} 0, & x \le 1 \\ 1/2, & 1 < x \le 4 \\ 0, & x > 4 \end{cases}$
- None of these

1745. Indicate the function that can be PDF of some random variable.

- $f(x)=\begin{cases} 0, & x \le 1 \\ x-1/2, & 1 < x \le 2 \\ 0, & x > 2 \end{cases}$
- $f(x)=\begin{cases} 0, & x \le 1 \\ x-1/2, & 1 < x \le 2 \\ 1, & x > 2 \end{cases}$

- $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 4\\ 0, & x>4\end{cases}$
- $f(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$
- $f(x)=\begin{cases}0, & x\le 1\\ x/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

1746. Continuous random variable X has the following CDF:

$$F(x)=\begin{cases}0, & x\le 0\\ \frac{x}{2}, & 1<x\le 2\\ 1, & x>2\end{cases}$$ **. What is the PDF of X in the interval 1<X≤2?**

2/2 – ½

- 1/2
- 0
- 1
- $X^2/4$
- x

1747. Continuous random variable X is given in the interval [0, 100]. What is the probability P(X=50)?

- 0
- 1
- 0.5
- 0.75
- 0.25

1748. CDF of discrete random variable X is given by

$$F(x)=\begin{cases}0, & x\le 1\\ 0{,}3, & 1<x\le 2\\ 0{,}5, & 2<x\le 3\\ 1, & x>3\end{cases}$$ **What is the probability P{1.3<X≤2.3}?**

0.5-0.3

- 0.8
- 0.2
- 0
- 0.6
- 0.4

1749. PMF of discrete random variable is given by

X	0	2	4
P	0,1	0,5	0,4

Find the value of CDF of X in the interval (2, 4].

- 0.4
  - 0.5
  - 0.2
- 0.6
  - 1

1750. PMF of discrete random variable is given by

X	0	2	4
P	0,3	0,1	0,6

Find F(2).

0.3+0.1

- 0.4
  - 0.6
  - 0.3
  - 0.7
  - 0.1

1751. PMF of discrete random variable X is given by

X	-1	5
P	0,4	0,6

Find standard deviation of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

Variance = sigma^2

Sigma= 2.93

- 15.4
- 8.64
- 2.6

- 2.9393
  - 3.3333

1752. **PMF of discrete random variable X is given by**

X	-1	5
P	0,4	0,6

Find variance of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

- ○ 15.4
- ● 8.64
- ○ 2.6
- ○ 2.93
- ○ 3.33

1753. **PMF of discrete random variable X is given by**

X	0	5	x_3
P	0,6	0,1	0,3

If E[X]=3.5 then find the value of x_3.

5*0.1+x3*0.3=3.5

x3*0.3=3

x3=10

- ● 10
- ○ 6
- ○ 8
- ○ 12
- ○ 24

1754. **Probability of success in each of 100 independent trials is constant and equals to 0.8. What is the probability that the number of successes is between 60 and 88?**

Mean = 80

Sigma=sqrt(100*0.8*0.2)=4

(88-80 / 4) – (60-80 / 4)= 2 - -5

- ○ $P_{100}(60 \le m \le 88) \approx \Phi(88) - \Phi(60)$
- ● $P_{100}(60 \le m \le 88) \approx \Phi(2) - \Phi(-5)$
- ○ $P_{100}(60 \le m \le 88) \approx \Phi(88) + \Phi(60)$
- ○ $P_{100}(60 \le m \le 88) \approx \Phi(2) + \Phi(5)$
- ○ $P_{100}(60 \le m \le 88) \approx \Phi(8) + \Phi(20)$

1755. A man is made 10 shots on the target. Assume that the probability of hitting the target in one shot is 0,7. What is the most probable number of hits?

- ○ 8
- ● 7
- ○ 6
- ○ 5
- ○ 9

1756. Consider two boxes, one containing 4 white and 6 black balls and the other - 8 white and 2 black balls. A box is selected at random, and a ball is drawn at random from the selected box. If the ball occurs to be white, what is the probability that the first box was selected?

P(B|A)=p(A|B)*p(B)/p(A)

- ○ 0.4
- ○ 0.6
- ○ 0.8
- ● 1/3
- ○ 2/3

1757. Each of two boxes contains 6 white and 4 black balls. A ball is drawn from 1st box and it is replaced to the 2nd box. Then a ball is drawn from the 2nd box. What is the probability that this ball occurs to be white?

(7/11+6/11) * ½

- ○ 0.3
- ○ 0.4
- ○ 0.5
- ● 0.6
- ○ 0.8

1758. Consider two boxes, one containing 3 white and 7 black balls and the other – 1 white and 9 black balls. A box is selected at random, and a ball is drawn at random from the selected box. What is the probability that the ball selected is black?

(7/10 + 9/10) * ½ =8/10 =0.8

- ● 0.8
- ○ 0.2
- ○ 0.4
- ○ 1.6
- ○ 0.9

1759. Urn I contains 4 black and 6 white balls, whereas urn II contains 3 white and 7 black balls. An urn is selected at random and a ball is drawn at random from the selected urn. What is the probability that the ball is white?

(6/10 + 3/10) * ½ = 9/10* ½ = 0.45

- 0.45
  - 0.15
  - 0.4
  - 0.9
  - 1

1760. A coin is tossed twice. Event A={ at least one Head appears}, event B={at least one Tail appears}. Find the conditional probability P(B|A).

A= HT TH HH=3/4

B= TT HT TH=3/4

2/3 sovpadenie

- 2/3
  - 1/3
  - 1/2
  - 3/4
  - 0

1761. A coin is tossed twice. Event A={ Head appears in the first tossing}, event B={at least one Tail appears}. Find the conditional probability P(B|A).

A=**HT** HH

B=**HT** TH TT

  - 1/4
- 1/2
  - 1/3
  - 2/3
  - 3/4

1762. Probability that each shot hits a target is 0.9. Total number of shots produced to the target is 5. What is the probability that at least one shot hits the target?

  - $1\text{-}0{,}9^5$
  - $0{,}9^5$
  - 1-5·0,9
- $1\text{-}0{,}1^5$
  - $0{,}1^5$
  - 1-5·0,1

1763. An urn contains 1 white and 9 black balls. Three balls are drawn from the urn without replacement. What is the probability that at least one of the balls is white? *

9/10*8/9*1/8 * 3= 0.3

  - 0.7
- 0.3

- 0.4
- 0.2
- 0.6

1764. Four independent shots are made to the target. Probability of missing in the first shot is 0.5; in the second shot – 0.3; in the 3rd – 0.2; in the 4th – 0.1. What is the probability that the target is not hit.

0.5*0.3*0.2*0.1=0.003

- 1.1
- 0.03
- 0.275
- 0.003
- 1.01

1765. Probability of successful result in the certain experiment is 3/4. Find the most probable number of successful trials, if their total number is 10.

¾*10=7.5

- 6
- 7
- 8
- 5
- 10

1766. Let E and F be two mutually exclusive events and P(E)=P(F)=1/3. The probability that none of them will occur is:

- No correct answer
- $\mathrm{P}((E \cup F)^c) = 1 - (\mathrm{P}(E) + \mathrm{P}(F)) = 1 - \frac{1}{3} - \frac{1}{3} = \frac{1}{3}$
- $\mathrm{P}(E \cup F) = \mathrm{P}(E) + \mathrm{P}(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
- $\mathrm{P}(E \cap F) = \mathrm{P}(E) + \mathrm{P}(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
- $\mathrm{P}(E^c \cup F^c) = \mathrm{P}(E^c)\mathrm{P}(F^c) = \frac{2}{3}\frac{2}{3} = \frac{4}{9}$

1767. Let E and F be two events. If $\mathrm{P}(E) = \frac{3}{4}$, $\mathrm{P}(F) = \frac{1}{2}$, $\mathrm{P}(E \cup F) = 1$ and $\mathrm{P}(E \cap F) = \frac{1}{4}$, then the conditional probability of E given F is:

¼ / ½ = ½

- $\mathrm{P}(E|F) = \frac{1}{4}$
- $\mathrm{P}(E|F) = \frac{3}{4}$
- $\mathrm{P}(E|F) = \frac{1}{2}$
- $\mathrm{P}(E|F) = \frac{1}{3}$
- No correct answer

1768. **Given that Z is a standard normal random variable. What is the value of Z if the area to the left of Z is 0.9382?**

- ○ 1.8
- ● 1.54
- ○ 2.1
- ○ 1.77
- ○ 3

1769. **At a university, 14% of students take math and computer classes, and 67% take math class. What is the probability that a student takes computer class given that the student takes math class?**

P(AB)=0.14

P(A)=0.67

P(B|A)=p(BA)/p(A)=0.14/0.67=0.21

- ○ 0.81
- ● 0.21
- ○ 0.53
- ○ No correct answer
- ○ 0.96

1770. **Let** $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, **be the joint p.d.f. of X and Y. Find the marginal PDF of X.**

X+y^2/2 ot 0 do 1 dlya Y= x + 1/2

- ○ x
- ● x+1/2
- ○ y+1/2
- ○ x^2+1
- ○ x^2+y^2

1771. **If two random variables X and Y have the joint density function,** $f_{X,Y}(x,y)=\begin{cases} xy & \text{for } 0<x<1,\ 0<y<2 \\ 0 & \text{elsewhere} \end{cases}$**, find the probability P(X+Y<1).**

- ● 1/24
- ○ 1/12
- ○ 5/12
- ○ 1/4
- ○ 0.003

1772. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases}\frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1\\ 0 & \text{elsewhere}\end{cases}$**, find the conditional PDF** $f_{X|Y}(x|y)$**.**

- ○ $\frac{(x+y^2)}{1+y^2}$
- ● $\frac{2(x+y^2)}{1+2y^2}$
- ○ $\frac{5(x+y^2)}{12}$
- ○ $\frac{\frac{6}{5}(x+y^2)}{1+y^2}$
- ○ None of these

1773. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases}\frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1\\ 0 & \text{elsewhere}\end{cases}$**, find the conditional PDF** $f_{Y|X}(y|x)$**.**

- ○ $\frac{(x+y^2)}{1+x}$
- ○ $\frac{3(x+y^2)}{x}$
- ● $\frac{3(x+y^2)}{1+3x}$
- ○ $\frac{\frac{6}{5}(x+y^2)}{1+3x}$
- ○ None of these

1774. A basketball player makes 90% of her free throws. What is the probability that she will miss for the first time on the seventh shot?

0.9^6*0.1

- ○ 0.0001
- ● 0.053
- ○ 0.002
- ○ 0.001
- ○ 0.01

1775. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}2(1-x) & \text{if} \quad 0\le x\le 1, 0\le y\le 1\\ 0, & \text{otherwise}\end{cases}$$

. Then find P(Y>0.5).

- 0.5
  - 0.25
  - 0.75
  - 1
  - 1.5

1776. Let X be a continuous random variable with probability density given by $f(x)=\begin{cases}\frac{x}{12} & \text{for } 1<x<5\\ 0 & \text{elsewhere}\end{cases}$.

Let Y=2X-3. Find P(Y≥4).

  - 0.3438
- 0.53125
  - 0.0625
  - 0.1563
  - 0

1777. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find $P(-0.8\le X\le 0.8)$**.**

  - 0.31
  - 0.428
- 0.512
  - 0
  - 0.78

1778. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find E[X].

- 0
  - 1
  - 2
  - 3
  - 4

1779. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find Var[X].

  - 0
  - 1
- 0.6

- 0.8
- 0.4

1780. Random variable X has the following PDF $f(x) = \frac{3x^2}{2}, -1 \le x \le 1.$

Find $E\left[\frac{1}{X}\right]$**.**

- 4
- 0
- 2
- 1
- -2

1781. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y) = \begin{cases} 6x^2 y & if \quad 0 \le x \le 1, 0 \le y \le 1 \\ 0, & otherwise \end{cases}$$

. Find the marginal density function for X.

- 6y
- $6y^2$
- $6x^2$
- $3x^2$
- $3x^3$

1782. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y) = \begin{cases} 6x^2 y & if \quad 0 \le x \le 1, 0 \le y \le 1 \\ 0, & otherwise \end{cases}$$

. Find the marginal density function for Y.

- $3x^2$
- 6y
- 2y
- $2y^2$-1
- y+6

1783. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y) = \begin{cases} 6x^2 y & if \quad 0 \le x \le 1, 0 \le y \le 1 \\ 0, & otherwise \end{cases}$$

. Find the E[X].

- 0.25
- 0.75
- 0.5
- 0.95

- None of these

1784. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & \text{if} \quad 0\le x\le 1, 0\le y\le 1\\ 0, & \text{otherwise}\end{cases}$$

. Find the E[Y].

- 1
- 2/3
- 1/3
- 0.5
- 0.25

1785. Assume that Z is standard normal random variable. What is the probability P(|Z|>2.53)?

- 0.9943
- 0.0114
- 0.0057
- 0.9886
- None of these

1786. If Z is normal random variable with parameters μ=0, σ^2=1 then the value of c such that P(|Z|<c)=0.7994 is

- 1.28
- 0.84
- 1.65
- 2.33
- None of these

1787. The random variable X has the continuous CDF

$$F(x)=\begin{cases}0, & x<0\\ \dfrac{x^2}{9}, & 0\le x<3\\ 1, & 3\le x\end{cases}$$

. Find P(2≤X≤4).

- 16/9
- 4/3
- 4/9
- 5/9
- 2/3

1788. Let X be the random variable for the life in hours for a certain electronic device. The probability density function is

$$f(x) = \begin{cases} \dfrac{200{,}000}{x^3} & \text{for } x > 100 \\ 0 & \text{elsewhere} \end{cases}$$

. Find the expected life for a component.

- 2000 hours
  - 1000 hours
  - 100 hours
  - 200 hours
  - None of these

1789. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y) = \begin{cases} x+y & \text{if} \quad 0 \le x \le 1, 0 \le y \le 1 \\ 0, & \text{otherwise} \end{cases}$$

. Find E[X-Y].

- 0
  - 7/6
  - 2/3
  - 1/6
  - None of these

1790. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y) = \begin{cases} x+y & \text{if} \quad 0 \le x \le 1, 0 \le y \le 1 \\ 0, & \text{otherwise} \end{cases}$$

. Find E[X+Y].

  - 1/6
  - 6/7
- 7/6
  - 5/6
  - 0

1791. The joint density function for the random variables X and Y is given by

$$f_{X,Y}(x,y) = \begin{cases} xe^{-x(1+y)} & \text{if} \quad x \ge 0,\ y \ge 0 \\ 0, & \text{otherwise} \end{cases}$$

. Find E[X].

  - 0
- 1
  - 1.4142
  - 2
  - None of these

1792. A box contains 15 balls, 10 of which are black. If 3 balls are drawn randomly from the box, what is the probability that all of them are black?

10/15*9/14*8/13=0.26

- 0.26
  - 0.52

- 0.1
- None of these
- 0.36

1793. The Cov(aX,bY) is equal to

- $aCov(X,Y)+bCov(X,Y)$
- $aCov(X,Y)-bCov(X,Y)$
- $abCov(X,Y)$
- $a^2b^2Cov(X,Y)$
- $\frac{a}{b}Cov(X,Y)$

1794. If A and B are two mutually exclusive events with P(A) = 0.15 and P(B) = 0.4, find the probability P(A and B^c) (i.e. probability of A and B complement).

0.15*0.6

- 0.4
- 0.15
- 0.85
- 0.6
- 0.65

1795. From a group of 5 men and 6 women, how many committees of size 3 are possible with two men and 1 woman if a certain man must be on the committee?

- $\binom{5}{1}\times\binom{6}{1}$
- $\binom{4}{1}\times\binom{1}{1}\times\binom{6}{1}$
- $\binom{1}{1}\times\binom{6}{1}$
- $\binom{5}{2}\times\binom{6}{1}$
- None of these

1796. Let $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, be the joint PDF of X and Y. Find the marginal PDF of Y.

- y+1/2
- y
- 1/2y
- $y^2/2$
- 1/2

1797. Let $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, be the joint PDF of X and Y. Compute E[X].

- ○ 0.2
- ● 0.823
- ○ 0.583
- ○ 1
- ○ 0

1798. Let $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, be the joint PDF of X and Y. Compute E[Y].

- ○ 0.2
- ● 0.823
- ○ 0.583
- ○ 1
- ○ 0

1799. Let $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, be the joint PDF of X and Y. Compute E[2X].

- ● 7/6
- ○ 0
- ○ 1
- ○ 7/12
- ○ 1/6

1800. Let X be continuous random variable with probability density function $f(x)=\begin{cases}\frac{x}{6}, & if\ 2<x<4\\ 0, & otherwise\end{cases}$. Find the expected value of random variable X.

- ○ 19/3
- ○ 13/3
- ○ 12/7
- ● 28/9
- ○ 27/4

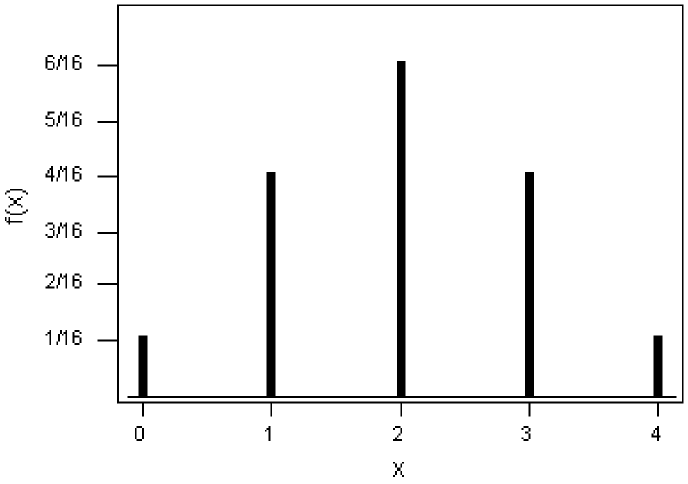
1801. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}2(1-x) & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Then find P(X>0.5).

- ○ 0.5
- ● 0.25
- ○ 0.15
- ○ 0.75
- ○ 0.1

1802. Probability mass function for discrete random variable X is represented by



the

graph. Find Var(X).

- 1
  - 4
  - 5
  - 2
  - 6

1803. Two dice are rolled, find the probability that the sum is less than 13.

- 1
  - 1.2
  - 0.5
  - 0.6
  - 0.8

1804. A bag has six red marbles and six blue marbles. If two marbles are drawn randomly from the bag, what is the probability that they will both be red?

C(2,6)/c(2,12)

- 1/2
- 11/12
- 5/12

- 5/22
  - 1/3

1805. A man can hit a target once in 4 shots. If he fires 4 shots in succession, what is the probability that he will hit his target?

$$1-\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)=1-\left(\frac{3}{4}\right)^4=1-\frac{81}{256}=\frac{256}{256}-\frac{81}{256}=\frac{175}{256}$$

- 175/256
  - 1
  - 1/256
  - 81/256
  - 144/256

1806. Let random variable *X be normal with parameters mean=5, variance=9*. Which of the following is a standard normal variable?

  - Z=(X-5)/5
  - Z=(X-3)/5
- Z=(X-5)/3
  - Z=(X-3)/3
  - None of these

1807. A coin is tossed 6 times. What is the probability of exactly 2 heads occurring in the 6 tosses.

- $\binom{6}{2}\left(\frac{1}{2}\right)^6$
  - $\left(\frac{1}{2}\right)^6$
  - $\left(\frac{1}{3}\right)^6$
  - $\binom{6}{2}\left(\frac{1}{3}\right)^6$
  - None of these

Mathematics 3. Nessipbayev Y. IS 2nd year

1.A class in probability theory consists of 2 men and 8 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores are possible?

a) $2!\,8!$

$10!$ b)

$\frac{10!}{2!}$ c)

$\frac{10!}{2!8!}$ d)

$\frac{10!}{(2!)^2}$ e)

2. A class in probability theory consists of 6 men and 4 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores are possible?

$6!\,4!$ a)

$10!$ b)

$\frac{10!}{2!}$ c)

$\frac{10!}{6!4!}$ d)

$\frac{10!}{(2!)^2}$ e)

3. Ms. Jones has 10 books that she is going to put on her bookshelf. Of these, 4 are math books, 3 are chemistry books, 2 are history books, and 1 is a language book. Ms. Jones wants to arrange her books so that all the books dealing with the same subject are together on the shelf. How many different arrangements are possible?

288 a)

6912 b

12600)

525 c

3456)

d

)

e

)

4. How many different signals, each consisting of 9 flags hung in a line, can be made from a set of 4 white flags, 3 red flags, and 2 blue flags if all flags of the same color are identical?

288 a

6912

1260

)

b

)

c

525)

3456 d

)

e

)

5.From a group of 5 women and 7 men, how many different committees consisting of 2 women and 3 men can be formed, if 2 of the men are refuse to serve on the committee together?

350 a)

b) 300

c) 4200

d) 500

e) 220

6. **A student has to answer to 10 questions in an examination. How many ways to answer exactly to 7 questions correctly?**

a) 120

b) 176

c) 45

d) 10

e) 220

7. **A student has 10 questions to answer in an examination. How many ways to answer to at least 7 questions correctly?**

a) 120

b) 176

c) 45

d) 10

e) 220

8. **An urn contains 30 balls, of which 10 are red and the other 20 blue. Suppose you take out 8 balls from this urn, without replacement. In how many ways among chosen 8 balls in this sample exactly 3 are red and 5 are blue?**

a) $\binom{30}{3}\binom{30}{5}$

b) $\binom{10}{3}\binom{20}{5}$

c) $\binom{10}{3}\binom{30}{8}$

d) $\binom{30}{8}\binom{20}{5}$

e) $\binom{10}{5}\binom{20}{3}$

9. **A bag contains six Scrabble tiles with the letters A-D-M-N-O-R. You reach into the bag and take out tiles one at a time exactly six times. After you pick a tile from the bag, write down that**

letter and then return the tile to the bag. How many possible words can be formed?

a) 720

b) 6

c) 46656

d) 120

e) 10240

10. **A police department in a small city consists of 10 officers. If the department policy is to have 5 of the officers patrolling the streets, 2 of the officers working full time at the station, and 3 of the officers on reserve at the station, how many different divisions of the 10 officers into the 3 groups are possible?**

a) 350

b) 2520

c) 4200

d) 300

e) 220

11. **Joel has an MP3 player called the Jumble. The Jumble randomly selects a song for the user to listen to. Joel's Jumble has 2 classical songs, 13 rock songs and 5 rap songs on it. What is the probability that the selected song is rock song or rap song?**

a) 0.1

b) $\frac{13}{20}$

c) 0.9

d) 18

e) 0.18

12. **Joel has an MP3 player called the Jumble. The Jumble randomly selects a song for the user to listen to. Joel's Jumble has 2 classical songs, 13 rock songs and 5 rap songs on it. What is the probability that the selected song is classical song or rap song?**

a) 0.9

b) $\frac{13}{20}$

c) 0.35

d) 7

e) 0.7

a) A chess tournament has 10 competitors, of which 4 are Russian, 3 are from the USA, 2 are from Great Britain, and 1 is from Brazil. If the tournament result lists just the nationalities of the players in the order in which they placed, how many outcomes are possible?

b) $\dfrac{10!}{4!+3!+2!+1!}$

c) 10!

d) $\dfrac{10!}{4!3!2!1!}$

e) $\frac{9!}{4!3!2!1!}$

f) $\frac{20!}{4!3!2!1!}$

13. An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.44. Calculate the number of blue balls in the second urn.

a) 64

b) 16

c) 4

d) 32

e) 8

14. An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the different color is 0.44. Calculate the number of blue balls in the second urn.

a) 4

b) 16

c) 64

d) 32

e) 8

15. License plates in Minnesota are issued with three letters from A to Z followed by three digits from 0 to 9. If each license plate is equally likely, what is the probability that a random license plate starts with G-Z-N?

a) $\frac{10^3}{26^3}$

b) 10^3

c) $\frac{1}{26^3}$

d) $\frac{1}{10^8}$

e) 26^3

16. A business man has 4 dress shirts and 7 ties. How many different shirt/tie outfits can he create?

a) 4

b) 7

c) 28

d) 11

e) 8

17. Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one A?

a) $\frac{369}{1000}$

b) $\frac{256}{625}$

c) $\frac{369}{625}$

d) $\frac{369}{3025}$

e) $\frac{125}{625}$

18. Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one B?

a) $\frac{369}{1000}$

b) $\frac{256}{625}$

c) $\frac{369}{625}$

d) $\frac{369}{3025}$

e) $\frac{125}{625}$

19. At a certain gas station 40% of the customers request regular gas, 35% request unleaded gas, and 25% request premium gas. Of those customers requesting regular gas, only 30% fill their tanks fully. Of those customers requesting unleaded gas, 60% fill their tanks fully, while of those requesting premium, 50% fill their tanks fully. If the next customer fills the tank, what is the probability that regular gas is requested.

a) 0.45

b) 0.745

c) 0.325

d) 0.264

e) 0.61

20. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

What is the probability that a student, taken at random from my class, would have failed the course, given that they failed the final?

a) $\frac{56}{145}$

b) $\frac{56}{89}$

c) $\frac{34}{56}$

d) $\frac{142}{145}$

e) $\frac{34}{89}$

21. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

e)

a)

b)

c)

d)

h a t i s t h e p r o b a b il it y that a student, taken at random from my class, would have passed the course, given that they failed the final?

W

89
145

56
~~89~~

34
~~56~~

$\frac{142}{145}$

$\frac{34}{89}$

22. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

Total number of students 321. What is the probability that a student, taken at random from my class, would have passed the course, given that they passed the final?

a) $\frac{142}{176}$

b) $\frac{89}{176}$

c) $\frac{34}{56}$

d) $\frac{142}{145}$

e) $\frac{34}{89}$

23. Using the given data, answer the following question.

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

Total number of students 321. What is the probability that a student, taken at random from my class, would have failed the course, given that they passed the final?

a) $\frac{34}{176}$

b) $\frac{56}{89}$

c) $\frac{34}{56}$

d) $\frac{142}{145}$

e) $\frac{34}{89}$

24. Insurance predictions for probability of auto accident.

	Under 25	25-39	Over 40
P	0.11	0.03	0.02

Table gives an insurance company's prediction for the likelihood that a person in a particular age group will have an auto accident during the next year. The company's policyholders are 20% under the age of 25, 30% between

25 and 39, and 50% over the age of 40. What is the probability that a random policyholder will have an auto accident next year?

a) 0.145

b) 0.041

c) 0.367

d) 0.512

e) 0.845

25. A friend who works in a big city owns two cars, one small and one large. Three-quarters of the time he drives the small car to work, and one-quarter of the time he drives the large car. If he takes the small car, he usually has little trouble parking, and so is at work on time with probability 0.9. If he takes the large car, he is at work on time with probability 0.6. What is the probability that he will not be at work on time tomorrow?

a) $\frac{1}{2}$

b) $\frac{7}{40}$

c) 0.6

d) $\frac{33}{40}$

e) $\frac{27}{40}$

26. A friend who works in a big city owns two cars, one small and one large. Three-quarters of the time he drives the small car to work, and one-quarter of the time he drives the large car. If he takes the small car, he usually has little trouble parking, and so is at work on time with probability 0.9. If he takes the large car, he is at work on time with probability 0.6. What is the probability that he will be at work on time tomorrow?

a) $\frac{1}{2}$

b) $\frac{33}{40}$

c) 0.6

d) $\frac{7}{40}$

e) $\frac{27}{40}$

27. At a certain university, 4% of men are over 6 feet tall and 1% of women are over 6 feet tall. The total student population is divided in the ratio 3:2 in favor of women (the number of women: the number of men). What is the probability that the randomly selected student is over 6 feet tall?

a) 0.05

b) 0.022

c) 0.14

d) 0.028

e) 0.11

28. You enter a chess tournament where your probability of winning a game is 0.3 against half the players, 0.4 against a quarter (among the remaining half) of the players, and 0.5 against the remaining quarter of the players. You play a game against a randomly chosen opponent. What

is the probability of winning?

a) 1.2

b) 0.375

c) 0.12

d) 0.028

e) 0.648

29. **Suppose that you have two bags with white and dark chocolates. Bag 1 has two white chocolates and six dark chocolates. Bag 2 has four white chocolates and two dark chocolates. You choose one bag at random, both being equally likely, and you grab one from the chosen bag. Let A be the event that you grab one white chocolate. Find $P(A)$.**

a) $\frac{11}{12}$

b) $\frac{11}{24}$

c) $\frac{13}{32}$

d) $\frac{1}{3}$

e) $\frac{1}{2}$

30. **Amy has two bags of candy. The first bag contains two packs of M&Ms and three packs of Gummi Bears. The second bag contains four packs of M&Ms and two packs of Gummi Bears. Amy chooses a bag uniformly at random and then picks a pack of candy. What is the probability that the pack chosen is Gummi Bears?**

a) $\frac{11}{12}$

b) $\frac{7}{15}$

c) $\frac{14}{15}$

d) $\frac{1}{3}$

e) $\frac{1}{2}$

31. **Amy has three bags of candy. The first bag contains one pack of M&Ms and two packs of Gummi Bears. The second bag contains four packs of M&Ms and two packs of Gummi Bears. The third bag contains five packs of M&Ms and three packs of Gummi Bears. Amy chooses a bag uniformly at random and then picks a pack of candy. What is the probability that the pack chosen is M&Ms?**

a) $\frac{11}{12}$

b) $\frac{13}{24}$

c) $\frac{2}{7}$

d) $\frac{5}{8}$

e) $\frac{1}{2}$

32. Amy has two bags of candy. The first bag contains two packs of M&Ms and three packs of Gummi Bears. The second bag contains four packs of M&Ms and two packs of Gummi Bears. Amy chooses the first bag with the probability 0.3 and the second – 0.7. Amy chooses a bag at random and then picks a pack of candy. What is the probability that the pack chosen is M&Ms?

a) $\frac{13}{24}$

b) $\frac{44}{75}$

c) $\frac{7}{15}$

d) $\frac{5}{8}$

e) $\frac{1}{2}$

33. A fair six-sided die is tossed. You win $2 if the result is a «5», you win $1 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the mathematical expectation of X?

a) -1/3

b) -1/6

c) 1/3

d) 1/6

e) 1/2

34. A fair six-sided die is tossed. You win $2 if the result is a «1», you win $1 if the result is a «6», but otherwise you lose $1. Let X be the amount you win. What is the dispersion of X?

a) 1.74

b) 1.47

c) -0.17

d) 1.5

e) 2.12

35. A fair six-sided die is tossed. You win $2 if the result is a «1», you win $1 if the result is a «6» or «3», but otherwise you lose $1. Let X be the amount you win. What is the mathematical expectation of X?

a) -1/3

b) 1/6

c) 1/3

d) -1/6

e) 1/2

36. A fair six-sided die is tossed. You win $2 if the result is a «1», you win $1 if the result is a «6» or «3», but otherwise you lose $1. Let X be the amount you win. What is the dispersion of X?

a) 1.74

b) 1.47

c) -0.17

1.5

2.12

d)

e)

37. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation of X+Y?

a) 2.3

b) 3.8

c) 1

d) 5.2

e) 2.4

38. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mean square (standard) deviation of X+Y?

a) 2.13

b) 1.296

c) 1.457

d) 1.795

e) 2.4

39. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the (mathematical) expectation of XY?

a) -3.8

b) -3.36

c) -1.4

d) 4.26

e) 2.44

40. A set of families has the following distribution on number of children:

X	x_1	x_2	2	3	4
P(X)	0.1	0.2	0.4	0.2	0.1

Determine $\boldsymbol{x_1, x_2}$, if it is known that $\boldsymbol{M(X) = 2, D(X) = 1.2}$?

a) $x_1 = \frac{1}{3}, x_2 = \frac{4}{3}$

b) $x_1 = 0, x_2 = 1$

c) $x_1 = 0, x_2 = \frac{4}{3}$

d) $x_1 = 0, x_2 = 10$

e) $x_1 = \frac{1}{3}, x_2 = -1$

41. The lifetime of a machine part has a continuous distribution on the interval (0, 30) with probability density function $f(x) = c(10+x)^{-2}$, $f(x) = 0$ **otherwise. Calculate the probability that the lifetime of the machine part is less than 6.**

a) $\frac{30}{53}$

b) $\frac{1}{2}$

c) $\frac{31}{35}$

d) $\frac{13}{28}$

e) $\frac{1}{17}$

42. The lifetime of a machine part has a continuous distribution on the interval (0, 30) with probability density function $f(x) = c(10+x)^{-2}$, $f(x) = 0$ **otherwise. Calculate the probability that the lifetime of the machine part is less than 10.**

a) 30/53

b) 2/3

c) 1/2

d) 13/28

e) 1/17

43. The lifetime of a machine part has a continuous distribution on the interval (0, 11) with probability density function $f(x) = c(10+x)^{-2}$, $f(x) = 0$ **otherwise. Calculate the probability that the lifetime of the machine part is less than 5.**

a) $\frac{1}{17}$

b) $\frac{7}{20}$

c) $\frac{10}{11}$

d) $\frac{19}{35}$

e) $\frac{7}{11}$

e bolady

44. A random variable *X* is given by the (probability) density function of distribution:

$$f(x)=\begin{cases} 0 & \text{if} \quad x<1 \ \text{ or } 7\le x, \\ \dfrac{x-1}{9} & \text{if } 1\le x<4, \\ \dfrac{7-x}{9} & \text{if } 4\le x<7. \end{cases}$$

Find the cumulative distribution function of the random variable X?

a)
$$F(x)=\begin{cases} 0 & \text{if} \quad x<1, \\ \dfrac{(x-1)^2}{18} & \text{if } 1\le x<4, \\ \dfrac{18-(7-x)^2}{18} & \text{if } 4\le x<7, \\ 1 & \text{if} \quad 7\le x. \end{cases}$$

b)
$$F(x)=\begin{cases} 0 & \text{if} \quad x<1, \\ \dfrac{(x-1)^2}{18} & \text{if } 1\le x<4, \\ -\dfrac{(7-x)^2}{18} & \text{if } 4\le x<7, \\ 1 & \text{if} \quad 7\le x. \end{cases}$$

$$\begin{cases} 0 & \text{if} \quad x<1 \ \text{ or } 7\le x, \\ \quad 18 \end{cases}$$

c)

$$F(x) = \begin{cases} (x-1)^2 & if\ \ 1 \le x < 4, \\ \dfrac{-(7-x)^2}{18} & if\ \ 4 \le x < 7. \end{cases}$$

d)

$$F(x)=\begin{cases}0 & if \quad x<1,\\ \dfrac{(x-1)^2}{9} & if \quad 1\le x<4,\\ \dfrac{(7-x)^2}{18} & if \quad 4\le x<7,\\ 1 & if \quad 7\le x.\end{cases}$$

e)

$$F(x)=\begin{cases}0 & if \quad x<1,\\ \dfrac{(x-1)^2-2}{18} & if \quad 1\le x<4,\\ \dfrac{(x-7)^2}{9} & if \quad 4\le x<7,\\ 1 & if \quad 7\le x.\end{cases}$$

45. A random variable *X* is given by the density function of distribution:

$$f(x)=\begin{cases}-x^2+8x-\dfrac{173}{12}, & if \ 2\le x<6,\\ 0 & otherwise.\end{cases}$$

Find the cumulative distribution function of the random variable X?

a)

$$F(x)=\begin{cases}0 & if \quad x<2\\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}+\dfrac{31}{2} & if \ 2\le x<6,\\ 1 & if \quad 6\le x.\end{cases}$$

$$F(x)=\begin{cases} 0 & \text{if } x<2, \\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12} & \text{if } 2\le x<6, \\ 1 & \text{if } 6\le x. \end{cases}$$

b)

,

$$F(x)=\begin{cases} 0 & \text{if } x<2 \\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}+\dfrac{173}{12} & \text{if } 2\le x<6, \\ 1 & \text{if } 6\le x. \end{cases}$$

c)

$$F(x)=\begin{cases} 0 & \text{if } x<2 \\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}-\dfrac{31}{2} & \text{if } 2\le x<6, \\ 1 & \text{if } 6\le x. \end{cases}$$

d)

$$F(x)=\begin{cases} 0 & \text{if } x<2, \\ -\dfrac{x^3}{3}+4x^2-\dfrac{173x}{12}-\dfrac{31}{2} & \text{if } 2\le x<6, \\ 0 & \text{if } 6\le x. \end{cases}$$

e)

46. A random variable *X* is given by the density function of distribution:

$$f(x) = \begin{cases} 8x - \dfrac{127}{4} & if \;\; 2 \le x < 6, \\ 0 & otherwise. \end{cases}$$

Find the cumulative distribution function of the random variable X?

a) $$F(x)=\begin{cases} 0 & \text{if } x<2, \\ 4x^2-\dfrac{127x}{4}+\dfrac{95}{2} & \text{if } 2\le x<6, \\ 1 & \text{if } 6\le x. \end{cases}$$

b) $$F(x)=\begin{cases} 0 & \text{if } x<2, \\ 4x^2-\dfrac{127x}{4} & \text{if } 2\le x<6, \\ 1 & \text{if } 6\le x. \end{cases}$$

c) $$F(x)=\begin{cases} 0 & \text{if } x<2, \\ 4x^2-\dfrac{127x}{4}+\dfrac{127}{4} & \text{if } 2\le x<6, \\ 1 & \text{if } 6\le x. \end{cases}$$

d) $$F(x)=\begin{cases} 0 & \text{if } x<2, \\ =4x^2-\dfrac{127x}{4}+\dfrac{31}{2} & \text{if } 2\le x<6, \\ 1 & \text{if } 6\le x. \end{cases}$$

e) $$F(x)=\begin{cases} 0 & \text{if } x<2, \\ 4x^2-\dfrac{127x}{4}-\dfrac{45}{2} & \text{if } 2\le x<6, \end{cases}$$

$$\begin{cases} 0 \quad if \quad 6 \le x. \end{cases}$$

47. A random variable *X* is given by the cumulative distribution function:

$$F(x)=\begin{cases} 0 \quad if \quad x \le 0, \\ \dfrac{Cx^3}{125} \quad if \;\; 0 \le x < 5, \\ 1 \quad if \quad 5 \le x. \end{cases}$$

Find the mathematical expectation of the random variable X?

a) $\frac{15}{4}$

b) 5

c) $\frac{5}{2}$

d) $\frac{3}{4}$

e) 1

48. A random variable *X* is given by the cumulative distribution function:

$$F(x)=\begin{cases} 0 \quad if \quad x \le 0, \\ \dfrac{Cx^3}{216} \quad if \;\; 0 \le x < 4, \\ 1 \quad if \quad 5 \le x. \end{cases}$$

Find the mathematical expectation of the random variable X?

a) 3

b) 15/4

c) 5/2

d) 7

e) 26/3

49. A random variable *X* is given by the cumulative distribution function:

$$\begin{cases} 0 \quad if \quad x \le -1, \\ Cx \end{cases}$$

$$F(x)=\begin{cases} \dfrac{\quad}{4} \; if \; -1 \le x < 1, \\ 1 \quad if \quad 1 \le x. \end{cases}$$

If $M(X) = 0$, then find the dispersion of the random variable X?

a) $\frac{1}{3}$

b) 1

c) 0

d) $\frac{3}{4}$

e) $-\frac{2}{3}$

50. A random variable *X* is given by the cumulative distribution function:

$$F(x)=\begin{cases} 0 & if \quad x\le -1, \\ \frac{Cx}{4} & if \quad -1\le x<1, \\ 1 & if \quad 1\le x. \end{cases}$$

Find the mathematical expectation of the random variable X^2?

a) $\frac{1}{3}$

b) 1

c) 0

d) $\frac{3}{4}$

e) $-\frac{2}{3}$

51. The probability that a shooter will beat out 10 points at one shot is equal to 0.1 and the probability to beat out 9 points is equal to 0.3. Find the probability of the event A – the shooter will beat out 8 or less points.

a) 0.1

b) 0.3

c) 0.6

d) 0.9

e) 0.4

52. The probability that a shooter will beat out 10 aces at one shot is equal to 0.1 and the probability to beat out 9 aces is equal to 0.3. Find the probability of the event B – the shooter will beat out no less than 9 aces.

a) 0.1

b) 0.3

c) 0.4

d) 0.9

e) 0.6

53. The probability that a shooter will beat out 10 aces at one shot is equal to 0.1 and the probability to beat out 9 aces is equal to 0.3. Find the probability of the event C – the shooter will beat out 9 or less aces.

a) 0.1

b) 0.3

c) 0.9

d) 0.6

e) 0.4

54. A die is tossed. Find the probability that an even number of aces will appear.

a) ½

b) 1

c) 0

d) 1/5

e) 1/9

55. A coin is tossed twice. Find the probability that the coin lands on tail exactly one time.

a) 1/2

b) 3/4

c) 1/3

d) 1/4

e) 0

56. There are 200 details in a box. It is known that 150 of them are details of the first kind, 10 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the third kind from the box are there?

a) 190

b) 10

c) 40

d) 200

e) 150

57. A coin is tossed twice. Find the probability that the coin lands on tails both times.

a) 1/4

b) 3/4

c) 1/3

d) ½

e) 0

58. Two dice are tossed. Find the probability that the sum of points on two dice will exceed 10.

a) 1/12

b) 5/12

c) 5/18

d) 1/18

e) 0

59. An urn contains 15 balls: 4 white, 6 black and 5 red. Find the probability that a randomly taken ball will be either red or white.

a) 3/7

b) 4/15

c) 3/5

d) 6/15

e) 1

60. The probability that a shooter will beat out 10 aces at one shot is equal to 0.1 and the probability to beat out 9 aces is equal to 0.3. Find the probability of the event D – the shooter will beat out more than 8 aces.

a) 0.1

b) 0.3

c) 0.4

d) 0.6

e) 0.9

61. Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «only one student will pass the exam on "excellent"». Here $\overline{A} = A^c$.

a) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3$

b) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3$

c) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3 + \overline{A}_1\overline{A}_2\overline{A}_3$

d) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3 + A_1A_2A_3$

e) $\overline{A}_1A_2A_3$

62. Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «none of them will pass the exam on "excellent"». Here $\overline{A} = A^c$.

a) $\overline{A}_1\overline{A}_2\overline{A}_3$

b) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3$

c) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1 A_2 \overline{A}_3 + \overline{A}_1 \overline{A}_2 A_3 + \overline{A}_1 \overline{A}_2 \overline{A}_3$

d) $A_1 A^{2} \overline{A}_3 + \overline{A}_1 A_2 A_3 + A_1 \overline{A}_2 A_3 + A_1 A_2 A_3$

e) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1 A_2 \overline{A}_3 + \overline{A}_1 \overline{A}_2 A_3$

63. Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «no more than one of them will pass the exam on "excellent"». Here $\overline{A} = A^c$.

a) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3 + \overline{A}_1\overline{A}_2\overline{A}_3$

b) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3$

c) $\overline{A}_1A_2A_3$

d) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3 + A_1A_2A_3$

e) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3$

64. Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «at least two of them will pass the exam on "excellent"». Here $\overline{A} = A^c$.

a) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3 + A_1A_2A_3$

b) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3$

c) $\overline{A}_1A_2A_3$

d) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3 + \overline{A}_1\overline{A}_2\overline{A}_3$

e) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3$

65. Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «exactly two of them will pass the exam on "excellent"». Here $\overline{A} = A^c$.

a) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3$

b) $A_1 A_2 \overline{A}_3 + \overline{A}_1 A_2 A_3 + A_1 \overline{A}_2 A_3 + A_1 A_2 A_3$

c) $\overline{A}_1 A_2 A_3$

d) $A_1 \overline{A}_2 \overline{A}_3 + \overline{A}_1 A_2 \overline{A}_3 + \overline{A}_1 \overline{A}_2 A_3 + \overline{A}_1 \overline{A}_2 \overline{A}_3$

e) $A_1\overline{A}_2\overline{A}_3+\overline{A}_1A_2\overline{A}_3+\overline{A}_1\overline{A}_2A_3$

66. A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the i-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event A – «only two hit». Here $\overline{A}=A^c$.

a) $A_1A_2\overline{A}_3+\overline{A}_1A_2A_3+A_1\overline{A}_2A_3$

b) $A_1\overline{A}_2\overline{A}_3+\overline{A}_1A_2A_3+A_1\overline{A}_2A_3+A_1A_2A_3$

c) $\overline{A}_1A_2A_3$

d) $A_1\overline{A}_2\overline{A}_3+\overline{A}_1A_2\overline{A}_3+\overline{A}_1\overline{A}_2A_3+\overline{A}_1\overline{A}_2\overline{A}_3$

e) $A_1\overline{A}_2\overline{A}_3+\overline{A}_1A_2\overline{A}_3+\overline{A}_1\overline{A}_2A_3$

67. A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the i-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event A – «only one hit». Here $\overline{A}=A^c$.

a) $\overline{A}_1\overline{A}_2\overline{A}_3+\overline{A}_1A_2\overline{A}_3+\overline{A}_1\overline{A}_2A_3$

b) $A_1A_2\overline{A}_3+\overline{A}_1A_2A_3+A_1\overline{A}_2A_3+A_1A_2A_3$

c) $A_1A_2A_3$

d) $A_1\overline{A}_2\overline{A}_3+\overline{A}_1A_2\overline{A}_3+\overline{A}_1\overline{A}_2A_3+\overline{A}_1\overline{A}_2\overline{A}_3$

e) $A_1A_2\overline{A}_3+\overline{A}_1A_2A_3+A_1\overline{A}_2A_3$

68. A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the i-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event A – «at least two hits». Here $\overline{A}=A^c$.

a) $A_1A_2\overline{A}_3+\overline{A}_1A_2A_3+A_1\overline{A}_2A_3+A_1A_2A_3$

b) $_{1}A_2A_3 + A\ A_2A_3 + A\ A_2A_3$

c) $\overline{A}_1A_2A_3$

d) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3 + \overline{A}_1\overline{A}_2\overline{A}_3$

e) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3$

69. A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the i-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event A – «three misses». Here $\overline{A} = A^c$.

a) $\overline{A}_1\overline{A}_2\overline{A}_3$

b) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3$

c) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3 + A_1A_2A_3$

d) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3 + \overline{A}_1\overline{A}_2\overline{A}_3$

e) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3$

70. A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the i-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event A – «at least two misses». Here $\overline{A} = A^c$.

a) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3 + \overline{A}_1\overline{A}_2\overline{A}_3$

b) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2\overline{A}_3 + \overline{A}_1\overline{A}_2A_3$

c) $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3 + A_1A_2A_3$

d) $\overline{A}_1A_2A_3$

e) $A_1A_2\overline{A}_3 + \overline{A}_1A_2A_3 + A_1\overline{A}_2A_3$

71. A random variable X is given by the cumulative distribution function:

$$F(x) = \begin{cases} 0 & if \quad x < 10, \\ \dfrac{x-10}{10} & if \quad 10 \le x < 20, \end{cases}$$

Find P (10 < X < 15).

$$\lfloor 1 \quad if \quad 20 \le x.$$

a) 1/4

b) 0

c) 1/2

d) 1 e)

3/4

72. A random variable *X* is given by the cumulative distribution function:

$$F(x) = \begin{cases} 0 & if \quad x < 10, \\ \dfrac{x-10}{10} & if \quad 10 \le x < 20, \\ 1 & if \quad 20 \le x. \end{cases}$$

Find P (10 < X < 25).

a) 1/4

b) 0 c)

1 d)

1/2 e)

3/4

73. A random variable *X* is given by the cumulative distribution function:

$$F(x) = \begin{cases} 0 & if \quad x < 10, \\ \dfrac{x-10}{10} & if \quad 10 \le x < 20, \\ 1 & if \quad 20 \le x. \end{cases}$$

Find P (5 < X < 17.5).

a) 1/4

b) 0

c) 3/4

d) 1/2

e) 1

74. A random variable X is given by the cumulative distribution function:

$$F(x) = \begin{cases} 0 & if \quad x \le 2, \\ \dfrac{1}{2}x - 1 & if \; 2 < x \le 4, \\ 1 & if \quad x > 4. \end{cases}$$

Find the probability of hit of the random variable X into the

interval (2.5; 4).

a) 0,25

b) 3/4

c) 1

d) 2/3

e) 1/2

75. A random variable X is given by the cumulative distribution function:

$$F(x)=\begin{cases}0 & if \quad x \le 2,\\ \frac{1}{2}x-1 & if\, 2 < x \le 4,\\ 1 & if \quad x > 4.\end{cases}$$

Find the probability of hit of the random variable X into the interval (1; 5).

a) 0,25

b) 1

c) 1/3

d) 2/3

e) 1/2

76. A random variable X is given by the cumulative distribution function:

$$F(x)=\begin{cases}0 & if \quad x \le 2,\\ \frac{1}{2}x-1 & if\, 2 < x \le 4,\\ 1 & if \quad x > 4.\end{cases}$$

Find the probability of hit of the random variable X into the interval (3; 5).

a) 0,25

b) 0,5

c) 1/3

d) 2/3

e) 1

77. A random variable X is given by the cumulative distribution function:

$$F(x)=\begin{cases}0 & if \quad x \le 2,\\ \frac{1}{2}x-1 & if\, 2 < x \le 4,\\ 1 & if \quad x > 4.\end{cases}$$

Find the probability of hit of the random variable X into the interval (1; 3.5).

a) 0,25

b) 3/4

c) 1/2

d) 2/3

e) 1

78. A random variable X is given by the cumulative distribution function:

$$F(x)=\begin{cases}0 & if \quad x \le 2,\\ \frac{1}{2}x-1 & if\ 2<x\le 4,\\ 1 & if \quad x>4.\end{cases}$$

Find the probability of hit of the random variable X into the interval (0; 2.5).

a) 0,5

b) 1/4

c) 1/3

d) 2/3

e) 1

79. A random variable X is given by the cumulative distribution function:

$$F(x)=\begin{cases}0 & if \quad x \le 2,\\ \frac{1}{2}x-1 & if\ 2<x\le 4,\\ 1 & if \quad x>4.\end{cases}$$

Find the probability of hit of the random variable X into the interval (2; 3).

a) 0,25

b) 0,5

c) 1/3

d) 2/3

e) 1

80. A random variable *X* is given by the cumulative distribution function:

$$F(x)=\begin{cases}0 & if \quad x<10,\\ \dfrac{x-10}{10} & if\ \ 10\le x<20,\\ 1 & if \quad 20\le x.\end{cases}$$

Find P (5 < X < 9).

a) 1/4

b) 3/4

c) 0

d) 1/2

e) 1

81. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target at least one time.

a) 0.384

b) 0.992

c) 0.896

d) 0.512

e) 0.096

82. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target at least two times.

a) 0.384

b) 0.896

c) 0.992

d) 0.512

e) 0.096

83. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target exactly two times.

a) 0.896

b) 0.384

c) 0.992

d) 0.512

e) 0.096

84. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target exactly one time.

a) 0.896

b) 0.096

c) 0.992

d) 0.512

e) 0.384

85. The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target exactly three times.

a) 0.896

b) 0.512

c) 0.992

d) 0.096

e) 0.384

86. A consulting point of an institute receives packages with control works from the cities *A*, *B* and *C*. The probability of receiving a package from the city *A* is equal 0,2; from the city *B* – 0,2. Find the probability that next package will be received from the city *C*.

a) 0,5

b) 0,9

c) 0,6

d) 0,8

e) 1

87. A consulting point of an institute receives packages with control works from the cities *A*, *B* and *C*. The probability of receiving a package from the city *A* is equal 0,3; from the city *B* – 0,2. Find the probability that next package will be received from the city *C*.

a) 0,6

b) 0,9

c) 0,5

d) 0,8

e) 1

88. The events *A, B, C* and *D* form a complete group (i.e. they are disjoint and their union is a sample space). The probabilities of the events are *P(A)* = 0,1; *P(B)* = 0,49; *P(C)* = 0,3. What is the probability of the event *D* equal to?

a) 0,11

b) 0,5

c) 0,2

d) 0,4

e) 0,1

89. The events *A, B, C* and *D* form a complete group (i.e. they are disjoint and their union is a sample space). The probabilities of the events are those: *P(A)* = 0,1; *P(B)* = 0,4; *P(C)* = 0,3. What is the probability of the event *D* equal to?

a) 0,2

b) 0,5

c) 0,11

d) 0,4

e) 0,1

90. The events *A, B, C* and *D* form a complete group (i.e. they are disjoint and their union is a sample space). The probabilities of the events are those: *P(A)* = 0,1; *P(B)* = 0,4; *P(C)* = 0,1. What is the probability of the event *D* equal to?

a) 0,4

b) 0,5

c) 0,11

d) 0,2

e) 0,1

91. All of the letters that spell STUDENT are put into a bag. Choose the correctly calculated probability of events.

a) P(drawing a S, and then drawing a T)=1/21

b) P(drawing a T, and then drawing a D)=1/42

c) P(selecting a vowel, and then drawing a U)=1/42

d) P(selecting a vowel, and then drawing a K)=1/42

e) P(selecting a vowel, and then drawing a T)=3/42

92. All of the letters that spell MISSISSIPPI are put into a bag. Choose the correctly calculated probability of events.

a) P(of selecting a vowel, and then after returning the letter also drawing a M)=4/121

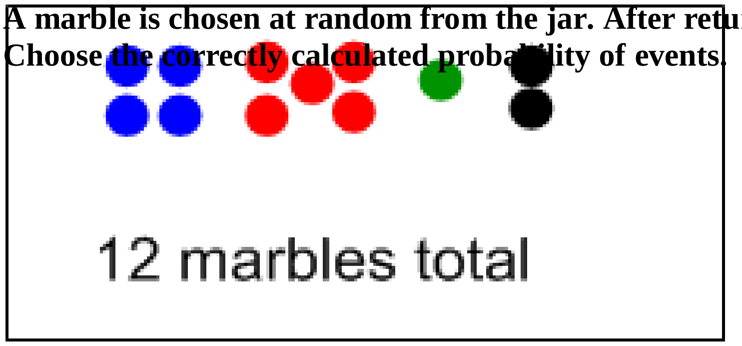
b) P(of drawing an I, and then after returning the letter also drawing a M)=3/121

c) P(of selecting a vowel, and then after returning the letter also drawing an O)=4/121

d) P(of selecting a vowel, and then after returning the letter also drawing a P)=6/121

e) P(of drawing a M, and then after returning the letter also drawing a S)=1/121

93. A jar of marbles contains 4 blue marbles, 5 red marbles, 1 green marble, and 2 black marbles. A marble is chosen at random from the jar. After returning it again, a second marble is chosen. Choose the correctly calculated probability of events.



a) P(green, and then red)=5/144

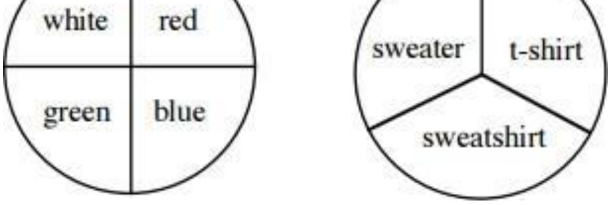
b) P(black, and then black)=1/12

c) P(red, and then black)=7/72

d) P(green, and then blue)=1/72

e) P(blue, and then blue)=1/6

94. If each of the regions in each spinner is the same



size. **Choose the correctly calculated probability of spinning each spinner.**

a) P(getting a red sweater)=1/12

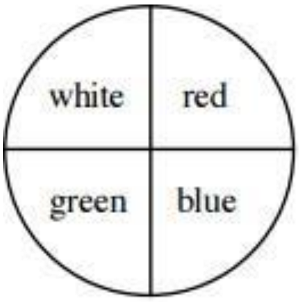
b) P(getting a white sweatshirt)=1/6

c) P(getting a white sweater)=5/12

d) P(getting a blue sweatshirt)=7/12

e) P(getting a blue t-shirt)=1/6

95. If each of the regions in each spinner is the same



size. Choose the correctly calculated probability of spinning each spinner.

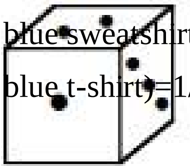
a) P(getting a red sweater)=1/12

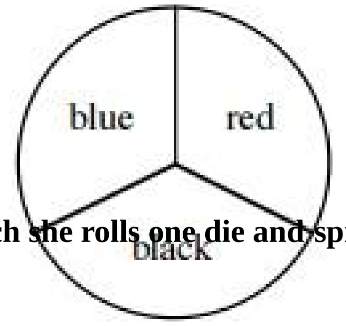
b) P(getting a white sweatshirt)=1/6

c) P(getting a white sweater)=5/12

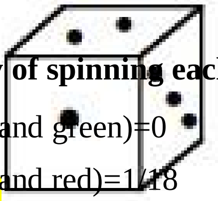
d) P(getting a blue sweatshirt)=7/12

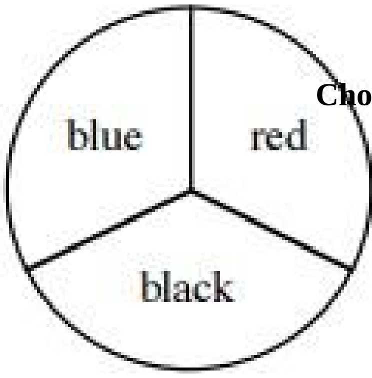
e) P(getting a blue t-shirt)=1/6





96. Mary is playing a game in which she rolls one die and spins a spinner. Choose the correctly calculated probability of spinning each spinner.





a) P(get the 1 and green)=0

b) P(get the 7 and red)=1/18

c) P(get the 3 and green)=1/18

d) P(get the 2 and black)=1/4

e) P(get the 1 and white)=1

97. **Mary is playing a game in which she rolls one die and spins a spinner. Choose the correctly calculated probability of spinning each spinner.**

a) P(get the 1 and green)=0

b) P(get the 7 and red)=1/18

c) P(get the 3 and green)=1/18

d) P(get the 2 and black)=1/4

e) P(get the 1 and white)=1

98. Find the Bernoulli formula.

a) $P_n(k) = \frac{n!}{k!(n-k)!} \cdot p^k \cdot (1-p)^{n-k}$

b) $P(B|A) = \frac{P(B) \cdot P(A|B)}{P(A)}$

c) $P(B|A) = \frac{P(AB)}{P(A)}$ P

d) ${}_n(k) = \frac{1}{\sqrt{npq}} \cdot e^{-2pq}$

$P^n(k) =$ e) $\frac{1}{\sqrt{-np}} \cdot \Phi\left(\frac{k}{\sqrt{npq}}\right)$ npq

99. Find the Bernoulli formula.

$P_n(k) =$ $-np$ a) $\frac{1}{\sqrt{npq}} \cdot \varphi\left(\frac{k}{\sqrt{npq}}\right)$

b) $P_n(k) = C_n^k \cdot p^k \cdot q^{n-k}$

c) $$P(B|A)=\frac{P(AB)}{P(A)}$$

d) $${}_{n}(k)=\frac{1}{\sqrt{npq}}\cdot e^{-2\,pq}$$

e) $P_n(k)=\frac{1}{\sqrt{npq}}\cdot\Phi\left(\frac{k-np}{\sqrt{npq}}\right)$

100. A coming up a grain stored in a warehouse is equal to 50%. What is the probability that the number of came up grains among 100 ones will make from a up to b pieces?

a) $a=5, b=10, P=\Phi\left(\frac{10-100*0{,}5}{\sqrt{100*0{,}5*0{,}5}}\right)-\Phi\left(\frac{5-100*0{,}5}{\sqrt{100*0{,}5*0{,}5}}\right)$

b) $a=50, b=75, P=\frac{1}{75-50}\varphi\left(\frac{25-100*0{,}5}{\sqrt{100*0{,}5*0{,}5}}\right)$

c) $a=10, b=40, P=\Phi\left(\frac{10-100*0{,}5}{\sqrt{100*0{,}5*0{,}5}}\right)-\Phi\left(\frac{40-100*0{,}5}{\sqrt{100*0{,}5*0{,}5}}\right)$

d) $a=10, b=20, P=\Phi\left(\frac{55-50}{\sqrt{100*0{,}5*0{,}5}}\right)$

e) $a=55, b=75, P=2\Phi\left(\frac{75-55}{\sqrt{100*0{,}5*0{,}5}}\right)$

101. The probability of striking a target by a shooter at one shot is equal to $\frac{3}{4}$. Find the probability P that at 100 shots the target will be struck no less than a and no more b times.

a) $a=70, b=80, P=\Phi\left(\frac{80-100*0{,}75}{\sqrt{100*0{,}75*0{,}25}}\right)-\Phi\left(\frac{70-100*0{,}75}{\sqrt{100*0{,}75*0{,}25}}\right)$

b) $a=5, b=75, P=\frac{1}{75-5}\varphi\left(\frac{5-100*0{,}75}{\sqrt{100*0{,}75*0{,}25}}\right)$

c) $a=50, b=75, P=\Phi\left(\frac{50-100*0{,}75}{\sqrt{100*0{,}75*0{,}25}}\right)$

d) $a=10, b=20, P=\Phi\left(\frac{20-10}{\sqrt{100*0{,}75*0{,}25}}\right)$

e) $a=50, b=75, P=2\Phi\left(\frac{75-50}{\sqrt{0.75*0.25}}\right)$

102. The probability of striking a target by a shooter at one shot is equal to $\frac{1}{4}$. Find the probability P that at 100 shots the target will be struck no less than a and no more b times.

a) $a = 50, b = 75, P = -\Phi\left(\frac{50-100*0,25}{\sqrt{100*0,75*0,25}}\right)$

b) $a = 50, b = 75, P = \frac{1}{75-50}\varphi\left(\frac{75-100*0,25}{\sqrt{100*0,75*0,25}}\right)$

c) $a = 70, b = 80, P = \Phi\left(\frac{80-100*0,25}{\sqrt{100*0,75*0,25}}\right) - \Phi\left(\frac{70-100*0,75}{\sqrt{100*0,75*0,25}}\right)$

d) $a = 10, b = 20, P = \Phi\left(\frac{20-10}{\sqrt{100*0,75*0,25}}\right)$

e) $a = 50, b = 75, P = \Phi\left(\frac{75-50}{\sqrt{100*0.75*0.25}}\right)$

103. Find approximately the probability that an event will happen exactly from a to b times at 400 trials if in each trial the probability of its occurrence is equal to 0.2.

a) $a = 140, b = 170, P = \Phi\left(\frac{170-400*0,2}{\sqrt{400*0,8*0,2}}\right) - \Phi\left(\frac{140-400*0,2}{\sqrt{400*0,8*0,2}}\right)$

b) $a = 80, b = 170, P = \frac{1}{170-80}\varphi\left(\frac{170-400*0,2}{\sqrt{400*0,8*0,2}}\right)$

c) $a = 70, b = 80, P = \Phi\left(\frac{80-400*0,2}{\sqrt{400*0,8*0,2}}\right) + \Phi\left(\frac{70-400*0,2}{\sqrt{400*0,8*0,2}}\right)$

d) $a = 110, b = 120, P = \Phi\left(\frac{120-110}{\sqrt{400*0,8*0,2}}\right)$

e) $a = 50, b = 75, P = \Phi\left(\frac{75-50}{\sqrt{400*0,8*0,2}}\right)$

104. Find approximately the probability that an event will happen exactly from a to b times at 484 trials if in each trial the probability of its occurrence is equal to 0.5.

a) $a = 180, b = 300, P = \Phi\left(\frac{300-242}{11}\right) - \Phi\left(\frac{180-242}{11}\right)$

b) $a = 80, b = 240, P = 2\varphi\left(\frac{160}{11}\right)$

c) $a = 70, b = 242, P = \Phi\left(\frac{70-484*0,5}{\sqrt{484*0.5*0.5}}\right)$

d) $a = 110, b = 120, P = \Phi\left(\frac{10-484*0,5}{\sqrt{484*0.5*0.5}}\right)$

e) $a = 50, b = 75, P = 2\Phi\left(\frac{75-484*0,5}{\sqrt{484*0.5*0.5}}\right)$

105. A factory has sent 2500 good-quality products. The probability that one product has been damaged at a transportation is $\frac{1}{5}$. Find the probability P that at the transportation it will be damaged from a to b products.

a) $a = 510, b = 525, P = \Phi\left(\frac{25}{20}\right) - \Phi\left(\frac{1}{2}\right)$

b) $a = 14, b = 170, P = \frac{1}{170-14}\varphi\left(\frac{156-2500*0.002}{\sqrt{2500*0.2*0.8}}\right)$

c) $a = 100, b = 500, P = \Phi\left(\frac{100-2500*0.002}{\sqrt{2500*0.2*0.8}}\right)$

d) $a = 110, b = 1000, P = \Phi\left(\frac{1000-2500*0.2}{\sqrt{2500*0.2*0.8}}\right) + \Phi\left(\frac{110-2500*0.2}{\sqrt{2500*0.2*0.8}}\right)$

e) $a = 50, b = 75, P = 2\Phi\left(\frac{60-2500*0.2}{\sqrt{2500*0.2*0.8}}\right)$

106. Find the right statements.

a) $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx$

b) $M(X) = \int_{-\infty}^{+\infty} xf(x)dx$

c) $F(x) = f'(x)$

d) $D(X) = \int_{-\infty}^{+\infty} x^2 f(x)dx - M(X)$

e) $P(X > A) > \frac{M(X)}{A}$

107. Find the <u>false</u> statements.

a) $0 \leq F(x) \leq 1$

b) $F(-\infty) = 0$

c) $F(+\infty) = 0$

d) $F(x) = P(X < x)$

e) $\int_{-\infty}^{+\infty} f(x)\,dx = 1$

108. Find the false statements.

a) $\int_{-\infty}^{+\infty} f(x)dx = 1$

b) $P(x_1 \leq X \leq x_2) = \int_{x_1}^{x_2} f(x)dx$

c) $F(x) = \int_{-\infty}^{x} f(t)dt$

d) $P(x_1 \leq X) = \int_{x_1}^{+\infty} f(t)dt$

e) $P(x_1 \leq X < x_2) = F(x_1) - F(x_2)$

109. Find the right property of distribution function.

a) $F(-\infty) = 0$

b) $f(-\infty) = \frac{1}{2}$

c) $P(x_1 \leq X) = \int_{x_1}^{1} f(x)dx$

d) $\int_{-\infty}^{+\infty} f(x)dx = 1$

e) $F(+\infty) = +\infty$

110. Find the right property of probability density.

a) $\int_{-\infty}^{+\infty} f(x)dx = 1$

b) $f(-\infty) = \frac{1}{2}$

c) $P(x_1 \leq X) = \int_{x_1}^{1} f(x)dx$

d) $F(-\infty) = 1$

e) $P(x_1 \leq X < x_2) = F(x_1) - F(x_2)$

111. Let a series of distribution of a random variable be given:

$$\begin{pmatrix} 1 & 2 & 3 & 4 \end{pmatrix}$$

$$X = \begin{pmatrix} & & & \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}$$

. What does this tell us about the random variable X?

a) $$F(x) = \begin{cases} 0 & \text{if } x \le 1, \\ 0.1 & \text{if } 1 < x \le 2, \\ 0.3 & \text{if } 2 < x \le 3, \\ 0.6 & \text{if } 3 < x \le 4, \\ 1 & \text{if } 4 < x. \end{cases}$$

b) $$F(x) = \begin{cases} 0 & \text{if } x \le 1, \\ 0.1 & \text{if } 1 < x \le 2, \\ 0.2 & \text{if } 2 < x \le 3, \\ 0.3 & \text{if } 3 < x \le 4, \\ 0.4 & \text{if } 4 < x. \end{cases}$$

c) $M(X) = 1$

d) $M(X^2) = 9$

e) $D(X) = 10$

112. Let a series of distribution of a random variable be given: $X = \begin{pmatrix} 0 & 2 & 4 & 8 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}$. **What does this tell us about the random variable X?**

a) $$F(x) = \begin{cases} 0 & \text{if} \quad\quad 1 \quad \text{if} \\ 0.1 & \text{if} \\ 0.3 & \text{if} \\ 0.6 & \text{if} \\ & \end{cases}$$

$x \leq 0,$,

0 $8 < x.$

$<$

x

$\leq$

2

,

2

$<$

x

$\leq$

4

,

4

$<$

x

$\leq$

8

b) $$F(x)=\begin{cases}0 & if \quad x\le 0,\\ 0.1 & if \quad 0<x\le 2,\\ 0.2 & if \quad 2<x\le 4,\\ 0.3 & if \quad 4<x\le 8,\\ 0.4 & if \quad 8<x.\end{cases}$$

c) $M(X) = 4$

d) $D(X) = 22.2$

e) $M(X) = 9$

113. The probability of working each of four combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What are the possible values of X?

a) 2

b) -1

c) 5

d) 6

e) -2

114. The probability of working each of three combines without breakages during a certain time is equal to 0,95. The random variable *X* – the number of combines working trouble-free. What are the possible values of X?

a) 2

b) -1

c) 5

d) 4

e) -2

115. Two dice are rolled. Let *X* equals the sum of the 2 dice. What are the possible values of X?

a) 5

b) -1

c) 1

d) 0

e) 13

116. Two dice are rolled. Let *X* equals the product of the 2 dice. What are the possible values of

X?

a) 24

b) 7

c) 11

d) 0

e) 33

117. Two dice are rolled. Let *X* equals the product of the 2 dice. What are the possible values of X?

a) 12

b) 7

c) 13

d) 0

e) 33

118. Let a series of distribution of a random variable be given:

$$X = \begin{pmatrix} -4 & -2 & 0 & 2 \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{8} & \frac{1}{8} \end{pmatrix}$$

. What does this tell us about the random variable X?

a) M(X)=2

b) $M(X) = -\frac{7}{4}$

c) $M(X^2) = 4$

d) $D(X) = 8$

e) $D(X) = 55$

119. The probability of working each of four combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What does this tell us about the random variable X?

a) $P(X = 0) = 0.1^4$

b) $P(X = 3) = 0.0009$

c) $P(X = 1) = 0.0729$

d) $P(X = 2) = 0.0081$

e) $P(X = 0) = 0.001$

120. The probability of working each of 3 combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What does this tell us about the random variable X?

a) $P(X = 2) = 0.243$

b) $P(X = 3) = 0.001$

$P(X = 1) = 0.009$

$P(X = 2) = 0.081$

$P(X = 0) = 0.1$

c)

d)

e)

121. Suppose that a batch of 100 items contains 6 that are defective and 94 that ate non-defective. If *X* is the number of defective items in a randomly drawn sample of 10 items from the batch. What does this tell us about the random variable X? Here $C_n^m = \binom{n}{m}$.

a) $P(X=0) = \frac{C_{94}^{10}}{C_{100}^{10}}$

b) $P(X<2) = \frac{C_6^1 C_{94}^9}{C_{100}^{10}}$

c) $P(X=2) = \frac{C_6^2 C_{94}^9}{C_{100}^{10}}$

d) $P(X>0) = 1 - \frac{C_6^6}{C_{100}^{10}}$

122. Suppose that the random variable *X* is the number of typographical errors on a single page of book has a Poisson distribution with parameter $\lambda = \frac{1}{2}$. What does this tell us about the random variable X?

a) $M(X) = 0.5$

b) $M(X) = 2$

c) D(X)= - 8

d) M(X) = 1

e) $D(X) = 4$

123. Suppose that the random variable *X* is the number of typographical errors on a single page of book has a Poisson distribution with parameter $\lambda = \frac{1}{3}$. What does this tell us about the random variable X?

a) $D(X) = \frac{1}{3}$

b) $M(X) = 3$

c) M(X)=1

d) D(X)= - 3

e) $D(X) = 9$

124. A die is tossed before the first landing "six" aces. Find the probability that the first appearance of "six" will take place at the n-th tossing the die?

a) $P(n=2)=\frac{5}{36}$

b) $P(n=5)=\frac{1}{6}*\left(\frac{5}{6}\right)^{3}$

c) $P(n=3)=\frac{1}{6}*\left(\frac{5}{6}\right)^{3}$

d) $P(n=2)=\frac{1}{6}*\left(\frac{5}{6}\right)^{2}$

e) $P(n=7)=\left(\frac{1}{6}\right)^{4}*\left(\frac{5}{6}\right)^{3}$

125. At horse-racing competitions it is necessary to overcome 3 obstacles with the probabilities equal 0.9; 0.8; 0.7 respectively. At the first failure the sportsman in the further competitions does not participate. The random variable *X* is the number of taken obstacles. Which of the following statements are right?

a) $P(X=0)=0.1$

b) $P(X=1)=0.9$

c) $P(X=3)=0.9*0.8*0.3$

d) $P(X=2)=0.9*0.2$

e) $P(X=1)=0.7$

126. At horse-racing competitions it is necessary to overcome 3 obstacles with the probabilities equal 0.9; 0.8; 0.7 respectively. At the first failure the sportsman in the further competitions does not participate. The random variable *X* is the number of taken obstacles. Which of the following statements are right?

a) $P(X=1)=0.18$

b) $P(X=1)=0.9$

c) $P(X=3)=0.9*0.8*0.3$

d) $P(X=2)=0.9*0.2$

e) $P(X=1)=1$

127. Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $a=173,\ \sigma^2=36$. Find the correctly calculated probabilities of the events.

a) $P(176;182)=0.1348$

b) $P(20;30)=\frac{10}{30}$

c) $P(-1;3)=\int_{-1}^{3}\frac{1}{20}dx$

d) $P(|X-173|\le 3)=2\Phi\left(\frac{1}{2}\right)$

e) $P(10;50)=0.2417$

128. Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(0;10)$. Find the correctly calculated probabilities of the events.

a) $P(3<X<8)=0.18$

b) $P(X<3)=0.3$

c) $P(5 < X < 10) = \frac{1}{3}$

d) $P(0; 10) = \frac{1}{4}$

e) $P(1; 5) = 0.17$

129. The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter λFind the correctly calculated probabilities of the events.

a) $\lambda = 2, P(2 < X < 3) = \Phi\left(\frac{3-2}{1}\right) - \Phi\left(\frac{1-2}{1}\right)$

b) $\lambda = 2, P(1 < X < 3) = \frac{e^4-1}{e^6}$

c) $\lambda = 2, P(1 < X < 3) = \frac{\int_{-\infty}^{3} 2e^{-2x}\,dx}{\int_{-\infty}^{1} 2e^{-2x}\,dx}$

d) $\lambda = 3, P(-1 < X < 3) = \int_{-1}^{3} 3e^{-3x}\,dx$

e) $\lambda = 2, P(1 < X < 4) = \Phi\left(\frac{4-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

130. A random variable X is distributed under an exponential law with parameter λ. Find the probability of hit of the random variable X into the interval $(a;b)$.

a) $\lambda = 2, a = 1, b = 3, P = \Phi\left(\frac{3-2}{1}\right) - \Phi\left(\frac{1-2}{1}\right)$

b) $\lambda = 2, a = 1, b = 3,\ P = \frac{\int_{-\infty}^{3} 2e^{-2x}\,dx}{\int_{-\infty}^{1} 2e^{-2x}\,dx}$

c) $\lambda = 3, a = -1, b = 3,\ P = \int_{0}^{3} 3e^{-3x}\,dx$

d) $\lambda = 3, a = -1, b = 3,\ P = \int_{-1}^{3} 3e^{-3x}\,dx$

e) $\lambda = 2, a = 1, b = 4, P = \Phi\left(\frac{4-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

131. How many ways are there to choose 2 details from a box containing 9 details?

a) 12

b) 4

c) 22

d) 11

e) 36

132. If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by … ways.

a) m+n

b) m-n

C_n^m

c) n-m

d) n!

e)

133. A random variable X is distributed under an exponential law with parameter λ. Find the probability of hit of the random variable X into the interval $(a; b)$.

a) $\lambda = 2, a = 1, b = 3, P = \Phi\left(\frac{3-2}{1}\right) - \Phi\left(\frac{1-2}{1}\right)$

b) $\lambda = 2, a = 1, b = 3,\ P = \int_1^3 2e^{-2x}dx$

c) $\lambda = 2, a = 1, b = 3,\ P = \frac{\int_{-\infty}^{3} 2e^{-2x}dx}{\int_{-\infty}^{1} 2e^{-2x}dx}$

d) $\lambda = 3, a = 1, b = 3,\ \ P = \frac{1}{\sqrt{3\cdot 0.5\cdot 0.5}}\varphi\left(\frac{3-3\cdot 1}{\sqrt{3\cdot 0.5\cdot 0.5}}\right)$

e) $\lambda = 2, a = 1, b = 4, P = \Phi\left(\frac{4-2}{2}\right) - \Phi\left(\frac{1-2}{2}\right)$

134. Which of the following is a discrete random variable?

a) The time of waiting a train.

b) The number of boys in family having 4 children.

c) A time of repair of TVs.

d) The velocity in any direction of a molecule in gas.

e) The height of a man.

135. Which of the following is a discrete random variable?

a) The time of waiting a train.

b) The number of people in a community living to 100 years of age.

c) The mistake of a rounding off of a number up to the whole number.

d) The velocity in any direction of a molecule in gas.

e) The amount of time (starting from now) until an earthquake occurs.

136. The number of all possible combinations

a) $C_n^m = \frac{n!}{m!(n-m)!}$

b) $C_n^m = \frac{n!}{(n-m)!}$

c) $C_n^m = \frac{m!}{n!}$

d) $C_n^m = \frac{n!}{m!}$

e) $C_n^m = n!$

137. The probability of a reliable (certain) event is equal to …

a) 1

b) 0

c) ½

d) 1/3

e) 1/5

138. The probability of an impossible event is equal to …

a) 0

b) 1

c) ½

d) 1/3

e) 1/5

139. The probability of a random event is …

a) the number between 0 and 1

b) the positive number between 0 and ½

c) the positive number between 0 and 10

d) the positive number between 0 and 1/3

e) the positive number between 0 and 1/5

140. How would it change the expected value of a random variable X if we multiply the X by a number k.

a) $M[kX] = k \cdot M[X]$

b) $M[kX] = |k| \cdot M[X]$

c) $M[kX] = M[X]$

d) $M[kX] = M[X] + k$

e) $M[kX] = k^2 \cdot M[X]$

141. Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?

a) $A + B + C$

b) $A \cdot B \cdot C$

c) $A \cdot B^c \cdot C^c + A^c \cdot B \cdot C^c + A^c \cdot B^c \cdot C$

d) $(A + B + C)^c$

e) $AB + AC + BC$

142. There are 100 identical details (and 20 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted.

a) 1/20

b) 1/5

c) ½

d) 1/10

e) 1/9

143. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,4. Find the number of hits if 20 shots were made.

a) 8

b) 3

c) 20

d) 1

e) 6

144. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

a) $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+3)^2}{18}}$

$f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$

b) $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{8}}$

c) $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{16}}$

d) $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-4)^2}{16}}$

e)

145. The mathematical expectation and dispersion of a random variable *X* having the uniformly distribution on [a,b] are …, respectively.

a) $EX = \frac{a+b}{2}, DX = \frac{(b-a)^2}{12}$

b) $EX = \frac{a-b}{2}, DX = \frac{(b-a)^2}{12}$

c) $EX = \frac{a+b}{2}, DX = \frac{(b+a)^2}{12}$

d) $EX = \frac{q}{p}, DX = \frac{q}{p^2}$

e) $EX = \frac{a+b}{2}, DX = \frac{(b-a)^2}{15}$

146. **Find the density function of random variable $X \sim U[a, b]$**

a) $\varphi_N(x) = \dfrac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

b) $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ \ x \geq 0, \\ 0 & for \ \ x < 0. \end{cases}$

c) $\varphi(x) = \begin{cases} \frac{1}{b-a} & \text{if} \quad a \le x \le b, \\ 0 & \text{if} \quad x < a \text{ or } x > b. \end{cases}$

d) $F(x) = \begin{cases} 0 & \text{for } x < 0, \\ 1 - e^{-\lambda x} & \text{for } x \ge 0. \end{cases}$

e) $P(X = m) = C_n^m p^m q^{n-m}$

147. The profit for a new product is given by $Z = 3X - Y - 5$. X and Y are independent random variables with $D(X) = 1$ and $D(Y) = 2$. Calculate $D(Z)$.

a) 1

b) 5

c) 11

d) 7

e) 16

148. The mathematical expectation and dispersion of a random variable X distributed under the binomial law are …, respectively.

a) $EX = np, DX = npq$

b) $EX = npq, DX = np$

c) $EX = C_n^k np, DX = npq$

d) $EX = np, DX = C_n^k npq$

e) $EX = np, DX = \lambda$

149. The mathematical expectation and the dispersion of a random variable distributed under the Poisson are …, respectively.

a) $EX = \lambda, DX = \lambda$

b) $EX = \lambda^2, DX = \lambda$

c) $EX = \lambda, DX = \lambda^2$

d) $EX = pq\lambda, DX = np\lambda$

e) $EX = \lambda, DX = \lambda^3$

150. The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.

a) p^5

b) $1 - (1 - p)^5$

c) $(1-p)^5$

d) $1-p^5$

e) None of the given answers is correct

151. Probability density function of the normal random variable X is given by $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-3)^2}{50}}$. What is the standard (mean square) deviation?

a) 5

b) 3

c) 25

d) 50

e) 9

152. A bag contains 4 white, 6 red and 10 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?

a) $1-\left(\frac{1}{4}\right)^4$

b) $1-\left(\frac{4}{5}\right)^4$

c) $\left(\frac{1}{5}\right)^4$

d) 0.7182

e) $\left(\frac{1}{4}\right)^4$

153. Participants of a toss-up pull a ticket with numbers from 1 up to 30 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 2.

a) 1/30

b) 1/3

c) ½

d) 2/5

e) 1/5

154. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

a) 1/4, always

b) 1/4, if A and B are independent

c) 1/2, always

d) 1/2, if A and B are independent

e) None of the given answers

155. A movie theatre sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?

a) 1

b) 3

c) 9

d) 27

e) 62

156. Evaluate 0!+1!+4!

a) 5

b) 13

c) 26

d) 25

e) 24

157. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

a) $\Phi(1.5)$

b) $\Phi(-1.5)$

c) $\Phi(0.5)$

d) $\Phi(0.67)$

e) $\Phi(1.67)$

158. The cumulative distribution function for continuous random variable X is given by

$$F(x) = \begin{cases} 0, & x < 0 \\ x/2, & 0 \le x \le 2 \\ 1, & x > 2 \end{cases}$$ **. Find the variance Var(X).**

a) $\frac{1}{\sqrt{6}}$

b) $\frac{1}{6}$

c) $\frac{1}{3}$

d) e)

159. $\frac{1}{4}$

a) $\frac{1}{12}$

A continuous random variable X uniformly distributed on [-1;7]. Find E[X] and Var(X).

4 and $\frac{4}{3}$

b) $\frac{16}{3}$ and 3

c) 3 and $\frac{16}{3}$

d) $\frac{2}{3}$ and 2

e) 2 and $\frac{4}{3}$

160. If P(E) is the probability that an event will occur, which of the following must be false?

a) P(E)=1

b) P(E)=1/2

c) P(E)=1/3

d) P(E)= - 1/3

e) P(E)=0

161. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is

a) 0.49

b) 0.51

c) 0.3

d) 0.6

e) none of the given answers

162. If the probability density function of a continuous random variable X is

$$f(x) = \begin{cases} kx^2 & 0 \leq x \leq 3 \\ 0 & otherwise \end{cases}$$

then the value of k is

a) 1/2

b) 0,25

c) 1/9

d) 0,3

e) Any positive value greater than 2

163. What kind of distribution is given by the density function

$(-\infty < x < \infty)$?

a) Poisson distribution

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

b) Normal distribution

c) Uniform distribution

d) Bernoulli distribution

e) Exponential distribution

164. How would it change the variance of a random variable X if we add a number a to the X.

a) Var(X+a)=Var(X)+a

b) Var(X+a)=Var(X)+a^2

c) Var(X+a)=Var(X)

d) Var(X+a)= $a \cdot$Var(X)

e) Var(X+a)= a^2Var(X)

165. Indicate the formula of computing the variance of a random variable X with mathematical expectation μ.

a) $Var(X) = E\left(X^2\right) - \mu^2$

b) $Var(X) = E(X - \mu)$

c) $Var(X) = (E\left(X^2\right) - \mu)^2$

d) $Var(X) = E\left(X^2\right) - \mu$ e) $Var(X) = E\left(X^2\right)$

166. A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value (expectation) of *X* is

a) 16

b) 18

c) 10

d) 3

e) 6

167. Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that two of them will make purchases.

a) 0,384

b) 0,512

c) 0,096

d) 0,128

e) 0,992

168. Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that one of them will make purchases.

a) 0,096

b) 0,512

c) 0,384

d) 0,032

e) 0,992

169. Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that at least two of them will make purchases.

a) 0,896

b) 0,512

c) 0,384

d) 0,992

e) 0,096

170. Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that at least one of them will make purchases.

a) 0,992

b) 0,512

c) 0,384

d) 0,032

e) 0,096

171. Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,8. Find the probability that all of them will make purchases.

a) 0,512

b) 0,096

c) 0,384

d) 0,032

e) 0,992

172. If E(X)=3, E(Y)=2 and X and Y are independent, find E(-3X+2Y-1).

a) 27

b) 34

c) -5

d) -6

e) 35

173. If random variables X and Y are independent with Var(X)=3, Var(Y)=2, find Var(-3X+2Y-1).

a) -6

b) 34

c) -5

d) 35

e) 3

174. If Var(X)=3, find Var(-3X+4).

a) 12

b) 31

c) -5

d) 27

e) 3

175. If E(X)=3, find E(-3X+4).

a) 12

b) 31

c) 27

d) -5

e) -9

176. If Var(X)=4, find Var(2X-3).

a) 8

b) 5

c) 13

d) 16

e) 4

177. If E(X)=4, find E(2X-3).

a) 8

b) 16

c) 13

d) 5

e) 4

178. The table below shows the distribution of a random variable X. Find E[x^2].

X	-2	0	1
P	0.1	0.5	0.4

a) 0.2

b) 1.3

c) 0.8

d) 0.76

e) 0.6

179. The table below shows the distribution of a random variable X. What is the Var(X)?

X	-2	1	2
P	0.2	0.5	0.3

a) 2,01

b) 1,67

c) 4,71

d) 0,7

e) 4,7

180. The table below shows the distribution of a random variable X. What is the $E(X^2)$?

X	-2	1	2
P	0,2	0,5	0,3

a) 2,5
b) 0,7
c) 4
d) 1
e) 4,7

181. The table below shows the distribution of a random variable X. What is the Var(X)?

X	-2	1	2
P	0,1	0,6	0,3

a) 1,2
b) 0,5
c) 1
d) 0,34
e) 2,2

X	-2	1	2
P	0,3	0,5	0,2

182. The table below shows the distribution of a random variable X. What is the E(X)?

a) 0,3
b) 0,5
c) 0,7
d) 0,34

X	-2	1	2
P	0,2	0,5	0,3

e) 4,7

183. The table below shows the distribution of a random variable X. What is the E(X)?

a) 0,7
b) 0,5
c) 4
d) 0,34
e) 4,7

184. The cumulative distribution function of a discrete random variable X is given by

$$\begin{cases} 0 & if \;\; x \le 2 \end{cases}$$

$$F(x) = \begin{cases} 0.5 & if\ \ 2 < x \le 5 \\ 0.8 & if\ \ 5 < x \le 8 \\ 1 & if\ \ x > 8 \end{cases}$$ **Find** $P(3 \le X < 8)$.

a) 0,4

b) 0,3
c) 0,6
d) 0,9
e) 0,5

185. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.5 & if\ \ 2<x\le 5\\ 0.8 & if\ \ 5<x\le 8\\ 1 & if\ \ x>8\end{cases}$$

Find $P(2\le X<8)$.

a) 0,4

b) 0,8
c) 0,6
d) 0,3
e) 0,5

186. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.5 & if\ \ 2<x\le 5\\ 0.8 & if\ \ 5<x\le 8\\ 1 & if\ \ x>8\end{cases}$$

Find $P(5\le X<10)$.

a) 0,4

b) 0,5
c) 0,6
d) 0,9
e) 0,3

187. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ \ x\le 2\\ 0.5 & if\ \ 2<x\le 5\end{cases}$$

$$\begin{cases} 0.8 & if\ \ 5 < x \leq 8 \\ 1 & if\ \ x > 8 \end{cases}$$ **Find** $P(3 \leq X < 9)$.

a) 0,4

b) 0,5

c) 0,6

d) 0,9

e) 0,3

188. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ x\le 2\\ 0.3 & if\ 2<x\le 5\\ 0.9 & if\ 5<x\le 8\\ 1 & if\ x>8\end{cases}$$

Find $P(2 \le X < 5)$.

a) 0,4

b) 0

,
3
c
)
0
,
6
d
)
1
e
)
0
,
5

189. The cumulative distribution function of a discrete random variable X is given by

$$F(x) = \begin{cases} 0 & \text{if } x \le 2 \\ 0.3 & \text{if } 2 < x \le 5 \\ 0.9 & \text{if } 5 < x \le 8 \\ 1 & \text{if } x > 8 \end{cases}$$

Find $P(4 \le X < 7)$.

a
)
0
,
4
b
)
0
,
6

c) 0,3

d) 1

e) 0,5

1. A reliable event is: **event is an event that necessarily will happen if a certain set of conditions S holds**

2. The probability of a reliable event is the number: 1

3. An impossible event is: (null) event is an event that certainly will not happen if the set of conditions S holds.

4. The probability of an impossible event is the number: 0

5. A random event is: event is an event that can either take place, or not to take place for holding the set of conditions S.

6. The probability of an arbitrary event A is the number: 0<=P(x)<=1

7 Probabilities of opposite events A and A satisfy the following condition: *P(A) + P(   ) = 1*

8. Let A and B be opposite events. Find P(B) if P(A) = 3/5. 2/5

9. Let A and B be events connected with the same trial. Show the event that means simultaneous occurrence of A and B. **P=AB**

10. Let A and B be events connected with the same trial. Show the event that means occurrence of only one of events A and B. **A*B s 4ertoi + *B**

11. Let A1, A2, A3 be events connected with the same trial. Let A be the event that means occurrence only one of events A1, A2 and A3. Express the event A by the events A1, A2 and A3.

12. Let A1, A2, A3 be events connected with the same trial. Let A be the event that means none of events A1, A2 and A3 have happened. Express the event A by the events A1, A2 and A3 A_3 **vse A s 4ertami**

13. Let n be the number of all outcomes, m be the number of the outcomes favorable to the event A. The classical formula of probability of the event A has the following form:

14. The probability of an arbitrary event cannot be: less than or more than

15. Two events form a complete group if they are: Some events form a *complete group* if in result of a trial at least one of them will appear.

16. A coin is tossed twice. Find probability that "heads" will land in both times. 1/4

17. A coin is tossed twice. Find probability that "heads" will land at least once. 3/4

18. There are 2000 tickets in a lottery. 1000 of them are winning, and the rest 1000 – non-winning. It was bought two tickets. What is the probability that both tickets are winning? 1000/2000 * 999/1999 = 0.24987

19. Two dice are tossed. Find probability that the sum of aces does not exceed 2. 1/36

20. Two dice are tossed. Find probability that the sum of aces doesn't exceed 5. 10/36

21. Two dice are tossed. Find probability that the product of aces does not exceed 3. 5/36

22. There are 20 white, 25 black, 10 blue and 15 red balls in an urn. One ball is randomly extracted. Find probability that the extracted ball is white or black. 45/70 = 9/14

23. There are 11 white and 2 black balls in an urn. Four balls are randomly extracted. What is the probability that all balls are white? C(4,11)/C(4,13) = 0.46 or 11/13 * 10/12 * 9/11 * 8/10 = 0.46

24. Calculate 4 C14 : 1001

25. Calculate 3 A7 : 210

26. One chooses randomly one letter of the word "HUNGRY". What is the probability that this letter is "E"? 0

27. The letters T, A, O, B are written on four cards. One mixes the cards and puts them

randomly in a row. What is the probability that it is possible to read the word "BOAT"? ¼! = 0.0416

28. There are 5 white and 4 black balls in an urn. One extracts randomly two balls. What is the probability that both balls are white? 5/9*4/8 = 0.2(7)

29. There are 11 white, 9 black, 15 yellow and 25 red balls in a box. Find probability that a randomly taken ball is white. 11/60

31. There are 11 white, 9 black, 15 yellow and 20 red balls in a box. Find probability that a randomly taken ball is black. 9/55

32. How many 6-place telephone numbers are there if the digits “0” and “9” are not used on the first place? 8*10^5

33. 15 shots are made; 9 hits are registered. Find relative frequency of hits in a target. 9/15

34. A point is thrown on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 5/6. (2 – 2*5/6)/2 = 1/6

35. Two dice are tossed. What is the probability that the sum of aces will be more than 8? 7/36

36. A coin is tossed 6 times. Find probability that "heads" will land 4 times. C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

37. There are 6 children in a family. Assuming that probabilities of births of boy and girl are equal, find probability that the family has 4 boys: C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

38. Two shots are made in a target by two shooters. The probability of hit by the first shooter is equal to 0,7, by the second – 0,8. Find probability of at least one hit in the target. 1 – 0.3*0.2 = 0.94

39. There are 5 books on mathematics and 7 books on chemistry on a book shelf. One takes randomly 2 books. Find the probability that these books are on mathematics. 5/12 * 4/11 = 10/66

40. There are 5 standard and 6 non-standard details in a box. One takes out randomly 2 details. Find probability that only one detail is standard. 5*6/C(2,11) = 30/55 = 6/11

41. Three shooters shoot on a target. Probability of hit in the target at one shot for the 1st shooter is 0,85; for the 2 nd – 0,9 and for the 3 rd – 0,95. Find probability of hit by all the shooters.
0.85*0.9*0.95 = 0,72675

42. A student knows 7 of 12 questions of examination. Find probability that he (or she) knows randomly chosen 3 questions. 7/12*6/11*5/10 = 0.15(90)

43. Two shooters shoot on a target. The probability of hit by the first shooter is 0,7, and the second – 0,8. Find probability that only one of shooters will hit in the target. 0.7*0.2 + 0.8*0.3 = 0.38

44. Three dice are tossed. Find probability that the sum of aces will be 6.

10/216

45. At shooting from a rifle the relative frequency of hit in a target appeared equal to 0,8. Find the number of hits if 200 shots have been made. 200*0.8

46. If A and B are independent events then for P(AB) one of the following equalities holds: P(AB) = P(A)*P(B)

47. If events A and B are compatible then for P(A + B) one of the following equalities holds: P(A+B) =P(A) + P(B) – P(AB)

48. If events A and B are incompatible then for P(A+ B) one of the following equalities holds: P(A+B) =P(A)+P(B)

49. The probability of joint occurrence of two dependent events is equal: P(AB) = $P(A) \times P_A(B)$

50. A point is put on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 4/7. (2 – 2*4/7)/2 = 3/7

51. There are 5 white and 7 black balls in an urn. One takes out randomly 2 balls. What is the probability that both balls are black? 7/12 * 6/11 = 0.318

52. There are 25 details in a box, and 20 of them are painted. One extracts randomly 4 details. Find probability that the extracted details are painted. 20/25 * 19/24 * 18/23 * 17/22 = 0.383

53. There are 20 students in a group, and 8 of them are pupils with honor. One randomly selects 10 students. Find probability that there are 6 pupils with honor among the selected students. C(6, 8) * C(4 , 12) / C(10, 20) = 28 * 495/184756 = 0.075

54. There are 4 defective lamps among 12 electric lamps. Find probability that randomly chosen 2 lamps will be defective. 4/12 * 3/11 = 0. (09)

55. A circle of radius l is placed in a big circle of radius L. Find probability that a randomly thrown point in the big circle will get as well in the small circle. l^2/L^2

56. There are 6 white and 4 red balls in an urn. The event A consists in that the first taken out ball is white, and the event B – the second taken out ball is white. Find the probability $P(A) \times P_A(B)$ 6/10 * 5/9 = 1/3

57. Probability not to pass exam for the first student is 0,2, for the second - 0,4, for the third - 0,3. What is the probability that only one of them will pass the exam? 0.8*0.4*0.3 + 0.2 * 0.6 *0.3 + 0.2 * 0.4 * 0.7 = 0.188

58. The probability of delay for the train №1 is equal to 0,1, and for the train №2 – 0,2. Find probability that at least one train will be late. 1 – 0.9*0.8 = 0.28

59. The probability of delay for the train №1 is equal to 0,3, and for the train №2 – 0,45. Find probability that both trains will be late. 0.3 * 0.45 = 0.135

60. The events A and B are independent, P(A) = 0,4; P(B) = 0,3. Find P(AB).

0.6*0.3 = 0.18

61. The events A and B are compatible, P(A) = 0,4; and P(B) = 0,3. Find P(A + B)

0.6 + 0.7 - 0.42 = 0.88

62 Show the formula of total probability: $P(A)=\sum_i P(A\cap B_i)=\sum_i P(A|B_i)P(B_i)$

63. The formula $\sum$= *Bayes's formulas*

64. If an event A can happen only provided that one of incompatible events B1, B2, B3 forming a complete group will occur, P (A) is calculated by the following formula:

65. If an event A can happen only provided that one of incompatible events B1, B2, B3, B4 forming a complete group will occur, PA(B2) is calculated by the following formula:

66. The probability of hit in 10 aces for a given shooter at one shot is 0,9. Find probability that for 10 independent shots the shooter will hit in 10 aces exactly 6 times. C(6, 10) * 0.9^6 * 0.1^4 = 0.0111

67. There are 6 children in a family. Assuming that probabilities of birth of boy and girl are equal, find the probability that there are 4 girls and 2 boys in the family. C(4, 6) * 0.5 ^4 * 0.5^2 = 15/64

68. It is known that 15 % of all radio lamps are non-standard. Find probability that among 5 randomly taken radio lamps appears no more than 1 non-standard. C(0, 5)*0.15^0 * 0.85^5 + C(1, 5)*0.15^1 * 0.85^4 = 0.8355

69. 10 buyers came in a shop. What is the probability that 4 of them will do shopping if the probability to make purchase for each buyer is equal to 0,2? C (4, 10) * 0.2 ^ 4 * 0.8^6 = 0.088

70. Distribution of a discrete random variable X is given by the table

X -3 -2 0 2 P 1/3 1/3 1/6 1/6

Find mathematical expectation M(X)

-4/3

71. Distribution of a discrete random variable X is given by the table

X -3 -2 0 2 P 1/3 1/3 1/6 1/6

Find dispersion D (X).

Find dispersion D (X).

M(x) = -4/3

M(x^2) = 5

D(x) = 5 – (4/3)^2 = 3, (2)

72. We say that a discrete random variable X is distributed under the binomial law (binomial distribution) if P (X = k) =

73. We say that a discrete random variable X is distributed under Poisson law with parameter λ (Poisson distribution) if P(X = k) =

74. We say that a discrete random variable X is distributed under the geometric law (geometric distribution) if P(X=k) = $P(X = m) = pq^{m-1}$

75. Dispersion of a discrete random variable X is D(x) =?

76. Dispersion of a constant C is D(C) = 0

77. The law of distribution of a discrete random variable X is given. Find Y. Y = 0.1

78. The law of distribution of a discrete random variable X is given, M (X) = 5. Find 1 x .
P2 = 0.5

X1 = 11

79. Mathematical expectations M (X) = 5, M(Y) = 4,3 are given for independent random variables X and Y. Find M(X ·Y) . 21.5

80. A discrete random variable X is given by the law of distribution:

Then the probability p3 is equal to:

Then the probability p_3 is equal to: 0.4

A discrete random variable X is given by the law of distribution:

Then the probability p_1 is equal to: 0.2

82. For an event – dropping two tails at tossing two coins – the opposite event is: 2 heads

83. 4 independent trials are made, and in each of them an event A occurs with probability p. Probability that the event A will occur at least once is: 1 – q*(m);

84. Show the Bernoulli formula

$$P_n(k) = \frac{n!}{k!(n-k)!} \cdot p^k \cdot (1-p)^{n-k}$$

$$P_n(k) = C_n^k \cdot p^k \cdot q^{n-k}$$

85. Show mathematical expectation of a discrete random variable X:

86. Show the Chebyshev inequality *P(|X – a| > e) £ D(X)/e* ^{2}

87. An improper integral of density of distribution in limits from – ∞ till ∞ is equal to 1

89. Show one of true properties of mathematical expectation (C is a constant): M (C) =

90. Let M(X) = 5. Find M(X – 4). 1

91. Let M(X) = 5. Find M(4X). 20

92. Let D(X) = 5. Then D(X – 4) is equal to 5

93. Let D(X) = 5. Then D(4X) is equal to 80

94. Random variables X and Y are independent. Find dispersion of the random variable Z = 4X – 5Y if it is known that D(X) = 1, D(Y) = 2. *16*1 + 25*2 = 66*

95. A die is tossed before the first landing 3 aces. Find the probability that the first appearance of 3 will occur at the fourth tossing the die.

96. Let f (x) be a density of distribution of a continuous random variable X. Then function of distribution is:

97. Function of distribution of a random variable X is: *$F(x) = P(X < x)$,*

98. If dispersion of a random variable D(X) = 5 then D(5X) is equal to 25*5 = 125

99. Differential function f(x) of a continuous random variable X is determined by the equality:

100. If F(x) is an integral function of distribution of probabilities of a random variable X then $P(a < X < b)$ is equal to

101. Show the formula of dispersion

$$\boxed{D(X) = M[X^2] - (M(X))^2}$$

103. A random variable X is distributed under an exponential law with parameter $\lambda = 2$. Find the dispersion of X: 1/4

104. Mean square deviation of a random variable X is determined by the following formula

$$\boxed{\sigma(X) = \sqrt{D(X)}}$$

105. Dispersion D(X) of a continuous random variable X is determined by the following equality

106. Distribution of probabilities of a continuous random variable X is exponential if it is described by the density

111. It is known that M (X) = - 3 and M (Y) = 5. Find M (3X – 2Y). 1

112. Random variables X and Y such that Y =4X – 2 and D(X) = 3 are given. Find D(Y). 48

113. How many ways are there to choose two employees on two various positions from 8 applicants?

A(2 , 8)

114. 3 dice are tossed. Find probability that each die lands on 5: 1/216

115. 2 dice are tossed. Find probability that the same number of aces will appear on each of the dice: 1/6

116. The pack of 52 cards is carefully hashed. Find probability that a randomly extracted card will be an ace: 4/36

117. The pack of 52 cards is carefully hashed. Find probability that two randomly extracted cards will be aces: C(2 , 4) / C(2,52)

118. How many ways are there to choose 3 books from 6? C(3, 6)

119. There are 60 identical items in a box, and 8 of them are painted. One takes out randomly one item. Find probability that a randomly taken item will be painted: 8/60

120. How many 4-place numbers can be composed of digits 1, 3, 9, 5? 4^4

121. Dialing the phone number, the subscriber has forgotten one digit and has typed it at random. Find probability that the necessary digit has been typed: 1/10

122. The urn contains 4 white and 6 black balls. One extracts by one randomly two balls without replacement. What is the probability that both balls will be black:

6/10 * 5/9

123. The urn contains 4 white and 6 black spheres. Two balls are randomly extracted from the urn. What is the probability that these balls will be of different color: 4*6/C(2, 10)

124. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that both of them will have the first sort: 3/ 7 * 2/6

125. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that they have the same sort: 3/7 * 2/6 + 4/7*3/6

126. A student knows 25 of 30 questions of the program. Find probability that the student knows offered by the examiner 3 questions. 25/30 * 24/29 * 23/28

127. Two shooters shoot on a target. The probability of hit in the target by the first shooter is 0,8, by the second – 0,9. Find probability that only one of shooters will hit in the target: 0.8 * 0.1 + 0.9* 0.2

128. A coin is tossed 5 times. Find probability that heads will land 3 times: C(3, 5) * 0.5 ^ 3 * 0.5 ^2

129. A coin is tossed 5 times. Find probability that heads never will land: C(0.5)*0.5^5

130. A coming up seeds of wheat makes 90 %. Find probability that 4 of 6 sown seeds will come up: C(4,6) * 0.9^4 * 0.1 ^2

131. A coming up seeds of wheat makes 90 %. Find probability that only one of 6 sown seeds will come up: C(6, 6) * 0.9 ^6

132. The dispersion D(X) of a random variable X is equal to 1,96. Find σ (X): 1.4

133. Find dispersion D(X) of a random variable X, knowing the law of its distribution

M(x) = 0.2 + 1 + 0.9 = 2.1

M(x^2) = 0.2 + 2 + 2.7 = 4.9

D(x) = 0.49

134. A random variable X is distributed under Poisson law with parameter λ . Find M(X).
Find M (X) =l

135. Let M be the number of all outcomes, and S be the number of non-favorable to the event A outcomes (S < M). Then P(A) is equal to:

136. Five events form a complete group if they are:

137. If X is uniformly distributed over (0, 7), calculate the probability that X < 2:

138. If X is uniformly distributed over (0, 7), calculate the probability that X > 6:

139. Identical products of three factories are delivered in a shop. The first factory delivers 30 %, and the second and third factories deliver 35 % each. 70 % of the first factory has the first sort, and 80% of both the second and the third factories have the first sort. One product has been bought. Find the probability that it has the first sort:

140. One letter has been randomly chosen from the word "STATISTICS". What is the probability that the chosen letter is "S"?

141. 150 shots have been made, and 25 hits have been registered. Find the relative frequency of hits in a target.

142. A point is thrown on an interval of length 3. Find the probability that the distance from the point to the ends of the interval is more than 1.

143. Show the Markov inequality:

$$\boxed{P(X > A) \leq M(X)/A}$$

A are opposite, changing $P(X > A)$ b

$$\boxed{P(X \leq A) \geq 1 - M(X)/A}$$

144. The events A and B are independent, P(A) = 0,6; P(B) = 0,8. Find P(AB).

Example:

The events A and B are independent, P(A) = 0,4; P(B) = 0,3. Find .

0.6*0.3 = 0.18

145. Two independent events A and B are compatible, P(A) = 0,6; and P(B) = 0,75. Find P(A+ B) .

146. It is known that 25 % of all items are non-standard. 8 items have been randomly taken. Find the probability that there is no more than 2 non-standard items of the taken.

Example:

74. It is known that 15 % of all radio lamps are non-standard. Find probability that among 5 randomly taken radio lamps appears no more than 1 non-standard. C(0, 5)*0.15^0 * 0.85^5 + C(1, 5)*0.15^1 * 0.85^4 = 0.8355

1. **Events are *equally possible* if … two probability equally**

2. **The probability of the event *A* is determined by the formula P(A)=m/n**

3. **The probability of a reliable event is equal to … 1** или universal

4. **The probability of an impossible event is equal to … 0 or null**

5. **The relative frequency of the event *A* is defined by the formula: W(A)=m/n**

6. **There are 50 identical details (and 5 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted. 1/10**

7. **A die is tossed. Find the probability that an even number of aces will appear. 1/2**

8. **Participants of a toss-up pull a ticket with numbers from 1 up to 60 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 3. 1/4**

9. **In a batch of 10 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to? 0.3**

10. **At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,35. Find the number of hits if 20 shots were made. 7**

11. **Two dice are tossed. Find the probability that the same number of aces will appear on both dice 1/6**

12. **An urn contains 15 balls: 4 white, 6 black and 5 red. Find the probability that a randomly taken ball will be white. 4/15**

13. 12 seeds have germinated of 36 planted seeds. Find the relative frequency of germination of seeds. 2.1/3

14. A point *C* is randomly appeared in a segment *AB* of the length 3. Determine the probability that the distance between *C* and *B* doesn't exceed 1. 1/3

15. A point *B(x)* is randomly put in a segment *OA* of the length 8 of the numeric axis *Ox*. Find the probability that both the segments *OB* and *BA* have the length which is greater than 3. 1/4

16. The number of all possible permutations Pn=n!

17. How many two-place numbers can be made of the digits 2, 4, 5 and 7 if each digit is included into the image of a number only once? 12

18. The number of all possible allocations An'm=n!/(n-m)!

19. How many signals is it possible to make of 5 flags of different color taken on 3? 60

20. The number of all possible combinations Cnm=n!/m!(n-m)!

21. How many ways are there to choose 2 details from a box containing 13 details? 78

22. The numbers of allocations, permutations and combinations are connected by the equality An"m=Pm*Cn'm

23. 4 films participate in a competition on 3 nominations. How many variants of distribution of prizes are there, if on each nomination are established different prizes. 64

24. If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by … ways. n+m

25. There are 200 details in a box. It is known that 150 of them are details of the first kind, 10 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the second kind from the box are there? 25 (C150"1+C10"1)

26. If an object *A* can be chosen from the set of objects by *m* ways and after every such choice an object *B* can be chosen by *n* ways then the pair of the objects (*A*, *B*) in this order can be chosen by ... ways. n*m

27. There are 15 students in a group. It is necessary to choose a leader, its deputy and head of professional committee. How many ways of choosing them are there? 2730

28. 6 of 30 students have sport categories. What is the probability that 3 randomly chosen students have sport categories? 1/203

29. **A group consists of 10 students, and 5 of them are pupils with honor. 3 students are randomly selected. Find the probability that 2 pupils with honor will be among the selected.** **1/12 это ответ апайки, мой 5/12**

30. **It has been sold 15 of 20 refrigerators of three marks available in quantities of 5, 7 and 8 units in a shop. Assuming that the probability to be sold for a refrigerator of each mark is the same, find the probability that refrigerators of one mark have been unsold.** **Апайкин: 0,0016, мой: 0,005**

31. **A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the *i*-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event *A* – «only two hit».**

    A.

    B.

    C.

    D.

    E.

32. **A randomly taken phone number consists of 5 digits. What is the probability that all digits of the phone number are different. It is known that any phone number does not begin with the digit zero.** **Апайкин: 0,0001, мой: 0,3204**

33. **The probability of appearance of any of two incompatible events is equal to the sum of the probabilities of these events:** **P(A+B)=P(A)+P(B)**

34. **A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,5 and in the second – 0,3. Find the probability that the shooter will hit at one shot either in the first area or in the third area.** **0.7**

35. **The sum of the probabilities of events $A_1, A_2, A_3, \ldots, A_n$ which form a complete group is equal to …** **1**

36. **Two uniquely possible events forming a complete group are …**

    A. Opposite

    B. Same

    C. Identically distributed

    D. Sample

    E. Density function

37. **The sum of the probabilities of opposite events is equal to …** **1**

38. ***The conditional probability* of an event *B* with the condition that an event *A* has already happened is equal to:** **Pa(B)=P(AB)/P(A)**

39. **There are 4 conic and 8 elliptic cylinders at a collector. The collector has taken one cylinder, and then he has taken the second cylinder. Find the probability that the first taken cylinder is conic, and the second – elliptic. 8/33**

40. **The events *A, B, C* and *D* form a complete group. The probabilities of the events are those: *P(A)* = 0,01; *P(B)* = 0,49; *P(C)* = 0,3. What is the probability of the event *D* equal to? 0.2**

41. **For independent events theorem of multiplication has the following form: P(AB)=P(A)*P(B)**

42. **The probabilities of hit in a target at shooting by three guns are the following: $p_1 = 0,6$; $p_2 = 0,7$; $p_3 = 0,5$. Find the probability of at least one hit at one shot by all three guns. 0.94**

43. **Three shots are made in a target. The probability of hit at each shot is equal to 0,6. Find the probability that only one hit will be in result of these shots. 0.288**

44. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,5; and by the third – 0,8. What is the probability that the exam will be passed on "excellent" by neither of the students? 0.07**

45. **10 of 20 savings banks are located behind a city boundary. 5 savings banks are randomly selected for an inspection. What is the probability that among the selected banks appears inside the city 3 savings banks? Апайкин: 9/38, мой: 225/646**

46. **A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will be solved ? 19/29**

47. **An urn contains 10 balls: 3 red and 7 blue. A second urn contains 6 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.54 . Calculate the number of blue balls in the second urn. 9**

48. **A bag contains 7 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue. 4/165**

49. **Find the Bernoulli formula Pn(K)=n!/k!(n-k)!*PkQn-k**

50. **Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?**

A. $A + B + C$

B. $A \cdot B \cdot C$

C. $A \cdot B^c \cdot C^c + A^c \cdot B \cdot C^c + A^c \cdot B^c \cdot C$

D. $(A + B + C)^c$

E. $AB + AC + BC$

○

51. Find the dispersion for the given probability distribution.

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

52.

○

○ 2.85

52. How would it change the dispersion of a random variable X if we add a number a to the X.

A. D(X+a)=D(X)+a

B. D(X+a)=D(X)+a^2

C. D(X+a)=D(X)

D. D(X+a)=$a \cdot$D(X)

E. D(X+a)= a^{2}D(X)

53. The cumulative distribution function of a discrete random variable X is given by

$$F(x) = \begin{cases} 0 & if\ x \le 2 \\ 0.5 & if\ 2 < x \le 5 \\ 0.8 & if\ 5 < x \le 8 \\ 1 & if\ x > 8 \end{cases}$$

Find P{3<X<9}. 0,5

54. Find the expectation of a random variable X if the cumulative distribution function

$$F(x) = \begin{cases} 1 - e^{-x/4}, x \ge 0 \\ 0, \quad x < 0 \end{cases}$$

. 4

55. If the dispersion of a random variable X is given D(X)=4. Then D(2X) is D(2x)=16

56. Indicate the expectation of a Poisson random variable X with parameter λ. λ

57. The lifetime of a machine part has a continuous distribution on the interval (0, 20) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5. 0.5

58. What kind of distribution is given by the density function $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{(x-\mu)^2}{2\sigma^2}}$ **(** $-\infty < x < \infty$ **)?**

A. Poisson distribution

B. Normal distribution

C. Uniform distribution

D. Bernoulli distribution

E. Exponential distribution

59. Suppose the test scores of 10000 students are normally distributed with an expectation of 76 and mean square deviation of 8. The number of students scoring between 60 and 82 is: 7065,6 or 71%

60. The distribution of weights in a large group is approximately normally distributed. The expectation is 80 kg. and approximately 68,26% of the weights are between 70 and 90 kg. The mean square deviation of the distribution of weights is equal to: 0,3413

61. A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value of *X* is 18

62. The cumulative distribution function for continuous random variable X is given by

$$F(x) = \begin{cases} 0, & x < 0 \\ x/2, & 0 \le x \le 2 \\ 1, & x > 2 \end{cases}$$

. Find the standard deviation $\sigma(X)$. Апайкин: 1/3, мой: 1/sqrt3

63. A continuous random variable X is exponentially distributed with the density

$$f(x) = \begin{cases} 3e^{-3x}, & x \ge 0 \\ 0, & x < 0 \end{cases}$$

. What is the M[X] and D(X)? MX=1/3 DX=1/9

64. How many different 5-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?6!

65. A fair coin is thrown in the air five times. If the coin lands with the head up on the first four tosses, what is the probability that the coin will land with the head up on the fifth toss? 1/2

66. A random variable Y has the following distribution:

○ Y	○ -1	○ 0	○ 1	○ 2
○ P(Y)	○ C	○ 4C	○ 0.4	○ 0.1

67.

1808. The value of the constant C is:0.1

67. Which one of these variables is a continuous random variable?

A. The time it takes a randomly selected student to complete an exam.

B. The number of tattoos a randomly selected person has.

C. The number of women taller than 68 inches in a random sample of 5 women.

D. The number of correct guesses on a multiple choice test.

E. The number of 1's in N rolls of a fair die

68. Heights of college women have a distribution that can be approximated by a normal curve with an expectation of 65 inches and a mean square deviation equal to 3 inches. About what proportion of college women are between 65 and 68 inches tall? 0,34134 Ф(1)-Ф(0)

69. A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...

A. Probability distribution

B. The expected value

C. The standard deviation

D. Coefficient of variation

E. Correlation

70. For a continuous random variable X, the probability density function f(x) represents

A. the probability at a fixed value of X

B. the area under the curve at X

C. the area under the curve to the right of X

D. the height of the function at X

E. the integral of the cumulative distribution function

71. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is Апайкин: 0,51, мой: 0,49

72. Suppose that 10% of people are left handed. If 6 people are selected at random, what is the probability that exactly 2 of them are left handed? 0,0984

73. Which of these has a Geometric model?

A. the number of aces in a five-card Poker hand

B. the number of people we survey until we find two people who have taken Statistics

C. the number of people in a class of 25 who have taken Statistics

D. the number of people we survey until we find someone who has taken Statistics

E. the number of sodas students drink per day

74. In a certain town, 55% of the households own a cellular phone, 40% own a pager, and 25% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is 30%

75. A probability function is a rule of correspondence or equation that:

A. Finds the mean value of the random variable.

B. Assigns values of x to the events of a probability experiment.

C. Assigns probabilities to the various values of x.

D. Defines the variability in the experiment.

E. None of the given answers is correct.

76. Which of the following is an example of a discrete random variable?

A. The distance you can drive in a car with a full tank of gas.

B. The weight of a package at the post office.

C. The amount of rain that falls over a 24-hour period.

D. The number of cows on a cattle ranch.

E. The time that a train arrives at a specified stop.

77. Which of the following is the appropriate definition for the union of two events A and B?

A. The set of all possible outcomes.

B. The set of all basic outcomes contained within both A and B.

C. The set of all basic outcomes in either A or B, or both.

D. None of the given answers

E. The set of all basic outcomes that are not in A and B.

78. What is the probability of drawing a Diamond from a standard deck of 52 cards?

1809. What is the probability of drawing a diamond from a standard deck of 52 cards?

- 1/52
- 13/39
- 1/13
- 1/4
- 1/2
-

79. The probability density function of a random variable X is given by $f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$

.

1810. What are the values of μ and σ?

○ $\mu = 1, \sigma = 4$

○ $\mu = -1, \sigma = 4$

□ $\mu = -1, \sigma = 2$

○ $\mu = 1, \sigma = 8$

○ $\mu = 1, \sigma = 2$

○

80. The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=4. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:

1811. Апайкин: 0.14, мой: 0.24

81. Table shows the cumulative distribution function of a random variable X. Determine

X	1	2	3	4
F(X)	3/8	1/8	3/4	1

82.

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3
- Ответ 5/8 я решила апай подтвердила

82. Which of the following statements is always true for A and A^C ?

A. $P(AA^c)=1$

B. $P(A^c)=P(A)$

C. $P(A+A^c)=0$

D. $P(AA^c)=0$

E. None of the given statements is true

83. If P(A)=1/6 and P(B)=1/3 then $P(A \cap B)$ =

A. 1/18, always

B. 1/18, if A and B are independent

C. 1/6, always

D. 1/2, if A and B are independent

E. None of the given answers

84. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

- 24/75
- 24/35
- 6/35
- 12/75
- None of the given answers
-

85. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$ **.**

A. $\lambda = np \sim const$, $n \to \infty,\ p \to 0$

B. $\lambda = \frac{n}{p}$, $n \to \infty$

C. $\lambda = ep$, $n \to \infty$

D. $\lambda = n^p$, p is const

5. None of the given answers is correct

86. The probability density function of a random variable X is given by

$f(x)=\begin{cases}\frac{1}{\gamma-2{,}5}, & if\ \ x\in(1{,}5;3)\\ 0, & otherwise\end{cases}$ **. Calculate the parameter** γ **. 4**

87. Probability density function of the normal random variable X is given by

$f(x)=\frac{1}{5\sqrt{2\pi}}e^{-\frac{(x-3)^2}{50}}$ **. What is the mean square deviation?**

- 5
- 3
- 25
- 50
- 9
-

88. The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.

A. p^5

B. $1-(1-p)^5$ correct

C. $(1-p)^5$

D. $1-p^5$

5. None of the given answers is correct

89. Choose the density function of random variable

A. $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for\ x \geq 0, \\ 0 & for\ \ x < 0. \end{cases}$

B. $\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \leq x \leq b, \\ 0 & if \quad x < a\ or\ \ x > b. \end{cases}$

C. $F(x) = \begin{cases} 0 & for\ x < 0, \\ 1 - e^{-\lambda x} & for\ x \geq 0. \end{cases}$

D. $\varphi_N(x) = \dfrac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

E. $P(X=m) = \dfrac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

90. Choose the probability distribution function of random variable

A. $P(X=m) = \dfrac{\lambda^m e^{-\lambda}}{m!}$

B. $P(X=m) = \dfrac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

C. $P(X=m) = C_n^m p^m q^{n-m}$

D. $\varphi_N(x) = \dfrac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

E. $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for\ x \geq 0, \\ 0 & for\ \ x < 0. \end{cases}$

91. Choose the probability density function of random variable

A. $\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

B. $\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for\ x \geq 0, \\ 0 & for\ \ x < 0. \end{cases}$

C. $\varphi(x) = \begin{cases} \frac{1}{b-a} & if \quad a \leq x \leq b, \\ 0 & if \quad x < a\ or\ \ x > b. \end{cases}$

D. $F(x) = \begin{cases} 0 & for\ x < 0, \\ 1 - e^{-\lambda x} & for\ x \geq 0. \end{cases}$

E. $P(X = m) = C_n^m p^m q^{n-m}$

92. The mathematical expectation and dispersion of a random variable *X* distributed under the binomial law are …, respectively.

A.

B.

C.

D.

E.

93. The mathematical expectation and the dispersion of a random variable distributed under the Poisson are …, respectively.

A.

B.

C.

D.

E.

94. The probability distribution function of random variable is

A.

2. $P(X = m) = \frac{\lambda^m e^{-\lambda}}{m!}$

3. $P(X = m) = \frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

4. $P(X = m) = C_n^m p^m q^{n-m}$

5. $\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$

95. The mathematical expectation and dispersion of a random variable *X* having the geometrical distribution with the parameter *p* are …, respectively.

A.

B.

C.

D.

E.

96. The mathematical expectation and dispersion of a random variable *X* having the uniformly distribution on [a,b] are …, respectively.

A.

B.

C.

D.

E.

97. A normally distributed random variable *X* is given by the differential function:

$f(x) = \frac{1}{\sqrt{2\pi}} \cdot e^{-\frac{x^2}{2}}$ **. Find the interval in which the random variable *X* will hit in result of trial with the probability 0,9973. (-3,3)**

98. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

A. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+3)^2}{18}}$

B. $f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$

C. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{8}}$

D. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{16}}$

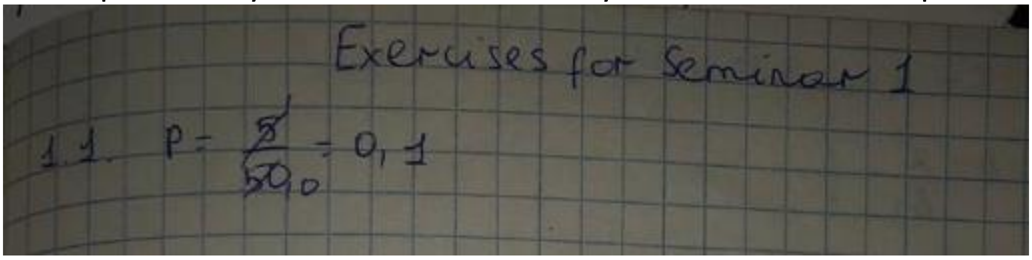
E. $$f(x)=\frac{1}{5\sqrt{2\pi}}e^{-\frac{(x-4)^2}{16}}$$

x_i	2	3	6	9
p_i	0,1	0,4	0,3	0,2

99. A discrete random variable X is given by the following law of distribution:

- ○
- ○
- ○
- ○
- ○ **By using Chebyshev inequality estimate the probability that |X-M(X)|>3.1/3**

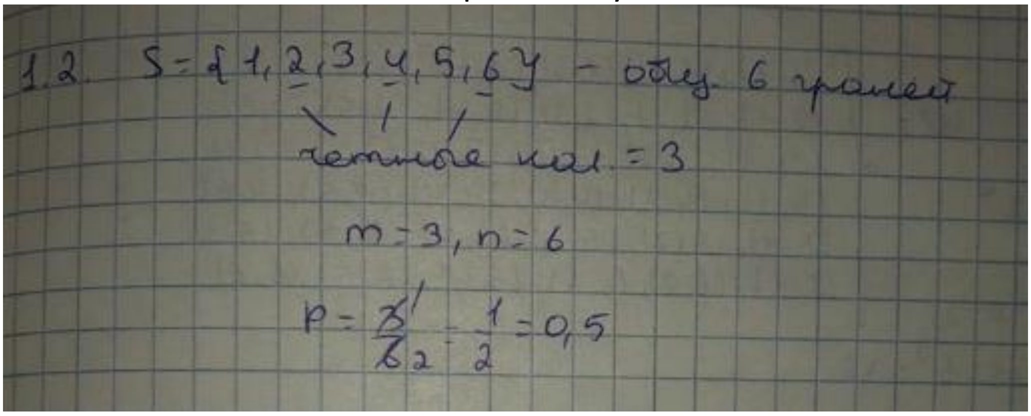
1.1. There are 50 identical details (and 5 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted.



Exercises for Seminar 1

1.1. $P=\frac{\cancel{5}^{1}}{\cancel{50}_{10}}=0,1$

1.2. A die is tossed. Find the probability that an even number of aces will appear.



1.2. $S=\{1,2,3,4,5,6\}$ – общ. 6 граней

четные кол. = 3

$m=3,\ n=6$

$P=\frac{\cancel{3}^{1}}{\cancel{6}_{2}}=\frac{1}{2}=0,5$

1.3. Participants of a toss-up pull a ticket with numbers from 1 up to 100 from a box. Find the probability that the number of the first randomly taken ticket does not contain the digit 5 (toss-up – жеребьевка; to pull – тянуть; ticket – жетон).

1.3. 5 цифр – 19

общ – 100

$100 - 19 = 81$

$P = \frac{81}{100} = 0{,}81$

1.4. In a batch of 100 details the quality department has found out 5 non-standard details. What is the relative frequency of appearance of non-standard details equal to? (batch – партия)

1.4 $P = \frac{5}{100} = 0{,}05$

1.5. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,85. Find the number of hits if 120 shots were made (a rifle – винтовка).

1.5. $P = 0{,}85$, $n = 120$

$0{,}85 = \frac{m}{120}$

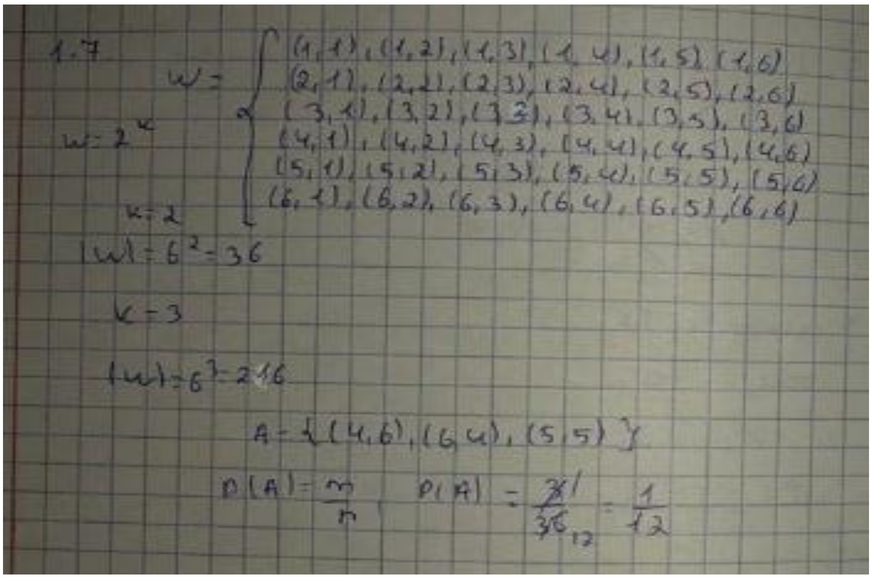
$m = 0{,}85 \cdot 120 = 102$

1.6. Roll one die and observe the numerical result. Then S = {1, 2, 3, 4, 5, 6}. Let E be the event that the die roll is a number greater than 4.

1.6. $S = \{1, 2, 3, 4, 5, 6\}$

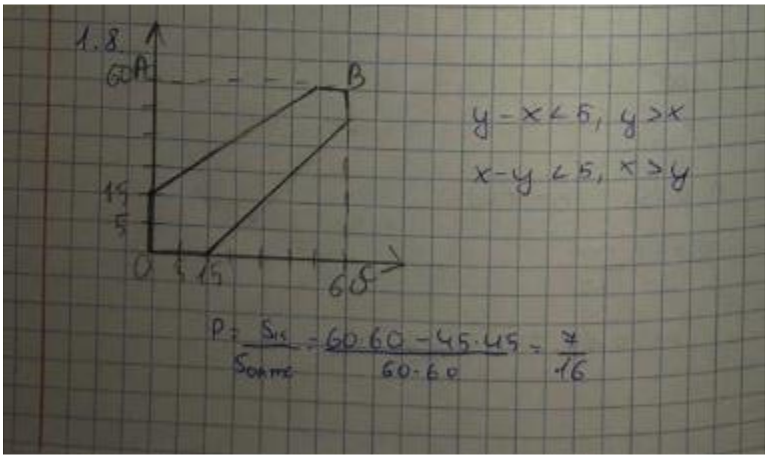
$P = \frac{\cancel{2}^{1}}{\cancel{6}_{3}} = \frac{1}{3}$

1.7. If two dice are tossed, what is the probability of rolling a sum of 10?



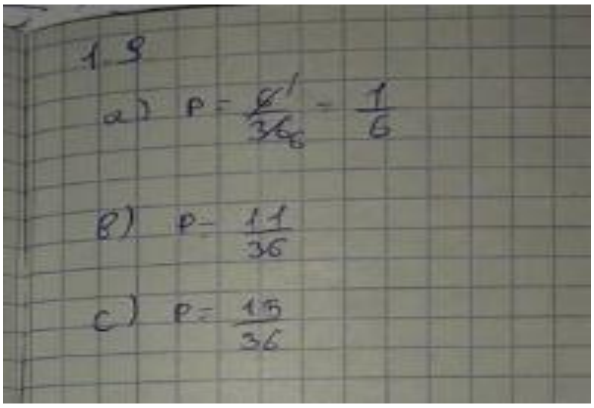
1.8. Two persons have agreed to meet in a certain place between 18 and 19 o'clock and have agreed that a person come the first waits for another person within 15 minutes then leaves. Find the probability of their meeting if arrival of everyone within the specified hour can take place at any time and the moments of arrival are independent.

***The answer*: 7/16.**



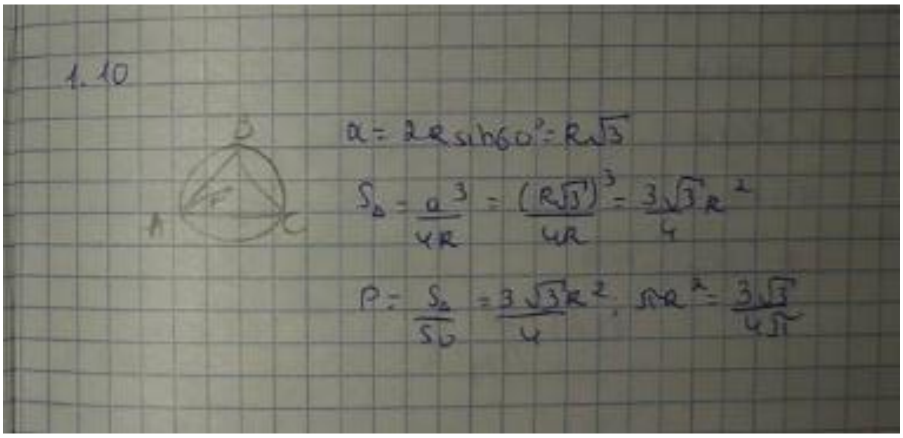
1.9. Two dice are tossed. Find the probability that: a) the same number of aces will appear on both dice;

b) two aces will appear at least on one die; c) the sum of aces will not exceed 6.



1.10. A point is randomly taken inside a circle of radius 5. Find the probability that the point will be inside a proper (equilateral) triangle entered in the circle (a proper triangle – правильный треугольник; equilateral – равносторонний).

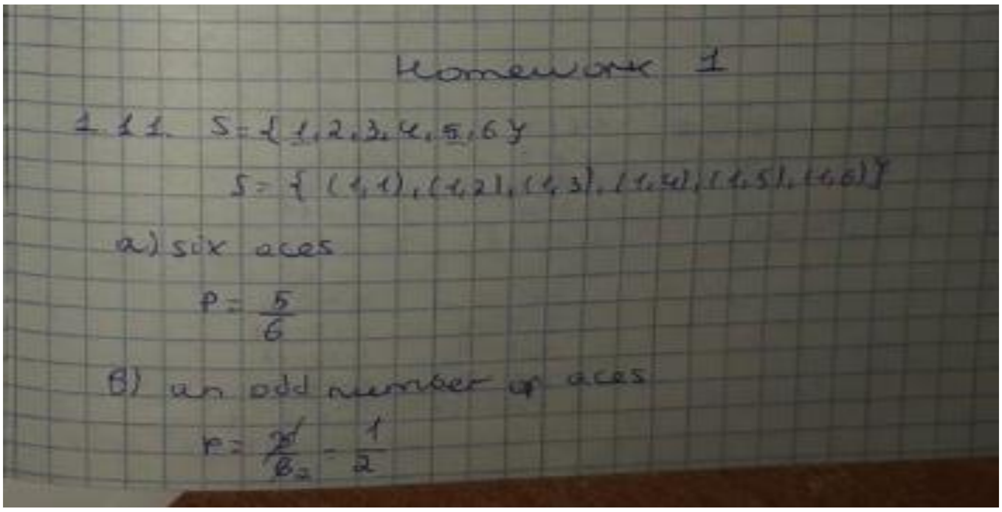
The answer: $\frac{3\sqrt{3}}{4\pi}$ **.**



Exercises for Homework 1

1.11. A die is tossed. Find the probability that the upper side of the die shows:

a) six aces; b) an odd number of aces; c) no less than four aces; d) no more than two aces.



Homework 1

1.11. $S=\{1,2,3,4,5,6\}$

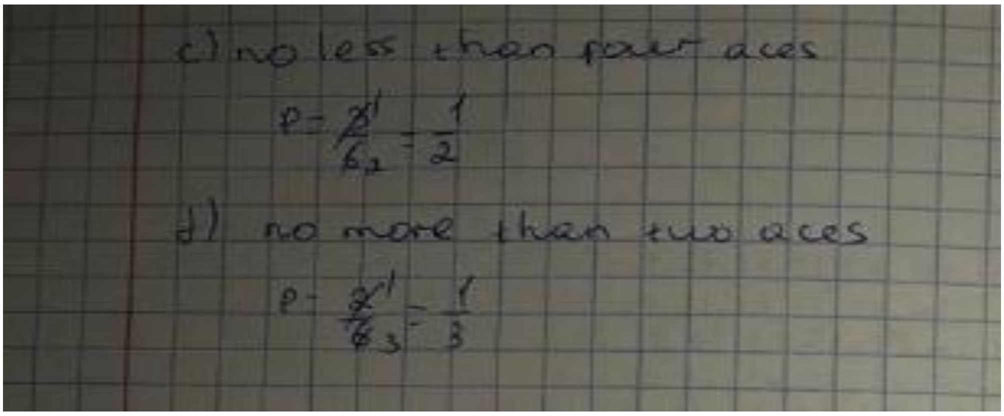
$S=\{(1,1),(1,2),(1,3),(1,4),(1,5),(1,6)\}$

a) six aces

$P=\frac{5}{6}$

b) an odd number of aces

$P=\frac{\cancel{3}^{1}}{\cancel{6}_{2}}=\frac{1}{2}$



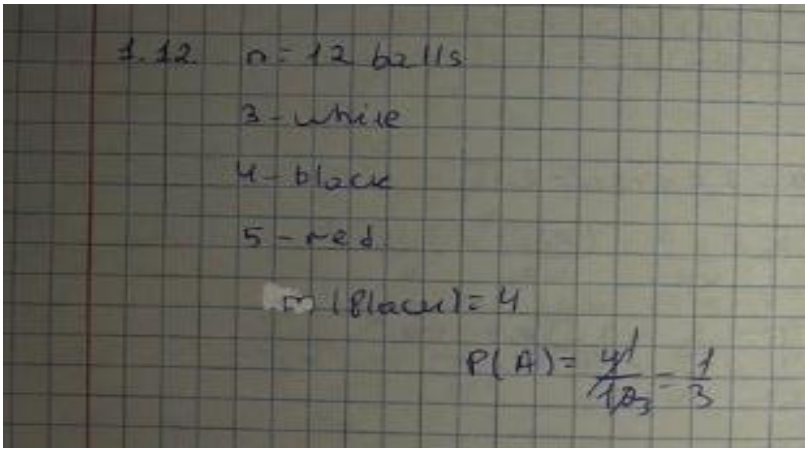
c) no less than four aces

$P=\frac{\cancel{3}^{1}}{\cancel{6}_{2}}=\frac{1}{2}$

d) no more than two aces

$P=\frac{\cancel{2}^{1}}{\cancel{6}_{3}}=\frac{1}{3}$

1.12. An urn contains 12 balls: 3 white, 4 black and 5 red. Find the probability that a randomly taken ball will be black.



1.12 $n=12$ balls

3 - white

4 - black

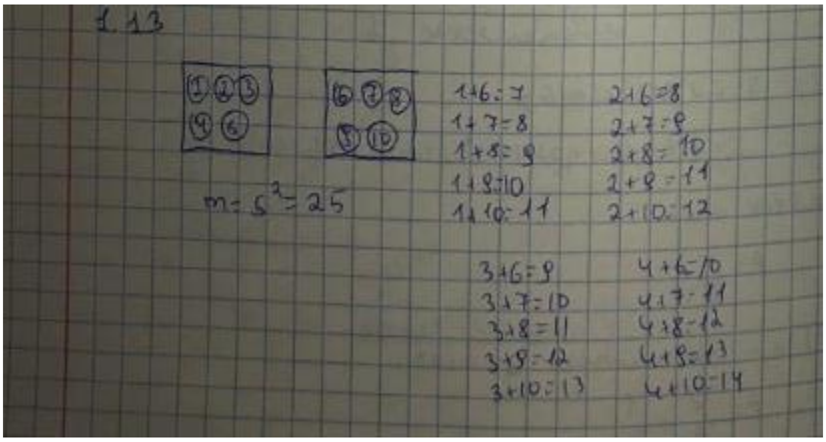
5 - red

$m(\text{Black})=4$

$P(A)=\frac{\cancel{4}^{1}}{\cancel{12}_{3}}=\frac{1}{3}$

1.13. The first box contains 5 balls with numbers from 1 up to 5, and the second – 5 balls with numbers from 6 up to 10. It has been randomly extracted on one ball from each box. Find the probability that the sum of numbers of the extracted balls will be: 1) no less than 7; 2) equal to 11; 3) no more than 11.

***The answer:* 2) 0,2; 3) 0,6.**



1.13

1 2 3 4 5   6 7 8 9 10

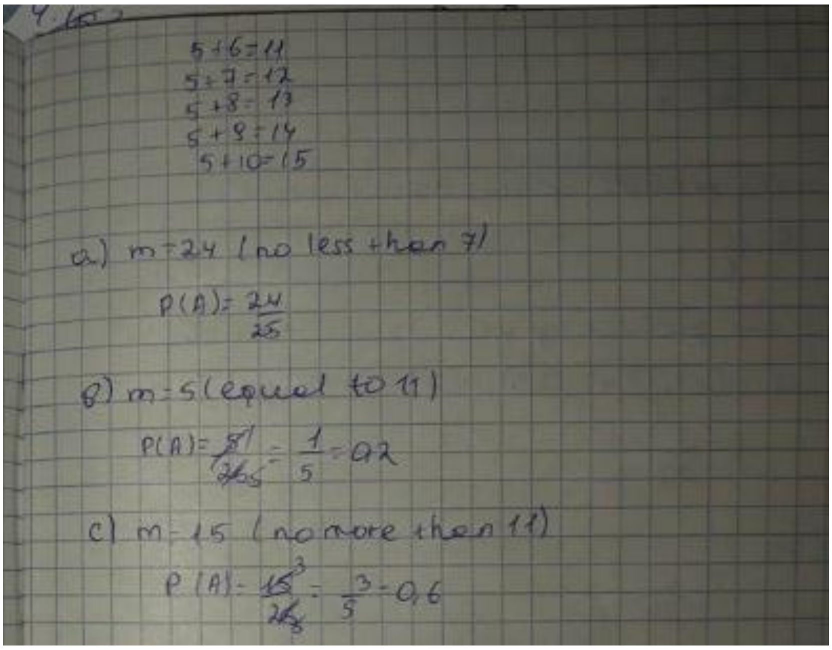
$m = 5^2 = 25$

1+6=7
1+7=8
1+8=9
1+9=10
1+10=11

2+6=8
2+7=9
2+8=10
2+9=11
2+10=12

3+6=9
3+7=10
3+8=11
3+9=12
3+10=13

4+6=10
4+7=11
4+8=12
4+9=13
4+10=14



5+6=11
5+7=12
5+8=13
5+9=14
5+10=15

a) m=24 (no less than 7)

$P(A) = \frac{24}{25}$

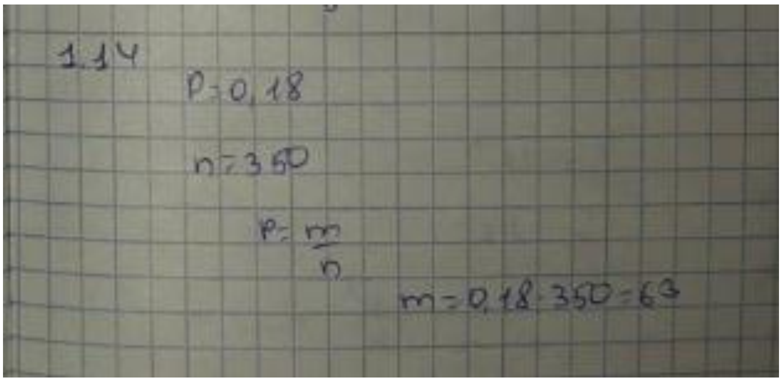
в) m=5 (equal to 11)

$P(A) = \frac{\cancel{5}^{1}}{\cancel{25}_{5}} = \frac{1}{5} = 0{,}2$

c) m=15 (no more than 11)

$P(A) = \frac{\cancel{15}^{3}}{\cancel{25}_{5}} = \frac{3}{5} = 0{,}6$

1.14. The relative frequency of workers of an enterprise having a higher education is equal to 0,18. Determine the number of workers having a higher education if the total number of workers of the enterprise is 350.



1.14

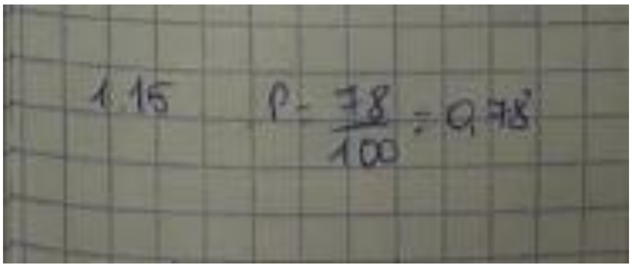
$P = 0{,}18$

$n = 350$

$P = \frac{m}{n}$

$m = 0{,}18 \cdot 350 = 63$

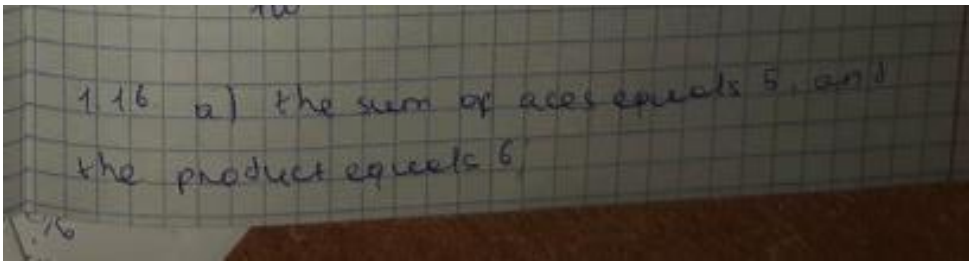
1.15. 78 seeds have germinated of 100 planted seeds. Find the relative frequency of germination of seeds (seed – семя; to germinate – прорастать).



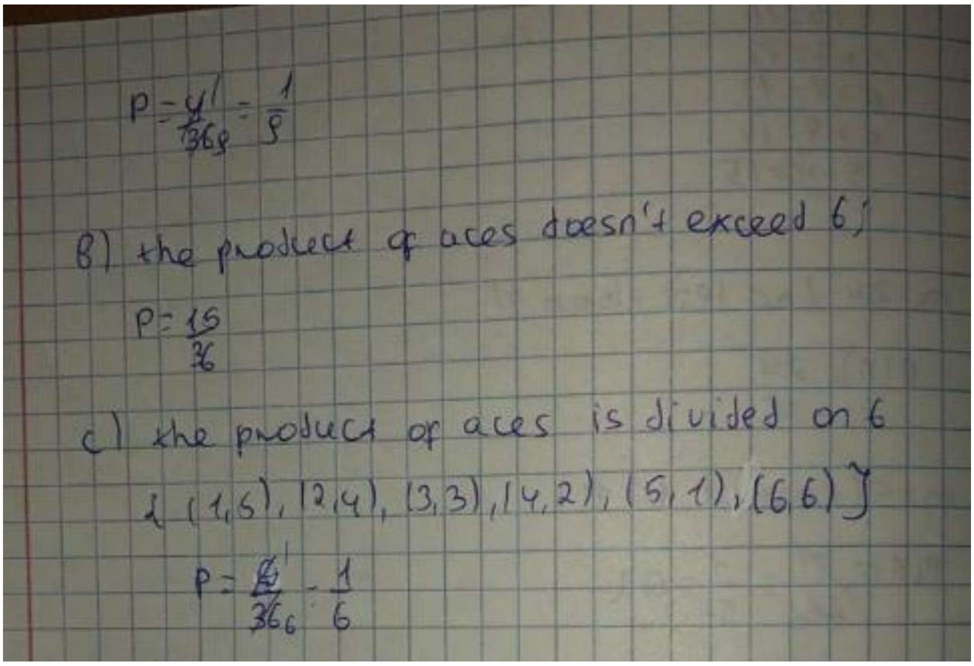
1.15 $P = \frac{78}{100} = 0{,}78$

1.16. Two dice are tossed. Find the probability that: a) the sum of aces equals 5, and the product equals 6;

b) the product of aces doesn't exceed 6; c) the product of aces is divided on 6.



1.16 a) the sum of aces equals 5, and the product equals 6



$P = \frac{4}{36} = \frac{1}{9}$

b) the product of aces doesn't exceed 6;

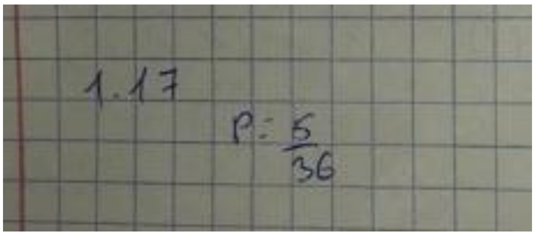
$P = \frac{15}{36}$

c) the product of aces is divided on 6

$\{(1,6), (2,4), (3,3), (4,2), (5,1), (6,6)\}$

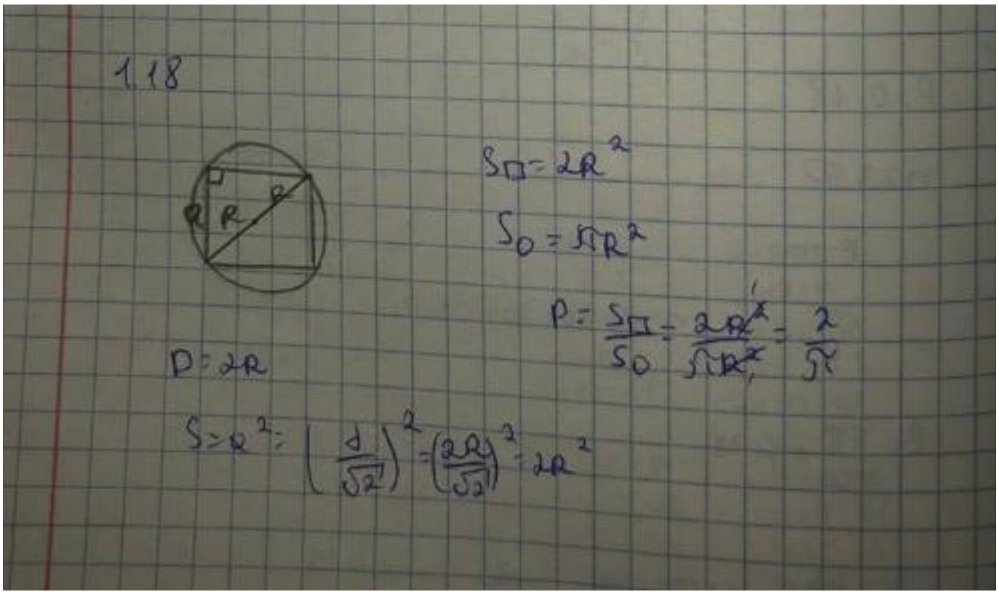
$P = \frac{6}{36} = \frac{1}{6}$

1.17. If two dice are tossed, what is the probability of rolling a sum of 6.



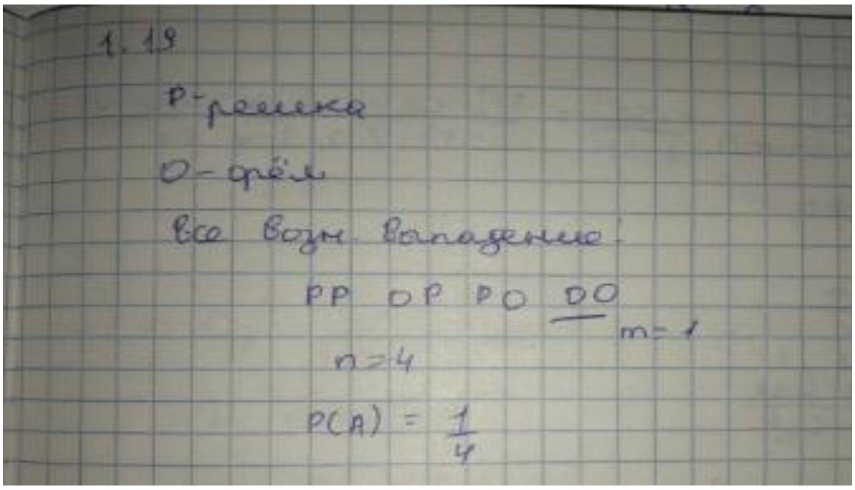
1.17 $P = \frac{5}{36}$

1.18. A point is randomly thrown inside of a circle of the radius *R*. Find the probability that the point will be inside the square entered in the circle. It is supposed that the probability of hit of a point in the square is proportional to its area and does not depend on its location regarding the circle. *The answer*: $2/\pi$.

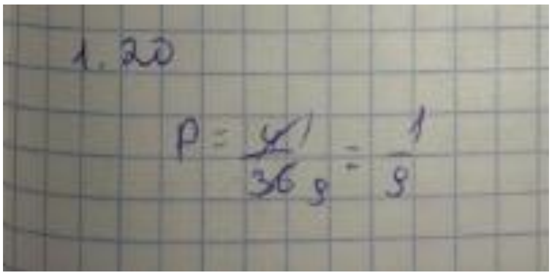


1.19. A coin is tossed twice. Find the probability that the coin lands on heads in both times.

***The answer:* 1/4.**

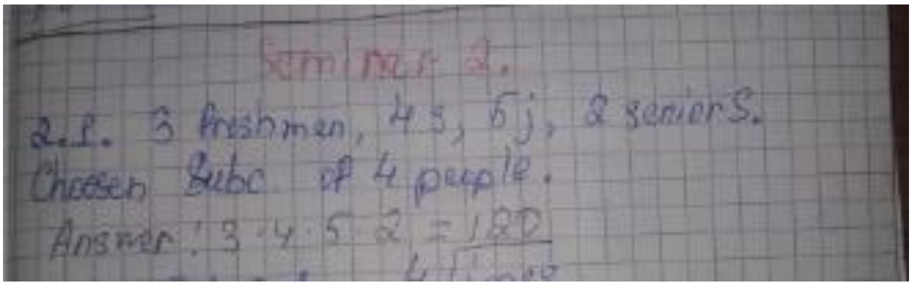


1.20. **What is the probability of getting a sum 9 from two throws of a dice?**



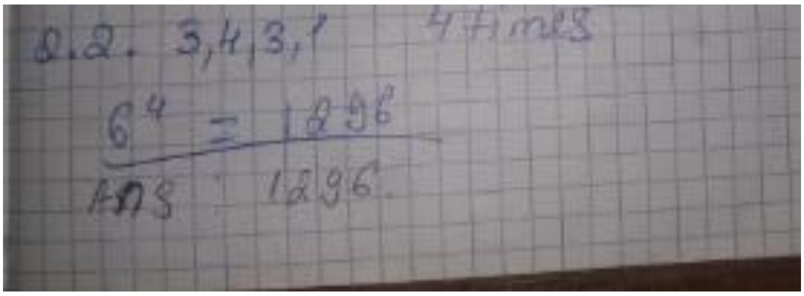
Exercises for Seminar 2

2.1. A college planning committee consists of 3 freshmen, 4 sophomores, 5 juniors, and 2 seniors. A subcommittee of 4, consisting of 1 person from each class, is to be chosen (a freshman – первокурсник; a sophomore – второкурсник). How many different subcommittees are possible?

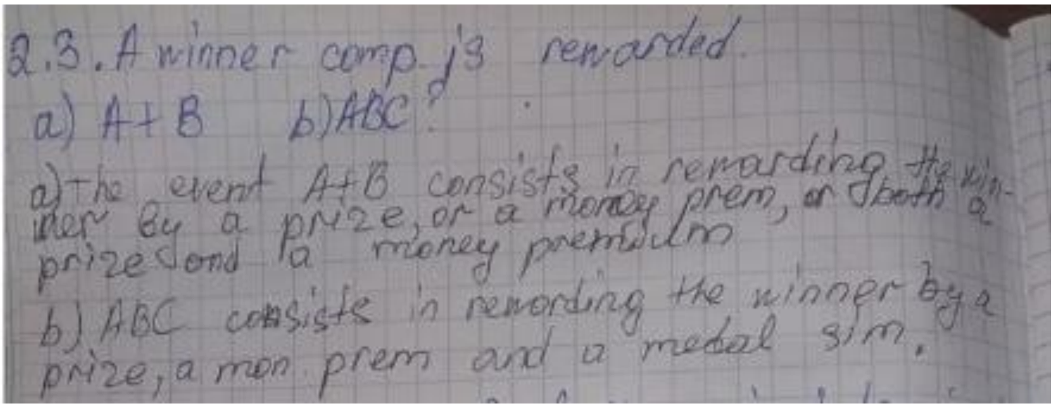

Seminar 2.

2.1. 3 freshmen, 4 s, 5 j, 2 seniors.
Chosen subc. of 4 people.
Answer: $3 \cdot 4 \cdot 5 \cdot 2 = 120$

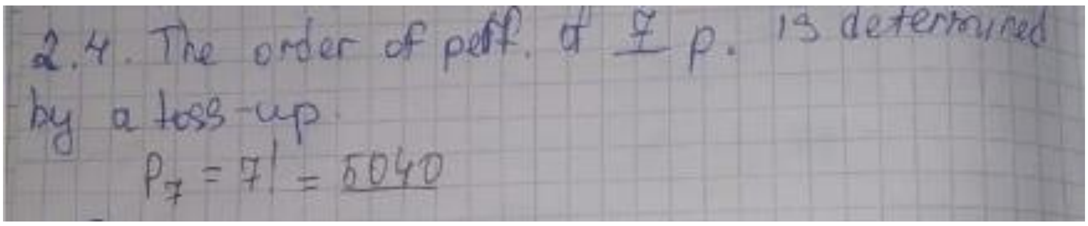
2.2. How many outcome sequences are possible when a die is rolled four times, where we say, for instance, that the outcome is 3, 4, 3, 1 if the first roll landed on 3, the second on 4, the third on 3, and the fourth on 1?


2.2. 3, 4, 3, 1   4 times
$6^4 = 1296$
Ans: 1296.

2.3. A winner of a competition is rewarded: by a prize (the event *A*), a money premium (the event *B*), a medal (the event *C*).


2.3. A winner comp. is rewarded.
a) A+B   b) ABC?
a) the event A+B consists in rewarding the winner by a prize, or a money prem, or both a prize and a money premium
b) ABC consists in rewarding the winner by a prize, a mon. prem and a medal sim.

2.4. The order of performance of 7 participants of a competition is determined by a toss-up. How many different variants of the toss-up are possible?


2.4. The order of perf. of 7 p. is determined by a toss-up.
$P_7 = 7! = 5040$

2.5. By the conditions of the lottery «Sportloto 6 of 45» a participant of the lottery who have guessed 4, 5 or 6 numbers from 6 randomly selected numbers of 45 receives a monetary prize. Find the probability that the participant will guess: a) all 6 numbers; b) 4 numbers.

2.5.

A – уг. 6 чисел $\Rightarrow n = C_{45}^{6}$ $m = 1$

$$P(A) = \frac{1}{C_{45}^{6}} = \frac{1\cdot 2\cdot 3\cdot 4\cdot 5\cdot 6}{45\cdot 44\cdot 43\cdot 42\cdot 41\cdot 40} = \boxed{0{,}0000001}$$

б)

C_6^4 C_{39}^2 $m = C_6^4 \cdot C_{39}^2$

$$P(B) = \frac{m}{n} = \frac{C_6^4 \cdot C_{39}^2}{C_{45}^6} = \frac{\frac{6!}{4!2!}\cdot\frac{39!}{2!37!}}{\frac{45!}{39!6!}} = \frac{15\cdot 741}{8145060} = \boxed{0{,}00136}$$

2.6. 10 of 30 students have sport categories. What is the probability that 3 randomly chosen students have sport categories? ***The answer:*** **0,03.**

2.6. 10 of 30 stud 3 rand chosen

$n = C_{30}^3$, $m = C_{10}^3$

$$P(A) = \frac{m}{n} = \frac{C_{10}^3}{C_{30}^3} = \frac{\frac{10!}{3!7!}}{\frac{30!}{27!3!}} = \frac{120}{4060} = 0{,}0295 \approx 0{,}03$$

2.7. A group consists of 12 students, and 8 of them are pupils with honor. 9 students are randomly selected. Find the probability that 5 pupils with honor will be among the selected. ***The answer:*** **0,255.**

2.7.

$$P(A) = \frac{C_8^5 \cdot C_4^4}{C_{12}^9} = \frac{\frac{8!}{5!3!}\cdot\frac{4!}{4!0!}}{\frac{12!}{9!3!}} = \frac{8!\cdot 9!\cdot 3!}{3!5!\cdot 12!} = \frac{14}{55} = 0{,}255$$

2.8. Eight different books are randomly placed on one shelf. Find the probability that two certain books will be put beside (a shelf – полка, beside – рядом). ***The answer:*** **0,25.**

2.8.

$P = \frac{m}{n}$ $n = 8!$ $m = 7 \cdot 2 \cdot 6!$

$P = \frac{7 \cdot 2 \cdot 6!}{8!} = \frac{7 \cdot 2}{8 \cdot 7} = 0,25$

или

$P_1 = \frac{1}{8} \cdot \frac{1}{8} \cdot 2 = \frac{1}{28}$ $P_2 = \frac{1}{8} \cdot \frac{2}{7} \cdot 6 = \frac{6}{28}$

$P = P_1 + P_2 = 0,25.$

2.9. A box contains 5 red, 3 green and 2 blue pencils. 3 pencils are randomly extracted from the box. Find the probabilities of the following events:

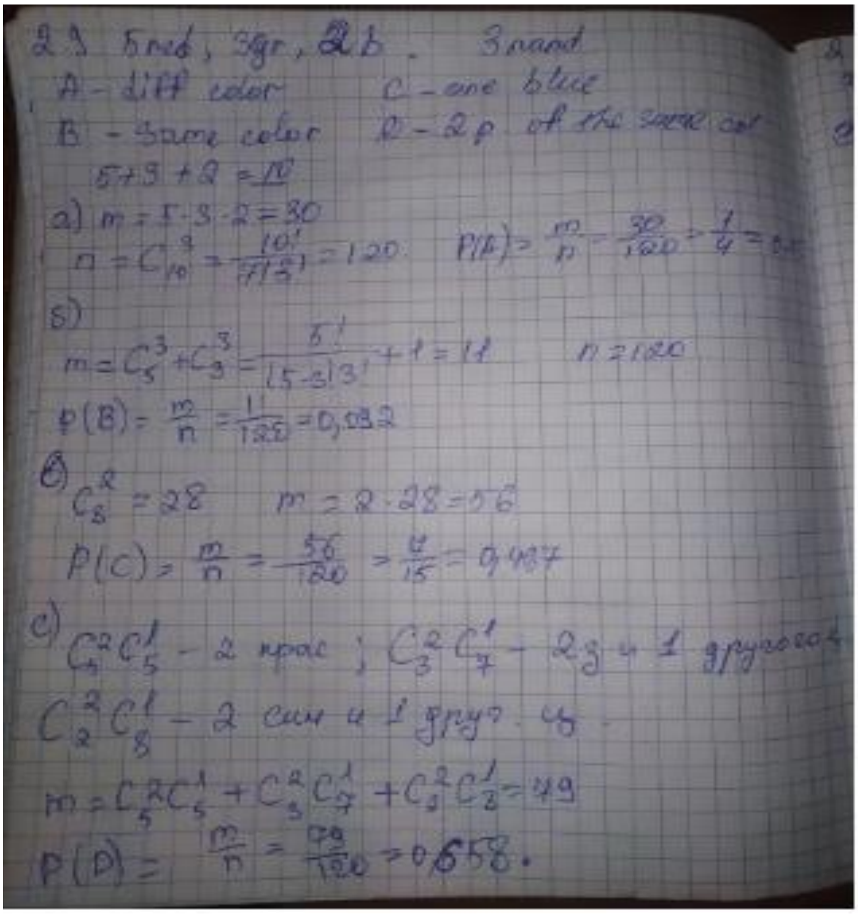
A – all the extracted pencils are different color;

B – all the extracted pencils are the same color;

C – one blue pencil among the extracted;

D – exactly two pencils of the same color among the extracted.

***The answer: P(A)* = 0,25; *P(B)* = 0,092; *P(C)* = 0,467; *P(D)* = 0,658.**



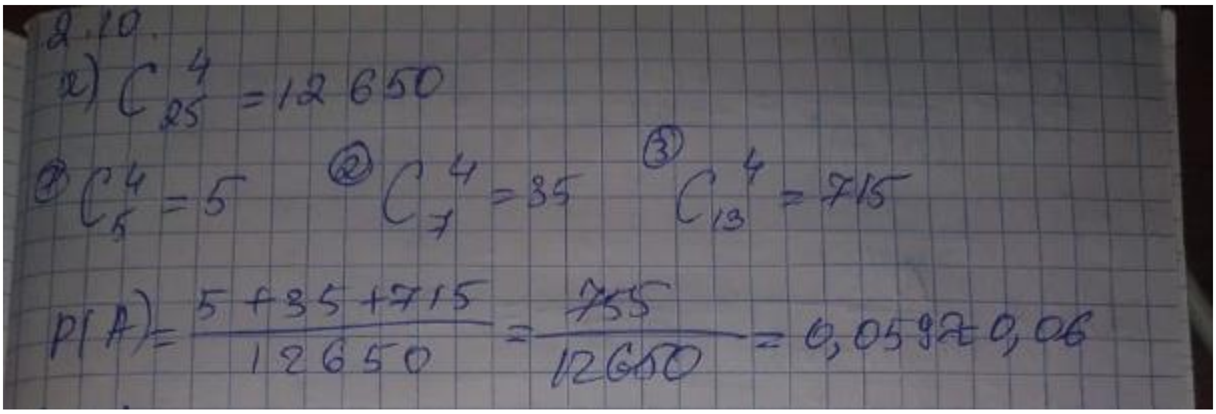
2.9 5 red, 3 gr, 2 b. 3 rand
A – diff color C – one blue
B – same color D – 2 p of the same col
$5+3+2=10$
a) $m = 5\cdot 3\cdot 2 = 30$
$n = C_{10}^{3} = \frac{10!}{7!3!} = 120$ $P(A) = \frac{m}{n} = \frac{30}{120} = \frac{1}{4} = 0.25$
б)
$m = C_5^3 + C_3^3 = \frac{5!}{(5-3)!3!} + 1 = 11$ $n = 120$
$P(B) = \frac{m}{n} = \frac{11}{120} = 0{,}092$
в) $C_8^2 = 28$ $m = 2\cdot 28 = 56$
$P(C) = \frac{m}{n} = \frac{56}{120} = \frac{7}{15} = 0{,}467$
c) $C_5^2 C_5^1$ – 2 крас ; $C_3^2 C_7^1$ – 2з и 1 другого ц
$C_2^2 C_8^1$ – 2 син и 1 друг. ц
$m = C_5^2 C_5^1 + C_3^2 C_7^1 + C_2^2 C_8^1 = 79$
$P(D) = \frac{m}{n} = \frac{79}{120} = 0{,}658.$

2.10. It has been sold 21 of 25 refrigerators of three marks available in quantities of 5, 7 and 13 units in a shop. Assuming that the probability to be sold for a refrigerator of each mark is the same, find the probability of the following events:

a) refrigerators of one mark have been unsold;

b) refrigerators of three different marks have been unsold.

The answer: **a) 0,06; b) 0,396.**



2.10.
a) $C_{25}^{4} = 12\,650$
(1) $C_5^4 = 5$ (2) $C_7^4 = 35$ (3) $C_{13}^4 = 715$
$P(A) = \frac{5+35+715}{12650} = \frac{755}{12650} = 0{,}059 \approx 0{,}06$

2.11. A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the i-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following events: A – «only one hit»; B – «three misses»; C – «three hits»; D – «at least one miss»; E – «no less than two hits»; F – «no more than one hit».

2.11.

a) 1 hit b) 3 misses c) 3 hits d) at least 1 m

e) no less than 2 hits, f) no more than 1 h.

A – хотя бы 1 попадание

a) $A = A_1 + A_2 + A_3$ c) $C = A_1 \cdot A_2 \cdot A_3$

б) $B = \bar{A}_1 \cdot \bar{A}_2 \cdot \bar{A}_3$ d) $D = \bar{A}_1 + \bar{A}_2 + \bar{A}_3$

e) $E = A_1 \cdot A_2 \cdot \bar{A}_3 + A_1 \cdot \bar{A}_2 \cdot A_3 + \bar{A}_1 A_2 A_3 + A_1 A_2 A_3$

f) $F = A_1 \bar{A}_2 \bar{A}_3 + \bar{A}_1 A_2 \bar{A}_3 + \bar{A}_1 \cdot A_2 \cdot A_3 + \bar{A}_1 \cdot \bar{A}_2 \cdot \bar{A}_3$

Exercises for Homework 2

2.12. How many different 7-place codes for license plates are possible if the first 3 places are to be occupied by letters of Latin alphabet and the final 4 by numbers?

The answer: **175760000.**

2.12.

$P(A) = 26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 175\,760\,000.$

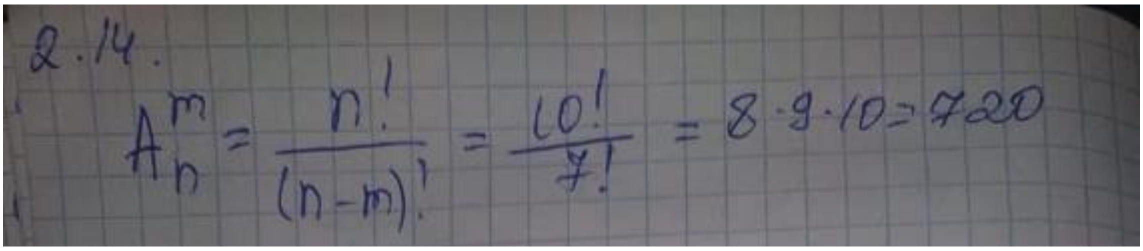
2.13. In Ex. 2.13, how many codes for license plates would be possible if repetition among letters or numbers were prohibited?

2.13.

$P(A) = 26 \cdot 25 \cdot 24 \cdot 10 \cdot 9 \cdot 8 \cdot 7 = 78\,624\,000$

2.14. 10 persons participate in competitions, and three of them will take the first, second and third places. How many different variants are possible?

The answer: **720.**

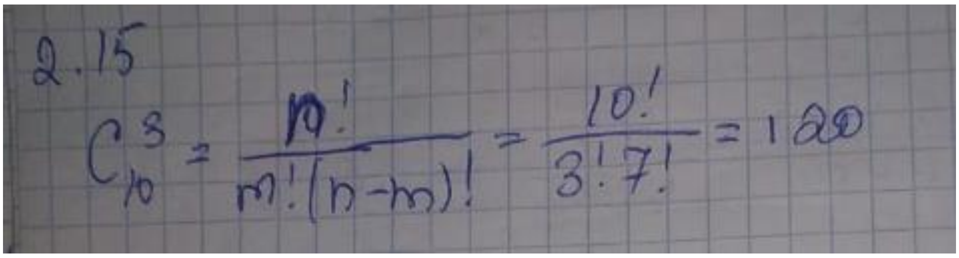


2.14.

$$A_n^m = \frac{n!}{(n-m)!} = \frac{10!}{7!} = 8\cdot 9\cdot 10 = 720$$

2.15. How many ways of choosing 3 persons of 10 are possible?

The answer: **120.**

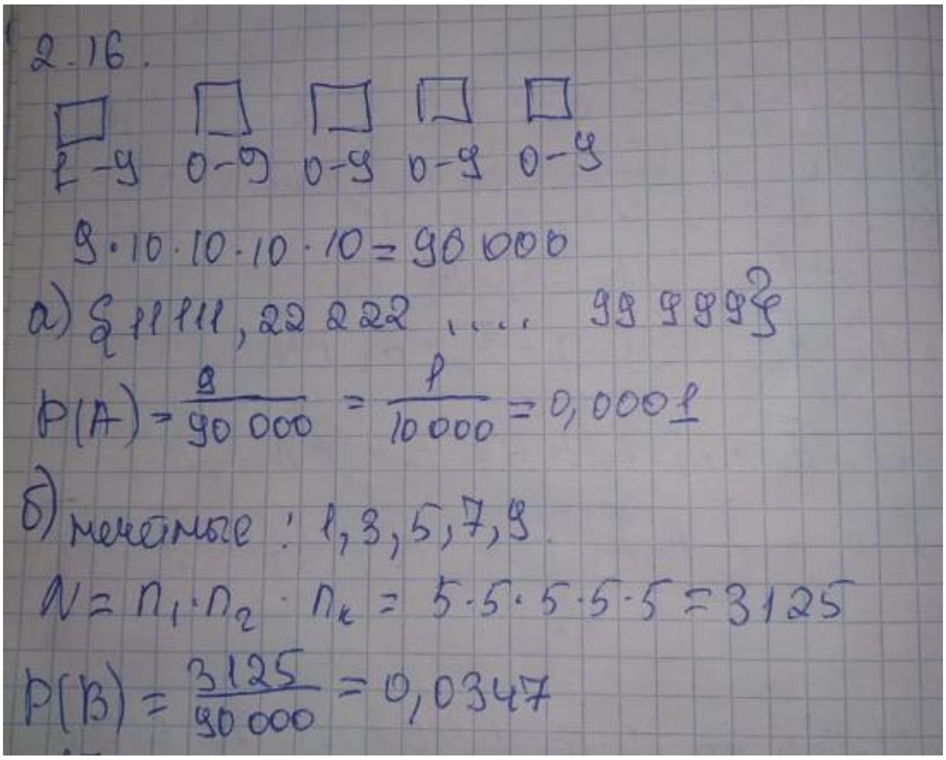


2.15

$$C_{10}^3 = \frac{n!}{m!(n-m)!} = \frac{10!}{3!\,7!} = 120$$

2.16. A randomly taken phone number consists of 5 digits. What is the probability that all digits of the phone number are: a) identical; b) odd? It is known that any phone number does not begin with the digit zero.

***The answer*: a) 0,0001; b) 0,0347.**



2.16.

1–9 0–9 0–9 0–9 0–9

$9\cdot 10\cdot 10\cdot 10\cdot 10 = 90\,000$

а) $\{11111, 22222, \ldots, 99999\}$

$$P(A) = \frac{9}{90\,000} = \frac{1}{10\,000} = 0{,}0001$$

б) нечетные: 1, 3, 5, 7, 9

$N = n_1\cdot n_2 \cdot n_k = 5\cdot 5\cdot 5\cdot 5\cdot 5 = 3125$

$$P(B) = \frac{3125}{90\,000} = 0{,}0347$$

2.17. A box contains 15 details, and 10 of them are painted. A collector chooses at random 3 details. Find the probability that the chosen details are painted (collector – сборщик).

The answer: **0,264.**

2.17

1-я g: $\frac{10}{15} = \frac{2}{3}$

2-я g: $\frac{2}{3} \cdot \frac{9}{14} = \frac{3}{7}$

3-я g: $\frac{3}{7} \cdot \frac{8}{13} = \frac{24}{91}$

Ans $= \frac{24}{91} = 0{,}264$

2.18. Find the probability that from 10 books located in a random order, 3 certain books will be beside.

***The answer*: 0,0667.**

$n = P_{10} = 10! = 3628800$

$n_A = 6 \cdot 8! = 241920$

$P(A) = \frac{n_A}{n} = \frac{6 \cdot 8!}{10!} = \frac{1}{15} = 0{,}067$

2.19. Four tickets are distributed among 25 students (15 of them are girls). Everyone can take only one ticket. What is the probability that owners of these tickets will be:

a) four girls;

b) four young men;

c) three young men and one girl?

***The answer*: a) 0,108; b) 0,017; c) 0,142.**

2.19

a) 4 g b) 4 b c) 3 b and 1 g

c)

$n = C_{25}^{4} = \frac{25!}{4!\,21!} = \frac{22 \cdot 23 \cdot 24 \cdot 25}{1 \cdot 2 \cdot 3 \cdot 4} = 12650$

$m = C_{15}^{1} \cdot C_{10}^{3} = \frac{15!}{14!} \cdot \frac{10!}{7!\,3!} = 15 \cdot 120 = 1800$

$P(C) = \frac{1800}{12650} = \boxed{0{,}142}$

b) $C_{10}^{4} = \frac{10!}{4!\cdot 6!} = \frac{7\cdot 8\cdot 9\cdot 10}{1\cdot 2\cdot 3\cdot 4} = 210$

$P(B) = \frac{210}{12650} = 0,0166 \approx 0,017.$

a) $C_{15}^{4} = \frac{15!}{4!\,11!} = \frac{12\cdot 13\cdot 14\cdot 15}{1\cdot 2\cdot 3\cdot 4} = 1365$

$P(A) = \frac{1365}{12650} = 0,108.$

2.20. There are 100 products (including 4 defective) in a batch. The batch is arbitrarily divided into two equal parts which are sent to two consumers. What is the probability that all defective products will be got: a) by one consumer; b) by both consumers fifty-fifty**?** ***The answer*****: a) 0,117; b) 0,383**

2.20

50%/50% $\Rightarrow$ $100-50=50$

$C_{100}^{50} = \frac{100!}{50!\,50!}$ $\quad m = C_{96}^{46}\cdot C_4^4 + C_{96}^{50}\cdot C_4^0$

$P(A) = \frac{m}{n} = \frac{C_{96}^{46}\cdot C_4^4 + C_{96}^{50}\cdot C_4^0}{C_{100}^{50}} = \frac{2\cdot C_{96}^{46}}{C_{100}^{50}} =$

$\frac{2\cdot 96!\cdot 50!\cdot 50!}{46!\cdot 50!\cdot 100!} = \frac{2\cdot 46!\cdot 96!\cdot 47\cdot 48\cdot 49\cdot 50}{46!\cdot 96!\cdot 97\cdot 98\cdot 99\cdot 100} = 0,117$

б)

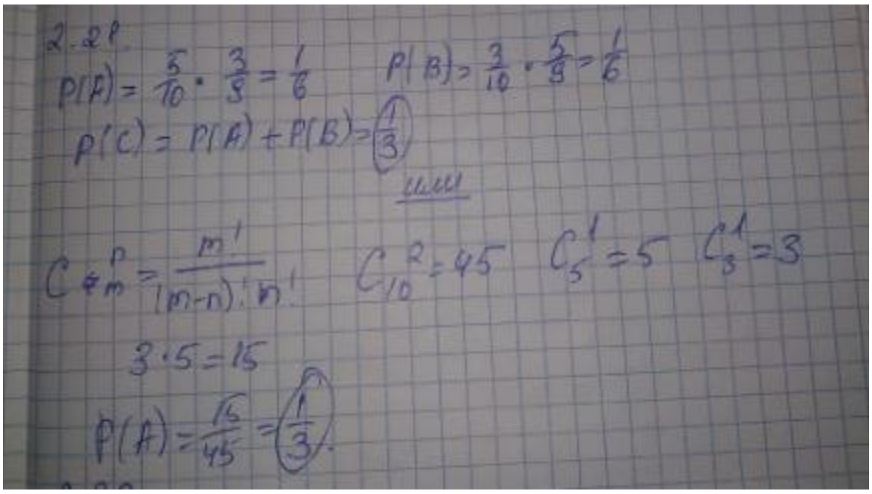
$m = m_1\cdot m_2 = C_{96}^{48}\cdot C_4^2 = \frac{96!}{48!\cdot 48!}$

$P(B) = \frac{m}{n} = \frac{96!\cdot 4!\cdot 50!\cdot 50!}{48!\cdot 48!\cdot 2!\cdot 2!\cdot 100!} = \frac{96!\cdot 2\cdot 3\cdot 4\cdot 49\cdot 49\cdot 50\cdot 50}{48!\cdot 2!\cdot 96!\cdot 97\cdot 98\cdot 99\cdot 100}$

$= 0,383$

.

2.21. A library consists of ten different books, and five books cost on 4 thousands of tenghe each, three books – on one thousand of tenghe and two books – on 3 thousands of tenghe. Find the probability that two randomly taken books cost 5 thousands of tenghe. ***The answer*: 1/3.**


2.21

$P(A) = \frac{5}{10} \cdot \frac{3}{9} = \frac{1}{6}$ $P(B) = \frac{3}{10} \cdot \frac{5}{9} = \frac{1}{6}$

$P(C) = P(A) + P(B) = \frac{1}{3}$

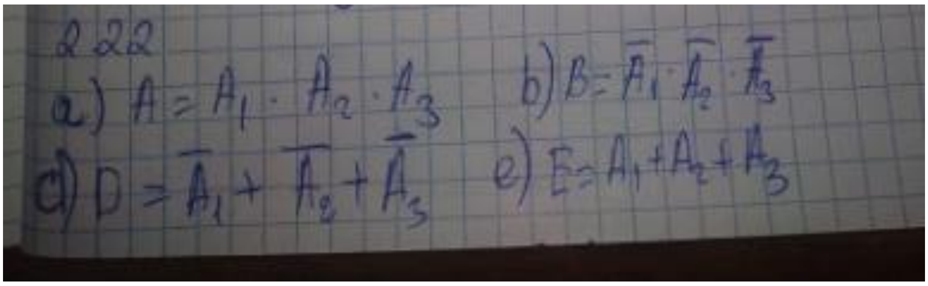
или

$C_m^n = \frac{m!}{(m-n)!\,n!}$ $C_{10}^2 = 45$ $C_5^1 = 5$ $C_3^1 = 3$

$3 \cdot 5 = 15$

$P(A) = \frac{15}{45} = \frac{1}{3}$

2.24. A coin is tossed three times. Let A_i be the event «an appearance of heads at the i-th tossing» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following events: A – «three heads»; B – «three tails»; C – «at least one heads»; D – «at least one tails»; E – «only one heads»; F – «only one tails».


2.22

a) $A = A_1 \cdot A_2 \cdot A_3$ b) $B = \bar{A}_1 \cdot \bar{A}_2 \cdot \bar{A}_3$

c) $D = \bar{A}_1 + \bar{A}_2 + \bar{A}_3$ e) $E = A_1 + A_2 + A_3$

Exercises for Seminar 3

3.1. In a cash–prize lottery 150 prizes and 50 monetary winnings are played on every 10000 tickets. What is the probability of a winning indifferently monetary or prize for an owner of one lottery ticket equal to?

Exercises 3.

1) $P(A+B) = P(A) + P(B)$.

$P(A) + P(B) = \frac{150+50}{10000} = \frac{200}{10000} = \frac{1}{50} = 0{,}02.$

3.2. The events *A, B, C* and *D* form a complete group. The probabilities of the events are those: *P(A)* = 0,1; *P(B)* = 0,4; *P(C)* = 0,3. What is the probability of the event *D* equal to?

2) $P(A_1) + P(A_2) + \dots P(A_n) = 1.$

$0{,}1 + 0{,}4 + 0{,}3 + P(D) = 1$

$P(D) = 0{,}2$

3.3. Jack took two tests. The probability of his passing both tests is 0.7. The probability of his passing the first test is 0.9. What is the probability of his passing the second test given that she has passed the first test?

3) $P(AB) = P(A) \cdot P(B)$

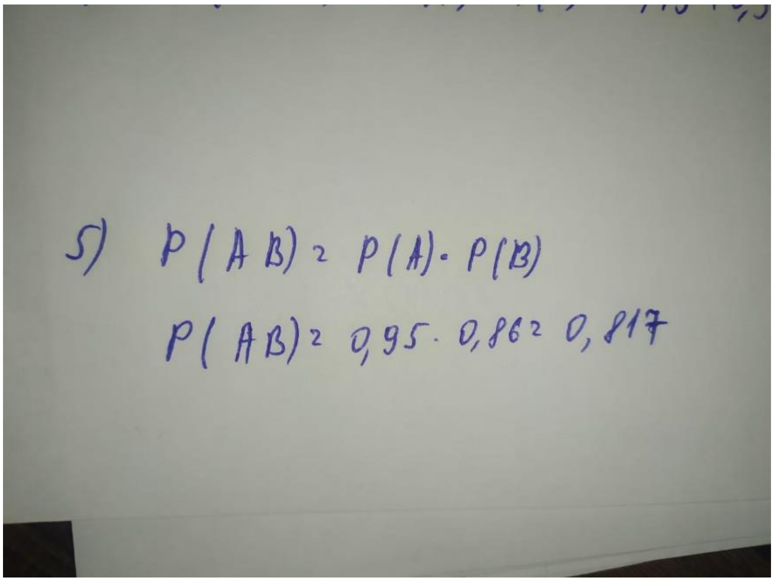
$0,7 = 0,9 \cdot P(B)$

$P(B) = \frac{0,7}{0,9} \approx 0,777$

3.4. A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,45 and in the second – 0,35. Find the probability that the shooter will hit at one shot either in the first area or in the second area.

4) $P(A+B) = P(A) + P(B) = 0,45 + 0,39 = 0,84$

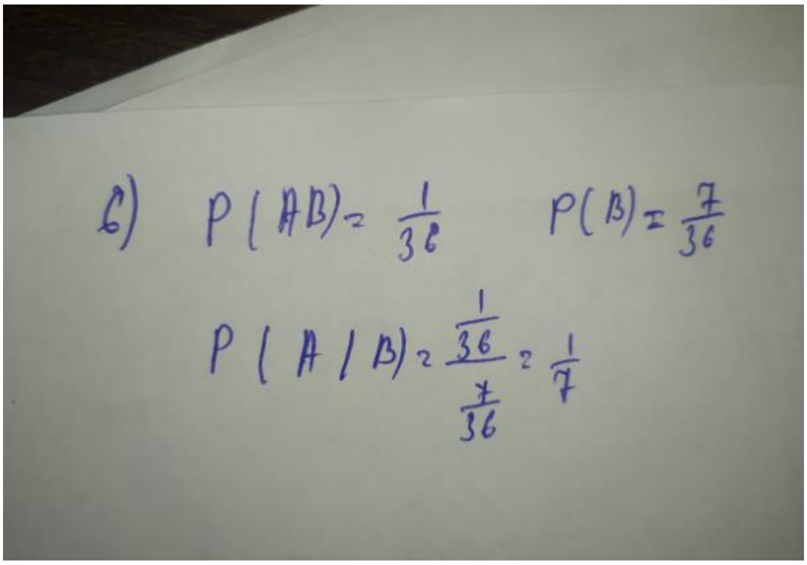
3.5. An enterprise produces 95% standard products, and 86% of them have the first grade. Find the probability that a randomly taken product made at the enterprise will be standard and the first grade (grade – сорт).



5) $P(AB) = P(A) \cdot P(B)$

$P(AB) = 0{,}95 \cdot 0{,}86 = 0{,}817$

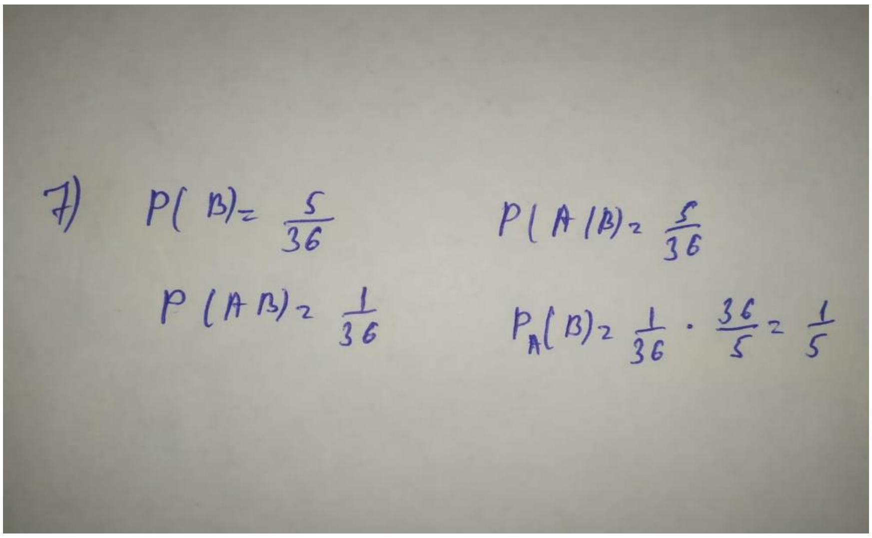
3.6. Two dice are thrown. Find the conditional probability that each die lands on 5 if it is known that the sum of aces is divided on 5.



6) $P(AB) = \frac{1}{36}$ $\quad P(B) = \frac{7}{36}$

$P(A/B) = \frac{\frac{1}{36}}{\frac{7}{36}} = \frac{1}{7}$

3.7. If two dice are rolled, what is the conditional probability that the first one lands on 4 given that the sum of the dice is 8?



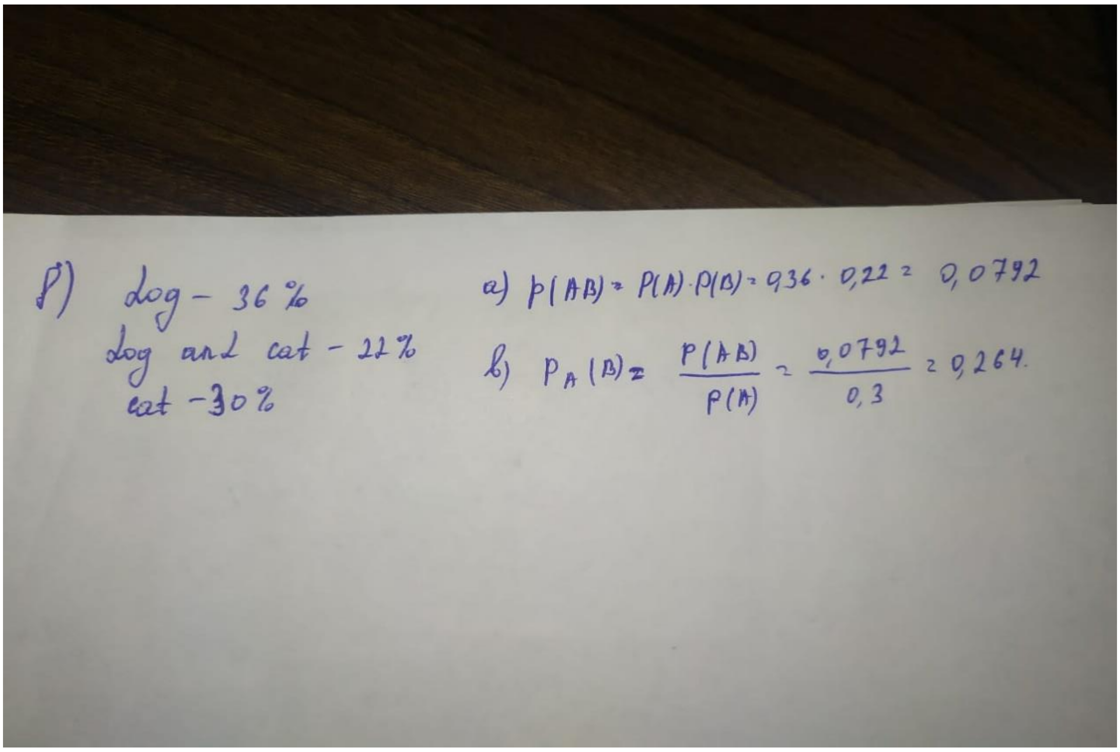
7) $P(B) = \frac{5}{36}$ $\quad P(A/B) = \frac{5}{36}$

$P(AB) = \frac{1}{36}$ $\quad P_A(B) = \frac{1}{36} \cdot \frac{36}{5} = \frac{1}{5}$

3.8. In a certain community, 36 percent of the families own a dog, and 22 percent of the families that own a dog also own a cat. In addition, 30 percent of the families own a cat. What is

(a) the probability that a randomly selected family owns both a dog and a cat;

(b) the conditional probability that a randomly selected family owns a dog given that it owns a cat?



8) dog – 36 %
dog and cat – 22 %
cat – 30 %

a) $P(AB) = P(A) \cdot P(B) = 0{,}36 \cdot 0{,}22 = 0{,}0792$

b) $P_A(B) = \frac{P(AB)}{P(A)} = \frac{0{,}0792}{0{,}3} = 0{,}264.$

3.9. An urn contains 10 white, 15 black, 20 blue and 25 red balls. A ball is taken at random from the urn. Find the probability that the taken ball is: a) white or black; b) blue or red.

9) а) $P(A+B) = P(A) + P(B) = \frac{10}{70} + \frac{15}{70} = \frac{5}{14}$

б) $P(A+B) = \frac{20}{70} + \frac{15}{70} = \frac{9}{14}$

3.10. The probability that it is Friday and that a student is absent is 0.03. Since there are 5 school days in a week, the probability that it is Friday is 0.2. What is the probability that a student is absent given that today is Friday?

10) $P(AB) = 0{,}03$

$P(B) = 0{,}2$

$P(A) = \frac{0{,}03}{0{,}2} = 0{,}15$

Exercises for Homework 3

3.11. By the statistical data of a repair shop 20 stops of a lathe are on the average: 10 – for change of a cutter; 3 – because of malfunction of a drive; 2 – because of delayed submission of details. The rest stops occur for other reasons. Find the probability of stop of the lathe for other reasons (repair shop – ремонтная мастерская; lathe – токарный станок; cutter – резец; malfunction – неисправность; drive – привод**).** ***The answer*****: 0,25.**

11) $a + b + c + d = 20$

$d = 20 - 10 - 3 - 2 = 5$

$P(D) = \frac{5}{20} = \frac{1}{4} = 0,25$

3.12. There are 30 TVs in a shop, and 20 of them are import. Find the probability that no less than 3 import TVs will be among 5 TVs sold for one day, assuming that the probabilities of purchase of TVs of different marks are identical.

***The answer*: 0,81.**

13) $$\frac{C_{20}^{3} \cdot C_{10}^{2} + C_{10}^{1} \cdot C_{20}^{4} + C_{20}^{5}}{C_{30}^{5}} = \frac{51300 + 48450 + 15504}{142506} = 0,81.$$

3.13. If two dice are rolled, what is the conditional probability that the first one lands on 6 given that the sum of the dice is 11?

***The answer*: 0,5.**

13) $P(B) = \frac{2}{36} = \frac{1}{18}$ $\qquad$ $P_A'(B) = \frac{1}{36} \cdot \frac{18}{1} = \frac{1}{2}$

$P(AB) = \frac{1}{36}$

$P(A/B) = \frac{1}{36} \cdot \frac{18}{1} = \frac{1}{2}$

3.14. An urn contains 6 white and 9 black balls. If 4 balls are to be randomly selected without replacement, what is the probability that the first 2 selected are white and the last 2 black?

***The answer*: 0,066.**

14) $$\frac{P(6,2) \cdot P(9,2)}{P(15,4)} = \frac{5 \cdot 6 \cdot 7 \cdot 8}{12 \cdot 13 \cdot 14 \cdot 15} = \frac{6}{91} = 0,066$$

3.15. Fifty-two percent of the students at a certain university are females. Five percent of the students in this university are majoring in computer science. Two percent of the students are women majoring in computer science. If a student is selected at random, find the conditional probability that

(a) this student is female, given that the student is majoring in computer science;

(b) this student is majoring in computer science, given that the student is female.

***The answer*: a) 0,4; b) 0,038.**

15) $P(F) = 0,52 \quad P(C) = 0,05 \quad P(F,C) = 0,02$

а) $P(F/C) = \dfrac{P(F,C)}{P(C)} = 0,4$

б) $P(C/F) = \dfrac{P(F,C)}{P(F)} = 0,038$

3.16. Celine is undecided as to whether to take a French course or a chemistry course. She estimates that her probability of receiving an A grade would be 1/2 in a French course and 2/3 in a chemistry course. If Celine decides to base her decision on the flip of a coin, what is the probability that she gets an A in chemistry (grade – оценка)?

***The answer*: 0,33.**

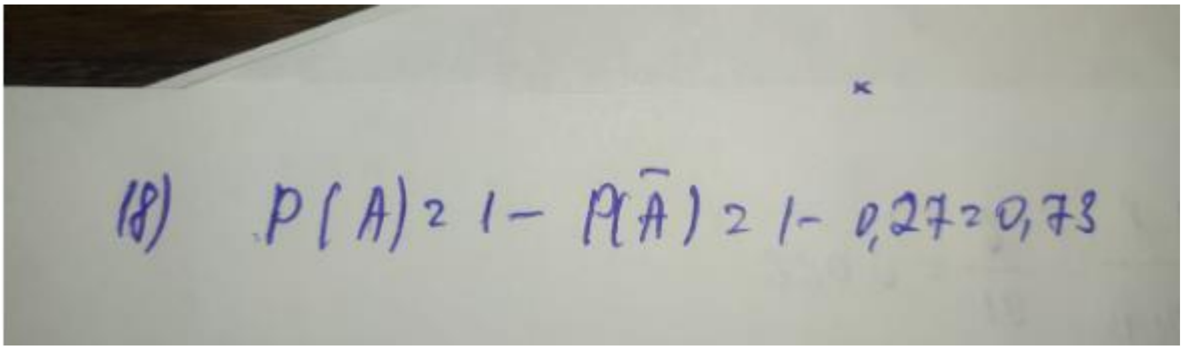
()

3.17. Suppose that an urn contains 8 red and 4 white balls. We draw 2 balls from the urn without replacement. If we assume that at each draw each ball in the urn is equally likely to be chosen, what is the probability that both balls drawn are red (to draw – тянуть)?

***The answer*: 0,424.**

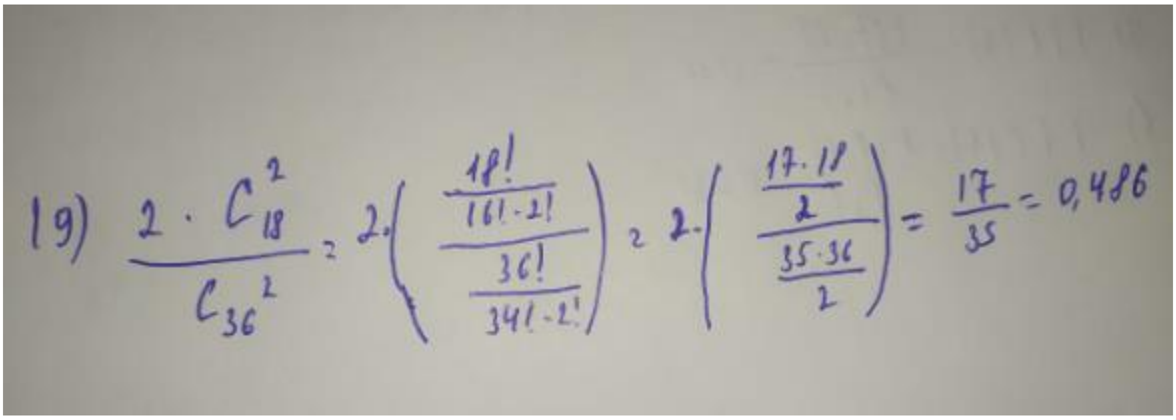
17) $P(AB) = P(A) \cdot P_A(B) = \dfrac{8}{12} \cdot \dfrac{7}{11} = \dfrac{14}{33} = 0,424$

3.18. Two shooters shoot in a target. Find the probability that the target will be struck at least one of the shooters if it is known that the probability of miss by both shooters is equal to 0,27.



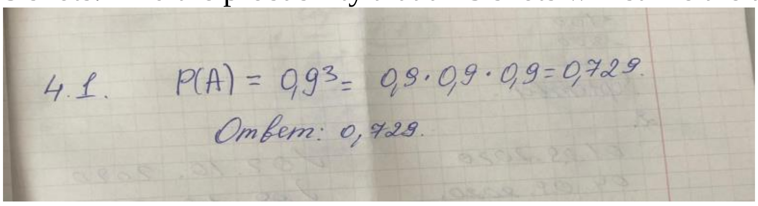
3.19. Two cards are randomly selected from a pack of 36 playing cards. Find the probability that both cards are the same color (a pack – колода).

The answer: **0,486.**

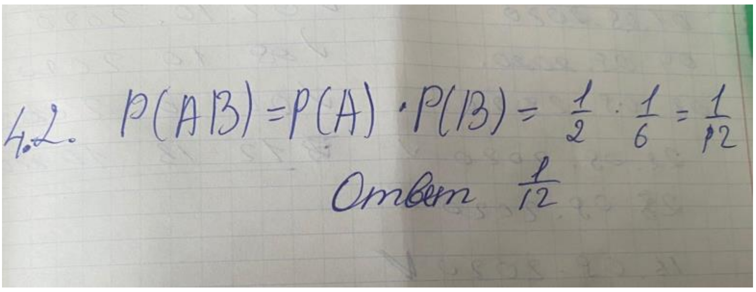


Exercises for Seminar 4

4.1. The probability that a shooter hit in a target at one shot is equal to 0,9. The shooter has made 3 shots. Find the probability that all 3 shots will strike the target.



4.2. A coin and a die are tossed. Find the probability of joint appearance of the following events: «the coin lands on heads» and «the die lands on 6».



4.3. What is the probability that at tossing three dice 6 aces will appear at least on one of the dice (the event A)? ***The answer:*** **0,421.**

4.3. $p = \frac{5}{6} \cdot \frac{5}{6} \cdot \frac{5}{6} = \frac{125}{216}$

$1 - \frac{125}{216} = \frac{91}{216} = 0{,}421.$

ответ 0,421.

4.4. There are 8 standard details in a batch of 10 details. Find the probability that there is at least one standard detail among two randomly taken details.

4.4. $n = 10$, $m = 8$, $P(A) = ?$

$P(B) = \frac{8}{10} = \frac{2}{5}$

$P(A) = 1 - q_1 \cdot q_2 = 1 - \frac{1}{25} = \frac{24}{25}.$

$q_1 = q_2 = 1 - \frac{4}{5} = \frac{1}{5}$

ответ $\frac{24}{25}$.

4.5. Two dice are rolled. What is the conditional probability that at least one lands on 6 given that the dice land on different numbers?

4.5. $P(A) = \frac{30}{36} = \frac{5}{6}$

$P(B) = \frac{11}{36}.$

$P_A B = \frac{\frac{10}{36}}{\frac{5}{6}} = \frac{10}{36} \cdot \frac{6}{5} = \frac{1}{3}.$

ответ: $\frac{1}{3}$

4.6. The probability of hit in a target by the first shooter at one shot is equal to 0,8, and by the second shooter – 0,6. Find the probability that the target will be struck only with one shooter. ***The answer*: 0,44.**

4.6. $p = q_1 \cdot q_2 = 0{,}2 \cdot 0{,}4 = 0{,}08$

$P_1 = p_1 \cdot q_2 + q_1 \cdot p_1 = 0{,}8 \cdot 0{,}4 + 0{,}2 \cdot 0{,}6 = 0{,}44$

ответ: 0,44.

4.7. The probability to receive high dividends under shares at the first enterprise – 0,2; on the second – 0,35; on the third – 0,15. Determine the probability that a shareholder having shares of all the enterprises will receive high dividends: a) only at one enterprise; b) at least on one enterprise (a share – акция).

***The answer:* a) 0,4265; b) 0,564.**

4.7. $p_1 = 0{,}2$ $\quad q_1 = 1 - p_1 = 1 - 0{,}2 = 0{,}8$

$p_2 = 0{,}35$ $\quad q_2 = 1 - p_2 = 1 - 0{,}35 = 0{,}65$

$p_3 = 0{,}15$ $\quad q_2 = 1 - p_3 = 1 - 0{,}15 = 0{,}85$

1) $P(A) = q_1 \cdot q_2 \cdot q_3 = 0{,}8 \cdot 0{,}65 \cdot 0{,}85 = 0{,}442$

2) $P(B) = 1 - P(A) = 1 - 0{,}442 = 0{,}562.$ ответ 0,442, 0,562

4.8. The first brigade has 6 tractors, and the second – 9. One tractor demands repair in each brigade. A tractor is chosen at random from each brigade. What is the probability that: a) both chosen tractors are serviceable; b) one of the chosen tractors demands repair (serviceable – исправный).

***The answer:* a) 20/27; b) 13/54.**

4.8. a) $P(A) = \left(\frac{n_1-1}{n_1}\right) \cdot \left(\frac{n_2-1}{n_2}\right) = \left(\frac{6-1}{6}\right) \cdot \left(\frac{9-1}{9}\right) = \frac{5}{6} \cdot \frac{8}{9} = \frac{20}{27}$

б) $P(B) = \left(\frac{5}{6} \cdot \frac{1}{9}\right) + \left(\frac{1}{6} \cdot \frac{8}{9}\right) = \frac{5}{54} + \frac{8}{54} = \frac{13}{54}$ ответ $\frac{20}{27}$; $\frac{13}{54}$

Exercises for Homework 4

4.9. There are details in two boxes: in the first – 10 (3 of them are standard), in the second – 15 (6 of them are standard). One takes out at random on one detail from each box. Find the probability that both details will be standard.

***The answer*: 0,12.**

4.9. $P(A) = \frac{3}{10} \cdot \frac{6}{15} = 0{,}12$

4.10. There are 3 television cameras in a TV studio. For each camera the probability that it is turned on at present, is equal to p = 0,6. Find the probability that at least one camera is turned on at present (the event A). ***The answer*: 0,936.**

4.10 $p = 0{,}6$ $\quad q_1 = q_2 = q_3$

$q = 1 - 0{,}6 = 0{,}4$

$P(A) = 1 - q_1 \cdot q_2 \cdot q_3 = 1 - 0{,}4 \cdot 0{,}4 \cdot 0{,}4 = 0{,}936$.

ответ: 0,936

4.11. What is the probability that at least one of a pair of dice lands on 6, given that the sum of the dice is 8? ***The answer*: 0,4.**

ответ: 0,93

4.11.

$E_8 = \{(6,2), (3,5), (4,4), (5,3), (2,6)\}$.

$B_8 = 5$.

$P\left(\frac{B_8}{E_8}\right) = \frac{2}{5} = 0{,}4$

4.12. 10 of 20 savings banks are located behind a city boundary. 5 savings banks are randomly selected for an inspection. What is the probability that among the selected banks appears inside the city:

a) 3 savings banks; b) at least one?

***The answer*: a) 0,348; b) 0,984.**

4.12.

a) $P(A) = \frac{n_A}{n} = \frac{C_{10}^3 \cdot C_{10}^2}{C_{20}^5} = \frac{120 \cdot 45}{15504} = 0{,}348$

$C_{10}^3 = \frac{10!}{3!(10-3)!} = \frac{8 \cdot 9 \cdot 10}{1 \cdot 2 \cdot 3} = \frac{720}{6} = 120$

$C_{10}^2 = \frac{10!}{2!\,8!} = \frac{10 \cdot 9}{2} = \frac{90}{2} = 45$

$C_{20}^5 = \frac{20!}{5!\,15!} = \frac{16 \cdot 17 \cdot 18 \cdot 19 \cdot 20}{120} = \frac{1860480}{120} = 15504.$

б) $P = 1 - \frac{C_{10}^5}{C_{20}^5} = \frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6}{20 \cdot 19 \cdot 18 \cdot 17 \cdot 16} \approx 0{,}984$

ответ: 0,348; 0,984.

4.13. There are 16 details made by the factory № 1 and 4 details of the factory № 2 at a collector. Two details are randomly taken. Find the probability that at least one of them has been made by the factory № 1. ***The answer*: 92/95.**

4.13.

$P(A) = \frac{4}{20} \cdot \frac{3}{19} = \frac{3}{95}$

$P(A_1) = 1 - \frac{3}{95} = \frac{92}{95}.$

ответ: $\frac{92}{95}.$

4.14. Three buyers went in a shop. The probability that each buyer makes purchases is equal to 0,3. Find the probability that: a) two of them will make purchases; b) all three will make purchases;

c) only one of them will make purchases.

***The answer:* a) 0,189; b) 0,027; c) 0,441.**

4.14. each $= 0{,}3$.

a) $P(A) = 0{,}7 \cdot 0{,}3 \cdot 0{,}3 \cdot 3 = 0{,}189$

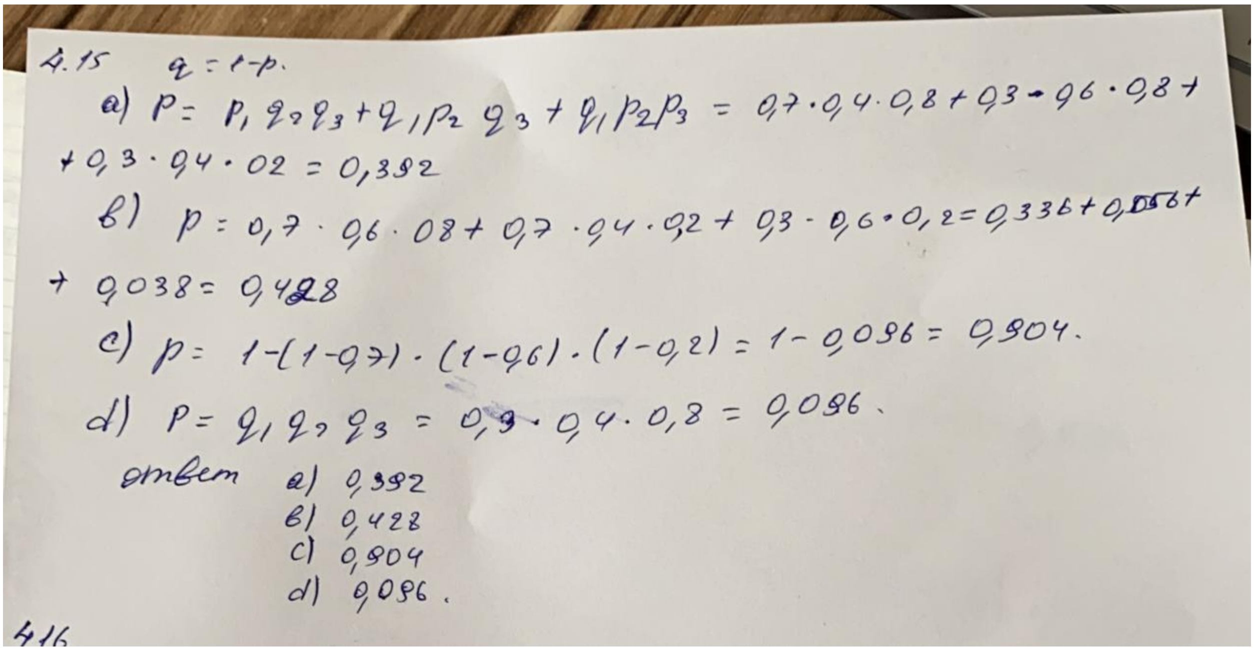
б) $P(B) = 0{,}3 \cdot 0{,}3 \cdot 0{,}3 = 0{,}027$

c) $P(C) = 0{,}3 \cdot 0{,}7 \cdot 0{,}7 \cdot 3 = 0{,}441$

ответ: a) 0,189; б) 0,027; c) 0,441

4.15. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,7; by the second – 0,6; and by the third – 0,2. What is the probability that the exam will be passed on "excellent" by: a) only one student; b) two students; c) at least one; d) neither of the students?

***The answer:* a) 0,392; b) 0,428; c) 0,904; d) 0,096.**


4.15 $q = 1-p$.

a) $P = p_1 q_2 q_3 + q_1 p_2 q_3 + q_1 p_2 p_3 = 0{,}7 \cdot 0{,}4 \cdot 0{,}8 + 0{,}3 \cdot 0{,}6 \cdot 0{,}8 + 0{,}3 \cdot 0{,}4 \cdot 0{,}2 = 0{,}392$

b) $p = 0{,}7 \cdot 0{,}6 \cdot 0{,}8 + 0{,}7 \cdot 0{,}4 \cdot 0{,}2 + 0{,}3 \cdot 0{,}6 \cdot 0{,}2 = 0{,}336 + 0{,}056 + 0{,}038 = 0{,}428$

c) $p = 1-(1-0{,}7) \cdot (1-0{,}6) \cdot (1-0{,}2) = 1 - 0{,}096 = 0{,}904$.

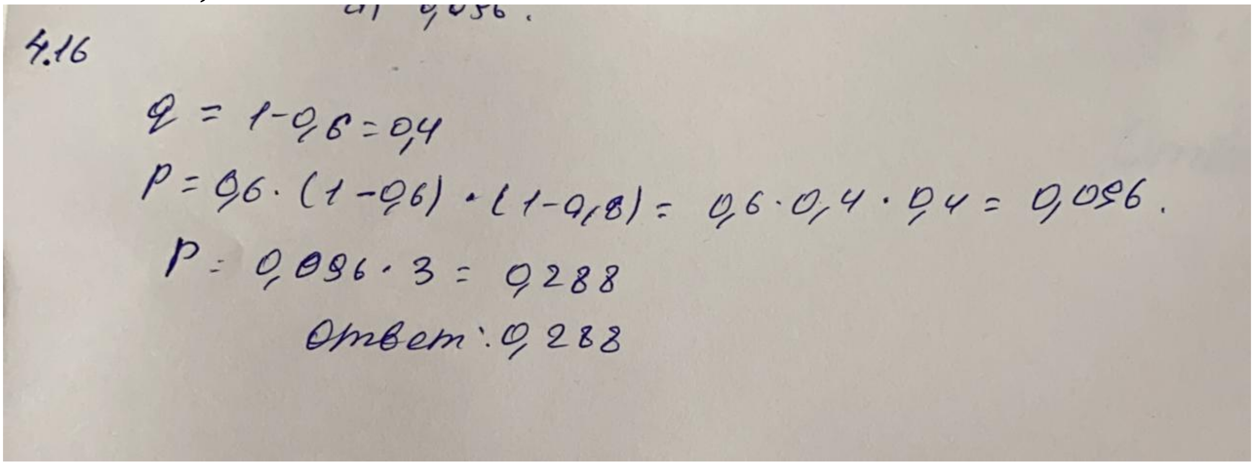
d) $P = q_1 q_2 q_3 = 0{,}3 \cdot 0{,}4 \cdot 0{,}8 = 0{,}096$.

ответ a) 0,392
b) 0,428
c) 0,904
d) 0,096.

4.16

4.16. Three shots are made in a target. The probability of hit at each shot is equal to 0,6. Find the probability that only one hit will be in result of these shots.

The answer: **0,288**


d) 0,096.

4.16

$q = 1-0{,}6 = 0{,}4$

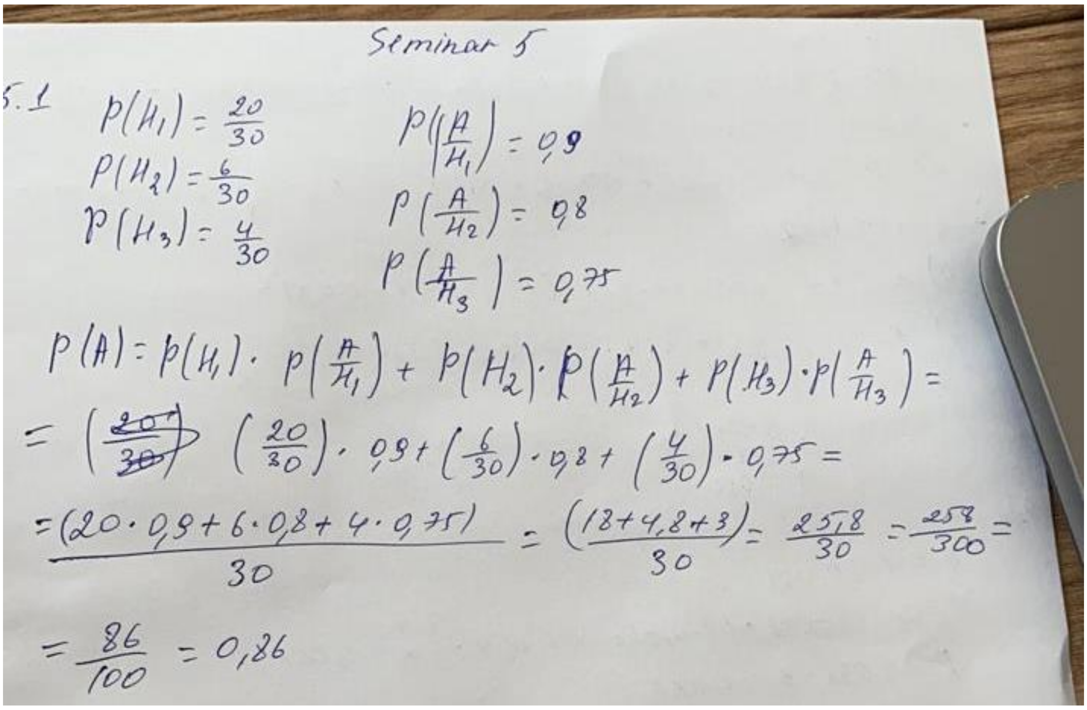
$P = 0{,}6 \cdot (1-0{,}6) \cdot (1-0{,}6) = 0{,}6 \cdot 0{,}4 \cdot 0{,}4 = 0{,}096$.

$P = 0{,}096 \cdot 3 = 0{,}288$

Ответ: 0,288

Exercises for Seminar 5

5.1. There are 20 skiers, 6 bicyclists and 4 runners in a group of sportsmen. The probability to execute the corresponding qualifying norm is: for a skier – 0,9, for a bicyclist – 0,8, and for a runner – 0,75. Find the probability that a randomly chosen sportsman will execute the norm.



Seminar 5

5.1 $P(H_1) = \frac{20}{30}$ $\quad P\left(\frac{A}{H_1}\right) = 0{,}9$

$P(H_2) = \frac{6}{30}$ $\quad P\left(\frac{A}{H_2}\right) = 0{,}8$

$P(H_3) = \frac{4}{30}$ $\quad P\left(\frac{A}{H_3}\right) = 0{,}75$

$$P(A) = P(H_1)\cdot P\left(\frac{A}{H_1}\right) + P(H_2)\cdot P\left(\frac{A}{H_2}\right) + P(H_3)\cdot P\left(\frac{A}{H_3}\right) =$$

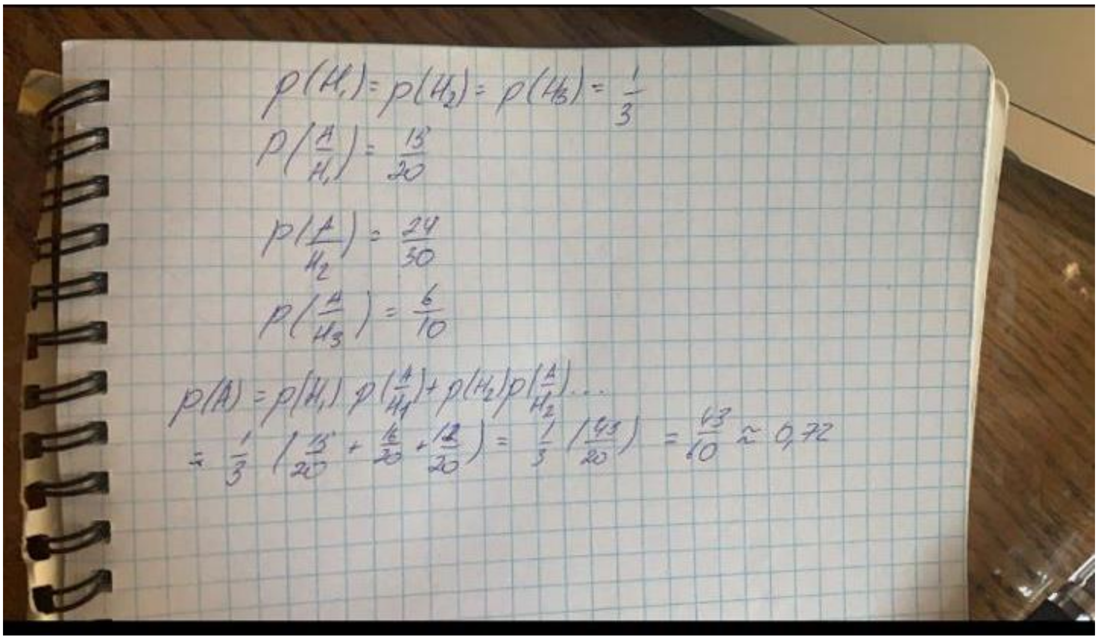
$$= \cancel{\left(\frac{20}{30}\right)} \left(\frac{20}{30}\right)\cdot 0{,}9 + \left(\frac{6}{30}\right)\cdot 0{,}8 + \left(\frac{4}{30}\right)\cdot 0{,}75 =$$

$$= \frac{(20\cdot 0{,}9 + 6\cdot 0{,}8 + 4\cdot 0{,}75)}{30} = \frac{(18+4{,}8+3)}{30} = \frac{25{,}8}{30} = \frac{258}{300} =$$

$$= \frac{86}{100} = 0{,}86$$

5.2. The first box contains 20 details and 15 of them are standard; the second – 30 details and 24 of them are standard; the third – 10 details and 6 of them are standard. Find the probability that a randomly extracted detail from a randomly taken box is standard.

The answer**: 43/60.**



$p(H_1) = p(H_2) = p(H_3) = \frac{1}{3}$

$P\left(\frac{A}{H_1}\right) = \frac{15}{20}$

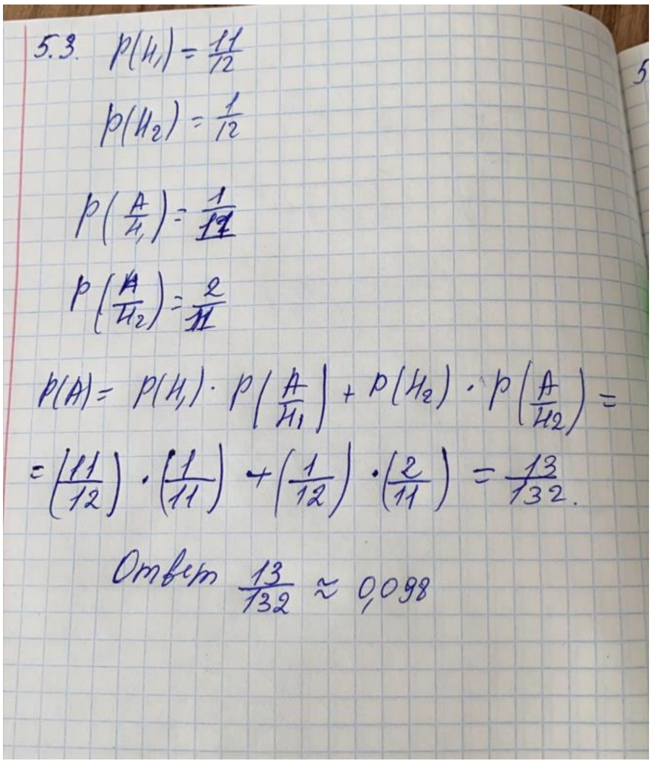
$P\left(\frac{A}{H_2}\right) = \frac{24}{30}$

$P\left(\frac{A}{H_3}\right) = \frac{6}{10}$

$$p(A) = p(H_1)\, p\left(\frac{A}{H_1}\right) + p(H_2)\, p\left(\frac{A}{H_2}\right) \ldots$$

$$= \frac{1}{3}\left(\frac{15}{20} + \frac{16}{20} + \frac{12}{20}\right) = \frac{1}{3}\left(\frac{43}{20}\right) = \frac{43}{60} \approx 0{,}72$$

5.3. There are radio lamps in two boxes. The first box contains 12 lamps, and 1 of them is non-standard; the second box contains 10 lamps, and 1 of them is non-standard. A lamp is randomly taken from the first box and placed in the second. Find the probability that a randomly extracted lamp from the second box will be non-standard.



5.3. $P(H_1)=\frac{11}{12}$

$P(H_2)=\frac{1}{12}$

$P\left(\frac{A}{H_1}\right)=\frac{1}{11}$

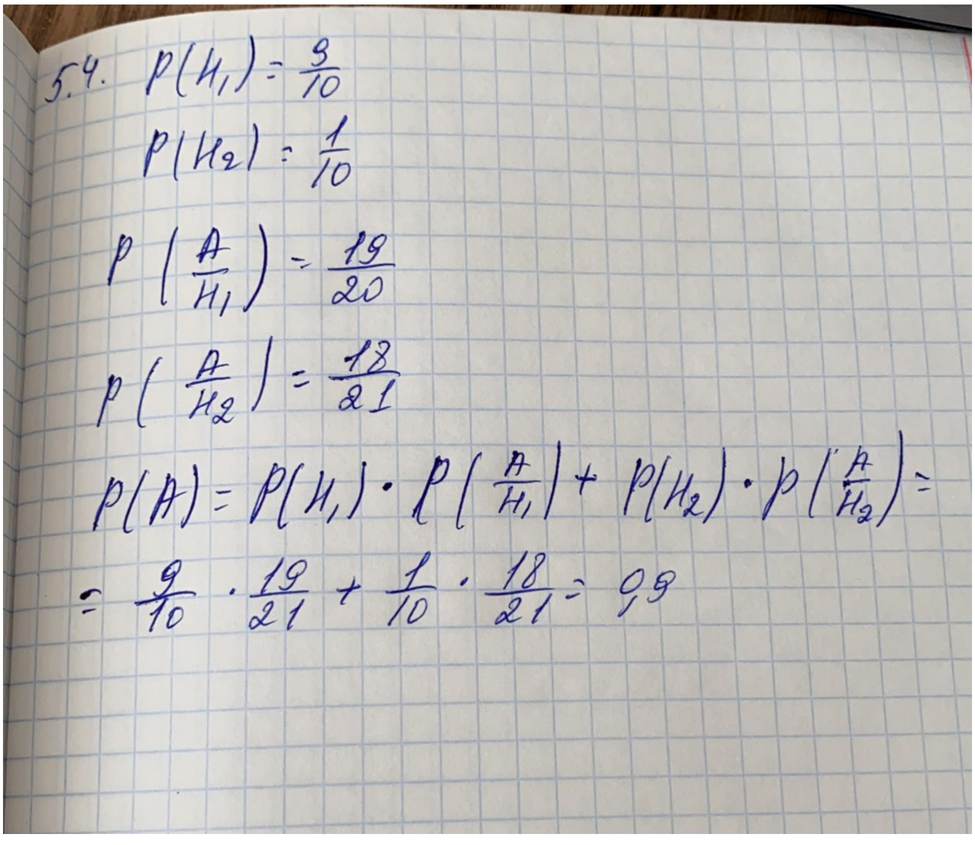
$P\left(\frac{A}{H_2}\right)=\frac{2}{11}$

$P(A)=P(H_1)\cdot P\left(\frac{A}{H_1}\right)+P(H_2)\cdot P\left(\frac{A}{H_2}\right)=$

$=\left(\frac{11}{12}\right)\cdot\left(\frac{1}{11}\right)+\left(\frac{1}{12}\right)\cdot\left(\frac{2}{11}\right)=\frac{13}{132}.$

Ответ $\frac{13}{132}\approx 0{,}098$

5.4. There are 20 radio lamps (including 18 standard ones) in the first box, and 10 radio lamps (including 9 standard ones) in the second box. A lamp has been taken randomly from the second box and placed to the first box. Find the probability that a lamp randomly extracted from the first box is standard.



5.4. $P(H_1)=\frac{9}{10}$

$P(H_2)=\frac{1}{10}$

$P\left(\frac{A}{H_1}\right)=\frac{19}{20}$

$P\left(\frac{A}{H_2}\right)=\frac{18}{21}$

$P(A)=P(H_1)\cdot P\left(\frac{A}{H_1}\right)+P(H_2)\cdot P\left(\frac{A}{H_2}\right)=$

$=\frac{9}{10}\cdot\frac{19}{21}+\frac{1}{10}\cdot\frac{18}{21}=0{,}9$

5.5. Urn A contains 2 white balls and 1 black ball, whereas urn B contains 1white ball and 5 black balls. A ball is drawn at random from urn A and placed in urn B. A ball is then drawn from urn B. It happens to be white. What is the probability that the ball transferred was white**?**

The answer: **0,8.**

if white ball $A \to B$ then $B\{2w; 5b\}$

$$P(B_1) = \frac{2}{7} \cdot \frac{2}{3} = \frac{4}{21} \cdot \text{(white ball)}$$

if black ball $A \to B$ then $B\{1w; 6b\}$

$$P(B_2) = \frac{1}{7} \cdot \frac{1}{3} = \frac{1}{21}.$$

$$P_A(B_1) = \frac{\frac{4}{21}}{\frac{4}{21} + \frac{1}{21}} = \frac{\frac{4}{21}}{\frac{5}{21}} = \frac{4}{5} = 0{,}8$$

$$\boxed{P_A B_1 = \frac{P(B_1) \cdot P_{B_1}(A)}{P(B_1) \cdot P_{B_1}(A) + P(B_2) \cdot P_{B_2}(A)}}$$

5.6. Suppose that two factories supply light bulbs to the market. Factory *X*'s bulbs work for over 5000 hours in 99% of cases, whereas factory *Y*'s bulbs work for over 5000 hours in 95% of cases. It is known that factory *X* supplies 60% of the total bulbs available and Y supplies 40% of the total bulbs available. What is the chance that a purchased bulb will work for longer than 5000 hours?

$P(X) = 0{,}6.$ $\quad P(Y) = 0{,}4$

$P(H_x) = 0{,}99$ $\quad P(H_y) = 0{,}95$

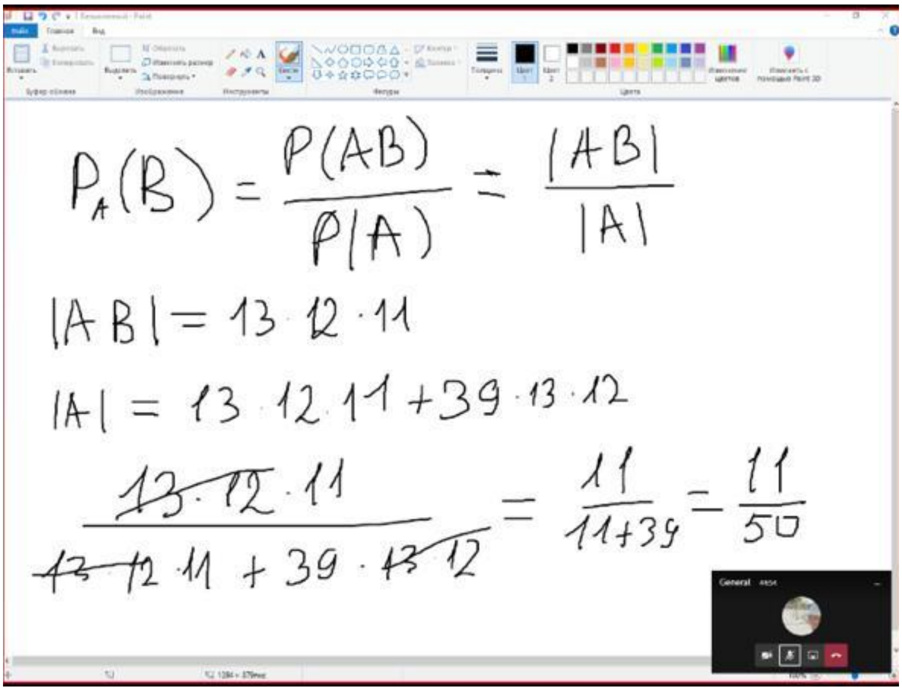
Law of Total Probability:

$$P(H) = P(H_x) \cdot P(X) + P(H_y) \cdot P(Y) =$$

$$0{,}99 \cdot 0{,}6 + 0{,}95 \cdot 0{,}4 = 0{,}594 + 0{,}38 = 0{,}974.$$

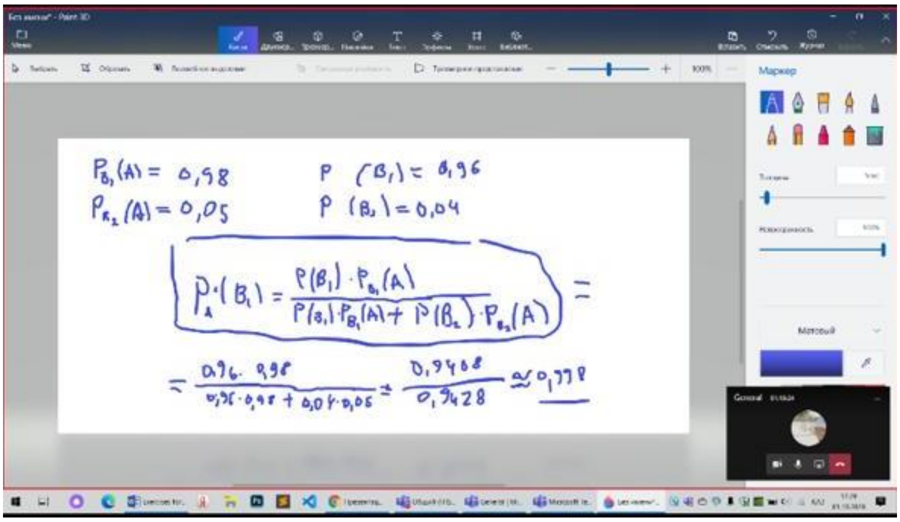
5.7. Three cards are randomly selected without replacement from an ordinary deck of 52 playing cards. Compute the conditional probability that the first card selected is a spade, given that the second and third cards are spades.

***The answer*: 0,22.**



5.8. The probability for products of a certain factory to satisfy the standard is equal to 0,96. A simplified system of checking on standardness gives positive result with the probability 0,98 for products satisfying the standard, and with the probability 0,05 – for products non-satisfying the standard. A randomly taken product has been recognized as standard at checking. Find the probability that it really satisfies the standard.

***The answer*: 0,998.**



Exercises for Homework 5

5.9. A collector has received 3 boxes of details made by the factory № 1, and 2 boxes of details made by the factory № 2. The probability that a detail of the factory № 1 is standard is equal to 0,8, and the factory № 2 – 0,9. The collector has randomly extracted a detail from a randomly taken box. Find the probability that a standard detail has been extracted (a collector – сборщик).

***The answer*: 0,84.**

Seminar 5

5.9

$3+2=5$ - all

$p(H_1)=\frac{3}{5}$

$p(H_2)=\frac{2}{5}$

$p\left(\frac{A}{H_1}\right)=0{,}8$

$p\left(\frac{A}{H_2}\right)=0{,}9$

$$P(A)=P(H_1)\cdot P\left(\frac{A}{H_1}\right)+P(H_2)\cdot P\left(\frac{A}{H_2}\right)=$$

$$=\frac{3}{5}\cdot 0{,}8+\frac{2}{5}\cdot 0{,}9=\frac{(3\cdot 0{,}8+2\cdot 0{,}9)}{5}=$$

$$=\frac{4{,}2}{5}=\frac{84}{100}=0{,}84.$$

Ответ 0,84

5.10. There are 4 kinescopes in a television studio. The probabilities that the kinescope will sustain the warranty period of service are equal to 0,8; 0,85; 0,9; 0,95 respectively. Find the probability that a randomly taken kinescope will sustain the warranty period of service (to sustain – выдержать).

***The answer*: 0,875.**

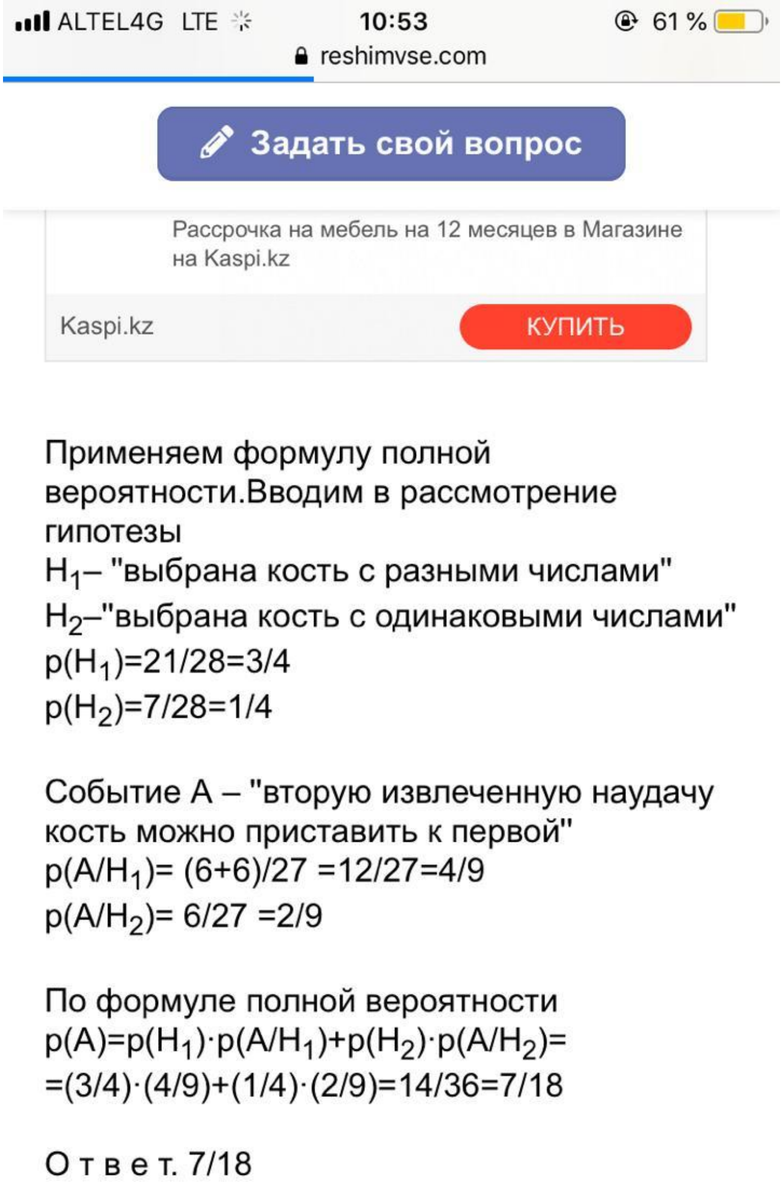
Применяем формулу полной вероятности.
Вводим в рассмотрение гипотезы
H_I–"выбран i–тый кинескоп", i=1,2,3,4
$p(H_1)=p(H_2)=p_{H_3}=p_{H_4}=1/4$

A–"кинескоп выдержит гарантийный срок службы"
По условию
$p(A/H_1)=0,8$
$p(A/H_2)=0,85$
$p(A/H_3)=0,9$
$p(A/H_4)=0,95$

По формуле полной вероятности
$p(A)=p(H_1)\cdot p(A/H_1)+p(H_2)\cdot p(A/H_2)+$
$+p(H_3)\cdot p(A/H_3)+p(H_4)\cdot p(A/H_4)=$
$=(1/4)\cdot 0,8+(1/4)\cdot 0,85+(1/4)\cdot 0,9+(1/4)\cdot 0,95=$
$=(1/4)\cdot(0,8+0,85+0,9+0,95)=$
$=3,5/4=0,875$
О т в е т. 0,875

5.11. A die has been randomly extracted from the full set of 28 dice of domino. Find the probability that the second randomly extracted die can be put to the first.

***The answer*: 7/18.**



Применяем формулу полной вероятности.Вводим в рассмотрение гипотезы

H_1– "выбрана кость с разными числами"

H_2–"выбрана кость с одинаковыми числами"

$p(H_1)=21/28=3/4$

$p(H_2)=7/28=1/4$

Событие А – "вторую извлеченную наудачу кость можно приставить к первой"

$p(A/H_1)= (6+6)/27 =12/27=4/9$

$p(A/H_2)= 6/27 =2/9$

По формуле полной вероятности

$p(A)=p(H_1)\cdot p(A/H_1)+p(H_2)\cdot p(A/H_2)=$

$=(3/4)\cdot(4/9)+(1/4)\cdot(2/9)=14/36=7/18$

О т в е т. 7/18

5.12. For participation in student selective sport competitions 4 students has been directed from the first group, 6 – from the second, 5 – from the third group. The probabilities that a student of the first, second and third group gets in the combined team of institute, are equal to 0,9; 0,7 and 0,8 respectively. A randomly chosen student as a result of competition has got in the combined team. Which of groups is this student most likely belonged to (a combined team – сборная)?

The answer**: The probabilities that the student has been chosen from the first, second and third group are equal to 18/59, 21/59, 20/59 respectively.**

Введем в рассмотрение

событие A – 'студент в итоге соревнования попал в сборную."

гипотезу H_1 – "студент из первой группы"
гипотезу H_2 – "студент из второй группы"
гипотезу H_3 – "студент из третьей группы"

Всего студентов 4+6+5=15
По условию
$p(H_1)=4/15$
$p(H_2)=6/15$
$p(H_3)=5/15$

$p(A/H_1)=0,9$
$p(A/H_2)=0,7$
$p(A/H_3)=0,8$
По формуле полной вероятности
$p(A)=p(H_1)\cdot p(A/H_1) + p(H_2)\cdot p(A/H_2) +$
$+p(H_3)\cdot p(A/H_3)=$
$=(4/15)\cdot 0,9+(6/15)\cdot 0,7+(5/15)\cdot 0,8=$
$=(3,6+4,2+4)/15=11,8/15=118/150$

По формуле Байеса
$p(H_1/A)=p(H_1)\cdot p(A/H_1)\ /p(A)=$
$=36/118$

$p(A/H_1)=0,9$
$p(A/H_2)=0,7$
$p(A/H_3)=0,8$
По формуле полной вероятности
$p(A)=p(H_1)\cdot p(A/H_1) + p(H_2)\cdot p(A/H_2) +$
$+p(H_3)\cdot p(A/H_3)=$
$=(4/15)\cdot 0,9+(6/15)\cdot 0,7+(5/15)\cdot 0,8=$
$=(3,6+4,2+4)/15=11,8/15=118/150$

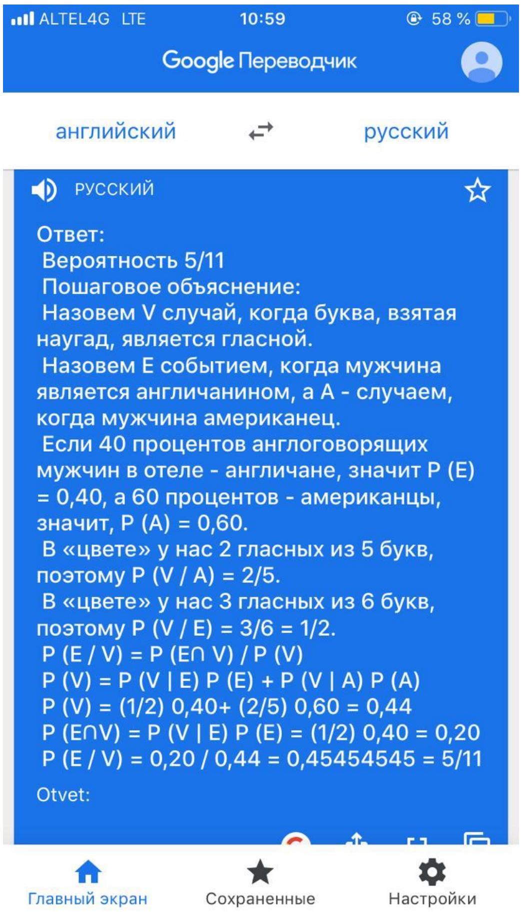
По формуле Байеса
$p(H_1/A)=p(H_1)\cdot p(A/H_1)\ /p(A)=$
$=36/118$
$p(H_2/A)=p(H_2)\cdot p(A/H_2)\ /p(A)=$
$=42/118$
$p(H_3/A)=p(H_3)\cdot p(A/H_3)\ /p(A)=$
$=40/118$

$42/118 > 36/118$
и
$42/118 > 40/118$

О т в е т. Вероятнее всего студент принадлежал ко второй группе.

5.13. English and American spellings are *rigour* and *rigor*, respectively. A man staying at a Parisian hotel writes this word, and a letter taken at random from his spelling is found to be a vowel. If 40 percent of the English-speaking men at the hotel are English and 60 percent are Americans, what is the probability that the writer is an Englishman (rigour (rigor) – суровость; a vowel – гласная)?

The answer: **5/11.**



5.14. Urn A has 5 white and 7 black balls. Urn B has 3 white and 12 black balls. We flip a coin. If the outcome is heads, then a ball from urn A is selected, whereas if the outcome is tails, then a ball from urn B is selected. Suppose that a white ball is selected. What is the probability that the coin landed on tails (to flip – подбросить)?

The answer: **12/37.**

Events:

$$A \text{ - the ball is taken from urn A (5 white, 7 black balls)}$$
$$B = A^c \text{ - the ball is taken from urn B (3 white, 12 black balls)}$$
$$W \text{ - a white ball is chosen}$$

Probabilities:
An urn is chosen based on a toss of a fair coin:

$$P(A) = \textit{ probability that the coin landed on heads } = \frac{1}{2}$$
$$P(B) = \textit{ probability that the coin landed on tails } = P(A^c) = \frac{1}{2}$$

Since the boxes' contents are known:

$$P(W|A) = \frac{5}{12} P(W|B) = \frac{3}{15} = \frac{1}{5}$$

Calculate: $P(B|W)$

With A and B being mutually exclusive events, whose union is the whole sample space, **the Bayes formula** in this instance is

$$P(B|W) = \frac{P(W|B)P(B)}{P(W|B)P(B) + P(W|A)P(A)}$$

By substituting before stated probabilities the result is:

$$\boxed{P(B) = \frac{12}{37} \approx 32.43\%}$$

RESULT

Bayes formula
$$P(B) = \frac{12}{37}$$

Enter your comment here x^2 SUBMIT

5.15. There are four urns. The first urn contains 1 white and 1 black ball, the second – 2 white and 3 black balls, the third – 3 white and 5 black balls, and the fourth – 4 white and 7 black balls. The event H_i is the choosing the i-th urn (i = 1, 2, 3, 4). It is known that the probability of choosing the i-th urn is equal to i/10. A ball is randomly extracted from a randomly chosen urn. Find the probability that a randomly extracted ball is white.

The answer: **0,388.**

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Total P(white ball)

$$P(W) = P(U_1) \times P\left(\frac{W}{U_1}\right) + P(U_2) \times P\left(\frac{W}{U_2}\right) + P(U_3) \times P\left(\frac{W}{U_3}\right) + P(U_4) \times P\left(\frac{W}{U_4}\right)$$

$$P(W) = \frac{2}{34} \times \frac{1}{2} + \frac{5}{34} \times \frac{2}{5} + \frac{10}{34} \times \frac{3}{8} + \frac{17}{34} \times \frac{4}{11}$$

$$\Longrightarrow P(W) = \frac{1}{34} + \frac{2}{34} + \frac{15}{4 \times 34} + \frac{68}{11 \times 34}$$

$$\Longrightarrow P(W) = \frac{44 + 88 + 165 + 272}{4 \times 11 \times 34} = \frac{569}{1496}$$

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Prev Question Next Question

Exercises for Seminar 6

6.1. There are 6 motors in a shop. For each motor the probability that it is turned (switched) on at present time is equal to 0,8. Find the probability that at present: a) 4 motors are turned on; b) all motors are turned on; c) all motors are turned off (a shop – цех).

***The answer*: a) 0,246; b) 0,26; c) 0,000064.**

6.1 We have 6 motors with the probability 0,8 that is turned on

Find prob a) 4 motors are turned on.

b) all motors are t.o

c) all m are t. off

P(4): $p=0{,}8$ $q=1-p=0{,}2$

a) $P_6(4) = C_6^4 \cdot p^4 \cdot q^2 = 15 \cdot 0{,}8^4 \cdot 0{,}2^2 = 15 \cdot 0{,}4096 \cdot 0{,}04$

$= 0{,}246$

b) $P_6(6) = 0{,}8^6 = 0{,}262$

c) $P_6(0) = \cancel{\frac{6}{720}} \cdot q^6 = \cancel{\frac{6}{729}} \cdot \frac{1}{15625} = 0{,}000064$

$C_6^6 = \frac{6!}{6!} = 1$

Bernaulli formula

6.2. Find the probability that an event *A* will appear in five independent trials no less than two times if the probability of occurrence of the event *A* for each trial is equal to 0,3.

***The answer*: 0,472.**

6.2 Событие B случится если событие A появится не менее 4-х раз. Найдите вероятност появления события B, если будет 5 независимых испытаний где вероятность соб. A равна 0,8. Ответ 0,737

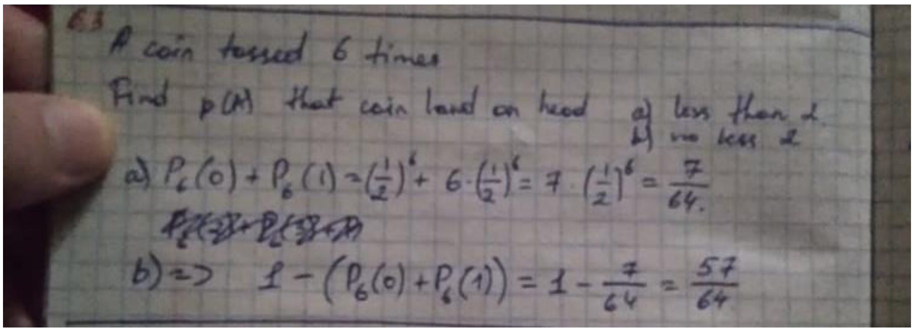
$n=5$ $p=0{,}8$ $q=0{,}2$

$P_5(4) + P_5(5) = 5 \cdot 0{,}8^4 \cdot 0{,}2 + 0{,}8^5 = 0{,}73728$

6.3. A coin is tossed 6 times. Find the probability that the coin lands on heads: a) less than two times;

b) no less than two times.

***The answer*: a) 7/64; b) 57/64.**


6.3 A coin tossed 6 times

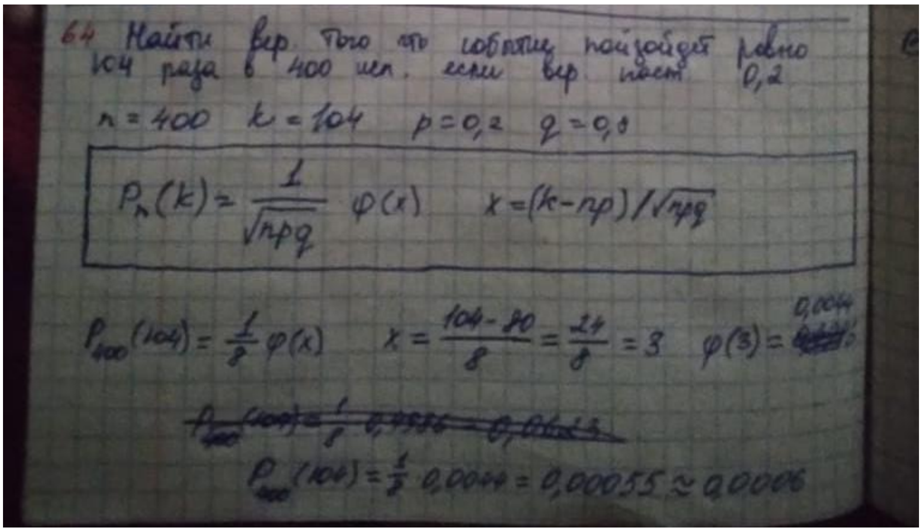
Find p(A) that coin land on head a) less than 2 b) no less 2

a) $P_6(0)+P_6(1)=(\frac{1}{2})^6+6\cdot(\frac{1}{2})^6=7\cdot(\frac{1}{2})^6=\frac{7}{64}.$

b) => $1-(P_6(0)+P_6(1))=1-\frac{7}{64}=\frac{57}{64}$

6.4. Find approximately the probability that an event will happen exactly 104 times at 400 trials if in each trial the probability of its occurrence is equal to 0,2.

***The answer*: 0,0006.**


6.4 Найти вер. того что событие произойдет ровно 104 раза в 400 исп. если вер. посет. 0,2

$n=400$ $k=104$ $p=0{,}2$ $q=0{,}8$

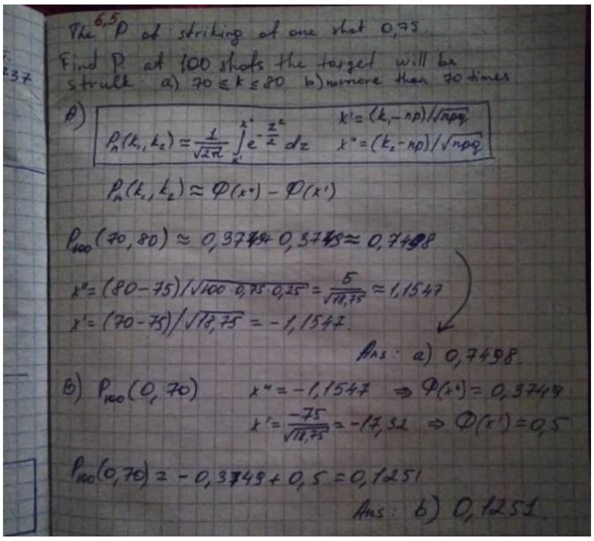
$$\boxed{P_n(k)=\frac{1}{\sqrt{npq}}\varphi(x) \qquad x=(k-np)/\sqrt{npq}}$$

$P_{400}(104)=\frac{1}{8}\varphi(x)$ $x=\frac{104-80}{8}=\frac{24}{8}=3$ $\varphi(3)=0{,}0044$

$P_{400}(104)=\frac{1}{8}\,0{,}0044=0{,}00055\approx 0{,}0006$

6.5. The probability of striking a target by a shooter at one shot is equal to 0,75. Find the probability that at 100 shots the target will be struck: a) no less than 70 and no more 80 times; b) no more than 70 times.

***The answer*: a) 0,7498; b) 0,1251.**


6.5 The P of striking at one shot 0,75

Find P at 100 shots the target will be struck a) $70\le k\le 80$ b) no more than 70 times

a) $$\boxed{P_n(k_1,k_2)=\frac{1}{\sqrt{2\pi}}\int_{x'}^{x''}e^{-\frac{z^2}{2}}dz \qquad x'=(k_1-np)/\sqrt{npq} \quad x''=(k_2-np)/\sqrt{npq}}$$

$P_n(k_1,k_2)\approx\Phi(x'')-\Phi(x')$

$P_{100}(70,80)\approx 0{,}3749+0{,}3749\approx 0{,}7498$

$x''=(80-75)/\sqrt{100\cdot 0{,}75\cdot 0{,}25}=\frac{5}{\sqrt{18{,}75}}\approx 1{,}1547$

$x'=(70-75)/\sqrt{18{,}75}=-1{,}1547$

Ans: a) 0,7498

b) $P_{100}(0,70)$ $x''=-1{,}1547 \Rightarrow \Phi(x'')=0{,}3749$

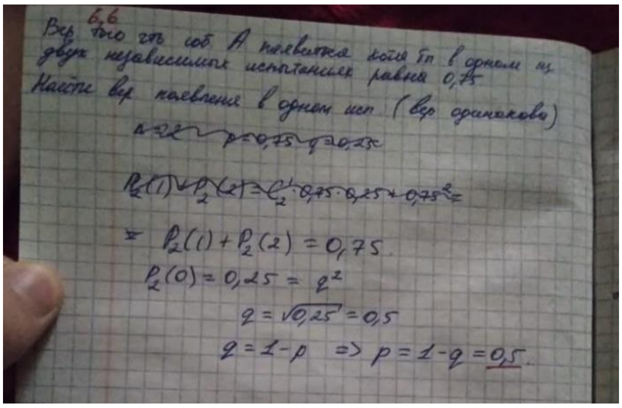
$x'=\frac{-75}{\sqrt{18{,}75}}=-17{,}32 \Rightarrow \Phi(x')=0{,}5$

$P_{100}(0,70)=-0{,}3749+0{,}5=0{,}1251$

Ans: b) 0,1251

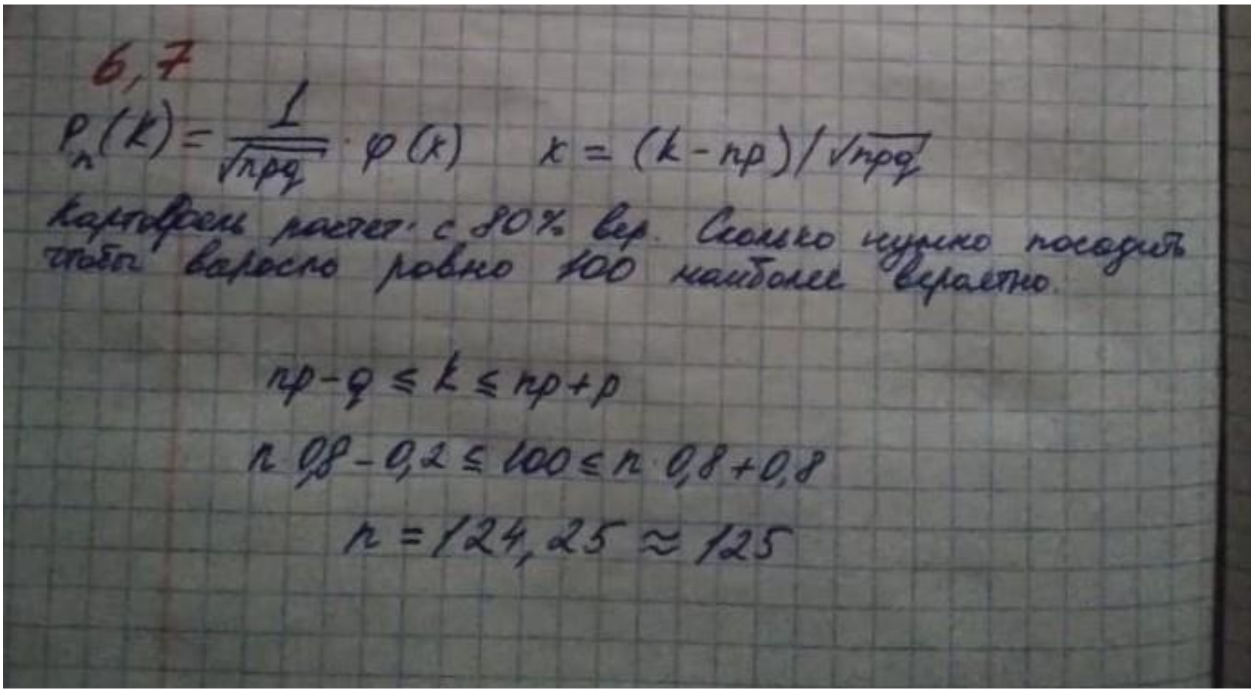
6.6. The probability that an event *A* will appear at least once at two independent trials is equal to 0,75. Find the probability of appearance of the event in one trial (it is supposed that the probability of appearance of the event in both trials is the same).

***The answer*: 0,5.**



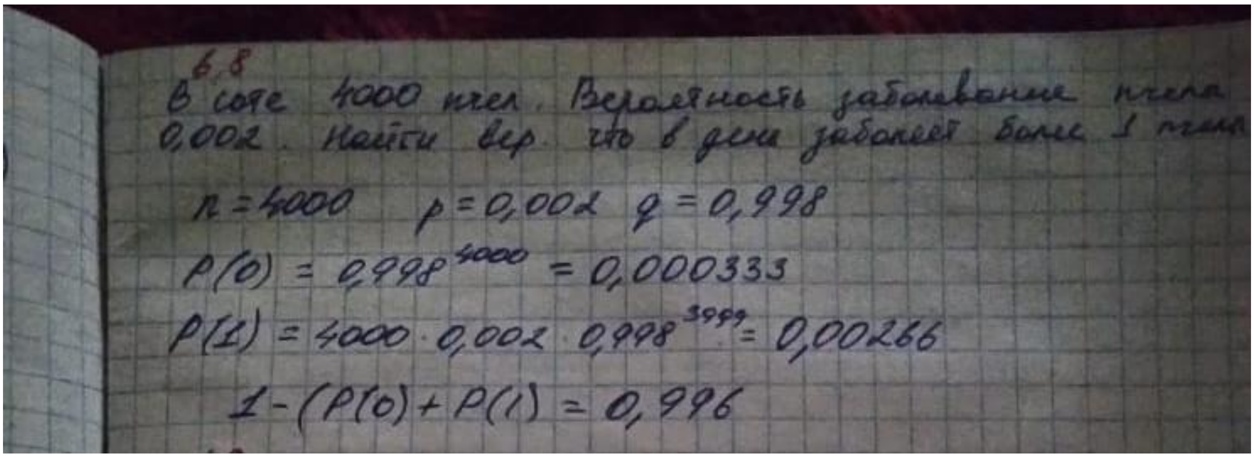
6.7. A coming up a potato is equal to 80 %. How many is it necessary to plant potatoes that the most probable number of came up potatoes of them was equal 100 (to come up – всходить (*о растении*))?

The answer: **124 or 125.**



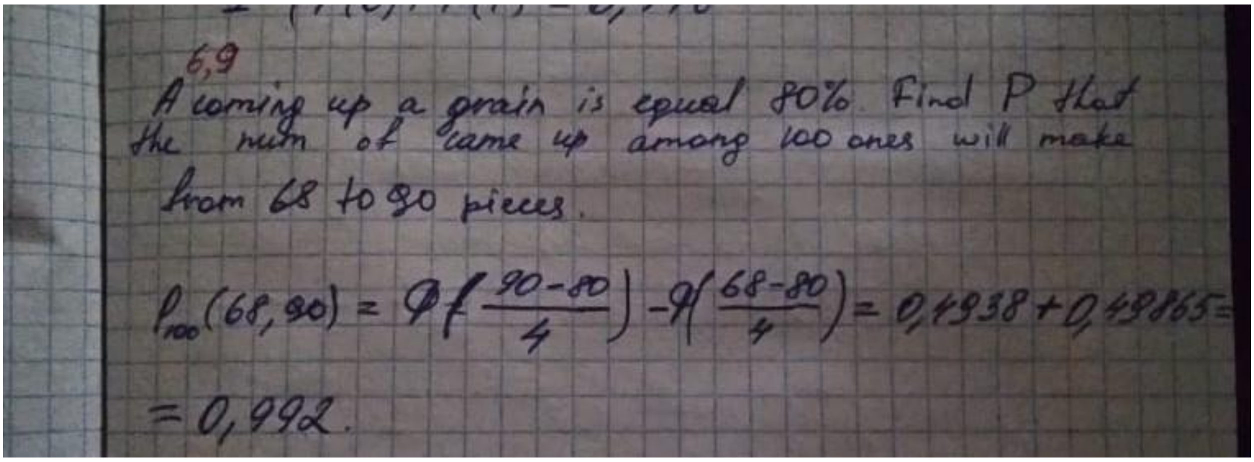
6.8. There are 4000 bees in a bee family. The probability of illness within a day is equal to 0,002 for each bee. Find the probability that more than one bee will be ill within a day (a bee – пчела).

The answer: **0,99.**



6.9. A coming up a grain stored in a warehouse is equal to 80%. What is the probability that the number of came up grains among 100 ones will make from 68 up to 90 pieces (a grain – зерно)?

The answer: **0,992.**


6,9

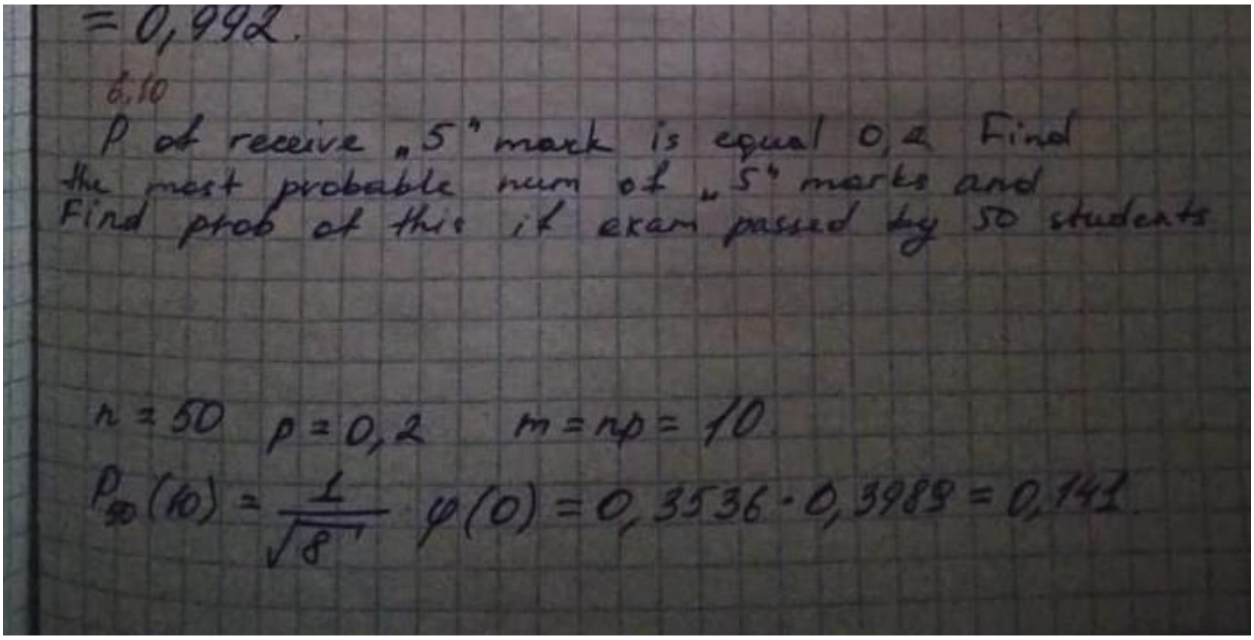
A coming up a grain is equal 80% Find P that the num of came up among 100 ones will make from 68 to 90 pieces.

$$P_{100}(68,90) = \Phi\left(\frac{90-80}{4}\right) - \Phi\left(\frac{68-80}{4}\right) = 0,4938 + 0,49865 =$$

$$= 0,992.$$

6.10. The probability of receiving an excellent mark at an exam is equal to 0,2. Find the most probable number of excellent marks and the probability of this number if 50 students pass the exam.

***The answer:* k_0 = 10 and $P_n(k_0)$ = 0,141.**


$= 0,992.$

6.10

P of receive „5" mark is equal 0,2 Find the most probable num of „5" marks and Find prob of this if exam passed by 50 students

$n = 50 \quad p = 0,2 \quad m = np = 10$

$$P_{50}(10) = \frac{1}{\sqrt{8}}\varphi(0) = 0,3536 \cdot 0,3989 = 0,141$$

Exercises for Homework 6

6.11. An event B will appear in case when an event A will appear no less than two times. Find the probability that the event B will happen if 6 independent trials will be made in each of which the probability of occurrence of the event A is equal to 0,4.

***The answer*: 0,767.**

6.11

$p = 0,4$

$P(A) = P_6(0) = q^6 = 0,6^6 = 0,047$

$P(A) = P_6(1) = 6 \cdot p \cdot q^5 = 0,186$

$P(B) = 1 - P_6(0) P_6(1) = 1 - 0,233 = 0,767.$

6.12. 8 independent trials have been made in each of which the probability of occurrence of an event A is equal to 0,1. Find the probability that the event A will appear at least 2 times.

***The answer*: 0,19.**

6.12

$n = 8$ in each the prob of $A \Rightarrow p = 0,1$

Find the event A will happen 2 times at least

$P(F) = 1 - P_8(0) - P_8(1)$

Here, $P(A) = P_n(k) = C_n^k p^k q^{n-k}$ (Bernoulli theorem)

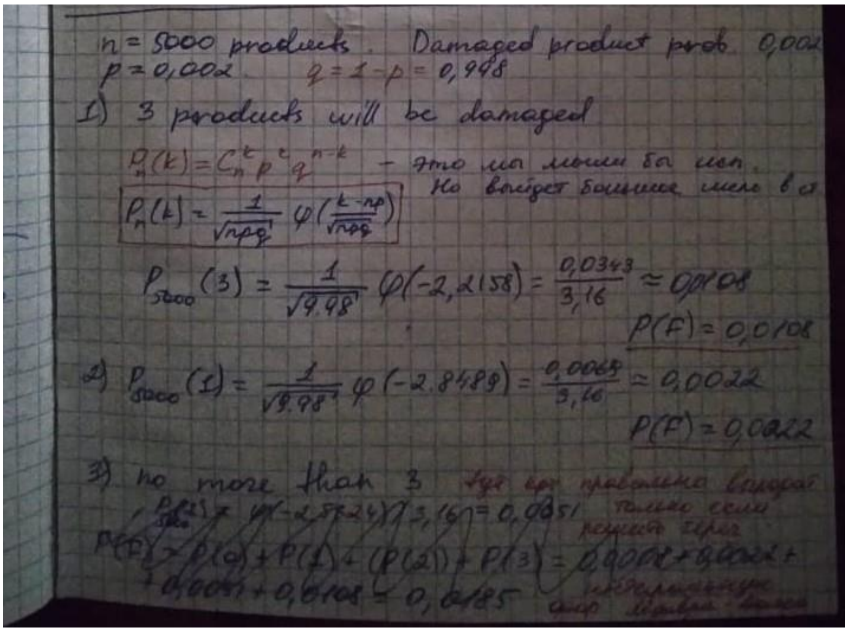
$P_8(0) = q^8 = 0,9^8 = 0,4305$

$P_8(1) = 8 \cdot 0,1 \cdot 0,9^7 = 0,3826$

$P(F) = 1 - 0,8131 = 0,1869 \approx \underline{0,19}$

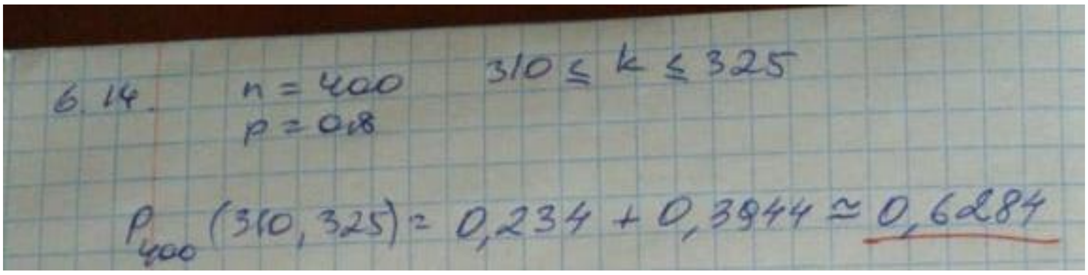
6.13. A factory has sent 5000 good-quality products. The probability that one product has been damaged at a transportation is 0,002. Find the probability that at the transportation it will be damaged: a) 3 products; b) 1 product; c) no more than 3 products.

***The answer*: a) 0,0107; b) 0,00218; c) 0,0124.**



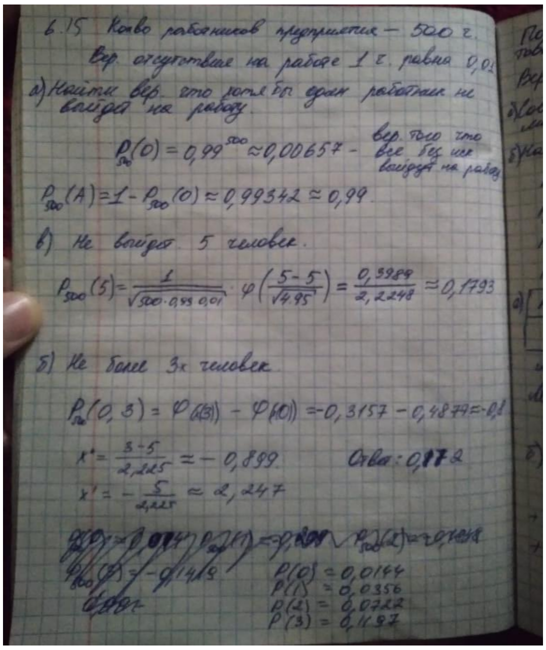
6.14. A shooter has made 400 shots, and the probability of hit in a target is 0,8. Find the probability that he hits from 310 up to 325 times.

***The answer*: 0,6284.**



6.15. The number of workers of an enterprise is 500 persons. The probability of absence on the work because of illness is equal to 0,01 for each worker of the enterprise. Determine the probability that at least one of workers will not come to work at the nearest day.

***The answer*: 0,985.**



6.15 Кол-во работников предприятия — 500 ч.
Вер. отсутствия на работе 1 ч. равна 0,01
а) Найти вер. что хотя бы один работник не выйдет на работу.

$P_{500}(0) = 0{,}99^{500} \approx 0{,}00657$ - вер. того что все без иск. выйдут на работу

$P_{500}(A) = 1 - P_{500}(0) \approx 0{,}99342 \approx 0{,}99$

б) Не выйдет 5 человек.

$P_{500}(5) = \frac{1}{\sqrt{500 \cdot 0{,}99 \cdot 0{,}01}} \cdot \varphi\left(\frac{5-5}{\sqrt{4{,}95}}\right) = \frac{0{,}3989}{2{,}2248} \approx 0{,}1793$

б) Не более 3х человек.

$P_{500}(0, 3) = \Phi(x'') - \Phi(x') = -0{,}3157 - 0{,}4879 = -0{,}8$

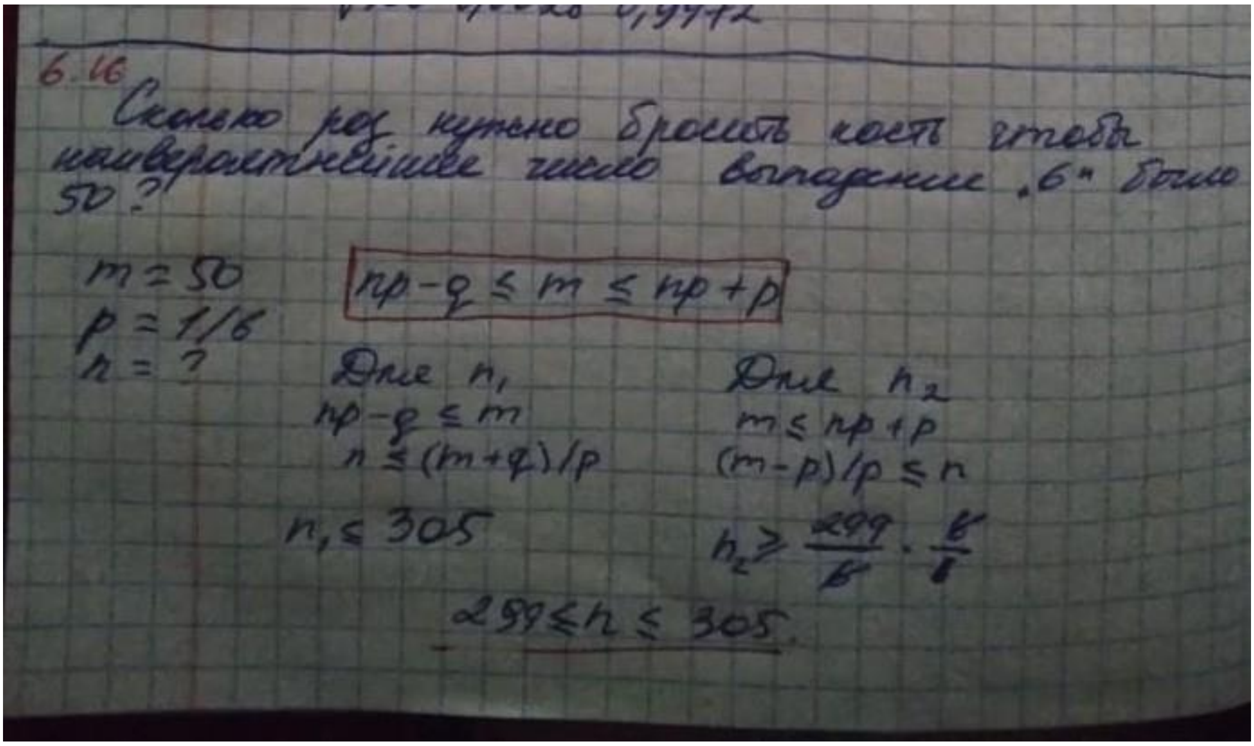
$x'' = \frac{3-5}{2{,}225} = -0{,}899$ Ответ: 0,172

$x' = -\frac{5}{2{,}225} \approx 2{,}247$

$P(0) = 0{,}0144$
$P(1) = 0{,}0356$
$P(2) = 0{,}0722$
$P(3) = 0{,}1197$

6.16. How many times is it necessary to toss a die in order that the most probable number of landing 6 aces was equal to 50?

***The answer:* 299 ≤ *n* ≤ 305.**



6.16 Сколько раз нужно бросить кость чтобы наивероятнейшее число выпадений „6" было 50?

$m = 50$
$p = 1/6$
$n = ?$

$\boxed{np - q \le m \le np + p}$

Для n_1
$np - q \le m$
$n \le (m+q)/p$
$n_1 \le 305$

Для n_2
$m \le np + p$
$(m-p)/p \le n$
$n_2 \ge \frac{299}{6} \cdot \frac{6}{1}$

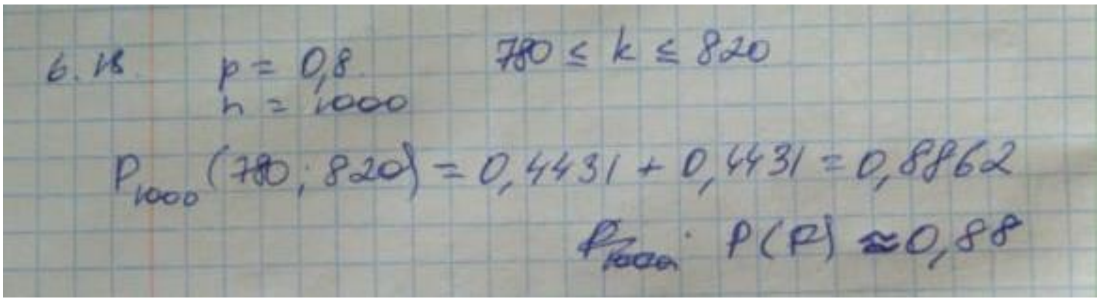
$299 \le n \le 305$

6.17. A shooter hits in a target with the probability 0,6. He is going to make 10 shots. Find the probability that he hits in the target: a) three times; b) at least once.

***The answer:* a) 0,0425; b) 0,9999.**

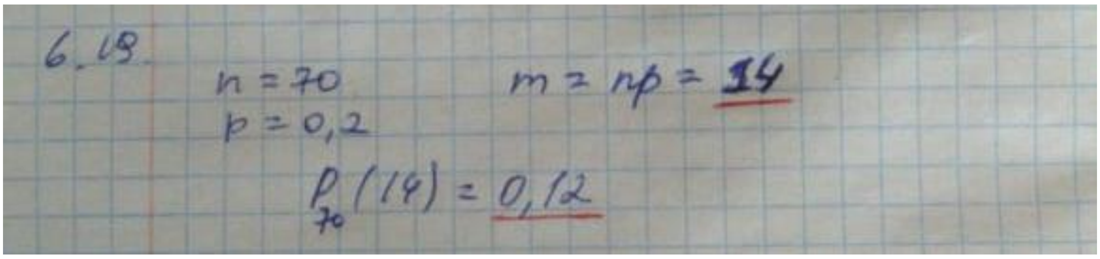
6.18. A coming up seeds makes 80%. What is the probability that from 780 up to 820 seeds will come up of 1000 sown seeds?

The answer: **0,8858.**



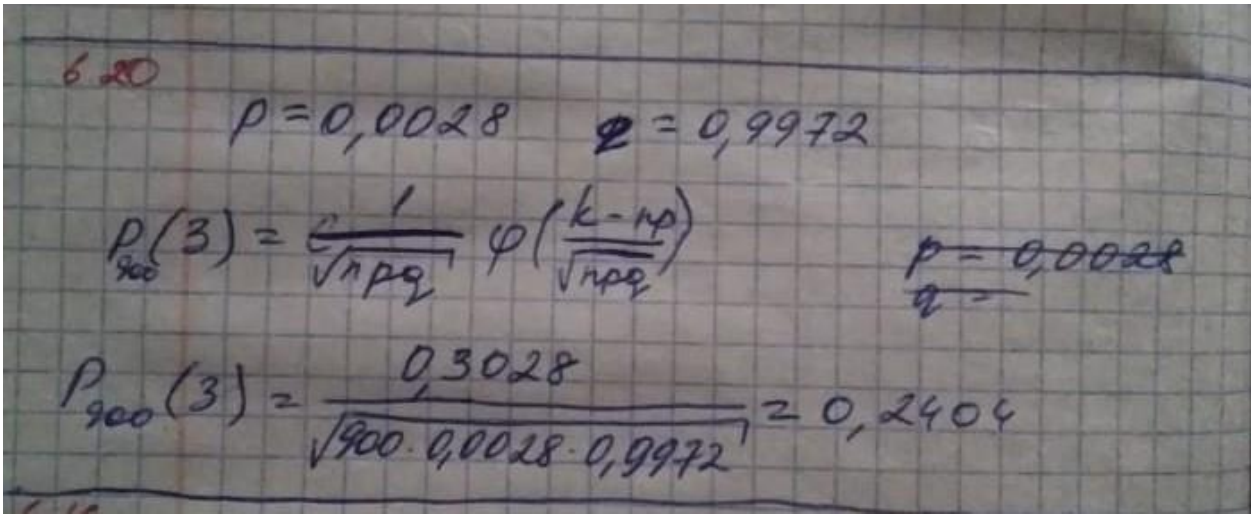
6.19. There are 70 automobiles in a park. The probability of breakage of an automobile is equal to 0,2. Find the most probable number of serviceable automobiles and the probability of this number.

The answer: ***k_0*** **= 14 and** ***$P_n(k_0)$*** **= 0,119.**



6.20. 900 students are studying at a faculty. The probability of birthday in a given day is equal to 1/365 for each student. Find the probability that there will be three students with the same birthday.

The answer: **0,24.**



Exercises for Seminar 7

7.1. Two balls are chosen randomly from an urn containing 8 white, 4 black and 2 orange balls. Suppose that we win \$2 for each black ball selected and we lose \$1 for each white ball selected. Let *X* denote our winnings. What are the possible values of *X*, and what are the probabilities associated with each value?

X	-2	-1	0	1	2	4
p	$\frac{4}{13}$	$\frac{16}{91}$	$\frac{1}{91}$	$\frac{32}{91}$	$\frac{8}{91}$	$\frac{6}{91}$

$p(X=-2) = \frac{8}{14}\cdot\frac{7}{13} = \frac{4}{13}$

$p(X=-1) = \frac{2}{14}\cdot\frac{8}{13} + \frac{8}{14}\cdot\frac{2}{13} = \frac{16}{91}$

$p(X=0) = \frac{2}{14}\cdot\frac{1}{13} = \frac{1}{91}$ | $p(X=1) = \frac{8}{14}\cdot\frac{4}{13} + \frac{4}{14}\cdot\frac{8}{13} = \frac{32}{91}$

$p(X=2) = \frac{4}{14}\cdot\frac{2}{13} + \frac{2}{14}\cdot\frac{4}{13} = \frac{8}{91}$

$p(X=4) = \frac{4}{14}\cdot\frac{3}{13} = \frac{6}{91}$

7.2. The probability of working each of four combines without breakages during a certain time is equal to 0,9. Compose the law of distribution of a random variable *X* – the number of combines working trouble-free. Find the mathematical expectation, the dispersion and the mean square deviation of the random variable *X*.

The answer*: *M(X) = 3,6; D(X) = 0,36; s(X) = 0,6.

7.2. 4c. $p = 0,9$.

$p(X=m) = C_n^m p^m q^{n-m}$ $\quad q = 1-p$

$X = 1, 2, 3, 4$

$p(X=1) = C_4^1 \cdot 0,9^1 \cdot 0,1^3 = \frac{4!}{3!\,1!}\cdot 0,9 \cdot 0,001 = 0,0036$

$p(X=2) = C_4^2\, 0,9^2\, 0,1^2 = \frac{4\cdot 3\cdot 2}{2!\,2!}\cdot 0,81 \cdot 0,01 = 0,0486$

$p(X=3) = C_4^3\, 0,9^3\, 0,1^1 = \frac{4!}{3!}\cdot 0,729 \cdot 0,1 = 0,2916$

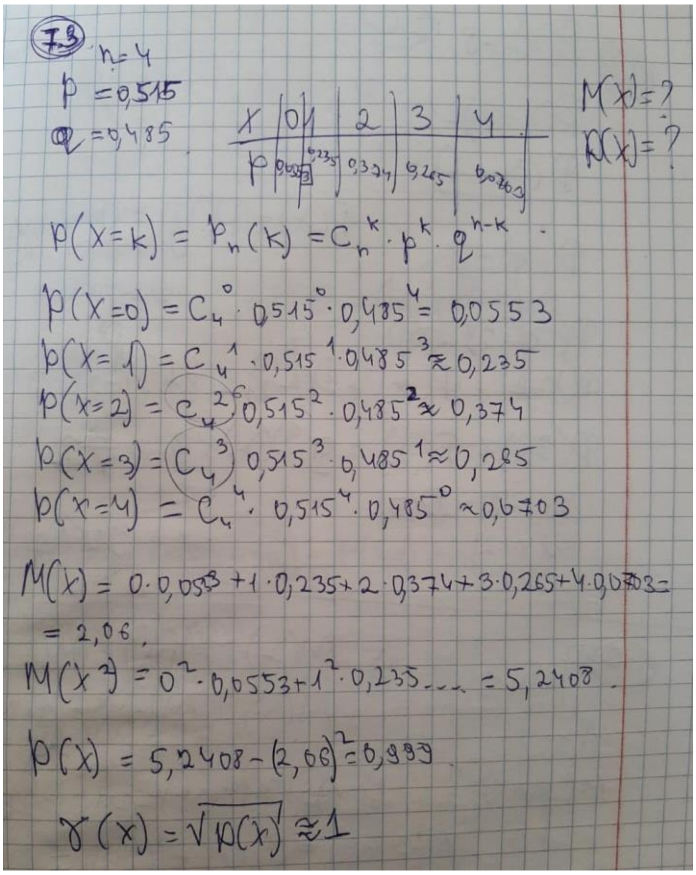
$p(X=4) = C_4^4\, 0,9^4 \cdot 0,1^0 = 0,6561$

$M(X) = x_1 p_1 + x_2 p_2 \ldots + x_n p_n = 0,0036 + 0,0972 + 0,8748 + 2,6244 = 3,6324 \approx 3,6.$

$D(X) = M(X)(1-p) = 3,6 \cdot (1 - 0,9) = 0,36$

7.3. The probability of birth of a boy in a family is equal to 0,515. Compose the law of distribution of a random variable X – the number of boys in families having four children. Find the mathematical expectation, the dispersion and the mean square deviation.

***The answer*: *M(X)* = 2,06; *D(X)* = 0,999; σ(*X*) = 1,0.**



7.3

$n = 4$

$p = 0{,}515$

$q = 0{,}485$

X	0	1	2	3	4
p	0,0553	0,235	0,374	0,265	0,0703

$M(X) = ?$

$D(X) = ?$

$P(X=k) = P_n(k) = C_n^k \cdot p^k \cdot q^{n-k}$.

$P(X=0) = C_4^0 \cdot 0{,}515^0 \cdot 0{,}485^4 = 0{,}0553$

$P(X=1) = C_4^1 \cdot 0{,}515^1 \cdot 0{,}485^3 \approx 0{,}235$

$P(X=2) = C_4^2 \cdot 0{,}515^2 \cdot 0{,}485^2 \approx 0{,}374$

$P(X=3) = C_4^3 \cdot 0{,}515^3 \cdot 0{,}485^1 \approx 0{,}265$

$P(X=4) = C_4^4 \cdot 0{,}515^4 \cdot 0{,}485^0 \approx 0{,}0703$

$M(X) = 0 \cdot 0{,}0553 + 1 \cdot 0{,}235 + 2 \cdot 0{,}374 + 3 \cdot 0{,}265 + 4 \cdot 0{,}0703 = 2{,}06$.

$M(X^2) = 0^2 \cdot 0{,}0553 + 1^2 \cdot 0{,}235 \ldots = 5{,}2408$.

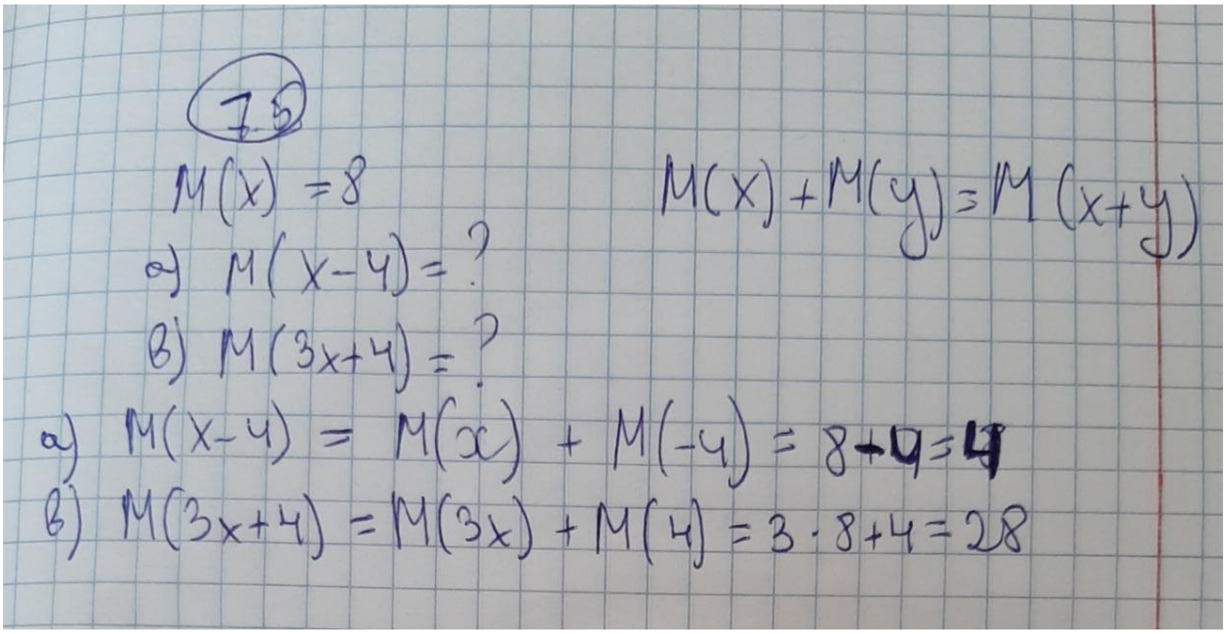
$D(X) = 5{,}2408 - (2{,}06)^2 = 0{,}999$

$\sigma(X) = \sqrt{D(X)} \approx 1$

7.4. There are 6 masters of sports in a group of 10 sportsmen. One selects (under the circuit without replacement) 3 sportsmen. Compose the law of distribution of a random variable X – the number of masters of sports of the selected sportsmen. Find the mathematical expectation of the random variable X.

***The answer*: *M(X)* = 1,8.**

7.5. The mathematical expectation of a random variable X is equal to 8. Find the mathematical expectation of the following random variables: a) $X - 4$; b) $3X + 4$.



7.5

$M(x) = 8$ $\qquad$ $M(x) + M(y) = M(x+y)$

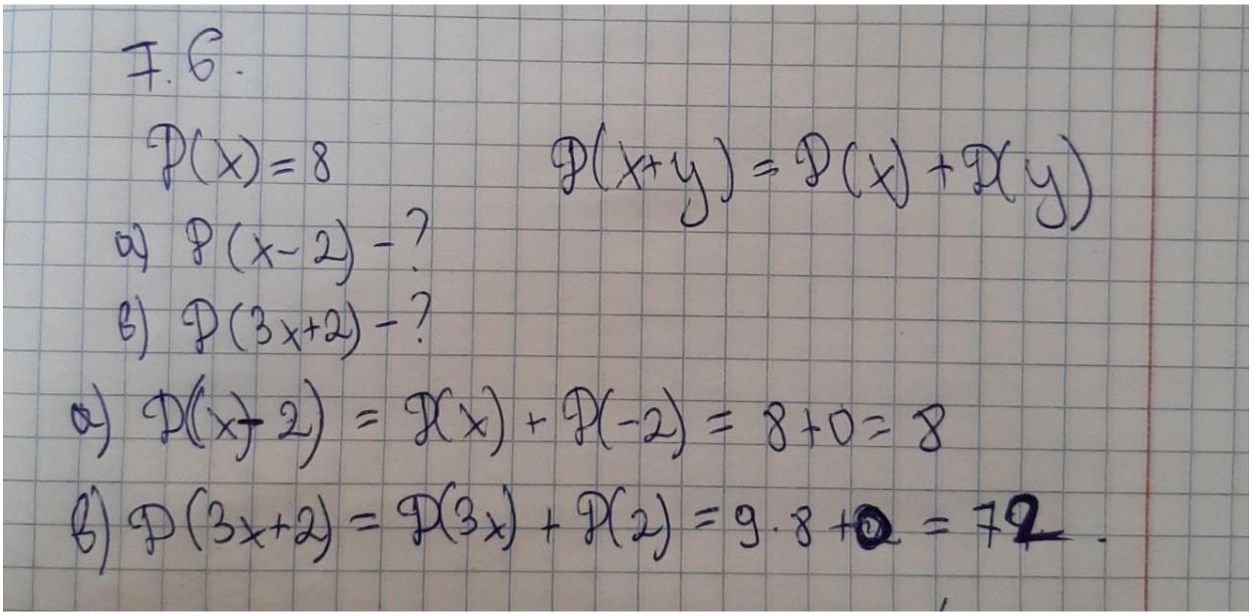
а) $M(x-4) = ?$

б) $M(3x+4) = ?$

а) $M(x-4) = M(x) + M(-4) = 8 + 4 = 4$

б) $M(3x+4) = M(3x) + M(4) = 3 \cdot 8 + 4 = 28$

7.6. The dispersion of a random variable *X* is equal to 8. Find the dispersion of the following random variables: a) *X* – 2; b) 3*X* + 2.



7.6.

$D(x) = 8$ $\qquad$ $D(x+y) = D(x) + D(y)$

а) $D(x-2) - ?$

б) $D(3x+2) - ?$

а) $D(x-2) = D(x) + D(-2) = 8 + 0 = 8$

б) $D(3x+2) = D(3x) + D(2) = 9 \cdot 8 + 0 = 72$.

7.7. Find the mathematical expectation and the dispersion of random variable *Z = 4X – 2Y* if *M(X) = 5, M(Y) = 3, D(X) = 4, D(Y) = 6*. The random variables *X* and *Y* are independent.

***The answer*: *M(Z)* = 14; *D(Z)* = 88.**

$$P(x=0)=\frac{4}{10}.$$

7.7) $M(Z)=M(4x-2y)=M(4x)+M(-2y)=$

$=4\cdot 5-2\cdot 3=14.$

$D(Z)=D(4x-2y)=D(4x)+D(-2y)=$

$=16\cdot D(X)+4D(Y)=16\cdot 4+4\cdot 6=88$

7.8. A total of 4 buses carrying 148 students from the same school arrives at a football stadium. The buses carry, respectively, 40, 33, 25, and 50 students. One of the students is randomly selected. Let *X* denote the number of students that were on the bus carrying this randomly selected student. One of the 4 bus drivers is also randomly selected. Let *Y* denote the number of students on his bus. Which of *M(X)* or *M(Y)* do you think is larger? Why? Compute *M(X)* and *M(Y).*

7.8

X	40	33	24	49
p	0,27	0,223	0,169	0,338

Y	40	33	25	50
p	0,25	0,25	0,25	0,25

$P(X=40)=\frac{40}{148}=0,27$

$P(X=33)=\frac{33}{148}=0,223$

$P(X=24)=\frac{24}{148}=0,169$

$P(X=49)=\frac{49}{148}=0,338$

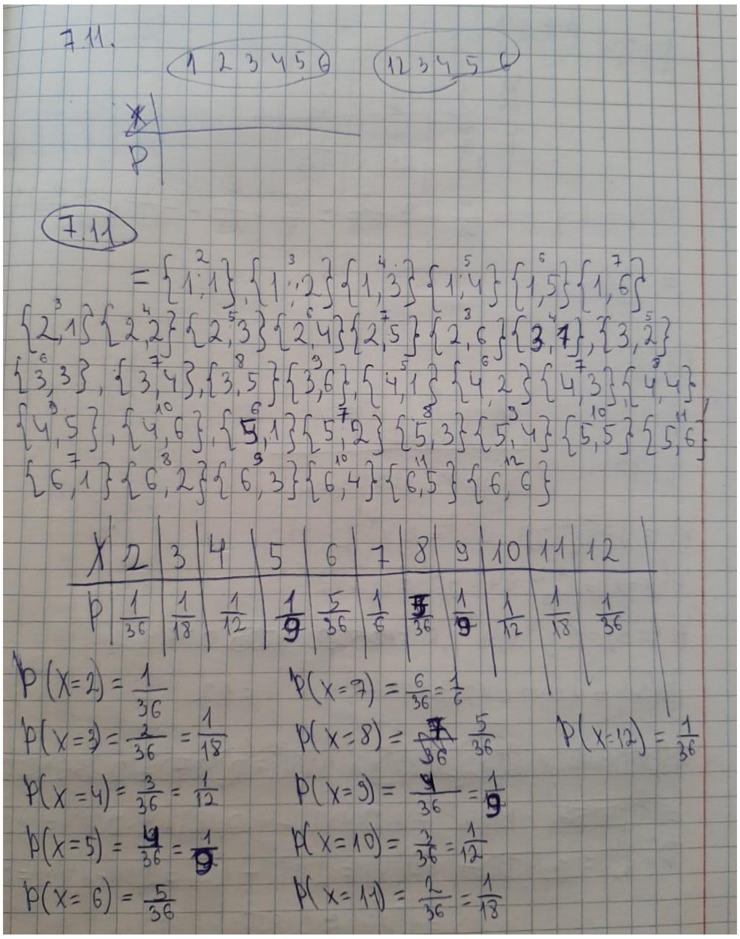
$M(X)=40\cdot 0,27+33\cdot 0,223+$
$+25\cdot 0,169+50\cdot 0,338=39,28$

$M(Y)=40\cdot 0,25+33\cdot 0,25+25\cdot 0,25+$
$+50\cdot 0,25=37$

Answer: M(X) is larger

Exercises for Homework 7

7.11. Two dice are rolled. Let X equal the sum of the 2 dice. What are the possible values of *X*, and what are the probabilities associated with each value?



7.11.

1 2 3 4 5 6   1 2 3 4 5 6

X	
P	

7.11

$= \{1;1\}, \{1;2\} \{1,3\} \{1,4\} \{1,5\} \{1,6\}$
$\{2,1\} \{2,2\} \{2,3\} \{2,4\} \{2,5\} \{2,6\} \{3,1\}, \{3,2\}$
$\{3,3\}, \{3,4\}, \{3,5\} \{3,6\}, \{4,1\} \{4,2\} \{4,3\} \{4,4\}$
$\{4,5\}, \{4,6\}, \{5,1\} \{5,2\} \{5,3\} \{5,4\} \{5,5\} \{5,6\}$
$\{6,1\} \{6,2\} \{6,3\} \{6,4\} \{6,5\} \{6,6\}$

X	2	3	4	5	6	7	8	9	10	11	12
p	$\frac{1}{36}$	$\frac{1}{18}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{5}{36}$	$\frac{1}{6}$	$\frac{5}{36}$	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{18}$	$\frac{1}{36}$

$P(X=2) = \frac{1}{36}$ $P(X=7) = \frac{6}{36} = \frac{1}{6}$

$P(X=3) = \frac{2}{36} = \frac{1}{18}$ $P(X=8) = \frac{5}{36}$ $P(X=12) = \frac{1}{36}$

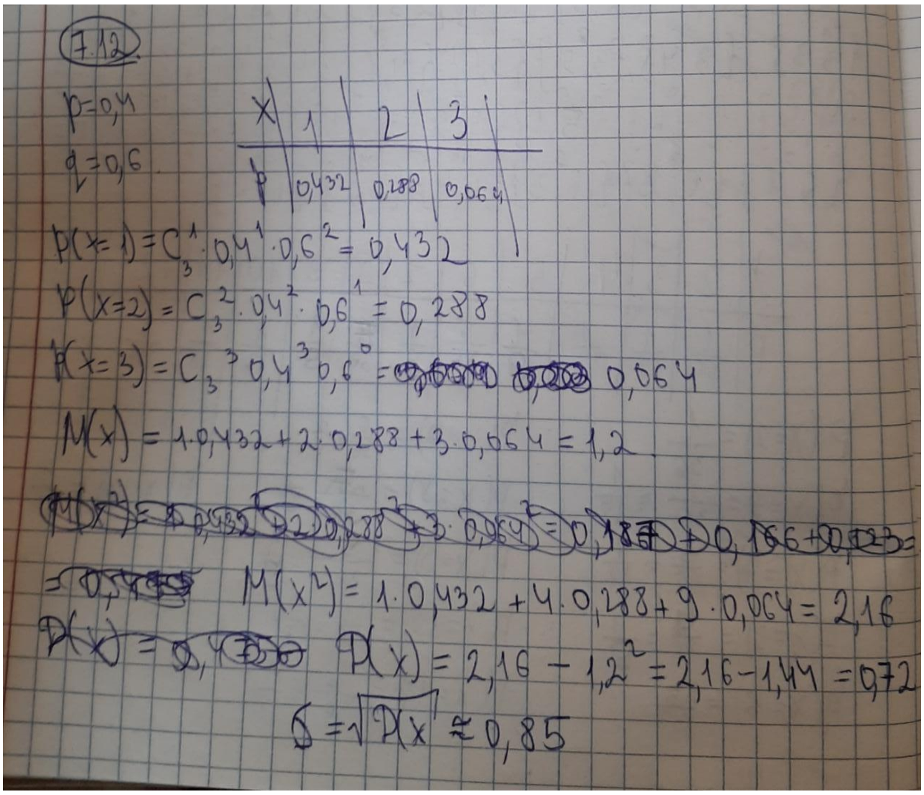
$P(X=4) = \frac{3}{36} = \frac{1}{12}$ $P(X=9) = \frac{4}{36} = \frac{1}{9}$

$P(X=5) = \frac{4}{36} = \frac{1}{9}$ $P(X=10) = \frac{3}{36} = \frac{1}{12}$

$P(X=6) = \frac{5}{36}$ $P(X=11) = \frac{2}{36} = \frac{1}{18}$

7.12. The probability that a buyer will make a purchase in a shop is equal to 0,4. Compose the law of distribution of a random variable *X* – the number of buyers who have made a purchase if the shop was visited by 3 buyers. Find the mathematical expectation, the dispersion and the mean square deviation of the random variable *X*.

The answer*: *M(X) = 1,2; D(X) = 0,72; σ(X) = 0,85.


7.12

$p=0,4$

$q=0,6$

X	1	2	3
p	0,432	0,288	0,064

$P(x=1)=C_3^1\cdot 0,4^1\cdot 0,6^2=0,432$

$P(x=2)=C_3^2\cdot 0,4^2\cdot 0,6^1=0,288$

$P(x=3)=C_3^3\cdot 0,4^3\cdot 0,6^0=0,064$

$M(x)=1\cdot 0,432+2\cdot 0,288+3\cdot 0,064=1,2$

$M(x^2)=1\cdot 0,432+4\cdot 0,288+9\cdot 0,064=2,16$

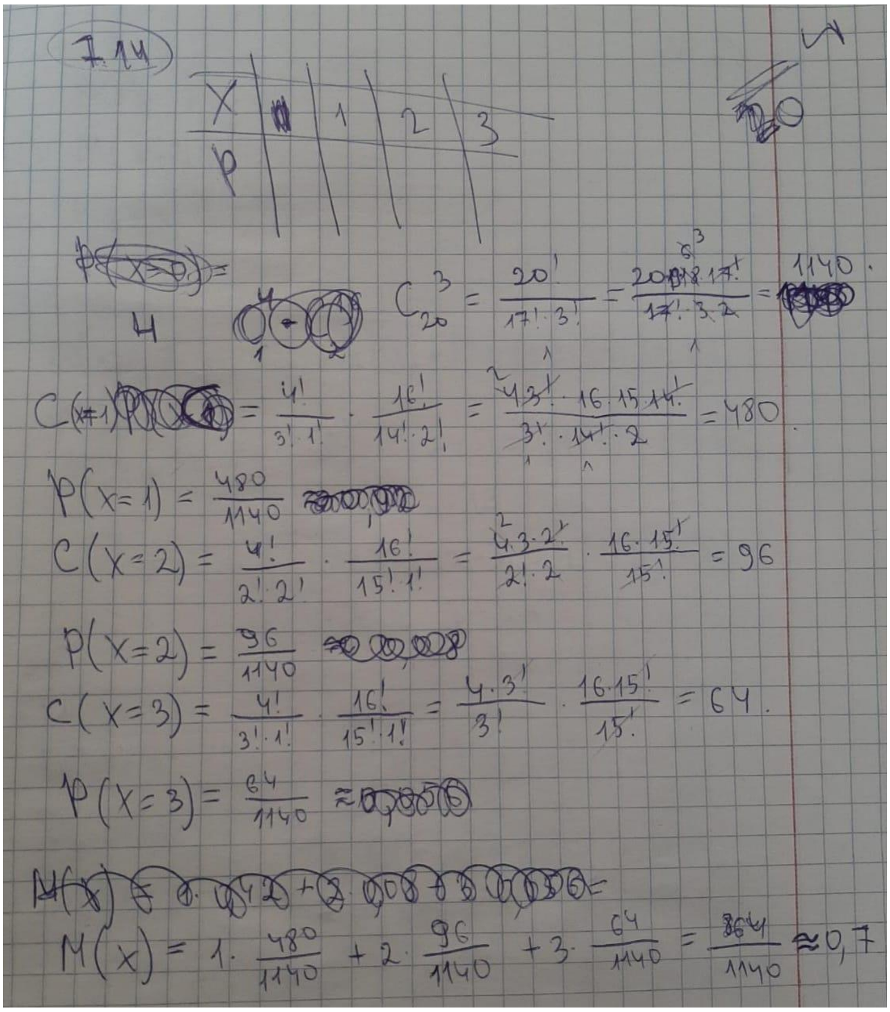
$D(x)=2,16-1,2^2=2,16-1,44=0,72$

$\sigma=\sqrt{D(x)}\approx 0,85$

7.13. A buyer attends shops for purchasing the necessary goods. The probability that the goods are in a certain shop is equal to 0,4. Compose the law of distribution of a random variable X – the number of shops which will be attended by the buyer from four possible. Find the most probable number of shops which will be visited by the buyer. ***The answer*: $1 \le k_0 \le 2$.**

7.14. A sample of 3 items is selected at random from a box containing 20 items of which 4 are defective. Find the expected number (mathematical expectation) of defective items in the sample.

***The answer:* 0,6.**


7.14

X	0	1	2	3
p				

$C_{20}^{3} = \frac{20!}{17!\cdot 3!} = \frac{20\cdot 19\cdot 18\cdot 17!}{17!\cdot 3\cdot 2} = 1140.$

$C(x=1) = \frac{4!}{3!\cdot 1!}\cdot\frac{16!}{14!\cdot 2!} = \frac{4\cdot 3!\cdot 16\cdot 15\cdot 14!}{3!\cdot 14!\cdot 2} = 480.$

$P(x=1) = \frac{480}{1140}$

$C(x=2) = \frac{4!}{2!\cdot 2!}\cdot\frac{16!}{15!\cdot 1!} = \frac{4\cdot 3\cdot 2!}{2!\cdot 2}\cdot\frac{16\cdot 15!}{15!} = 96$

$P(x=2) = \frac{96}{1140}$

$C(x=3) = \frac{4!}{3!\cdot 1!}\cdot\frac{16!}{15!\cdot 1!} = \frac{4\cdot 3!}{3!}\cdot\frac{16\cdot 15!}{15!} = 64.$

$P(x=3) = \frac{64}{1140}$

$M(x) = 1\cdot\frac{480}{1140} + 2\cdot\frac{96}{1140} + 3\cdot\frac{64}{1140} = \frac{864}{1140} \approx 0{,}7$

7.15. A box contains 5 red and 5 blue marbles. Two marbles are withdrawn randomly. If they are the same color, then you win \$1.10; if they are different colors, then you win – \$1.00 (that is, you lose \$1.00). Calculate the mathematical expectation and the dispersion of the amount you win (marble – мрамор; to withdraw – извлекать).

***The answer: M(X)* = – 1/15; *D(X)* = 49/45.**

7.16. The mathematical expectation of a random variable X is equal to 7. Find the mathematical expectation of the following random variables: a) $X + 6$; b) $4X – 3$.

7.16.

$M(x) = 7$

$M(x+6) - ?$

$M(4x-3) - ?$

$M(X) + M(Y) = M(X+Y)$

а) $M(x+6) = M(x) + M(6) =$

$= 7 + 6 = 13$

б) $M(4x-3) = 4M(x) + M(-3) =$

$= 4 \cdot 7 - 3 = 24$.

7.17. The dispersion of a random variable *X* is equal to 9. Find the dispersion of the following random variables: a) *X* + 6; b) 2*X* – 7.

7.17.

$D(x) = 9$

$D(x+6) - ?$

$D(2x-7) - ?$

$D(x) + D(y) = D(x+y)$

а) $D(x+6) = D(x) + D(6) =$

$= 9 + 0 = 9$

б) $D(2x-7) = 4D(x) + D(-7) =$

$= 4 \cdot 9 + 0 = 36$.

7.18. Independent random variables *X* and *Y* have the following distributions:

X	2	4	6
p	0,3	0,5	0,2

Y	3	4
p	0,4	0,6

Compose the law of distribution of the random variable *V* = *XY.* Find the mathematical expectation, the dispersion and the mean square deviation of the random variable *V*.

***The answer: M(V)* = 13,68; *D(V)* = 29,3376.**

7.19. Find the mathematical expectation and the dispersion of random variables: a) $Z = 2X - 4Y$; b) $Z = 3X + 5Y$ if $M(X) = 5$, $M(Y) = 3$, $D(X) = 4$, $D(Y) = 6$. The random variables X and Y are independent.

***The answer*:** **a) $M(Z) = -2$; $D(Z) = 112$; b) $M(Z) = 30$; $D(Z) = 186$.**

7.19.

a) $Z = 2X - 4Y$ if $M(X) = 5$, $M(Y) = 3$

b) $Z = 3X + 5Y$ $D(X) = 4$, $D(Y) = 6$.

$M(Z) - ?$

$D(Z) - ?$

a) $M(Z) = M(2X - 4Y) = M(2X) + M(-4Y) =$
$= 2M(X) - 4M(Y) = 2 \cdot 5 - 4 \cdot 3 = -2$.

$D(Z) = D(2X - 4Y) = D(2X) + D(-4Y) =$
$= 4D(X) + 16D(Y) = 4 \cdot 4 + 16 \cdot 6 = 112$.

b) $M(Z) = M(3X + 5Y) = M(3X) + M(5Y) =$
$= 3M(X) + 5M(Y) = 3 \cdot 5 + 5 \cdot 3 = 30$

$D(Z) = D(3X + 5Y) = D(3X) + D(5Y) =$
$= 9D(X) + 25D(Y) = 9 \cdot 4 + 25 \cdot 6 = 186$.

Exercises for Seminar 8

8.1. Let the law of distribution of a discrete random variable be given:

X	1	4	6	8
P	0,1	0,3	0,4	0,2

Find the integral function of the random variable *X* and construct its graph.

8.1

X	1	4	6	8
P	0,1	0,3	0,4	0,2

Find $F(x) = ?$

1) $x \le 1$, $F(x) = 0$;

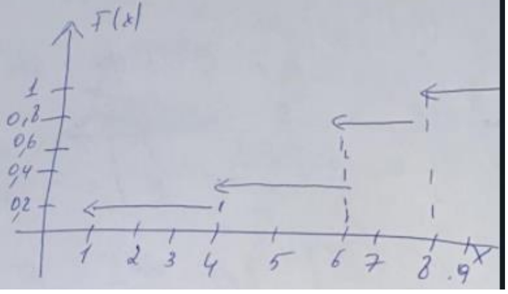
2) $1 < x \le 4$, $F(x) = P(x=1) = 0,1$, $F(4) - P(X<4) = 0,1$

3) $4 < x \le 6$, $F(x) = P(X < x) = P(x=1) + P(x=4) = 0,1+0,3 = 0,4$.

4) $6 < x \le 8$; $F(x) = [P(x=1) + P(x=4)] + P(x=6) =$
$= 0,4 + 0,4 = 0,8$. $F(8) = 0,8$.

5) $x > 8$ $F(x) = [P(x=1) + P(x=4) + P(x=6)] + P(x=8) =$
$= 0,8 + 0,2 = 1$

$$F(x) = \begin{cases} 0, & x \le 1 \\ 0,1, & 1 < x \le 4 \\ 0,4, & 4 < x \le 6 \\ 0,8, & 6 < x \le 8 \\ 1, & x > 8 \end{cases}$$



8.2. Find the integral function of distribution of the random variable *X* – the number of hits in a target if three shots were made with the probability of hit in the target equal 0,8 for each shot.

8.2

$p = 0,8$
$q = 0,2$
$n = 4$
$P_n(x < n) = ?$

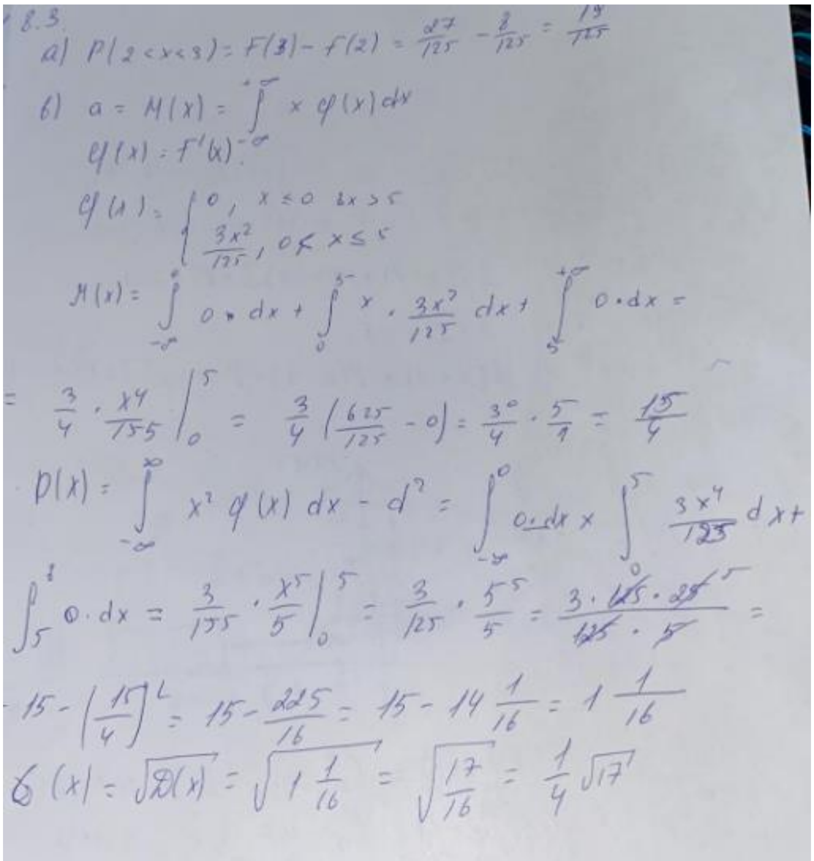
$P(x=0) = C_3^0 \cdot 0,8^0 \cdot 0,2^3 = 0,008$
$P(x=1) = C_3^1 \cdot 0,8 \cdot 0,2^2 = 0,048$
$P(x=2) = C_3^2 \cdot 0,8^2 \cdot 0,2^1 = 0,384$
$P(x=3) = C_3^3 \cdot 0,8^3 - 0,2^0 = 0,512$

$F(x) = P(X < x)$
$x \le 0$ $F(x) = 0$
$0 < x \le 1$ $F(x) = 0,008$
$1 < x \le 2$ $F(x) = 0,008 + 0,048 = 0,056$.
$2 < x \le 3$ $F(x) = 0,056 + 0,384 = 0,44$
$x > 3$ $F(x) = 1$

95 = ?

8.3. A continuous random variable *X* is given by the integral function:

$$F(x)=\begin{cases} 0 & if \quad x\le 0, \\ \dfrac{x^3}{125} & if \quad 0<x\le 5, \\ 1 & if \quad x>5. \end{cases}$$



8.3.

a) $P(2<x<3)=F(3)-F(2)=\frac{27}{125}-\frac{8}{125}=\frac{19}{125}$

б) $a=M(x)=\int_{-\infty}^{+\infty} x\,\varphi(x)\,dx$

$\varphi(x)=F'(x)$

$\varphi(x)=\begin{cases} 0, & x\le 0 \ \& \ x>5 \\ \frac{3x^2}{125}, & 0< x\le 5 \end{cases}$

$M(x)=\int_{-\infty}^{0} 0\cdot dx+\int_{0}^{5} x\cdot\frac{3x^2}{125}\,dx+\int_{5}^{+\infty} 0\cdot dx=$

$=\frac{3}{4}\cdot\frac{x^4}{125}\Big|_0^5=\frac{3}{4}\left(\frac{625}{125}-0\right)=\frac{3}{4}\cdot\frac{5}{1}=\frac{15}{4}$

$D(x)=\int_{-\infty}^{\infty} x^2\,\varphi(x)\,dx-a^2=\int_{-\infty}^{0} 0\cdot dx+\int_{0}^{5}\frac{3x^4}{125}\,dx+$

$\int_{5}^{\infty} 0\cdot dx=\frac{3}{125}\cdot\frac{x^5}{5}\Big|_0^5=\frac{3}{125}\cdot\frac{5^5}{5}=\frac{3\cdot\cancel{125}\cdot\cancel{25}}{\cancel{125}\cdot\cancel{5}}=$

$=15-\left(\frac{15}{4}\right)^2=15-\frac{225}{16}=15-14\frac{1}{16}=1\frac{1}{16}$

$\sigma(x)=\sqrt{D(x)}=\sqrt{1\frac{1}{16}}=\sqrt{\frac{17}{16}}=\frac{1}{4}\sqrt{17}$

Determine: a) the probability of hit of the random variable into the interval (2; 3); b) the mathematical expectation, the dispersion and the mean square deviation of the random variable *X*.

8.4. The amount of time, in hours, that a computer functions before breaking down is a continuous random variable with probability density function given by $f(x)=\begin{cases}\lambda e^{-x/100} & if \quad x\ge 0 \\ 0 & if \quad x<0\end{cases}$

What is the probability that (a) a computer will function between 50 and 150 hours before breaking down; (b) it will function less than 100 hours? *Direction:* Take *e* equal 2,718281.

Ответ*:* a) 0,3834; b) 0,632.

density function given by

$$f(x) = \begin{cases} \lambda e^{-x/100} & x \geq 0 \\ 0 & x < 0 \end{cases}$$

$$f(x) = \lambda e^{-x/100} = \lambda e^{-\lambda x} \quad \ldots\ldots \ (1)$$

This is the pdf of an exponential distribution.

So commulative distribution function is

$$F(x) = P(X \leq x)$$

$$= 1 - e^{-\lambda x}, \quad \lambda = \frac{1}{100} \ (\text{from } (1))$$

→ The probability that a computer will function between 50 and 150 hours before breaking down is

$$F(x) = P(X \leq x) = 1 - e^{-\lambda x} \quad (\because \lambda = \tfrac{1}{100})$$

$$= 1 - e^{-x/100}$$

$$P(50 \leq X \leq 150) = F(150) - F(50)$$

$$= \left(1 - e^{-\frac{x_1}{100}}\right) - \left(1 - e^{-\frac{x_2}{100}}\right) \quad (\because x_1 = 150,\ x_2 = 50)$$

$$= \left[1 - e^{-\frac{150}{100}}\right] - \left[1 - e^{-\frac{50}{100}}\right]$$

$$= \left(1 - e^{-1.5}\right) - \left(1 - e^{-0.5}\right)$$

$$= (1 - 0.2231) - (1 - 0.60653)$$

$$= 0.776869 - 0.39346$$

$$= 0.3834$$

$$\boxed{\therefore P(50 \leq X \leq 150) = 0.3834}$$

8.5. Let *X* be a random variable with probability density function

$$f(x) = \begin{cases} C(1 - x^2) & if \quad -1 < x < 1 \\ 0 & otherwise \end{cases}$$

(a) What is the value of *C*? (b) What is the cumulative distribution function of *X*?

Ответ: **a) 3/4.**

8.5. $f(x) = \begin{cases} c(1-x^2), & -1<x<1 \\ 0 & \text{otherwise} \end{cases}$

$$\int_{-\infty}^{+\infty} \varphi(x)\,dx = 1.$$

$$\int_{-\infty}^{+\infty} \varphi(x)\,dx = \int_{-\infty}^{-1} 0\cdot dx + \int_{-1}^{1} c(1-x^2)\,dx + \int_{1}^{+\infty} 0\cdot dx = \int_{-1}^{1} c(1-x^2)\,dx$$

$$= \int_{-1}^{1} c(1-x^2)\,dx = 1$$

$$c\left(\int 1\,dx - \int x^2\,dx\right) = c\left(x - \frac{x^3}{3}\right)\Big|_{-1}^{1} = c\left(\left(1-\frac{1}{3}\right)-\left(1+\frac{1}{3}\right)\right) =$$

$$= c\left(\frac{6-2}{3}\right) = c\left(\frac{4}{3}\right).$$

The answer: a) 3/4

8.5. b) $f(x) = \int_{-\infty}^{x} \varphi(t)\,dt.$

$$\int_{-\infty}^{0} c(2t-t^3)\,dt + \int_{x}^{0} c(2t-t^3)\,dt +$$

$$+ \int_{\frac{x}{2}}^{x} (2t-t^3)\,dt.$$

$$\int_{0}^{x} (2t-t^3)\,dt = t^2 - \frac{t^4}{4}\Big|_{0}^{x} = 0 + x^2 + \frac{x^4}{4} =$$

$$= x^2 + \frac{x^4}{4}$$

8.6. Compute *M(X)* if *X* has a density function given by $f(x) = \begin{cases} \frac{1}{4}xe^{-x/2} & if \quad x>0 \\ 0 & otherwise \end{cases}$

***Ответ:* 4.**

8.6.

$$f(x)=\begin{cases}\frac{1}{4}xe^{-x/2} & x>0\\ 0\end{cases}$$

$$M(x)=\int_{-\infty}^{\infty} x f(x)\,dx=\int_{-\infty}^{\infty} x\left(\frac{1}{4}xe^{-x/2}\right)dx=\frac{1}{4}\int_{-\infty}^{\infty} x^2e^{-x/2}dx=$$

$$=\frac{1}{4}\int_0^{\infty} 8y^2e^{-y}dy=2\int_0^{\infty} y^2e^{-y}dy=2\int_0^{\infty} y^{3-1}e^{-y}dy=$$

$$=2\Gamma(3)=2(2!)=2(2\cdot 1)=4.$$

$$\Gamma(\alpha)=\int_0^{\infty} e^{-y}y^{\alpha-1}dy.$$

Answer: 4

8.7. A random variable *X* is given by the differential function: $f(x)=\begin{cases}0 & if \quad x\le 0,\\ \dfrac{4a-2x}{3a^2} & if \quad 0<x\le a,\\ 0 & if \quad x>a.\end{cases}$

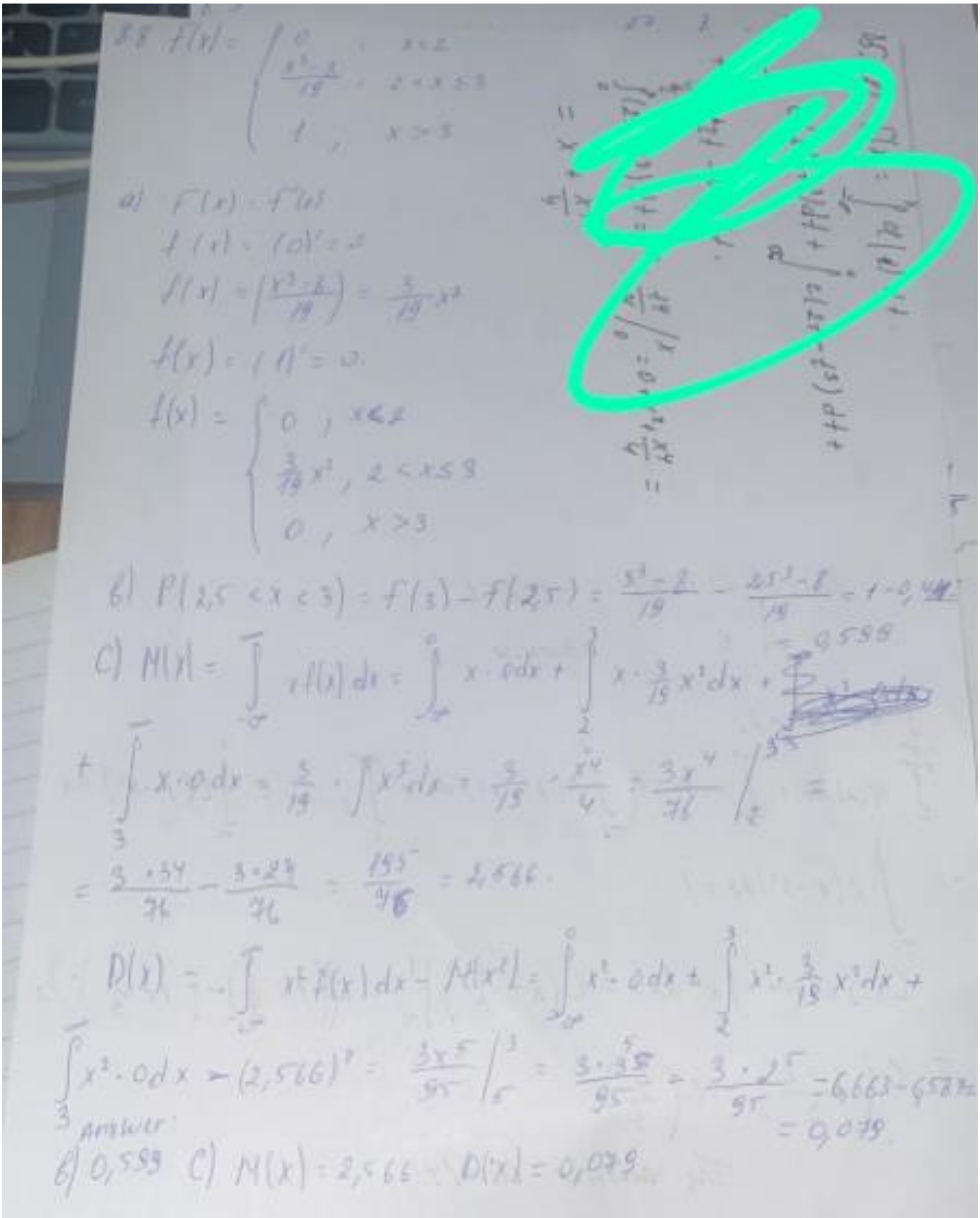
Find: (a) the integral function; (b) the probability of hit of the random variable into the interval (*a*/6; *a*/3).

***Ответ*: b) 7/36.**

8.8. A random variable *X* is given by the integral function: $F(x)=\begin{cases}0 & if \quad x\le 2,\\ \dfrac{x^3-8}{19} & if \quad 2<x\le 3,\\ 1 & if \quad x>3.\end{cases}$

Find: (a) the differential function; (b) the probability of hit of the random variable *X* into the interval (2,5; 3); (c) the mathematical expectation, the dispersion and the mean square deviation of the random variable *X*.

Ответ: b) 0,599; c) *M(X)* = 2,566; *D(X)* = 0,079.

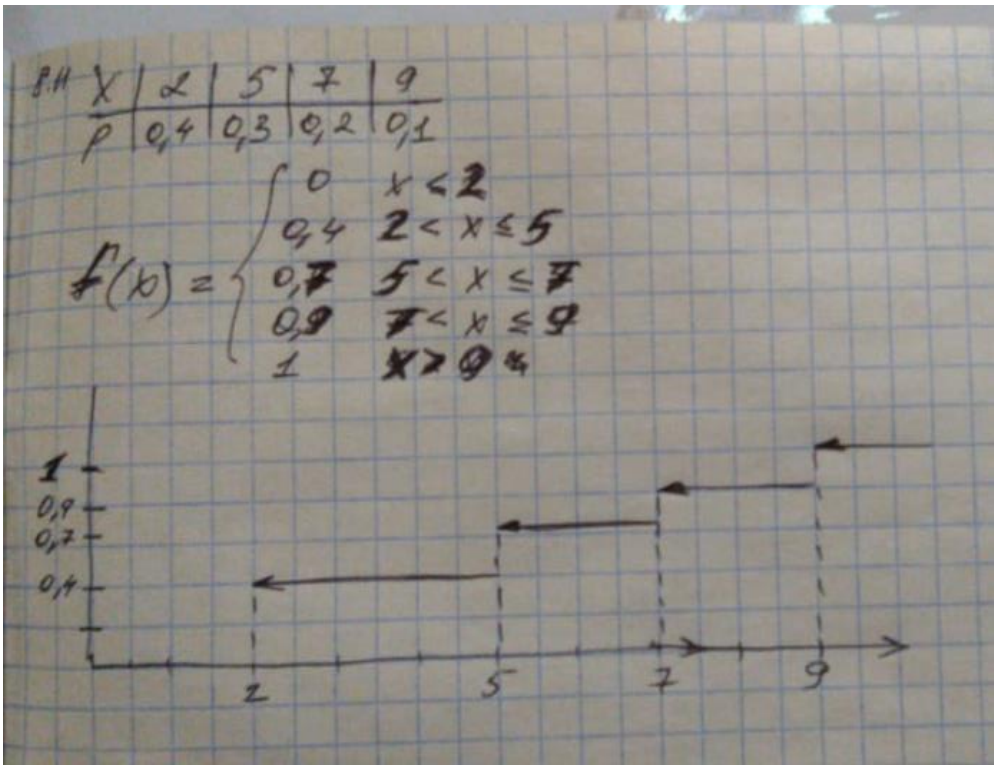


Exercises for Homework 8

8.11. Let the law of distribution of a discrete random variable be given:

X	– 2	5	7	9
p	0,4	0,3	0,2	0,1

Find the integral function of the random variable X and construct its graph.



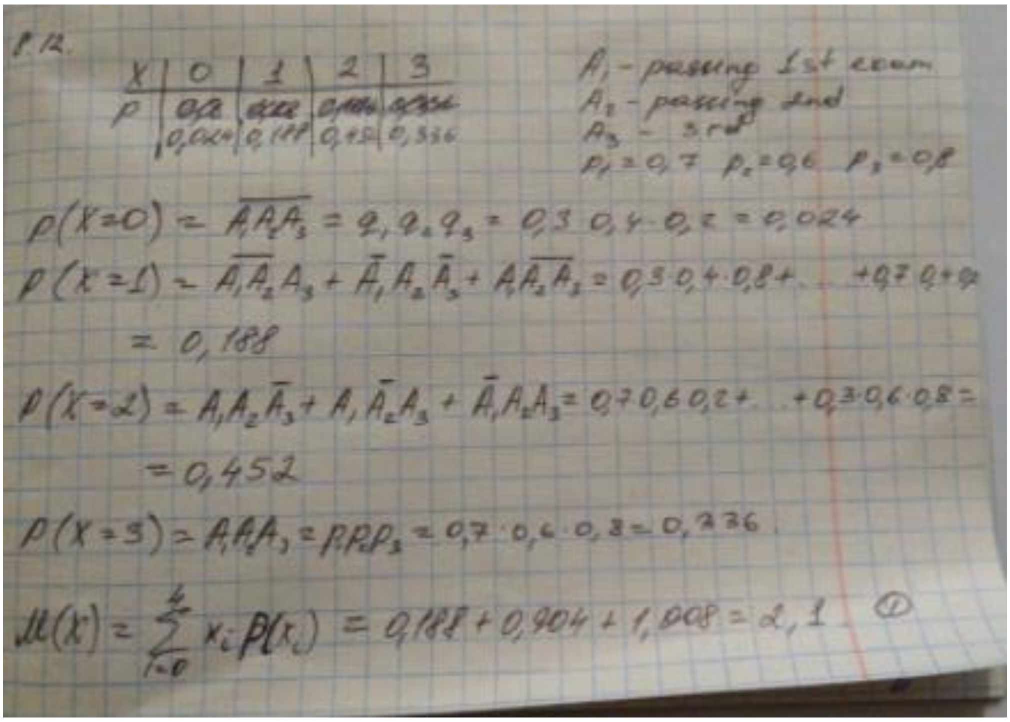
8.11

X	2	5	7	9
p	0,4	0,3	0,2	0,1

$$F(x)=\begin{cases}0 & x<2\\ 0{,}4 & 2<x\le 5\\ 0{,}7 & 5<x\le 7\\ 0{,}9 & 7<x\le 9\\ 1 & x>9\end{cases}$$

8.12. The probability of passing the first exam by a student is 0,7, the second exam – 0,6 and the third exam – 0,8. Find the integral function of the random variable *X* – the number of exams passed by the student. Determine *M(X).*

Ответ: M(X) **= 2,1.**



8.12.

X	0	1	2	3
p	0,024	0,188	0,452	0,336

A_1 – passing 1st exam
A_2 – passing 2nd
A_3 – 3rd
$p_1=0{,}7$ $p_2=0{,}6$ $p_3=0{,}8$

$P(X=0)=\bar{A}_1\bar{A}_2\bar{A}_3=q_1q_2q_3=0{,}3\cdot0{,}4\cdot0{,}2=0{,}024$

$P(X=1)=\bar{A}_1\bar{A}_2A_3+\bar{A}_1A_2\bar{A}_3+A_1\bar{A}_2\bar{A}_3=0{,}3\cdot0{,}4\cdot0{,}8+\ldots+0{,}7\cdot0{,}4\cdot0{,}2$
$=0{,}188$

$P(X=2)=A_1A_2\bar{A}_3+A_1\bar{A}_2A_3+\bar{A}_1A_2A_3=0{,}7\cdot0{,}6\cdot0{,}2+\ldots+0{,}3\cdot0{,}6\cdot0{,}8=$
$=0{,}452$

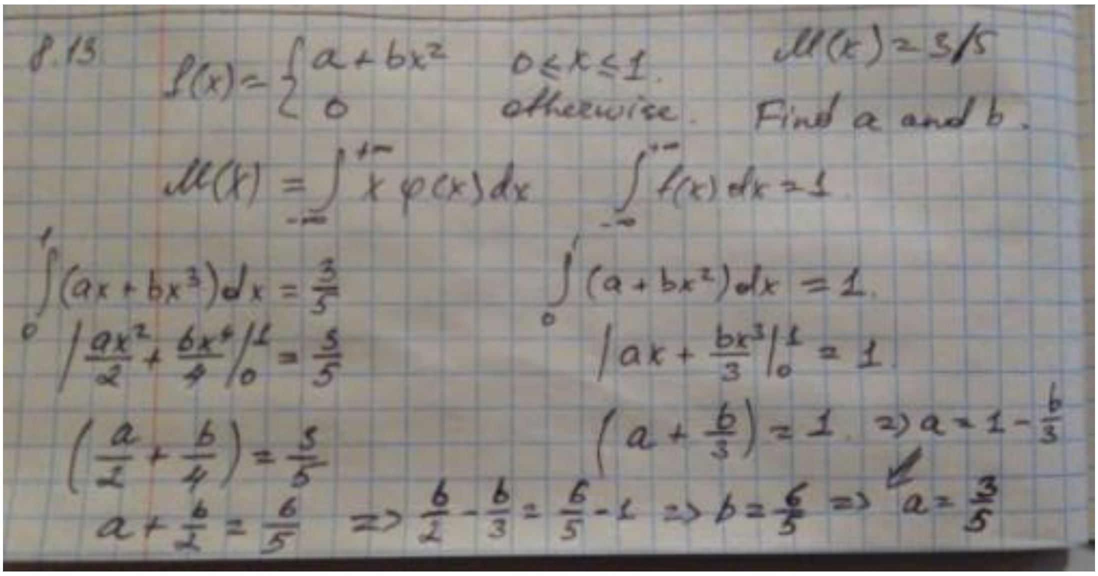
$P(X=3)=A_1A_2A_3=p_1p_2p_3=0{,}7\cdot0{,}6\cdot0{,}8=0{,}336$

$M(X)=\sum_{i=0}^{4}x_iP(x_i)=0{,}188+0{,}904+1{,}008=2{,}1$

8.13. The density function of *X* is given by $f(x)=\begin{cases}a+bx^2 & if\quad 0\le x\le 1\\ 0 & otherwise\end{cases}$

If *M(X)* = 3/5, find *a* and *b*.

Ответ*: a* = 3/5; *b* = 6/5.


8.13 $f(x) = \begin{cases} a + bx^2 & 0 \le x \le 1 \\ 0 & \text{otherwise} \end{cases}$ $M(x) = 3/5$ Find a and b.

$M(X) = \int_{-\infty}^{+\infty} x \varphi(x)\,dx$ $\int_{-\infty}^{+\infty} f(x)\,dx = 1$

$\int_0^1 (ax + bx^3)\,dx = \frac{3}{5}$ $\int_0^1 (a + bx^2)\,dx = 1$

$\left| \frac{ax^2}{2} + \frac{bx^4}{4} \right|_0^1 = \frac{3}{5}$ $\left| ax + \frac{bx^3}{3} \right|_0^1 = 1$

$\left(\frac{a}{2} + \frac{b}{4}\right) = \frac{3}{5}$ $\left(a + \frac{b}{3}\right) = 1 \Rightarrow a = 1 - \frac{b}{3}$

$a + \frac{b}{2} = \frac{6}{5} \Rightarrow \frac{b}{2} - \frac{b}{3} = \frac{6}{5} - 1 \Rightarrow b = \frac{6}{5} \Rightarrow a = \frac{3}{5}$

8.14. A system consisting of one original unit and a spare can function for a random amount of time *X*. If the density of *X* is given (in units of months) by $f(x) = \begin{cases} Cxe^{-x/2} & if \quad x > 0 \\ 0 & if \quad x \le 0 \end{cases}$

what is the probability that the system functions for at least 5 months (a spare – запасной элемент)?

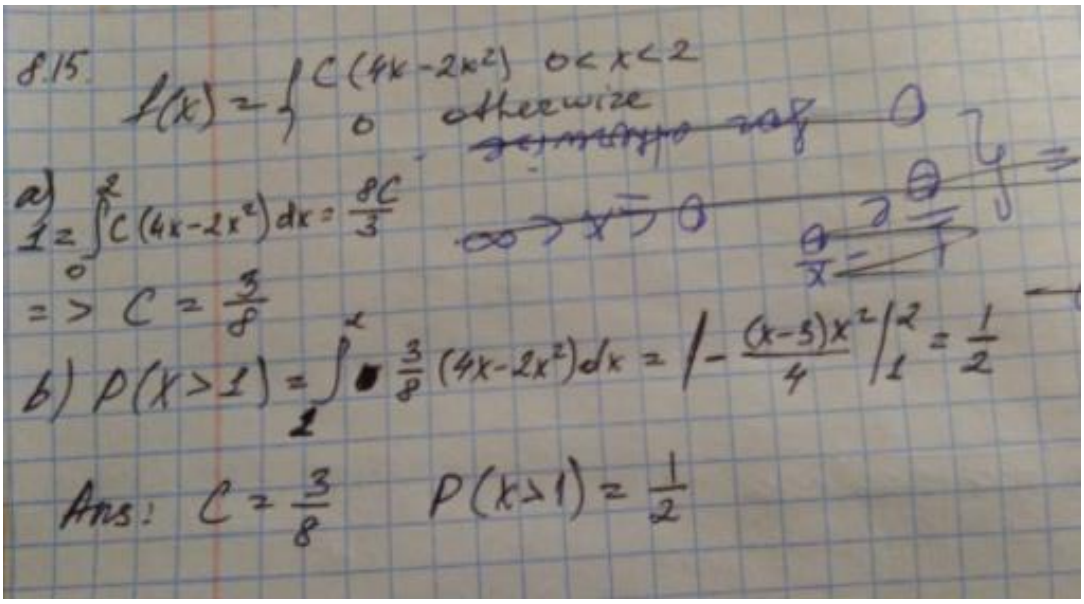
***Ответ:* 0,616.**

8.15. Suppose that *X* is a continuous random variable whose probability density function is given by

$$f(x) = \begin{cases} C(4x - 2x^2) & if \quad 0 < x < 2 \\ 0 & otherwise \end{cases}$$

(a) What is the value of *C*? (b) Find *P*(*X* > 1).

***Ответ:* a) 3/8; b) 1/2.**



8.15 $f(x) = \begin{cases} C(4x-2x^2) & 0<x<2 \\ 0 & \text{otherwize} \end{cases}$

a) $1 = \int_0^2 C(4x-2x^2)\,dx = \frac{8C}{3}$

$=> C = \frac{3}{8}$

b) $P(X>1) = \int_1^2 \frac{3}{8}(4x-2x^2)\,dx = \left. -\frac{(x-3)x^2}{4} \right|_1^2 = \frac{1}{2}$

Ans: $C = \frac{3}{8}$ $P(X>1) = \frac{1}{2}$

8.16. Find *M(X)* and *D(X)* when the density function of *X* is $f(x) = \begin{cases} 2x & if \quad 0 \le x \le 1 \\ 0 & otherwise \end{cases}$

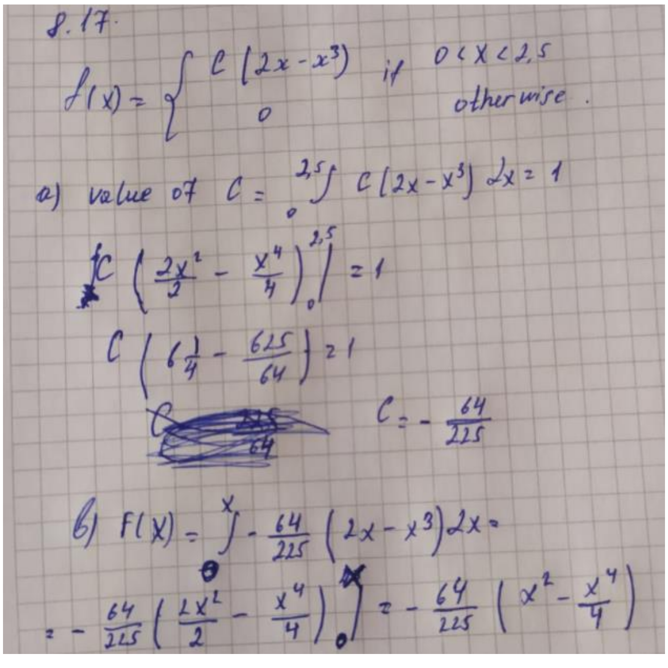
Ответ*: M(X)* = 2/3; *D(X)* = 1/18.

8.17. Let *X* be a random variable with probability density function

$$f(x) = \begin{cases} C(2x - x^3) & if \quad 0 < x < \dfrac{5}{2} \\ 0 & otherwise \end{cases}$$

(a) What is the value of *C*? (b) What is the cumulative distribution function of *X*?

Ответ*:* a) – 64/225.



8.17.

$f(x) = \begin{cases} C(2x-x^3) & \text{if } 0<x<2{,}5 \\ 0 & \text{otherwise.} \end{cases}$

a) value of $C = \int_0^{2,5} C(2x-x^3)\,dx = 1$

$C\left(\frac{2x^2}{2} - \frac{x^4}{4}\right)\Big|_0^{2,5} = 1$

$C\left(6\frac{1}{4} - \frac{625}{64}\right) = 1$

$C = -\frac{64}{225}$

b) $F(X) = \int_0^x -\frac{64}{225}(2x-x^3)\,dx =$

$= -\frac{64}{225}\left(\frac{2x^2}{2} - \frac{x^4}{4}\right)\Big|_0^x = -\frac{64}{225}\left(x^2 - \frac{x^4}{4}\right)$

8.18. Compute $M(X)$ if X has a density function given by $f(x)=\begin{cases}\frac{50}{x^3} & if \quad x>5\\ 0 & otherwise\end{cases}$

Ответ: **10.**

8.19. A random variable X is given by the differential function:

$$f(x)=\begin{cases}0 & if \quad x\le 0,\\ x^3+x & if \quad 0<x\le\sqrt{\sqrt{5}-1},\\ 0 & if \quad x>\sqrt{\sqrt{5}-1}.\end{cases}$$

Find: (a) the integral function; (b) the probability of hit of the random variable into the interval (1; 1,1).

Ответ: **b) 0,221.**

8.20. A random variable X is given by the integral function: $F(x)=\begin{cases}0 & if \quad x\le 1,\\ \frac{x^2}{2}-\frac{x}{2} & if \quad 1<x\le 2,\\ 1 & if \quad x>2.\end{cases}$

Find: (a) the differential function; (b) the probability of hit of the random variable X into the interval (1; 1,5); (c) the mathematical expectation, the dispersion and the mean square deviation of the random variable X.

Ответ: **b) 0,375; c) *M(X)* = 19/12; *D(X)* = 11/144.**

Exercises for Seminar 9

9.1. A die is tossed three times. Write the law of distribution of the number of appearance of 6.

9.1

X	0	1	2	3
p	$\frac{125}{216}$	$\frac{75}{216}$	$\frac{15}{216}$	$\frac{1}{216}$

$p=\frac{1}{6}$
$q=\frac{5}{6}$

$P(X=0)=\frac{5}{6}\cdot\frac{5}{6}\cdot\frac{5}{6}=\frac{125}{216}$

$P(X=1)=\frac{1}{6}\cdot\frac{5}{6}\cdot\frac{5}{6}+\frac{5}{6}\cdot\frac{1}{6}\cdot\frac{5}{6}+\frac{5}{6}\cdot\frac{5}{6}\cdot\frac{1}{6}=\frac{75}{216}$

$P(X=2)=\frac{1}{6}\cdot\frac{1}{6}\cdot\frac{5}{6}+\frac{5}{6}\cdot\frac{1}{6}\cdot\frac{1}{6}+\frac{1}{6}\cdot\frac{5}{6}\cdot\frac{1}{6}=\frac{15}{216}$

$P(X=3)=\frac{1}{6}\cdot\frac{1}{6}\cdot\frac{1}{6}=\frac{1}{216}.$

9.2. Find an average number (mathematical expectation) of typing errors on page of the manuscript if the probability that the page of the manuscript contains at least one typing error is 0,95. It is supposed that the number of typing errors is distributed under the Poisson law (typing error – опечатка; an average number – среднее число).

Ответ: 3.

9.2 $P(X=m)=\frac{\lambda^m e^{-\lambda}}{m!}$

$1-0{,}95=0{,}05$

$P(X=0)=\frac{\lambda^0\cdot e^{-\lambda}}{0!}=e^{-\lambda}$

$e^{-\lambda}=0{,}05$

$-\lambda=\ln 0{,}05$

$-\lambda=-2{,}995$

$\lambda\approx 3$

Answer: 3.

9.3. The switchboard of an enterprise serves 100 subscribers. The probability that a subscriber will call on the switchboard within 1 minute is equal 0,02. Which of two events is more probable: 3 subscribers will call or 4 subscribers will call within 1 minute? (Subscriber – абонент, switchboard – коммутатор).

Ответ: 3 subscribers

9.3 $P(X=m)=\frac{\lambda^m e^{-\lambda}}{m!}$

$\lambda=n\cdot p$

$\lambda=100\cdot 0{,}02=2$

а) $P(m=3)=\frac{2^3 e^{-2}}{3!}\approx 0{,}1805$

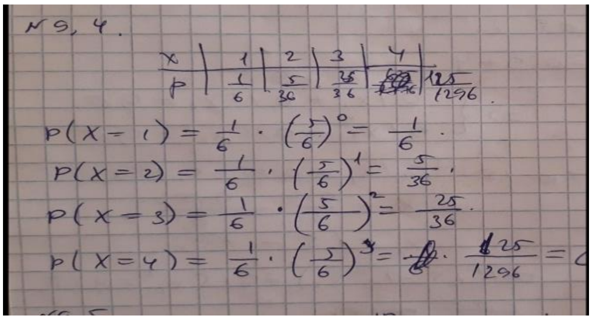
б) $P(m=4)=\frac{2^4 e^{-2}}{4!}=0{,}0902$

$0{,}1805>0{,}0902$

Ans: вероятнее, что позвонят 3 аб.

9.4. A die is tossed before the first landing «six» aces. Find the probability that the first appearance of «six» will take place: (a) at the second tossing the die; (b) at the third tossing the die; (c) at the fourth tossing the die.

Ответ: *(a)* 5/36, *(b) 25/36, (c) 125/1296*


№9,4.

x	1	2	3	4
p	$\frac{1}{6}$	$\frac{5}{36}$	$\frac{25}{36}$	$\frac{125}{1296}$

$P(X=1)=\frac{1}{6}\cdot\left(\frac{5}{6}\right)^0=\frac{1}{6}$.

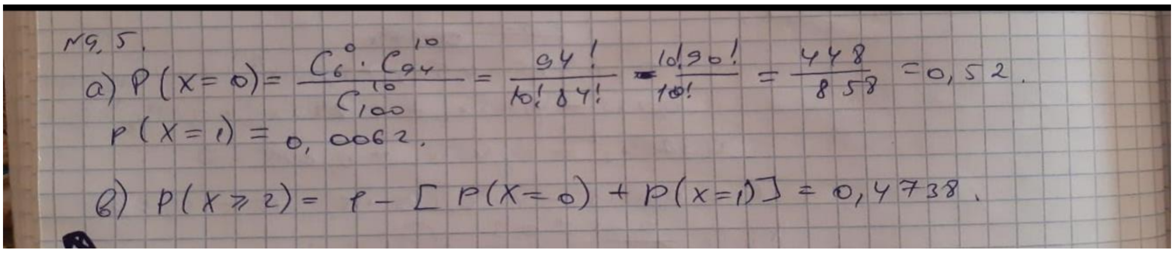
$P(X=2)=\frac{1}{6}\cdot\left(\frac{5}{6}\right)^1=\frac{5}{36}$.

$P(X=3)=\frac{1}{6}\cdot\left(\frac{5}{6}\right)^2=\frac{25}{36}$.

$P(X=4)=\frac{1}{6}\cdot\left(\frac{5}{6}\right)^3=\frac{125}{1296}=$

9.5. Suppose that a batch of 100 items contains 6 that are defective and 94 that are non-defective. If X is the number of defective items in a randomly drawn sample of 10 items from the batch, find (a) $P(X = 0)$ and (b) $P(X > 2)$.

Ответ: (а) 0,52, (б) 0,4738


№9,5.

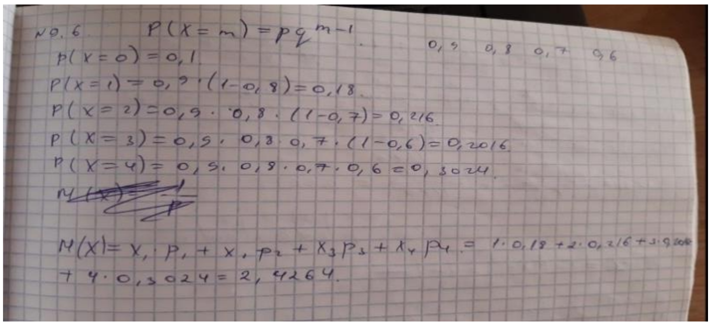
а) $P(X=0)=\frac{C_6^0\cdot C_{94}^{10}}{C_{100}^{10}}=\frac{94!}{10!\,84!}=\frac{10!\,90!}{100!}=\frac{448}{858}=0,52$.

$P(X=1)=0,0062$.

б) $P(X\geq 2)=1-[P(X=0)+P(X=1)]=0,4738$.

9.6. At horse-racing competitions it is necessary to overcome four obstacles with the probabilities equal 0,9; 0,8; 0,7; 0,6 respectively. At the first failure the sportsman in the further competitions does not participate. Compose the law of distribution of a random variable X – the number of taken obstacles. Find the mathematical expectation of the random variable X (obstacle – препятствие).

Ответ: $M(X)$ = 2,4264.


№9.6 $P(X=m)=pq^{m-1}$. 0,9 0,8 0,7 0,6

$P(X=0)=0,1$

$P(X=1)=0,9\cdot(1-0,8)=0,18$

$P(X=2)=0,9\cdot0,8\cdot(1-0,7)=0,216$

$P(X=3)=0,9\cdot0,8\cdot0,7\cdot(1-0,6)=0,2016$

$P(X=4)=0,9\cdot0,8\cdot0,7\cdot0,6=0,3024$

$M(X)=x_1p_1+x_2p_2+x_3p_3+x_4p_4=1\cdot0,18+2\cdot0,216+3\cdot0,2016$
$+4\cdot0,3024=2,4264$.

9.7. A set of families has the following distribution on number of children:

x_i	x_1	x_2	2	3
p_i	0,1	p_2	0,4	0,35

Determine x_1, x_2, p_2, if it is known that $M(X)$ = 2, $D(X)$ = 0,9.

9.9. $0,1 \cdot x_1 + x_2 p_2 + 0,4 \cdot 2 + 3 \cdot 0,35 = 2$.

$(0,1 \cdot x_1^2 + x_2^2 p_2 + 0,4 \cdot 2^2 + 3^2 \cdot 0,35) - 4 = 0,9$

$$\sim \begin{cases} 0,1x_1 + x_2p_2 + 0,8 + 1,05 = 2 \\ 0,1x^2 + x_2^2 p_2 + 1,6 + 3,15 = 0,9 + 4 \end{cases}$$

$$\begin{cases} 0,1x_1 + x_2p_2 = 0,15. \\ 0,1x^2 + x_2^2 p_2 = 0,15. \end{cases} \Rightarrow \begin{cases} 0,1x_1 + 0,15x_2 = 0,15. \\ 0,1x_1^2 + 0,15x_2^2 = 0,15 \end{cases}$$

$p_2 = 1 - (0,1 + 0,4 + 0,35) = 0,15$.

$0,1x_1 = 0,15 - 0,15x_2$

$x_1 = \frac{0,15}{0,1} - \frac{0,15x_2}{0,1}$.

$x_1 = 1,5 - 1,5x_2$.

$0,1(1,5 - 1,5x_2)^2 + 0,15x_2^2 = 0,15$.

$\cancel{0,15 \quad 0,15x}$

$0,1(2,25 - 4,5x_2 + 2,25x_2^2) + 0,15x_2^2 = 0,15$

$0,225 - 0,45x_2 + 0,225x_2^2 + 0,15x_2^2 = 0,15$

$0,375x_2^2 - 0,45x_2 + 0,075 = 0$

$D = 0,2025 - 4 \cdot 0,375 \cdot 0,075 = 0,09$.

$x_{2_{1,2}} = \frac{0,45 \pm 0,3}{2 \cdot 0,375} = 1;\ 0,2$.

$x_1 = 1,5 - 1,5 \cdot 1 = 0$.

$x_1 = 1,5 - 1,5 \cdot 0,2 = 1,2$.

Exercises for Homework 9

9.11. Compose the law of distribution of probabilities of the number of appearances of the event A in three independent trials if the probability of appearance of the event is 0,6 for each trial.

№ 9.11

$P(X=0) = C_3^0 \cdot 0,6^0 \cdot 0,4^{3-0} = 0,4^3 = 0,064$

$P(X=1) = C_3^1 \cdot 0,6^1 \cdot 0,4^{3-1} = 3 \cdot 0,6 \cdot 0,4^2 = 0,288$

$P(X=2) = C_3^2 \cdot 0,6^2 \cdot 0,4^{3-2} = 3 \cdot 0,6^2 \cdot 0,4 = 0,432$

$P(X=3) = C_3^3 \cdot 0,6^3 \cdot 0,4^{3-3} = 0,6^3 = 0,216$

x_i	0	1	2	3
p_i	0,064	0,288	0,432	0,216

$M(X) = np = 3 \cdot 0,6 = 1,8$.

$D(X) = npq = 0,6 \cdot 3 \cdot 0,4 = 0,72$

$\sigma(X) = \sqrt{D(X)} \approx 0,849$

9.12. Let *X* be a random variable equal to the number of boys in families with five children. Assume that probabilities of births of both boy and girl are the same. Find the law of distribution of the random variable *X*. Find the probabilities of the following events: (a) there are 2-3 boys in a family;

(b) no more than three boys; (c) more than 1 boy.

Ответ: a) 5/8; b) 13/16; c) 13/16.

X	0	1	2	3	4	5
P	1/32	5/32	10/32	10/32	5/32	1/32

$P(A) = P(2 \le X \le 3) = \frac{5}{8}$

$P(B) = P(X \le 3) = \frac{13}{16}$

$P(C) = P(x > 1) = \frac{13}{16}$

9.13. A factory has sent 5000 suitable details to its warehouse. The probability that a detail is broken during a transportation is 0,0002. Find the probability that 3 non-suitable details will be arrived at the warehouse.

Ответ: 0,06.

№9.13.

5000 detail $\quad n = 5000,$

$p = 0,002. \quad p = 0,002,$

non 3 $\quad m = 3.$

$\lambda = np = 5000 \cdot 0,002 = 5 \cdot 2 = 10,$

$$P(m=3) = \frac{\lambda^m e^{-\lambda}}{m!} = \frac{10^3 \cdot e^{-10}}{3!} = \frac{1000 \cdot 0,0000453}{6} = 0,0075$$

$$= \frac{1 \cdot 0,367}{6} = 0,06$$

Answer: 0,06

9.14. Suppose that the number of accidents occurring on a highway each day is a Poisson random variable with parameter $\lambda = 3$. (a) Find the probability that 3 or more accidents occur today.

(b) Repeat part (a) under the assumption that at least 1 accident occurs today.

The answer: **a) 0,577; b) 0,627.**

№9.14.

$\lambda = 3.$

$$P(X \geq 3) = 1 - \sum_{i=0}^{2} \frac{3^i}{i!\, e^{\lambda}} = 1 - \left(\frac{3^0 e^{-3}}{0!} + \frac{3^1}{1!\, e^3} + \frac{3^2 e^{-3}}{2!}\right)$$

$= 0,57681.$

$$P\{(X \geq 3)(X \geq 1)\} = \frac{P\{(X \geq 3) \cap (X \geq 1)\}}{P\{X \geq 1\}} \Rightarrow (X \geq 1) \subset (X \geq 3) \Rightarrow$$

$$\frac{P\{(X \geq 3) \cap (X \geq 1)\}}{P\{X \geq 1\}} = \frac{P(X \geq 3)}{P(X \geq 1)} = \frac{0,57681}{1 - P(X=0)} = \frac{0,57681}{1 - e^{-3}} =$$

$= 0,607.$

9.15. A hunter shoots on a game before the first hit, but he managed to make no more than four shots. The probability of hit by him at one shot is 0,9.

(a) Find the law of distribution of a random variable *X* – the number of misses;

(b) Find the probability of the following events: $X < 2$, $X \leq 3$, $1 < X \leq 3$ (hunter – охотник; game – дичь).

The answer: **b) 0,99; 0,9999; 0,0099.**

№9.15.

$p = 0,9.$

$P(X=0) = 0,9.$

$P(X=1) = 0,1 \cdot 0,9 = 0,09.$

$P(X=2) = 0,1 \cdot 0,1 \cdot 0,9 = 0,009$

$P(X=3) = 0,1 \cdot 0,1 \cdot 0,1 \cdot 0,9 = 0,0009$

9.16. There are 11 students in a group, and 5 of them are girls. Compose the law of distribution of the random variable *X* – the number of girls from randomly selected three students.

9.16 students – 11, girls – 5

X	0	1	2	3
p	$\frac{4}{33}$	$\frac{5}{11}$	$\frac{12}{33}$	$\frac{2}{33}$

$$P(X=k)=\frac{C_5^k\cdot C_6^{3-k}}{C_{11}^3},\ k=0,1,2,3.$$

$$P(X=0)=\frac{C_5^0\cdot C_6^3}{C_{11}^3}=\frac{\frac{5!}{0!\,5!}\cdot\frac{6!}{3!\,3!}}{\frac{11!}{8!\,3!}}=\frac{\frac{6\cdot5\cdot4}{3\cdot2}}{\frac{11\cdot10\cdot9}{3\cdot2}}=\frac{6\cdot5\cdot4}{11\cdot10\cdot9}=\frac{4}{33}$$

$$P(X=1)=\frac{C_5^1\cdot C_6^2}{C_{11}^3}=\frac{\frac{5!}{4!}\cdot\frac{6!}{4!\,2!}}{\frac{11!}{8!\,3!}}=\frac{5\cdot\frac{6\cdot5}{2}}{\frac{11\cdot10\cdot9}{3\cdot2}}=\frac{5\cdot5\cdot3}{1}\cdot\frac{3\cdot2}{11\cdot10\cdot9}=\frac{5}{11}$$

$$P(X=2)=\frac{C_5^2\cdot C_6^1}{C_{11}^3}=\frac{\frac{5!}{3!\,2!}\cdot\frac{6!}{5!}}{\frac{11!}{8!\,3!}}=\frac{\frac{5\cdot4}{2}\cdot6}{\frac{11\cdot10\cdot9}{3\cdot2}}=\frac{5\cdot5\cdot2}{1}\cdot\frac{3\cdot2}{11\cdot10\cdot9}=\frac{12}{33}$$

$$P(X=3)=\frac{C_5^3\cdot C_6^0}{C_{11}^3}=\frac{\frac{5!}{2!\,3!}\cdot\frac{6!}{6!\,0!}}{\frac{11!}{8!\,3!}}=\frac{\frac{5\cdot4}{2}}{\frac{11\cdot10\cdot9}{3\cdot2}}=\frac{5\cdot2}{1}\cdot\frac{3\cdot2}{11\cdot10\cdot9}=\frac{2}{33}$$

9.17. There are 8 pencils in a box, and 5 of them are green. 3 pencils are randomly taken from the box.

(a) Find the law of distribution of a random variable *X* equal to the number of green pencils among taken.

(b) Find the probability of the event: $0 < X \leq 2$.

The answer: **b) 45/56.**

9.17 pencils – 8, green – 5.

a)

X	0	1	2	3
p	$\frac{1}{56}$	$\frac{15}{56}$	$\frac{30}{56}$	$\frac{10}{56}$

$$P(X=k)=\frac{C_5^k\, C_3^{3-k}}{C_8^3},\ k=0,1,2,3.$$

$$P(X=0)=\frac{C_5^0\cdot C_3^3}{C_8^3}=\frac{\frac{5!}{5!\,0!}\cdot\frac{3!}{0!\,3!}}{\frac{3!}{5!\,3!}}=\frac{1}{\frac{8\cdot7\cdot6}{3\cdot2}}=\frac{3\cdot2}{8\cdot7\cdot6}=\frac{1}{56}$$

$$P(X=1)=\frac{C_5^1\cdot C_3^2}{C_8^3}=\frac{\frac{5!}{4!\,1!}\cdot\frac{3!}{2!\,1!}}{\frac{8!}{5!\,3!}}=\frac{\frac{5}{1}\cdot\frac{3}{1}}{\frac{8\cdot7\cdot6}{3\cdot2}}=15\cdot\frac{6}{8\cdot7\cdot6}=\frac{15}{56}$$

$$P(X=2)=\frac{C_5^2\cdot C_3^1}{C_8^3}=\frac{\frac{5!}{3!\,2!}\cdot\frac{3!}{2!}}{\frac{8!}{5!\,3!}}=\frac{\frac{5\cdot4}{2}\cdot\frac{3}{1}}{\frac{8\cdot7\cdot6}{6}}=5\cdot2\cdot3\cdot\frac{6}{8\cdot7\cdot6}=\frac{30}{56}$$

$$P(X=3)=\frac{C_5^3\, C_3^0}{C_8^3}=\frac{\frac{5!}{2!\,3!}\cdot\frac{3!}{0!\,3!}}{\frac{8\cdot7\cdot6}{3\cdot2}}=\frac{\frac{5\cdot4}{2}\cdot1}{8\cdot7}=\frac{10}{56}$$

b) $0\leq X<2$, $P=\frac{15}{56}+\frac{30}{56}=\frac{45}{56}$

9.18. There are 20 products in a set, and 4 of them are defective. 3 products are randomly chosen for checking their quality. Compose the law of distribution of a random variable *X* – the number of defective products contained in the sample.

9.18 products – 20
defective – 4

X	0	1	2	3
P	$\frac{140}{285}$	$\frac{120}{285}$	$\frac{24}{285}$	$\frac{1}{285}$

$$P(x=k)=\frac{C_4^k C_{16}^{3-k}}{C_{20}^3},\quad k=0,1,2,3.$$

$$P(x=0)=\frac{C_4^0 C_{16}^3}{C_{20}^3}=\frac{\frac{4!}{4!\,0!}\cdot\frac{16!}{13!\,3!}}{\frac{20!}{17!\,3!}}=\frac{\frac{16\cdot15\cdot14}{3\cdot2}}{\frac{20\cdot19\cdot18}{3\cdot2}}=$$

$$=\frac{16\cdot15\cdot14}{3\cdot2}\cdot\frac{3\cdot2}{20\cdot19\cdot18}=\frac{28}{57}$$

$$P(x=1)=\frac{C_4^1 C_{16}^2}{C_{20}^3}=\frac{\frac{4!}{3!\,1!}\cdot\frac{16!}{14!\,2!}}{20\cdot19\cdot3}=\frac{4\cdot\frac{16\cdot15}{2}}{20\cdot19\cdot3}=$$

$$=\frac{2\cdot16\cdot15}{20\cdot19\cdot3}=\frac{8}{19}$$

$$P(x=2)=\frac{C_4^2\cdot C_{16}^1}{C_{20}^3}=\frac{\frac{4!}{2!\,2!}\cdot\frac{16!}{15!}}{20\cdot19\cdot3}=\frac{\frac{4\cdot3}{2}\cdot16}{20\cdot19\cdot3}=\frac{8\cdot16}{20\cdot19\cdot8}=$$

$$=\frac{8}{95}$$

$$P(x=3)=\frac{C_4^3 C_{16}^0}{C_{20}^3}=\frac{\frac{4!}{3!}\cdot\frac{16!}{16!\,0!}}{20\cdot19\cdot3}=\frac{4}{20\cdot19\cdot3}=\frac{1}{285}$$

9.19. The probability of successful passing an exam by the first student is 0,7, and by the second – 0,8. Compose the law of distribution of a random variable *X* – the number of the students successfully passed the exam if each of them can retake only once the exam if he didn't pass it at the first time. Find the mathematical expectation of the random variable *X*.

***The answer*: *M(X)* = 1,87.**

9.19
$p_1=0{,}7$
$p_2=0{,}8$
$q_1=0{,}3$
$q_2=0{,}2$

X	0	1	2
P	0,0036	0,1228	0,8736

$P(0)=0{,}3\cdot0{,}3\cdot0{,}2\cdot0{,}2=0{,}0036$

$P(1)=0{,}7\cdot0{,}2\cdot0{,}2+0{,}3\cdot0{,}7\cdot0{,}2\cdot0{,}2+0{,}3\cdot0{,}3\cdot0{,}8+0{,}3\cdot0{,}3\cdot0{,}2\cdot0{,}8=0{,}028+0{,}084+0{,}072+0{,}0144=0{,}1228$

$P(2)=0{,}7\cdot0{,}8+0{,}7\cdot0{,}2\cdot0{,}8+0{,}3\cdot0{,}7\cdot0{,}8+0{,}3\cdot0{,}7\cdot0{,}8=0{,}56+0{,}112+0{,}168+0{,}0336=$
$=0{,}8736$

$M(x)=0\cdot0{,}0036+1\cdot0{,}1228+2\cdot0{,}8736=$
$=1{,}87.$

9.20. A discrete random variable *X* is given by the following law of distribution:

x_i	1	X_2	x_3	3
p_i	0,1	P_2	0,5	0,1

Determine x_2, x_3, p_2, if it is known that $M(X) = 4$, $M(X^2) = 20{,}2$.

***The answer:* $x_2 = 2$; $x_3 = 6$ or $x_2 = 7$; $x_3 = 3$.**

№20

$$\begin{cases} 1\cdot 0{,}1 + x_2\cdot p_2 + x_3\cdot 0{,}5 + 3\cdot 0{,}1 = 4 \\ 1^2\cdot 0{,}1 + x_2^2\cdot p_2 + x_3^2\cdot 0{,}5 + 3^2\cdot 0{,}1 = 20{,}2 \end{cases}$$

$$p_2 = 1 - 0{,}1 - 0{,}5 - 0{,}1 = 0{,}3$$

$$\begin{cases} 0{,}1 + x_2\cdot 0{,}3 + x_3\cdot 0{,}5 + 0{,}3 = 4 \\ 0{,}1 + x_2^2\cdot 0{,}3 + x_3^2\cdot 0{,}5 + 0{,}9 = 20{,}2 \end{cases} \Rightarrow \begin{cases} x_2\, 0{,}3 + x_3\, 0{,}5 = 3{,}6 \\ x_2^2\cdot 0{,}3 + x_3^2\cdot 0{,}5 = 19{,}2 \end{cases}$$

$$\begin{cases} 3x_2 + 5x_3 = 36 \\ 3x_2^2 + 5x_3^2 = 192 \end{cases}$$

$$x_2 = \frac{36 - 5x_3}{3}$$

$$3\cdot\frac{(36-5x_3)^2}{9} + 5x_3^2 = 192 \;|\cdot 3$$

$$(36 - 5x_3)^2 + 15x_3^2 = 576$$

$$1296 - 360x_3 + 25x_3^2 + 15x_3^2 - 576 = 0$$

$$40x_3^2 - 360x_3 + 720 = 0$$

$$4x_3^2 - 36x_3 + 72 = 0$$

$$x_3^2 - 9x_3 + 18 = 0$$

$$D = 81 - 72 = 9$$

$$x_{3_{1/2}} = \frac{9 \pm 3}{2} = \boxed{6;\ 3}$$

$$x_{2_1} = \frac{36-30}{3} = 2$$

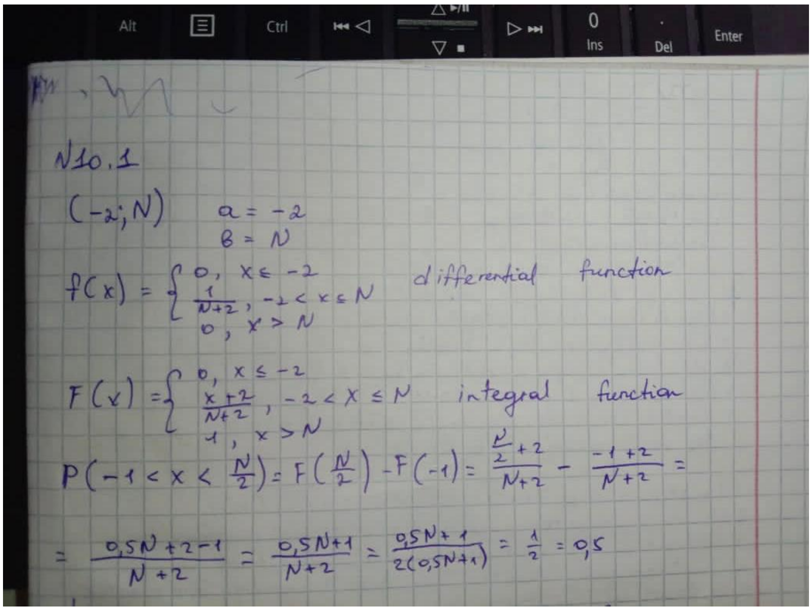
$$x_{2_2} = \frac{36-15}{3} = 7$$

Answer: $x_2 = 2$; $x_3 = 6$ or $x_2 = 7$; $x_3 = 3$, $p_2 = 0{,}3$

Exercises for Seminar 10

10.1. A random variable *X* is uniformly distributed in the interval (-2; *N*). Find: (a) the differential function of the random variable *X*; (b) the integral function; (c) the probability of hit of the random variable into the interval (-1; *N*/2); (d) the mathematical expectation, the dispersion and the mean square deviation the random variable *X*.

***The answer*: c) 0,5.**



N10.1

$(-2;N)$ $\quad a=-2$, $\quad в = N$

$$f(x)=\begin{cases}0, & x\le -2\\ \frac{1}{N+2}, & -2<x\le N\\ 0, & x>N\end{cases}$$ differential function

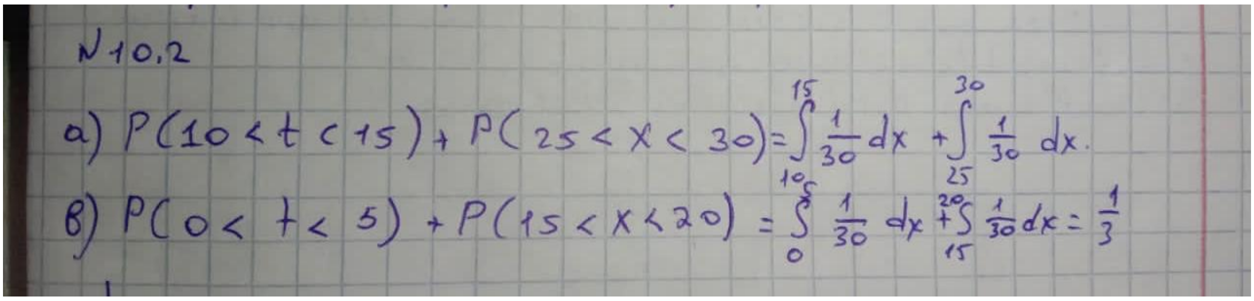
$$F(x)=\begin{cases}0, & x\le -2\\ \frac{x+2}{N+2}, & -2<x\le N\\ 1, & x>N\end{cases}$$ integral function

$$P\left(-1<x<\frac{N}{2}\right)=F\left(\frac{N}{2}\right)-F(-1)=\frac{\frac{N}{2}+2}{N+2}-\frac{-1+2}{N+2}=$$

$$=\frac{0{,}5N+2-1}{N+2}=\frac{0{,}5N+1}{N+2}=\frac{0{,}5N+1}{2(0{,}5N+1)}=\frac{1}{2}=0{,}5$$

10.2. Buses arrive at a specified stop at 15-minute intervals starting at 7 a.m. That is, they arrive at 7, 7:15, 7:30, 7:45, and so on. If a passenger arrives at the stop at a time that is uniformly distributed between 7 and 7:30, find the probability that he waits: (a) less than 5 minutes for a bus; (b) more than 10 minutes for a bus.

***The answer:* a) 1/3; b) 1/3.**



N10.2

a) $P(10<t<15)+P(25<X<30)=\int_{10}^{15}\frac{1}{30}dx+\int_{25}^{30}\frac{1}{30}dx.$

в) $P(0<t<5)+P(15<X<20)=\int_{0}^{5}\frac{1}{30}dx+\int_{15}^{20}\frac{1}{30}dx=\frac{1}{3}$

10.3. You arrive at a bus stop at 10 o'clock, knowing that the bus will arrive at some time uniformly distributed between 10 and 10:30.

What is the probability that you will have to wait longer than 10 minutes?

***The answer:* 2/3.**

N 10.3

(10; 10:30)

$P(x > 10)$

$\varphi(x) = \frac{1}{b-a} = \frac{1}{30}$

$P(x > 10) = \int_{10}^{30} \frac{1}{30}\,dx = \frac{1}{30}x \Big|_{10}^{30} = \frac{1}{30} \cdot 30 - \frac{1}{30} \cdot 10 = \frac{2}{3}$

$P(x > 10) = \frac{2}{3}$

10.4. A random variable *X* is distributed under an exponential law with parameter λ = 0,5. Find:

(a) the probability density and the distribution function of *X*; (b) the probability of hit of the random variable *X* into the interval (2; 4); (c) the mathematical expectation, the dispersion and the mean square deviation of *X*.

The answer: **b) 0,233.**

N 10.4

$\lambda = 0,5$

a) $\varphi(x)$ - ? $F(x)$ - ? b) $P(x_1 \le x < x_2)$ = ? c) $M(x)$ - ? $D(x)$ - ? σ - ?

a) $\varphi(x) = \begin{cases} 0,5\, e^{-0,5x} & \text{for } x \ge 0 \\ 0 & \text{for } x < 0 \end{cases}$ $F(x) = \begin{cases} 0 & \text{for } x < 0 \\ 1 - e^{-0,5x} & \text{for } x \ge 0 \end{cases}$

$F(x) = 1 - e^{-0,5x}$

b) $P(x_1 \le x < x_2) = F(x_2) - F(x_1)$ interval (2; 4)

$x_1 = 2$ $x_2 = 4$

$(1 - e^{-0,5 \cdot 4}) - (1 - e^{-0,5 \cdot 2})$

$e^{-\frac{1}{2}} + e^{-1} - \frac{1}{\sqrt{e}_{2,7}} + \frac{1}{e} = \frac{1}{e} - \frac{1}{\sqrt{e}}$

$-((e^{-0,5 \cdot 4}) - (e^{-0,5 \cdot 2})) = -((e^{-2}) - (e^{-1})) = -(\frac{1}{\sqrt{e}} - \frac{1}{e})$

$= \frac{1}{e} - \frac{1}{\sqrt{e}} = \frac{1}{2,7} - \frac{1}{\sqrt{2,7}} \approx 0,233$

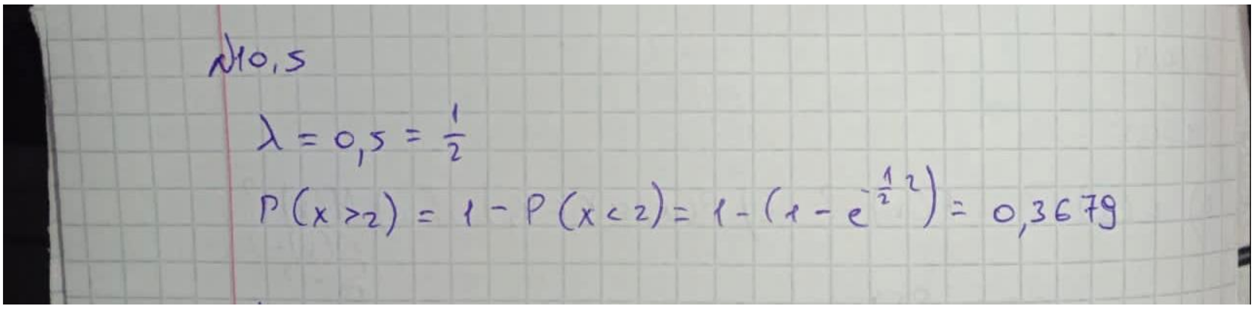
c) $M(x) = \frac{1}{\lambda} = \frac{1}{0,5} = 2$

$D(x) = \frac{1}{(0,5)^2} = \cancel{2,5}\ 25$

$\sigma = \sqrt{D(x)} = 5.$

10.5. The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter λ = 0,5. What is the probability that a repair time exceeds 2 hours?

The answer: **0,3679.**



№10,5

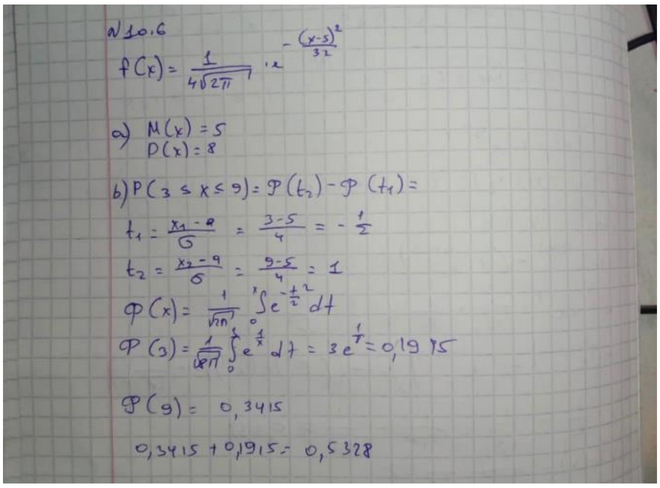
$\lambda = 0{,}5 = \frac{1}{2}$

$P(x>2) = 1 - P(x<2) = 1 - (1 - e^{-\frac{1}{2} \cdot 2}) = 0{,}3679$

10.6. A normally distributed random variable *X* is given by the differential function:

$f(x) = \frac{1}{4\sqrt{2\pi}} \cdot e^{-\frac{(x-5)^2}{32}}$. Determine: (a) the mathematical expectation and the dispersion of the random variable *X;* (b) the probability of hit of the random variable *X* into the interval (3; 9).

***The answer*: b) 0,5328.**



№10.6

$f(x) = \frac{1}{4\sqrt{2\pi}} \cdot e^{-\frac{(x-5)^2}{32}}$

a) $M(x) = 5$
$D(x) = 8$

b) $P(3 \le x \le 9) = \Phi(t_2) - \Phi(t_1) =$

$t_1 = \frac{x_1 - a}{\sigma} = \frac{3-5}{4} = -\frac{1}{2}$

$t_2 = \frac{x_2 - a}{\sigma} = \frac{9-5}{4} = 1$

$\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_0^x e^{-\frac{t^2}{2}} dt$

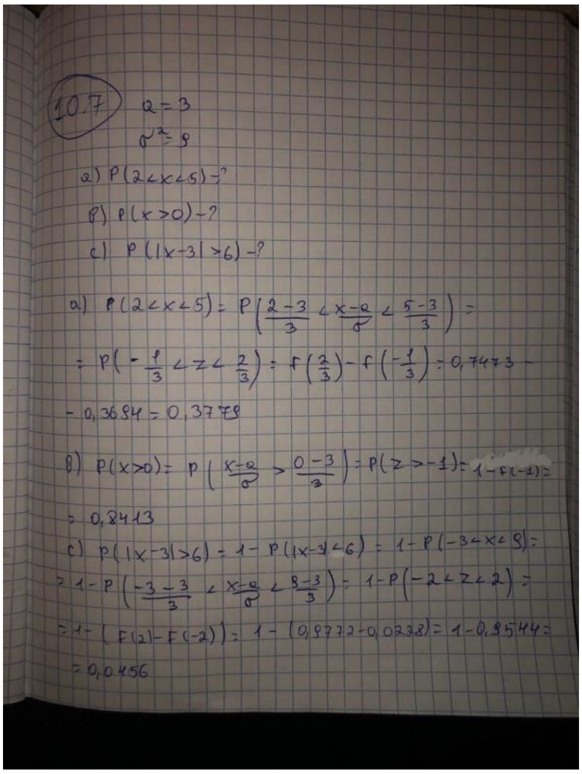
$\Phi(3) = \frac{1}{\sqrt{2\pi}} \int_0^x e^{\frac{1}{x}} dt = 3e^{\frac{1}{7}} = 0{,}1915$

$\Phi(9) = 0{,}3415$

$0{,}3415 + 0{,}1915 = 0{,}5328$

10.7. If *X* is a normal random variable with parameters *a* = 3 and σ^2 = 9, find (a) *P*(2 < *X* < 5); (b) *P*(*X* > 0); (c) *P*(|*X* – 3| > 6).

***The answer:* a) 0,3779; b) 0,8413; c) 0,0456.**



10.7 $a=3$, $\sigma^2=9$

a) $P(2<X<5)$ -?

b) $P(X>0)$ -?

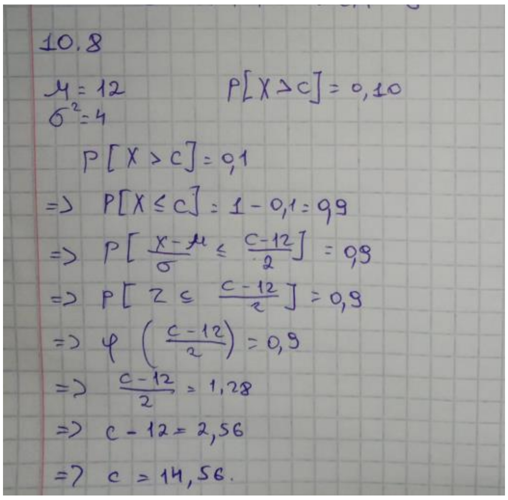
c) $P(|X-3|>6)$ -?

a) $P(2<X<5) = P\left(\frac{2-3}{3} < \frac{X-a}{\sigma} < \frac{5-3}{3}\right) = P\left(-\frac{1}{3} < Z < \frac{2}{3}\right) = F\left(\frac{2}{3}\right) - F\left(-\frac{1}{3}\right) = 0{,}7473 - 0{,}3694 = 0{,}3779$

b) $P(X>0) = P\left(\frac{X-a}{\sigma} > \frac{0-3}{3}\right) = P(Z>-1) = 1-F(-1) = 0{,}8413$

c) $P(|X-3|>6) = 1 - P(|X-3|<6) = 1 - P(-3<X<9) = 1 - P\left(\frac{-3-3}{3} < \frac{X-a}{\sigma} < \frac{9-3}{3}\right) = 1 - P(-2<Z<2) = 1 - (F(2)-F(-2)) = 1 - (0{,}9772-0{,}0228) = 1 - 0{,}9544 = 0{,}0456$

10.8. Let *X* be a normal random variable with mathematical expectation 12 and dispersion 4. Find the value of *C* such that *P*(*X* > *C*) = 0,1.



10.8

$\mu = 12$ $\quad P[X>c] = 0{,}10$

$\sigma^2 = 4$

$P[X>c] = 0{,}1$

$\Rightarrow P[X \le c] = 1 - 0{,}1 = 0{,}9$

$\Rightarrow P\left[\frac{X-\mu}{\sigma} \le \frac{c-12}{2}\right] = 0{,}9$

$\Rightarrow P\left[Z \le \frac{c-12}{2}\right] = 0{,}9$

$\Rightarrow \varphi\left(\frac{c-12}{2}\right) = 0{,}9$

$\Rightarrow \frac{c-12}{2} = 1{,}28$

$\Rightarrow c - 12 = 2{,}56$

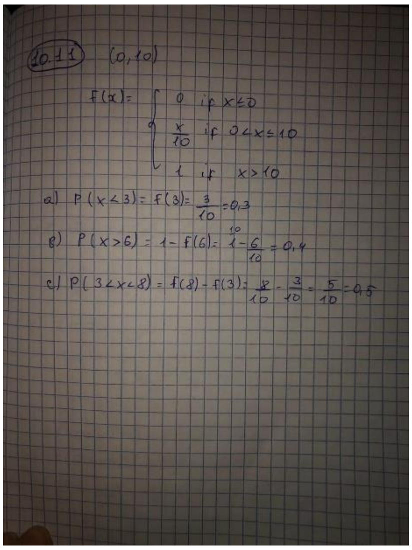
$\Rightarrow c = 14{,}56.$

Exercises for Homework 10

10.11. If *X* is uniformly distributed over (0, 10), calculate the probability that

(a) *X* < 3; (b) *X* > 6; (c) 3 < *X* < 8.

The answer: **a) 0,3; b) 0,4; c) 0,5.**



10.11 (0,10)

$$F(x)=\begin{cases} 0 & \text{if } x\le 0 \\ \frac{x}{10} & \text{if } 0<x\le 10 \\ 1 & \text{if } x>10 \end{cases}$$

a) $P(x<3)=F(3)=\frac{3}{10}=0{,}3$

б) $P(x>6)=1-F(6)=\frac{10}{10}-\frac{6}{10}=0{,}4$

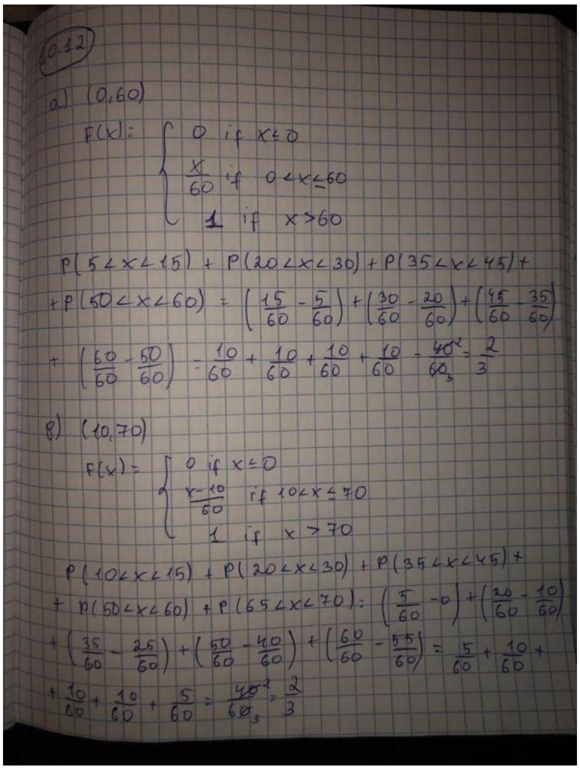
c) $P(3<x<8)=F(8)-F(3)=\frac{8}{10}-\frac{3}{10}=\frac{5}{10}=0{,}5$

10.12. Trains headed for destination A arrive at the train station at 15-minute intervals starting at 7 a.m., whereas trains headed for destination B arrive at 15-minute intervals starting at 7:05 a.m.

(a) If a certain passenger arrives at the station at a time uniformly distributed between 7 and 8 a.m. and then gets on the first train that arrives, what proportion of time does he or she go to destination A?

(b) What if the passenger arrives at a time uniformly distributed between 7:10 and 8:10 a.m.?

The answer: **a) 2/3; b) 7/12.**



10.12

a) (0,60)

$$F(x)=\begin{cases} 0 & \text{if } x\le 0 \\ \frac{x}{60} & \text{if } 0<x\le 60 \\ 1 & \text{if } x>60 \end{cases}$$

$$P(5<x<15)+P(20<x<30)+P(35<x<45)+P(50<x<60)=\left(\frac{15}{60}-\frac{5}{60}\right)+\left(\frac{30}{60}-\frac{20}{60}\right)+\left(\frac{45}{60}-\frac{35}{60}\right)+\left(\frac{60}{60}-\frac{50}{60}\right)=\frac{10}{60}+\frac{10}{60}+\frac{10}{60}+\frac{10}{60}=\frac{40}{60}=\frac{2}{3}$$

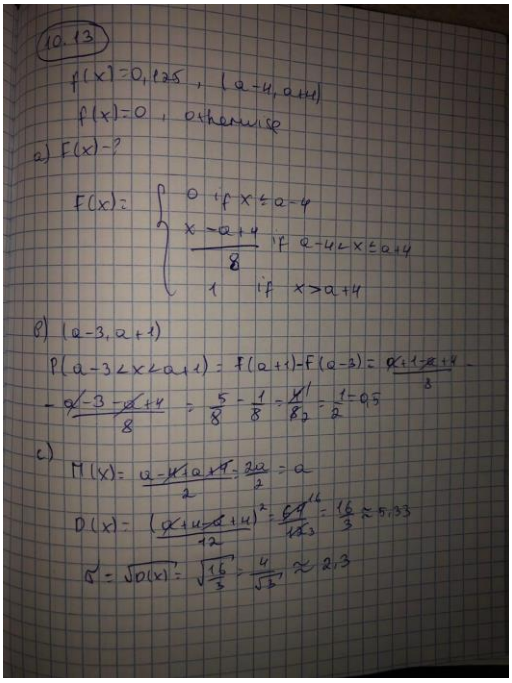
б) (10,70)

$$F(x)=\begin{cases} 0 & \text{if } x\le 0 \\ \frac{x-10}{60} & \text{if } 10<x\le 70 \\ 1 & \text{if } x>70 \end{cases}$$

$$P(10<x<15)+P(20<x<30)+P(35<x<45)+P(50<x<60)+P(65<x<70)=\left(\frac{5}{60}-0\right)+\left(\frac{20}{60}-\frac{10}{60}\right)+\left(\frac{35}{60}-\frac{25}{60}\right)+\left(\frac{50}{60}-\frac{40}{60}\right)+\left(\frac{60}{60}-\frac{55}{60}\right)=\frac{5}{60}+\frac{10}{60}+\frac{10}{60}+\frac{10}{60}+\frac{5}{60}=\frac{40}{60}=\frac{2}{3}$$

10.13. A uniformly distributed random variable *X* is given by the probability density *f(x)* = 0,125 in the interval (*a* – 4; *a* + 4), and *f(x)* = 0 if otherwise. Find: (a) the distribution function of *X*; (b) the probability of hit of *X* into the interval (*a* – 3; *a* + 1); (c) the mathematical expectation, the dispersion and the mean square deviation of *X*.

The answer**: b) 0,5.**



10.13

$f(x)=0{,}125$, $(a-4, a+4)$

$f(x)=0$, otherwise

a) $F(x)-?$

$$F(x)=\begin{cases} 0 & \text{if } x \le a-4 \\ \frac{x-a+4}{8} & \text{if } a-4<x\le a+4 \\ 1 & \text{if } x>a+4 \end{cases}$$

b) $(a-3, a+1)$

$P(a-3<x<a+1)=F(a+1)-F(a-3)=\frac{\cancel{a}+1-\cancel{a}+4}{8}-\frac{\cancel{a}-3-\cancel{a}+4}{8}=\frac{5}{8}-\frac{1}{8}=\frac{4}{8}=\frac{1}{2}=0{,}5$

c)

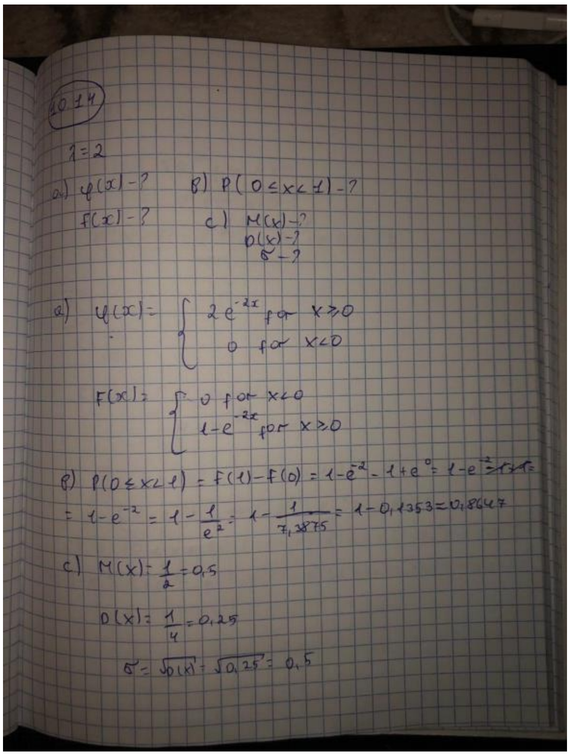
$M(x)=\frac{a-\cancel{4}+a+\cancel{4}}{2}=\frac{2a}{2}=a$

$D(x)=\frac{(\cancel{a}+4-\cancel{a}+4)^2}{12}=\frac{64}{12}=\frac{16}{3}\approx 5{,}33$

$\sigma=\sqrt{D(x)}=\sqrt{\frac{16}{3}}=\frac{4}{\sqrt{3}}\approx 2{,}3$

10.14. A random variable *X* is distributed under an exponential law with parameter λ = 2. Find: (a) the probability density and the distribution function of *X*; (b) the probability of hit of the random variable *X* into the interval (0; 1); (c) the mathematical expectation, the dispersion and the mean square deviation of *X*.

The answer: **b) 0,8647.**



10.14

$\lambda=2$

a) $\varphi(x)-?$ b) $P(0\le x<1)-?$

$F(x)-?$ c) $M(x)-?$ $D(x)-?$ $\sigma-?$

a) $$\varphi(x)=\begin{cases} 2e^{-2x} & \text{for } x\ge 0 \\ 0 & \text{for } x<0 \end{cases}$$

$$F(x)=\begin{cases} 0 & \text{for } x<0 \\ 1-e^{-2x} & \text{for } x\ge 0 \end{cases}$$

b) $P(0\le x<1)=F(1)-F(0)=1-e^{-2}-1+e^{0}=1-e^{-2}=1-e^{-2}=1-\frac{1}{e^2}=1-\frac{1}{7{,}3875}=1-0{,}1353=0{,}8647$

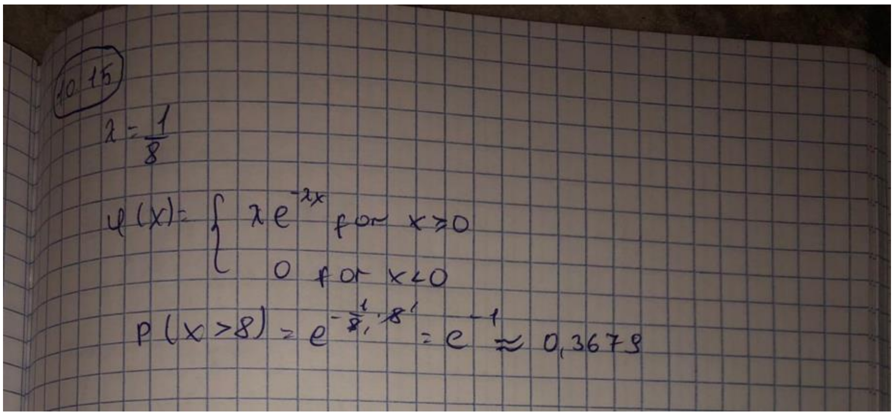
c) $M(x)=\frac{1}{2}=0{,}5$

$D(x)=\frac{1}{4}=0{,}25$

$\sigma=\sqrt{D(x)}=\sqrt{0{,}25}=0{,}5$

10.15. The number of years a radio functions is exponentially distributed with parameter λ = 1/8. If Jones buys a used radio, what is the probability that it will be working after an additional 8 years?

The answer: **0,3679.**



10.15

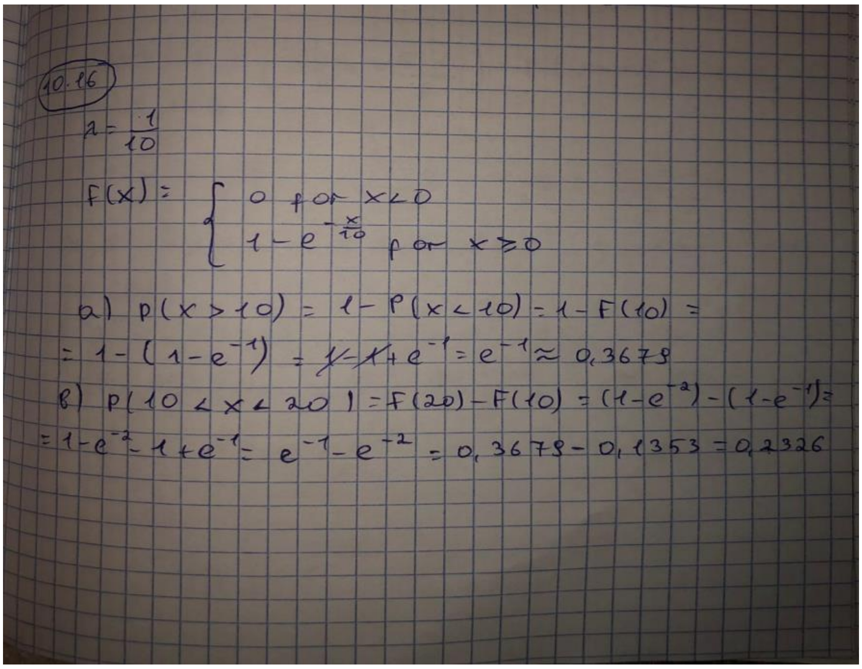
$\lambda = \frac{1}{8}$

$$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & \text{for } x \geq 0 \\ 0 & \text{for } x < 0 \end{cases}$$

$$P(X>8) = e^{-\frac{1}{8}\cdot 8} = e^{-1} \approx 0{,}3679$$

10.16. Suppose that the length of a phone call in minutes is an exponential random variable with parameter λ = 1/10. If someone arrives immediately ahead of you at a public telephone booth, find the probability that you will have to wait (a) more than 10 minutes; (b) between 10 and 20 minutes.

The answer: **a) 0,3679; b) 0,2326.**



10.16

$\lambda = \frac{1}{10}$

$$F(x) = \begin{cases} 0 & \text{for } x < 0 \\ 1 - e^{-\frac{x}{10}} & \text{for } x \geq 0 \end{cases}$$

a) $P(X>10) = 1 - P(X<10) = 1 - F(10) =$

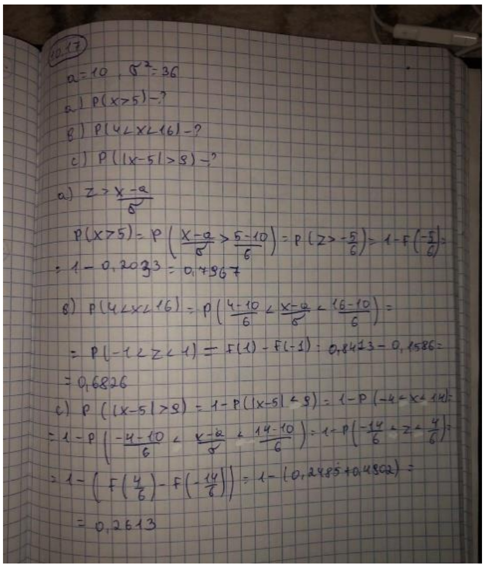
$= 1 - (1 - e^{-1}) = \cancel{1} - \cancel{1} + e^{-1} = e^{-1} \approx 0{,}3679$

b) $P(10 < X < 20) = F(20) - F(10) = (1 - e^{-2}) - (1 - e^{-1}) =$

$= 1 - e^{-2} - 1 + e^{-1} = e^{-1} - e^{-2} = 0{,}3679 - 0{,}1353 = 0{,}2326$

10.17. If X is a normal random variable with parameters a = 10 and σ^2 = 36, compute: (a) $P(X > 5)$; (b) $P(4 < X < 16)$; (c) $P(|X - 5| > 9)$.

The answer: **a) 0,7967; b) 0,6826; c) 0,2613.**



10.17

$a = 10,\ \sigma^2 = 36$

a) $P(X>5)$ – ?

b) $P(4<X<16)$ – ?

c) $P(|X-5|>9)$ – ?

a) $Z = \frac{X-a}{\sigma}$

$P(X>5) = P\left(\frac{X-a}{\sigma} > \frac{5-10}{6}\right) = P\left(Z > -\frac{5}{6}\right) = 1 - F\left(-\frac{5}{6}\right) =$

$= 1 - 0{,}2033 = 0{,}7967$

b) $P(4<X<16) = P\left(\frac{4-10}{6} < \frac{X-a}{\sigma} < \frac{16-10}{6}\right) =$

$= P(-1<Z<1) = F(1) - F(-1) = 0{,}8413 - 0{,}1586 =$

$= 0{,}6826$

c) $P(|X-5|>9) = 1 - P(|X-5|<9) = 1 - P(-4<X<14) =$

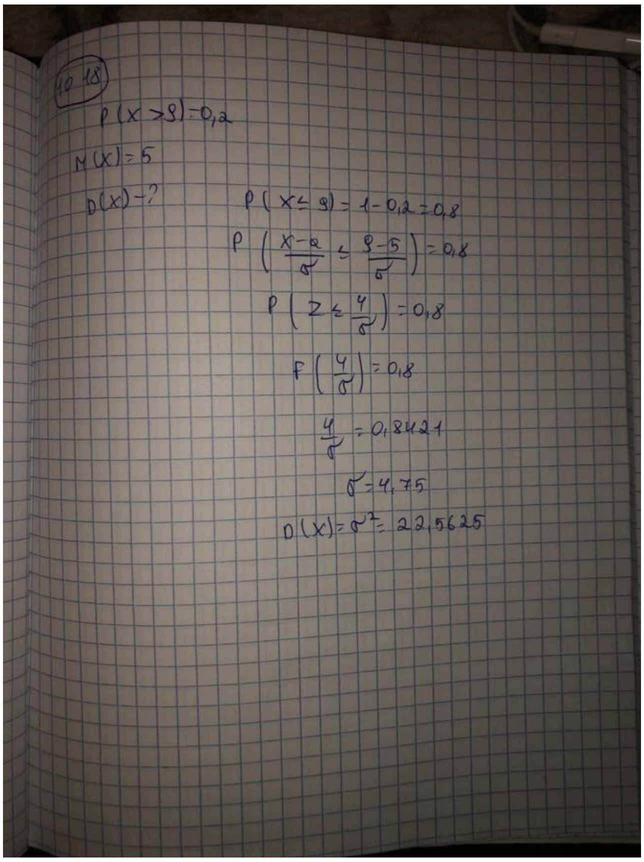
$= 1 - P\left(\frac{-4-10}{6} < \frac{X-a}{\sigma} < \frac{14-10}{6}\right) = 1 - P\left(-\frac{14}{6} < Z < \frac{4}{6}\right) =$

$= 1 - \left(F\left(\frac{4}{6}\right) - F\left(-\frac{14}{6}\right)\right) = 1 - (0{,}2485 + 0{,}4902) =$

$= 0{,}2613$

10.18. Suppose that *X* is a normal random variable with mathematical expectation 5. If *P*(*X* > 9) = 0,2, approximately what is *D(X)*?

The answer: **22,5625.**



10.18

$P(X>9) = 0{,}2$

$M(X) = 5$

$D(X)$ – ?

$P(X \le 9) = 1 - 0{,}2 = 0{,}8$

$P\left(\frac{X-a}{\sigma} \le \frac{9-5}{\sigma}\right) = 0{,}8$

$P\left(Z \le \frac{4}{\sigma}\right) = 0{,}8$

$F\left(\frac{4}{\sigma}\right) = 0{,}8$

$\frac{4}{\sigma} = 0{,}8421$

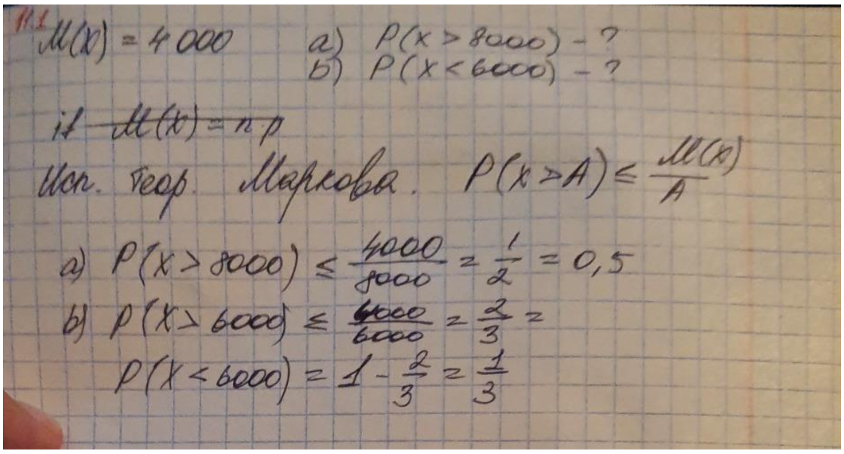
$\sigma = 4{,}75$

$D(X) = \sigma^2 = 22{,}5625$

Exercises for Seminar 11

11.1. The amount of electric power consumed by a settlement within day is a random variable of which the mathematical expectation is 4 thousands of kWt·h. Estimate the probability that for the nearest day the consumption of energy: a) will exceed 8 thousands of kWt·h; b) will not exceed 6 thousands of kWt·h (settlement – поселок; electric power – электроэнергия; consumption – потребление).

***The answer*: a) 0,5; b) 0,33.**



11.1 $M(X) = 4000$ a) $P(X > 8000)$ – ? b) $P(X < 6000)$ – ?

~~if $M(X) = np$~~

Исп. теор. Маркова. $P(X > A) \le \frac{M(X)}{A}$

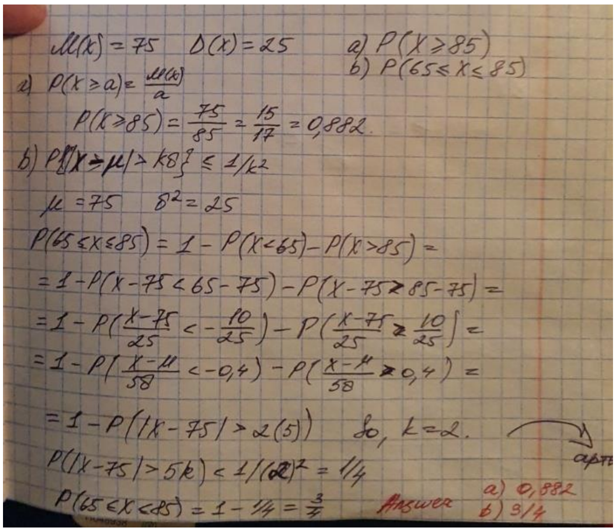
a) $P(X > 8000) \le \frac{4000}{8000} = \frac{1}{2} = 0,5$

b) $P(X > 6000) \le \frac{4000}{6000} = \frac{2}{3} =$

$P(X < 6000) = 1 - \frac{2}{3} = \frac{1}{3}$

11.2. From past experience a professor knows that the test score of a student taking his or her final examination is a random variable with mathematical expectation 75. Give an upper bound for the probability that a student's test score will exceed 85. Suppose, in addition, the professor knows that the dispersion of a student's test score is equal to 25. What can be said about the probability that a student will score between 65 and 85?

***The answer:* 0,882; 0,75.**



$M(X) = 75$ $D(X) = 25$ a) $P(X \ge 85)$ b) $P(65 \le X \le 85)$

a) $P(X \ge a) \le \frac{M(X)}{a}$

$P(X \ge 85) = \frac{75}{85} = \frac{15}{17} = 0,882$

b) $P\{|X - \mu| > k\delta\} \le 1/k^2$

$\mu = 75$ $\delta^2 = 25$

$P(65 \le X \le 85) = 1 - P(X < 65) - P(X > 85) =$

$= 1 - P(X - 75 < 65 - 75) - P(X - 75 \ge 85 - 75) =$

$= 1 - P\left(\frac{X-75}{25} < -\frac{10}{25}\right) - P\left(\frac{X-75}{25} \ge \frac{10}{25}\right) =$

$= 1 - P\left(\frac{X-\mu}{5\delta} < -0,4\right) - P\left(\frac{X-\mu}{5\delta} \ge 0,4\right) =$

$= 1 - P(|X - 75| > 2(5))$ so, $k = 2$.

$P(|X - 75| > 5k) < 1/(2)^2 = 1/4$

$P(65 \le X \le 85) = 1 - 1/4 = \frac{3}{4}$ Answer a) 0,882 b) 3/4

b) $a \Rightarrow M(X) = 75$ $\qquad P(65 \le X \le 85)$

$$65 - 75 \le X - a \le 85 - 75$$

$$-10 \le X - a \le 10.$$

$$|X - a| \le 10$$

$$P(|X - 75| \le 10) > 1 - \frac{25}{100} = 1 - \frac{1}{4} = \frac{3}{4} = 0{,}75.$$

11.3. A discrete random variable *X* is given by the following law of distribution:

X	2	3	6	9
P	0,1	0,4	0,3	0,2

By using the Chebyshev inequality estimate the probability that $|X - M(X)| > 3.$

The answer: **2/3.**

b) $a \Rightarrow M(X) = 75$ $\quad P(65 \le X \le 85)$

$$65-75 \le X-a \le 85-75$$
$$-10 \le X-a \le 10.$$
$$|X-a| \le 10$$
$$P(|X-75| \le 10) > 1 - \frac{25}{100} = 1 - \frac{1}{4} = \frac{3}{4} = 0{,}75.$$

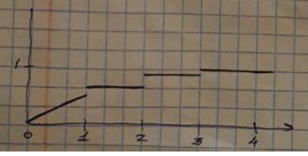
11.3.

X	2	3	6	9
P	0,1	0,4	0,3	0,2

$$|X - M(X)| > 3$$
$$M(X) = 2\cdot 0{,}1 + 3\cdot 0{,}4 + 6\cdot 0{,}3 + 9\cdot 0{,}2 = 5$$
$$D(X) = 6$$
$$P(|X-M(X)| \ge \varepsilon) \le \frac{D(X)}{\varepsilon^2}$$
$$P(|X-5| \ge 3) \le \frac{6}{9} = \frac{2}{3}$$

$$F(x) = \begin{cases} 0 & x < 0 \\ x/2 & 0 \le x < 1 \\ 2/3 & 1 \le x < 2 \\ 11/12 & 2 \le x < 3 \\ 1 & 3 \le x \end{cases}$$

Plot this distribution function.



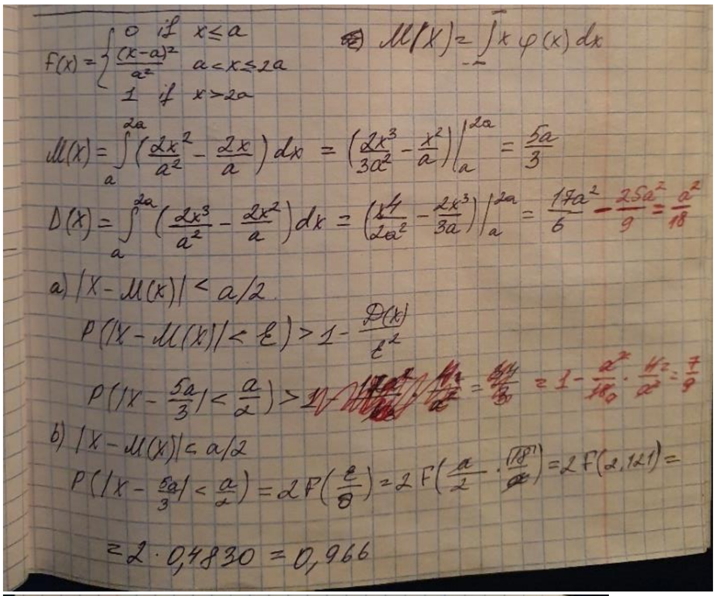
$$P(X > \tfrac{1}{2}) = 1 - P(X \le \tfrac{1}{2}) = 1 - \frac{1}{4} = \frac{3}{4}$$
$$P(2 < X \le 4) = P(X \le 4) - P(X \le 2) = F(4) - F(2) = 1 - \frac{11}{12} = \frac{1}{12}$$
$$P(X < 3) = \lim_{h \to 0} F(3-h) = \frac{11}{12}$$
$$P(X=1) = P(X \le 1) - P(X < 1) = F(1) - \lim_{h\to 0}(F(1-h)) = \frac{2}{3} - \frac{1}{2} = \frac{1}{6}$$

11.4. A random variable is given by the integral function:

$$F(x) = \begin{cases} 0 & if \quad x \le a, \\ \dfrac{(x-a)^2}{a^2} & if \quad a < x \le 2a, \\ 1 & if \quad x > 2a. \end{cases}$$

(a) By using the Chebyshev inequality estimate the probability that $|X - M(X)| < a/2$; (b) Determine the probability that $|X - M(X)| < a/2.$

The answer: **a) 7/9; b) 35/36.**



$$F(x)=\begin{cases}0 \text{ if } x\le a\\ \frac{(x-a)^2}{a^2} & a<x\le 2a\\ 1 \text{ if } x>2a\end{cases}$$

$M(X)=\int x\varphi(x)\,dx$

$M(X)=\int_a^{2a}\left(\frac{2x^2}{a^2}-\frac{2x}{a}\right)dx=\left(\frac{2x^3}{3a^2}-\frac{x^2}{a}\right)\Big|_a^{2a}=\frac{5a}{3}$

$D(X)=\int_a^{2a}\left(\frac{2x^3}{a^2}-\frac{2x^2}{a}\right)dx=\left(\frac{x^4}{2a^2}-\frac{2x^3}{3a}\right)\Big|_a^{2a}=\frac{17a^2}{6}-\frac{25a^2}{9}=\frac{a^2}{18}$

a) $|X-M(X)|<a/2$

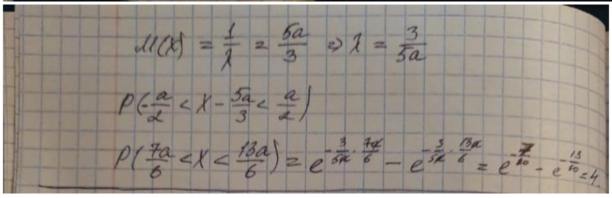
$P(|X-M(X)|<\varepsilon)>1-\frac{D(X)}{\varepsilon^2}$

$P(|X-\frac{5a}{3}|<\frac{a}{2})>1-\frac{a^2}{18}\cdot\frac{4}{a^2}=\frac{7}{9}$

b) $|X-M(X)|<a/2$

$P(|X-\frac{5a}{3}|<\frac{a}{2})=2F\left(\frac{\varepsilon}{\sigma}\right)=2F\left(\frac{a}{2}\cdot\frac{\sqrt{18}}{a}\right)=2F(2{,}121)=$

$=2\cdot 0{,}4830=0{,}966$

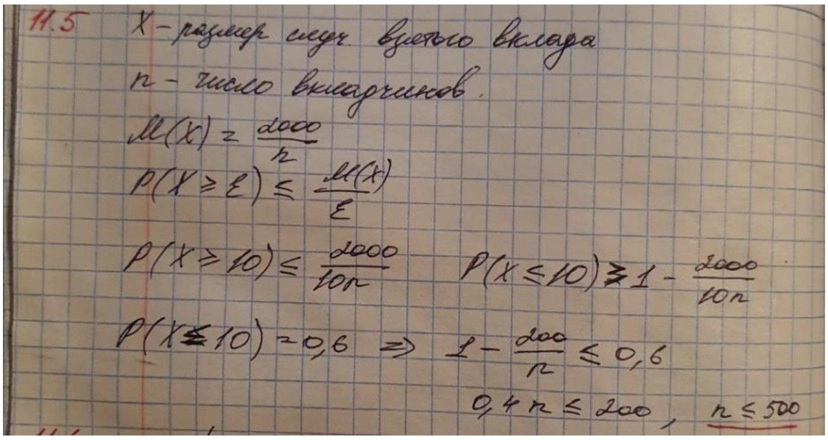


$M(X)=\frac{1}{\lambda}=\frac{5a}{3}\Rightarrow\lambda=\frac{3}{5a}$

$P(-\frac{a}{2}<X-\frac{5a}{3}<\frac{a}{2})$

$P(\frac{7a}{6}<X<\frac{13a}{6})=e^{-\frac{3}{5a}\cdot\frac{7a}{6}}-e^{-\frac{3}{5a}\cdot\frac{13a}{6}}=e^{-\frac{7}{10}}-e^{-\frac{13}{10}}\approx$

11.5. The sum of all deposits in a branch of bank makes 2 million roubles, and the probability that a randomly taken deposit will not exceed 10 thousand roubles is equal to 0,6. What is it possible to tell about the number of depositors?



11.5 X – размер случ. взятого вклада

n – число вкладчиков.

$M(X)=\frac{2000}{n}$

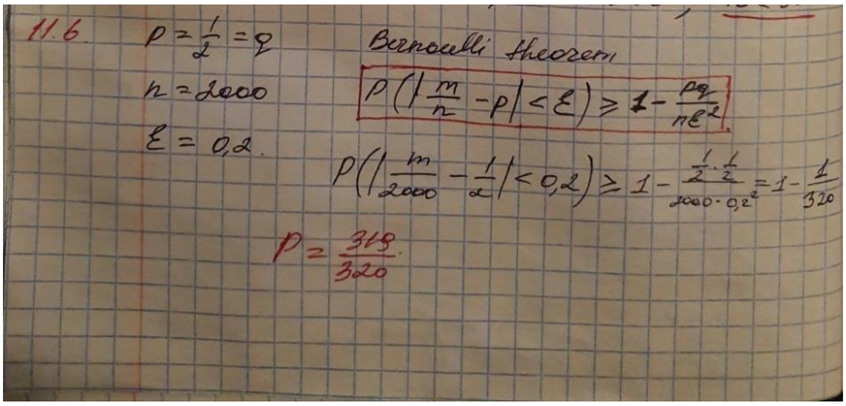
$P(X\ge\varepsilon)\le\frac{M(X)}{\varepsilon}$

$P(X\ge 10)\le\frac{2000}{10n}$ $\quad P(X\le 10)\ge 1-\frac{2000}{10n}$

$P(X\le 10)=0{,}6\Rightarrow 1-\frac{200}{n}\le 0{,}6$

$0{,}4n\le 200,\quad n\le 500$

11.6 A die is tossed 2000 times. Give a lower bound for the probability that the absolute value of a deviation of the relative frequency of appearance of heads from the probability of its appearance is less than 0,2.



11.6 $p=\frac{1}{2}=q$ $n=2000$ $\varepsilon=0,2$.

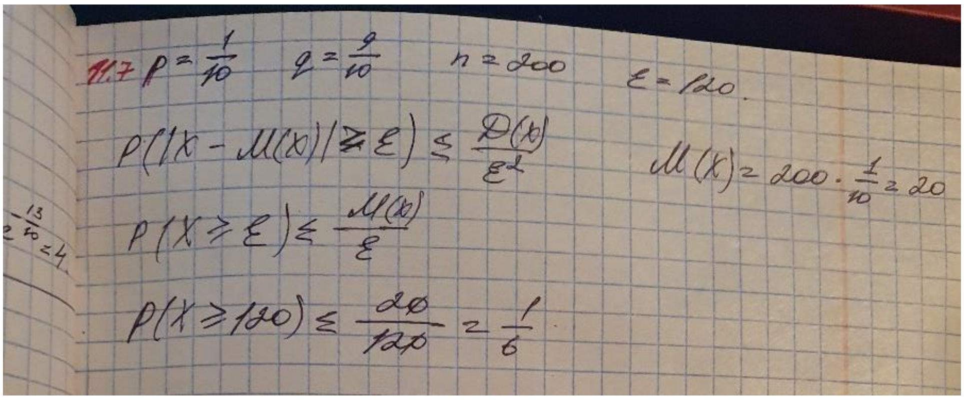
Bernoulli theorem

$$\boxed{P\left(\left|\frac{m}{n}-p\right|<\varepsilon\right)\geq 1-\frac{pq}{n\varepsilon^2}}$$

$$P\left(\left|\frac{m}{2000}-\frac{1}{2}\right|<0,2\right)\geq 1-\frac{\frac{1}{2}\cdot\frac{1}{2}}{2000\cdot 0,2^2}=1-\frac{1}{320}$$

$$P=\frac{319}{320}$$

11.7 A biased coin, which lands heads with probability 1/10 each time it is flipped, is flipped 200 times consecutively. Give an upper bound on the probability that it lands heads at least 120 times.



11.7 $p=\frac{1}{10}$ $q=\frac{9}{10}$ $n=200$ $\varepsilon=120$.

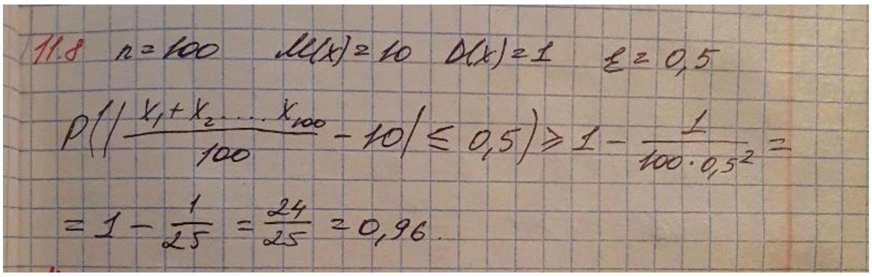
$$P(|X-M(X)|\geq\varepsilon)\leq\frac{D(X)}{\varepsilon^2} \qquad M(X)=200\cdot\frac{1}{10}=20$$

$$P(X\geq\varepsilon)\leq\frac{M(X)}{\varepsilon}$$

$$P(X\geq 120)\leq\frac{20}{120}=\frac{1}{6}$$

11.8. Let as a result of 100 independent trials values of a random variable X have been found: $x_1, x_2, \ldots, x_{100}$. Let the mathematical expectation $M(X)$ = 10 and the dispersion $D(X)$ = 1. Give a lower bound for the probability that the absolute value of the difference between the arithmetic mean of observed values of the random variable and the mathematical expectation will be less than 0,5.

The answer: **0,96.**



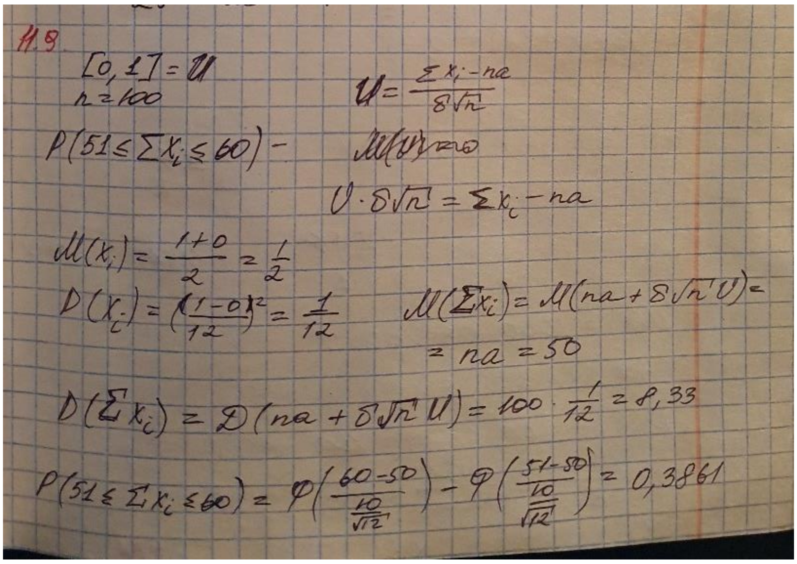
11.8 $n=100$ $M(X)=10$ $D(X)=1$ $\varepsilon=0,5$

$$P\left(\left|\frac{X_1+X_2\ldots X_{100}}{100}-10\right|\leq 0,5\right)\geq 1-\frac{1}{100\cdot 0,5^2}=$$

$$=1-\frac{1}{25}=\frac{24}{25}=0,96.$$

11.9. 100 numbers have been randomly chosen on the segment [0; 1], more precisely 100 independent random variables $X_1, X_2, \ldots, X_n$ uniformly distributed over the segment [0; 1] are considered. Find the probability that their sum is between 51 and 60, i.e. $P\left(51 \le \sum X_i \le 60\right)$.

Answer: 0,3861



11.8

$[0, 1] = U$

$n = 100$

$P(51 \le \sum X_i \le 60) -$

$U = \frac{\sum x_i - na}{\sigma\sqrt{n}}$

$M(U) = 0$

$U \cdot \sigma\sqrt{n} = \sum x_i - na$

$M(x_i) = \frac{1+0}{2} = \frac{1}{2}$

$D(x_i) = \frac{(1-0)^2}{12} = \frac{1}{12}$

$M(\sum x_i) = M(na + \sigma\sqrt{n}U) = na = 50$

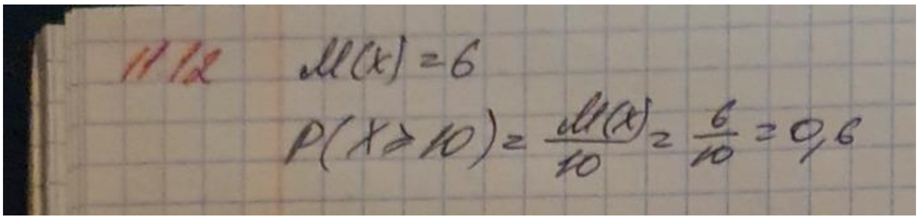
$D(\sum x_i) = D(na + \sigma\sqrt{n}U) = 100 \cdot \frac{1}{12} = 8,33$

$P(51 \le \sum x_i \le 60) = \Phi\left(\frac{60-50}{\frac{10}{\sqrt{12}}}\right) - \Phi\left(\frac{51-50}{\frac{10}{\sqrt{12}}}\right) = 0,3861$

Exercises for Homework 11

11.12. The amount of forages spent on a farm of large horned livestock in a day is a random variable of which the mathematical expectation is 6 tons. Estimate the probability that for the nearest day the expense of forages on the farm will exceed 10 tons (forage – корм; large horned livestock – крупный рогатый скот).

***The answer*: 0,6.**

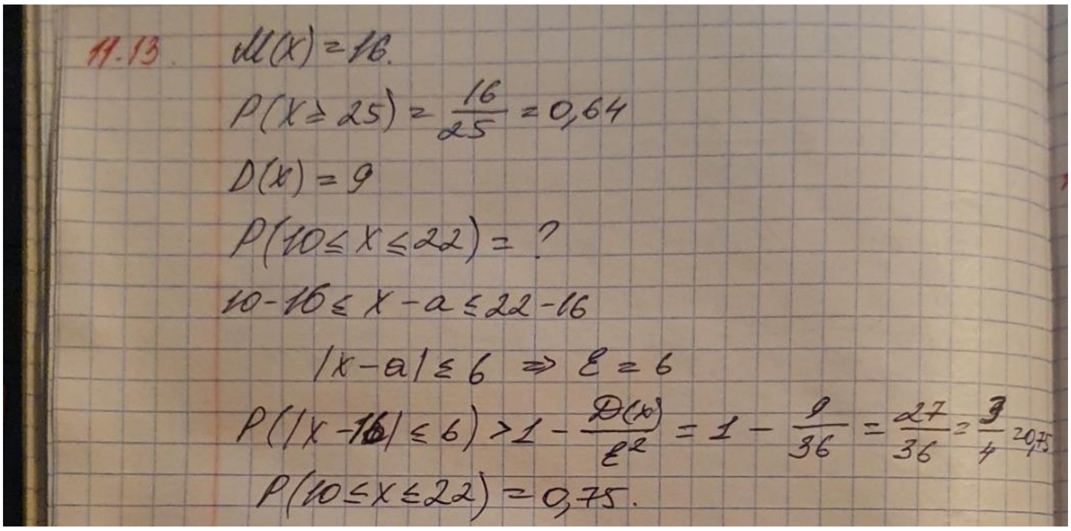


11.12 $M(x) = 6$

$P(X \ge 10) = \frac{M(X)}{10} = \frac{6}{10} = 0,6$

11.13. The number of automobiles sold weekly at a certain dealership is a random variable with mathematical expectation 16. Give an upper bound to the probability that next week's sales exceed 25. Suppose, in addition, that the dispersion of the number of automobiles sold weekly is 9. Give a lower bound to the probability that next week's sales are between 10 and 22 inclusively (dealership – представительство).

***The answer:* 0,64; 0,75.**



11.13 $M(X)=16.$

$P(X\geq 25)\leq \frac{16}{25}=0,64$

$D(X)=9$

$P(10\leq X\leq 22)=?$

$10-16\leq X-a\leq 22-16$

$|X-a|\leq 6 \Rightarrow \varepsilon=6$

$P(|X-16|\leq 6)>1-\frac{D(X)}{\varepsilon^2}=1-\frac{9}{36}=\frac{27}{36}=\frac{3}{4}=0,75$

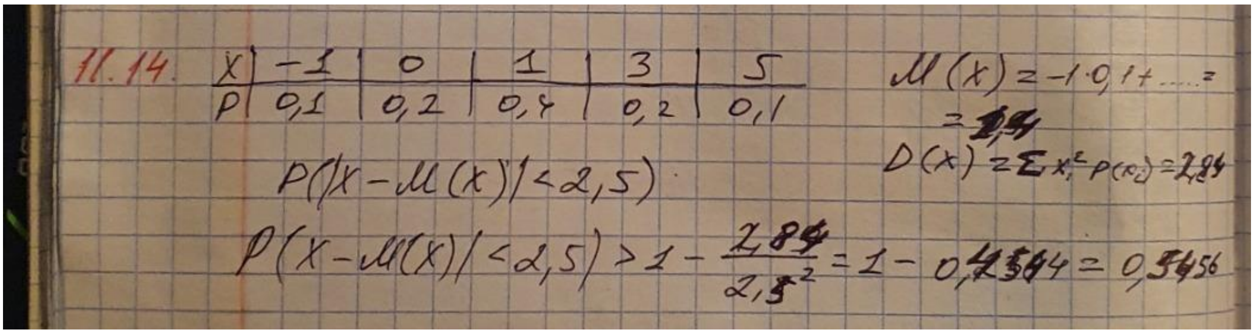
$P(10\leq X\leq 22)=0,75.$

11.14. A discrete random variable *X* is given by the following law of distribution:

X	–1	0	1	3	5
P	0,1	0,2	0,4	0,2	0,1

By the Chebyshev inequality estimate the probability that *|X – M(X)| < 2,5.*

***The answer*: 0,5456.**



11.14.

X	-1	0	1	3	5
P	$0,1$	$0,2$	$0,4$	$0,2$	$0,1$

$M(X)=-1\cdot 0,1+\ldots=$
$=1,4$

$D(X)=\sum x_i^2 p(x_i)=2,84$

$P(|X-M(X)|<2,5)$

$P(|X-M(X)|<2,5)>1-\frac{2,84}{2,5^2}=1-0,4544=0,5456$

11.15. The probability of ripening seeds of vegetable culture in a given district is equal to 0,8. By using the Chebyshev inequality estimate the probability that the number of plants with ripened seeds will make of 1000 plants from 750 up to 850 (ripening – вызревание; plant – растение).

***The answer*: 0,936.**

11.15. $M(X) = 1000 \cdot 0{,}8 = 800 \Leftarrow M(X) = np$

$750 \le X \le 850 \Rightarrow |X - a| \le 50 \Rightarrow \varepsilon = 50$

$D(X) = 1000 \cdot 0{,}8 \cdot 0{,}2 = 160 \Leftarrow D(X) = npq$

$1 - \frac{D(X)}{\varepsilon^2} = 1 - \frac{160}{2500} = \frac{234}{250} = 0{,}936$

$P(750 \le X \le 850) = 0{,}936.$

11.16. Suppose that it is known that the number of items produced in a factory during a week is a random variable with mathematical expectation 50.

(a) What can be said about the probability that this week's production will exceed 75?

(b) If the dispersion of a week's production is known to equal 25, then what can be said about the probability that this week's production will be between 40 and 60?

The answer: **a) 2/3; b) 3/4.**

11.16 $M(X) = 50.$

a) $P(X \ge 75) = \frac{50}{75} = \frac{2}{3}$

b) $D(X) = 25$ $\quad |X - a| \le 10 \Rightarrow \varepsilon = 10$

$P(40 \le X \le 60) = 1 - \frac{D(X)}{\varepsilon^2} = 1 - \frac{25}{100} = 0{,}75$ or $\frac{3}{4}$

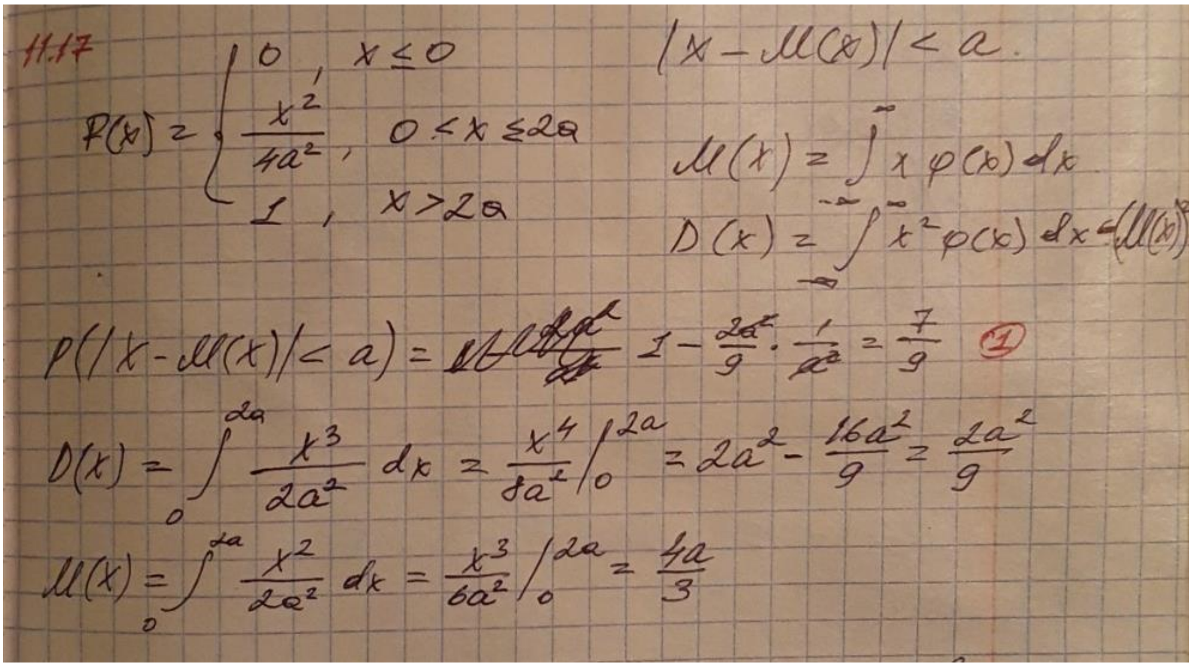
11.17. A random variable is given by the integral function:

$$F(x) = \begin{cases} 0 & \text{if} \quad x \le 0, \\ \dfrac{x^2}{4a^2} & \text{if} \quad 0 < x \le 2a, \\ 1 & \text{if} \quad x > 2a. \end{cases}$$

(a) By the Chebyshev inequality estimate the probability that $|X - M(X)| < a$;

(b) Determine the probability that $|X - M(X)| < a$.

The answer: **a) 7/9; b) 35/36.**



11.17

$$F(x) = \begin{cases} 0, & x \le 0 \\ \frac{x^2}{4a^2}, & 0 < x \le 2a \\ 1, & x > 2a \end{cases}$$

$|X - M(X)| < a$.

$$M(X) = \int_{-\infty}^{\infty} x \varphi(x)\, dx$$

$$D(X) = \int_{-\infty}^{\infty} x^2 \varphi(x)\, dx - (M(X))^2$$

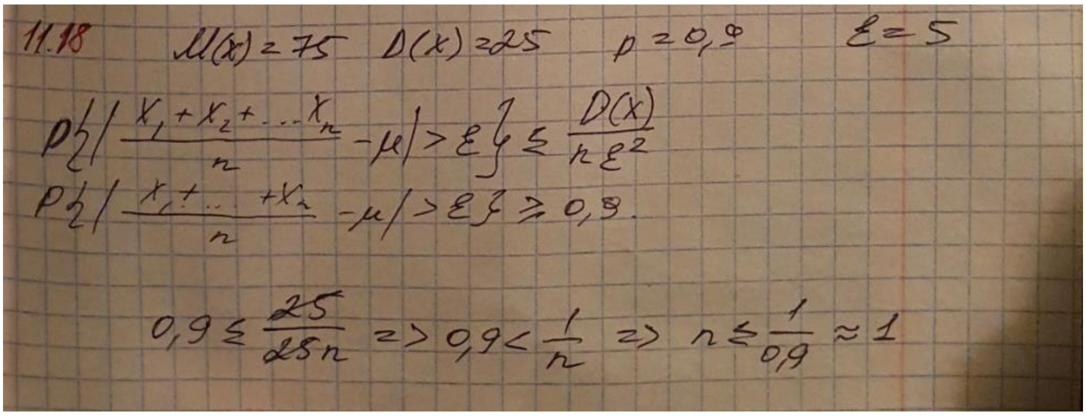
$$P(|X - M(X)| < a) = 1 - \frac{2a^2}{9} \cdot \frac{1}{a^2} = \frac{7}{9} \quad 1$$

$$D(X) = \int_0^{2a} \frac{x^3}{2a^2}\, dx = \frac{x^4}{8a^2}\Big|_0^{2a} = 2a^2 - \frac{16a^2}{9} = \frac{2a^2}{9}$$

$$M(X) = \int_0^{2a} \frac{x^2}{2a^2}\, dx = \frac{x^3}{6a^2}\Big|_0^{2a} = \frac{4a}{3}$$

11.18. From past experience a professor knows that the test score of a student taking his or her final examination is a random variable with mathematical expectation 75 and dispersion 25. How many students would have to take the examination to ensure, with probability at least 0,9, that the class average would be within 5 of 75?

The answer: **10.**



11.18 $M(X) = 75$ $D(X) = 25$ $p = 0,9$ $\varepsilon = 5$

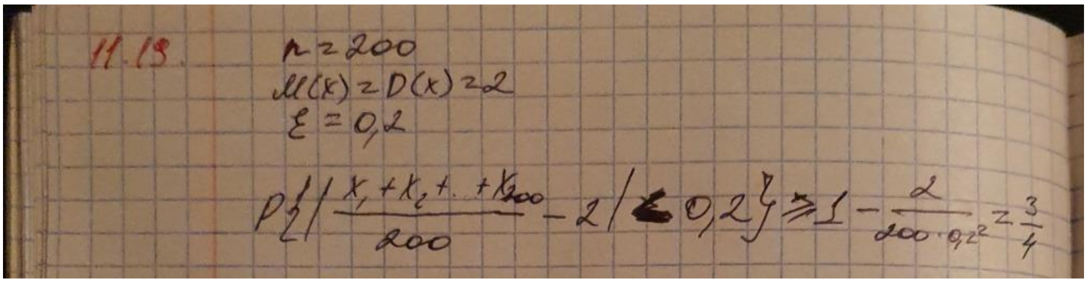
$$P\left\{\left|\frac{X_1 + X_2 + \dots X_n}{n} - \mu\right| > \varepsilon\right\} \le \frac{D(X)}{n\varepsilon^2}$$

$$P\left\{\left|\frac{X_1 + \dots + X_n}{n} - \mu\right| > \varepsilon\right\} \ge 0,9.$$

$$0,9 \le \frac{25}{25n} \Rightarrow 0,9 < \frac{1}{n} \Rightarrow n \le \frac{1}{0,9} \approx 1$$

11.19. As a result of 200 independent trials values of a random variable X: $x_1, x_2, \dots, x_{200}$ have been found, and $M(X) = D(X) = 2$. Give a lower bound for the probability that the absolute value of the difference between the arithmetic mean of the values of the random variable and the mathematical expectation will be less than 1/5.

The answer: **3/4.**



11.19.

$n = 200$

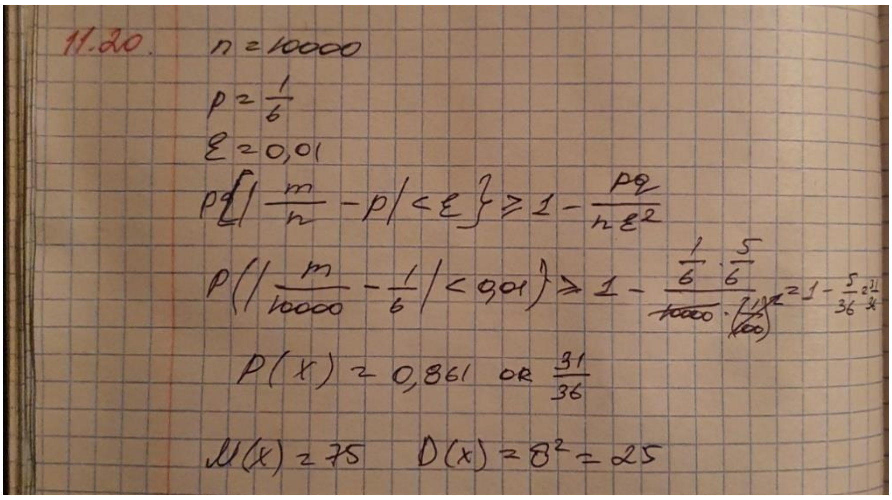
$M(X) = D(X) = 2$

$\varepsilon = 0{,}2$

$$P\left\{\left|\frac{X_1 + X_2 + \ldots + X_{200}}{200} - 2\right| \le 0{,}2\right\} \geq 1 - \frac{2}{200 \cdot 0{,}2^2} = \frac{3}{4}$$

11.20. A die is tossed 10000 times. Estimate the probability of the deviation of the relative frequency of occurrence of six aces from the probability of occurrence of the same number of aces will be less than on 0,01.

The answer: **0,861.**



11.20.

$n = 10000$

$p = \frac{1}{6}$

$\varepsilon = 0{,}01$

$$P\left\{\left|\frac{m}{n} - p\right| < \varepsilon\right\} \geq 1 - \frac{pq}{n\varepsilon^2}$$

$$P\left(\left|\frac{m}{10000} - \frac{1}{6}\right| < 0{,}01\right) \geq 1 - \frac{\frac{1}{6} \cdot \frac{5}{6}}{\cancel{10000} \cdot \frac{1}{\cancel{10000}}} = 1 - \frac{5}{36} = \frac{31}{36}$$

$P(X) = 0{,}861$ OR $\frac{31}{36}$

$M(X) = 75 \quad D(X) = 8^2 = 25$

11.21. Use the central limit theorem to solve Exercise 11.18.

The answer: **3.**

11.22. Let $X_1, X_2, \ldots, X_{20}$ be independent Poisson random variables with mathematical expectation 1. Use the central limit theorem to approximate $P\left(\sum_{i=1}^{20} X_x > 25\right)$.

The answer: **0,1318.**

Exercises for seminar 13

1. Consider a (n infinite) population of paper notes, 50% of which are blank, 30% are ten-dollar bills, and the remaining 20% are twenty-dollar bills. Find the mean, the variance?

$$\text{Mean } \boldsymbol{\mu}_X = E[X] = (.5)(0) + (.3)(10) + (.2)(20) = \mathbf{\$7.00}$$

$$\text{Variance } \boldsymbol{\sigma}_X^2 = E[(X - \boldsymbol{\mu}_X)^2] = (.5)(-7)^2 + (.3)(3)^2 + (.2)(13)^2 = \mathbf{61}$$

$$\text{Standard deviation } \boldsymbol{\sigma}_X = \mathbf{\$7.81}$$

2. Let $\overline{X}$ be the mean of a random sample of size 50 drawn from a population with mean 112 and standard deviation 40.
   a. Find the mean   and standard deviation of $\overline{X}$.
   b. Find the probability that $\overline{X}$ assumes a value between 110 and 114.

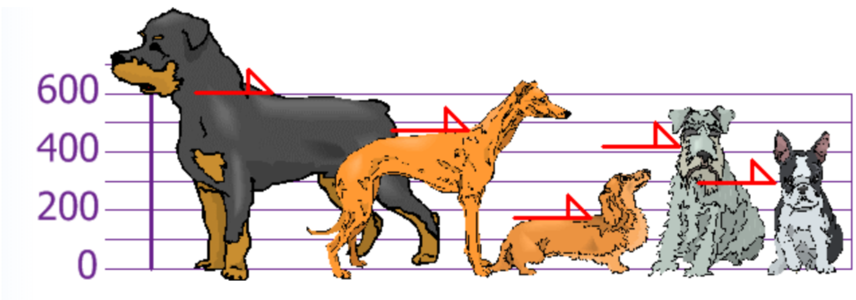
By the formulas in the previous section

µx−−=µ=112 and σx−−=σn−−√=4050−−√=5.65685

Since the sample size is at least 30, the Central Limit Theorem applies: X−−X- is approximately normally distributed. We compute probabilities using Figure 12.2 "Cumulative Normal Probability" in the usual way, just being careful to use σX−−σX- and not *σ* when we standardize:

P(110<X−−<114)=P(110−µx−−σx−−<Z<114−µx−−σx−−)=P(110−1125.65685<Z<114−1125.65685)=P(−0.35<Z<0.35)=0.6368−0.3632=0.2736

3. Daniyar and Aliya measured the heights of their dogs (in millimeters):



The heights (at the shoulders) are: 600mm, 470mm, 170mm, 430mm and 300mm.
Find out the Mean, the Variance, and the Standard Deviation.

Решение:

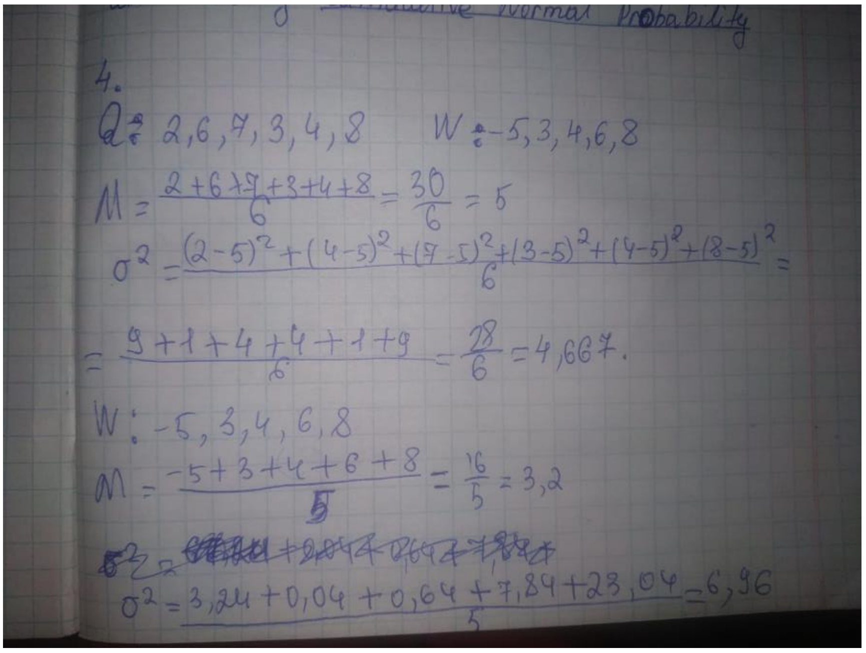
Mean: $\mu_X = \frac{600+470+170+430+300}{5} = \frac{1970}{5} = 394$

heights	$x - \bar{x}$	$(x - \bar{x})^2$
600	206	42436
470	76	5776

170	-224	50176
430	36	1296
300	-94	8836

Variance: $\sigma^2 = \frac{206^2+76^2+(-224)^2+36^2+(-94)^2}{5} = \frac{42436+5776+50176+1296+8836}{5} = \frac{108520}{5} = 21704$

4. Find the sample variances of the data sets Q and W given below.
   Q: 2,6,7,3,4,8 W:-5,3,4,6,8



4.

Q: 2,6,7,3,4,8 W: -5,3,4,6,8

$M = \frac{2+6+7+3+4+8}{6} = \frac{30}{6} = 5$

$\sigma^2 = \frac{(2-5)^2+(4-5)^2+(7-5)^2+(3-5)^2+(4-5)^2+(8-5)^2}{6} =$

$= \frac{9+1+4+4+1+9}{6} = \frac{28}{6} = 4,667.$

W: -5,3,4,6,8

$M = \frac{-5+3+4+6+8}{5} = \frac{16}{5} = 3,2$

$\sigma^2 = \frac{3,24+0,04+0,64+7,84+23,04}{5} = 6,96$

5. A hen lays eight eggs. Each egg was weighed and recorded as follows:60 g, 56 g, 61 g, 68 g, 51 g, 53 g, 69 g, 54 g. Find the mean and standard deviation?

a. First, calculate the mean:

$$\bar{x} = \frac{\sum x}{n} = \frac{472}{8} = 59$$

b. Now, find the standard deviation.

Table 1. Weight of eggs, in grams

Weight (x)	$(x - \bar{x})$	$(x - \bar{x})^2$
60	1	1
56	-3	9
61	2	4
68	9	81
51	-8	64
53	-6	36
69	10	100
54	-5	25
472		**320**

Using the information from the above table, we can see that

$$\sum (x - \bar{x})^2 = 320$$

In order to calculate the standard deviation, we must use the following formula:

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} = \sqrt{\frac{320}{8}} = 6.32 \text{ grams}$$

6. Let X and Y be two random variables with the joint density

$$f(x, y) = \begin{cases} e^{-(x+y)} & \text{for } x < 0, y < \infty \\ 0 & \text{for otherwise.} \end{cases}$$

What is the expected value of the continuous random variable $Z = X^2Y^2 + XY^2 + X^2 + X$?

Answer: Since

$$\begin{aligned} f(x, y) &= e^{-(x+y)} \\ &= e^{-x} e^{-y} \\ &= f_1(x)\, f_2(y), \end{aligned}$$

the random variables X and Y are mutually independent. Hence, the expected value of X is

$$\begin{aligned} E(X) &= \int_0^\infty x\, f_1(x)\, dx \\ &= \int_0^\infty x e^{-x}\, dx \\ &= \Gamma(2) \\ &= 1. \end{aligned}$$

Similarly, the expected value of X^2 is given by

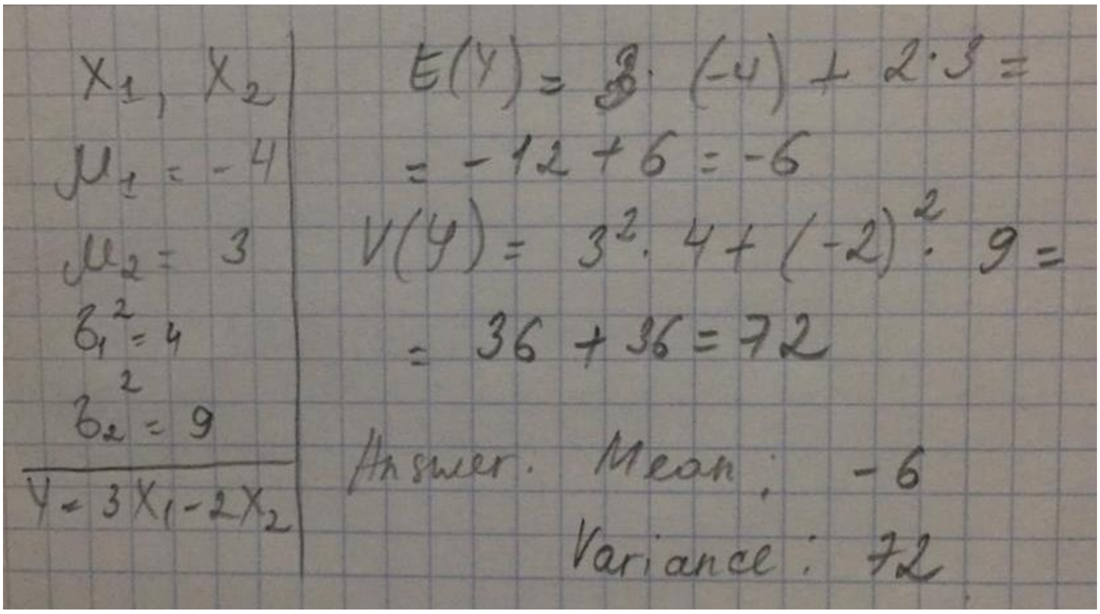
$$\begin{aligned} E\left(X^2\right) &= \int_0^\infty x^2\, f_1(x) dx \\ &= \int_0^\infty x^2 e^{-x}\, dx \\ &= \Gamma(3) \\ &= 2. \end{aligned}$$

$$\begin{aligned} &= \Gamma(3) \\ &= 2. \end{aligned}$$

Since the marginals of X and Y are same, we also get $E(Y) = 1$ and $E(Y^2) = 2$. Further, by Theorem 13.1, we get

$$\begin{aligned} E[Z] &= E\left[X^2Y^2 + XY^2 + X^2 + X\right] \\ &= E\left[\left(X^2 + X\right)\left(Y^2 + 1\right)\right] \\ &= E\left[X^2 + X\right] E\left[Y^2 + 1\right] \qquad \text{(by Theorem 13.1)} \\ &= \left(E\left[X^2\right] + E[X]\right)\left(E\left[Y^2\right] + 1\right) \\ &= (2 + 1)\,(2 + 1) \\ &= 9. \end{aligned}$$

7. Let the independent random variables X_1 and X_2 have means $\mu_1 = -4$ and $\mu_2 = 3$, respectively and variances $\sigma_1^2 = 4$ and $\sigma_2^2 = 9$. What are the mean and variance of $Y = 3X_1 - 2X_2$?


X_1, X_2
$\mu_1 = -4$
$\mu_2 = 3$
$\sigma_1^2 = 4$
$\sigma_2^2 = 9$
$Y = 3X_1 - 2X_2$

$E(Y) = 3 \cdot (-4) + 2 \cdot 3 =$
$= -12 + 6 = -6$
$V(Y) = 3^2 \cdot 4 + (-2)^2 \cdot 9 =$
$= 36 + 36 = 72$

Answer: Mean: -6
Variance: 72

8. Let $X_1, X_2, ..., X_{50}$ be a random sample of size 50 from a distribution with density

$$f(x,y) = \begin{cases} \frac{1}{\theta} e^{-\frac{x}{\theta}} & \text{for } 0 \le x < \infty \\ 0 & \text{for otherwise.} \end{cases}$$

What are the mean and variance of the sample mean $\overline{X}$?

9. Let $X_1, X_2, ..., X_{10}$ be the observation from a random sample of size 10 from distribution with density

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}, -\infty < x < \infty.$$

What is the moment generating function of the sample mean?

1. A reliable event is: - **event is an event that necessarily will happen if a certain set of conditions S holds**

2. The probability of reliable event is the number: **1**

3. An impossible event is: (null) event is an event that certainly will not happen if the set of conditions S holds.

4. The probability of impossible event is the number: 0

5. A random event is: event is an event that can either take place, or not to take place for holding the set of conditions S.

6. The probability of an arbitrary event A is the number: 0<=P(x)<=1

7. Probabilities of opposite events *A* and $\overline{A}$ satisfy the following condition: *P(A) + P(*$\overline{A}$*) = 1*

8. For opposite events A and $\overline{A}$ one of the following equalities holds: $P(A \cdot \overline{A}) =$ 0 $P(A + \overline{A}) =$ 1

9. Let A and B be opposite events. Find P(B) if P(A) = 3/5. 2/5

10. Let A and B be events connected with the same trial. Show the event that means simultaneous occurrence of A and B.

P=AB

11. Let A and B be events connected with the same trial. Show the event that means occurrence of only one of events A and B.

A*B s 4ertoi + $\overline{A}$ ***B**

12. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means occurrence only one of events A_1, A_2 and A_3. Express the event A by the events A_1, A_2 and A_3.

$\overline{A}$ **1*** $\overline{A}$ **2*A3 +** $\overline{A}$ **1*A2*** $\overline{A}$ **3+A1*** $\overline{A}$ **2*** $\overline{A}$ **3**

13. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means none of events A_1, A_2 and A_3 have happened. Express the event A by the events A_1, A_2 and A_3

A_3 **vse A s 4ertami**

14. Let *n* be the number of all outcomes, *m* be the number of the outcomes favorable to the event *A.* The classical formula of probability of the event *A* has the following form:

P(A) = m/n

15. The probability of an arbitrary event cannot be: less than 0 or more than 1

16. Let the random variable *X* be given by the law of distribution

x_i	-4	-1	0	1	4
p_i	0,2	0,1	0,3	0,2	0,2

Find mean square deviation σ (X)*:*

M(x) = 0.1

D(x) = 6.69

σ (X) = 2.5865

17. Two events form a complete group if they are:

Some events form a *complete group* if in result of a trial at least one of them will appear.

18. A coin is tossed twice. Find probability that "heads" will land in both times.

1/4

19. A coin is tossed twice. Find probability that "heads" will land at least once.

3/4

20. There are 2000 tickets in a lottery. 1000 of them are winning, and the rest 1000 – non-winning. It was bought two tickets. What is the probability that both tickets are winning?

1000/2000 * 999/1999 = 0.24987

21. Two dice are tossed. Find probability that the sum of aces does not exceed 2.

1/36

22. Two dice are tossed. Find probability that the sum of aces doesn't exceed 5.

10/36

23. Two dice are tossed. Find probability that the product of aces does not exceed 3.

5/36

24. There are 20 white, 25 black, 10 blue and 15 red balls in an urn. One ball is randomly extracted. Find probability that the extracted ball is white or black.

45/70 = 9/14

25. There are 11 white and 2 black balls in an urn. Four balls are randomly extracted. What is the probability that all balls are white?

C(4,11)/C(4,13) = 0.46 or 11/13 * 10/12 * 9/11 * 8/10 = 0.46

26. Calculate C_{14}^{4}: 1001

27. Calculate A_{7}^{3}: 210

28. One chooses randomly one letter of the word "HUNGRY". What is the probability that this letter is "E"? 0

29. The letters T, A, O, B are written on four cards. One mixes the cards and puts them randomly in a row. What is the probability that it is possible to read the word "BOAT"? ¼! = 0.0416

30. There are 5 white and 4 black balls in an urn. One extracts randomly two balls. What is the probability that both balls are white? 5/9*4/8 = 0.2(7)

31. There are 11 white, 9 black, 15 yellow and 25 red balls in a box. Find probability that a randomly taken ball is white. 11/60

32. There are 11 white, 9 black, 15 yellow and 20 red balls in a box. Find probability that a randomly taken ball is black. 9/55

33. How many 6-place telephone numbers are there if the digits "0" and "9" are not used on the first place? 8*10^5

34. 15 shots are made; 9 hits are registered. Find relative frequency of hits in a target. 9/15

35. A point is thrown on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 5/6. (2 – 2*5/6)/2 = 1/6

36. Two dice are tossed. What is the probability that the sum of aces will be more than 8? 7/36

37. A coin is tossed 6 times. Find probability that "heads" will land 4 times. C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

38. There are 6 children in a family. Assuming that probabilities of births of boy and girl are equal, find probability that the family has 4 boys: C(4,6)*0.5^4*0.5^2 = 15*0.5^6 = 15/64

39. Two shots are made in a target by two shooters. The probability of hit by the first shooter is equal to 0,7, by the second – 0,8. Find probability of at least one hit in the target. 1 – 0.3*0.2 = 0.94

40. The device consists of two independently working elements of which probabilities of non-failure operation are equal 0,8 and 0,7 respectively. Find probability of non-failure operation of two elements. 0.8*0.7 = 0.56

41. There are 5 books on mathematics and 7 books on chemistry on a book shelf. One takes randomly 2 books. Find the probability that these books are on mathematics. 5/12 * 4/11 = 10/66

42. There are 5 standard and 6 non-standard details in a box. One takes out randomly 2 details. Find probability that only one detail is standard. 5*6/C(2,11) = 30/55 = 6/11

43. Three shooters shoot on a target. Probability of hit in the target at one shot for the 1st shooter is 0,85; for the 2^{nd} – 0,9 and for the 3^{rd} – 0,95. Find probability of hit by all the shooters. 0.85*0.9*0.95 = 0,72675

44. A student knows 7 of 12 questions of examination. Find probability that he (or she) knows randomly chosen 3 questions.

7/12*6/11*5/10 = 0.15(90)

45. Two shooters shoot on a target. The probability of hit by the first shooter is 0,7, and the second – 0,8. Find probability that only one of shooters will hit in the target. 0.7*0.2 + 0.8*0.3 = 0.38

46. Three dice are tossed. Find probability that the sum of aces will be 6.

10/216

47. At shooting from a rifle the relative frequency of hit in a target appeared equal to 0,8. Find the number of hits if 200 shots have been made. 200*0.8

48. In a batch of 200 details the checking department has found out 13 non-standard details. What is the relative frequency of occurrence of non-standard details equal to? 13/200 = 0.065

49. If A and B are independent events then for P(AB) one of the following equalities holds: P(AB) = P(A)*P(B)

50. If events A and B are compatible then for P(A + B) one of the following equalities holds: P(A+B) =P(A) + P(B) – P(AB)

51. If events A and B are incompatible then for P(A+ B) one of the following equalities holds: P(A+B) =P(A)+P(B)

52. The probability of joint occurrence of two dependent events is equal: $P(AB) = P(A) \cdot P_A(B)$

53. A point is put on an interval of length 2. Find probability that the distance from a point to the ends of the interval is more than 4/7. (2 – 2*4/7)/2 = 3/7

54. There are 5 white and 7 black balls in an urn. One takes out randomly 2 balls. What is the probability that both balls are black?

7/12 * 6/11 = 0.318

55. There are 7 identical balls numbered by numbers 1, 2..., 7 in a box. All balls by one are randomly extracted from a box. Find probability that numbers of extracted balls will appear in ascending order. 1/7! = 1.98*10^4

56. There are 25 details in a box, and 20 of them are painted. One extracts randomly 4 details. Find probability that the extracted details are painted. 20/25 * 19/24 * 18/23 * 17/22 = 0.383

57. There are 20 students in a group, and 8 of them are pupils with honor. One randomly selects 10 students. Find probability that there are 6 pupils with honor among the selected students. C(6, 8) * C(4 , 12) / C(10, 20) = 28 * 495/184756 = 0.075

58. There are 4 detective lamps among 12 electric lamps. Find probability that randomly chosen 2 lamps will be defective.

4/12 * 3/11 = 0. (09)

59. A circle of radius *l* is placed in a big circle of radius *L*. Find probability that a randomly thrown point in the big circle will get as well in the small circle.

l^2/L^2

60. There are 6 white and 4 red balls in an urn. The event A consists in that the first taken out ball is white, and the event B – the second taken out ball is white. Find the probability $P(A)\cdot P_A(B)$ = 6/10 * 5/9 = 1/3

61. Probability not to pass exam for the first student is 0,2, for the second - 0,4, for the third - 0,3. What is the probability that only one of them will pass the exam? 0.8*0.4*0.3 + 0.2 * 0.6 *0.3 + 0.2 * 0.4 * 0.7 = 0.188

62. The probability of delay for the train №1 is equal to 0,1, and for the train №2 – 0,2. Find probability that at least one train will be late. 1 – 0.9*0.8 = 0.28

63. The probability of delay for the train №1 is equal to 0,3, and for the train №2 – 0,45. Find probability that both trains will be late. 0.3 * 0.45 = 0.135

64. The events A and B are independent, P(A) = 0,4; P(B) = 0,3. Find $P(\overline{A}B)$.

0.6*0.3 = 0.18

65. The events A and B are compatible, P(A) = 0,4; and P(B) = 0,3. Find P($\overline{A}+\overline{B}$). = 0.6 + 0.7 - 0.42 = 0.88

66. If the probability of a random event A is equal to P(A), the probability of the opposite event $\overline{A}$ is equal: 1 - P(A),

67. Show the formula of total probability:

$$P(A)=P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)$$

68. The formula $P_A(B_i)=\dfrac{P(B_i)\cdot P_{B_i}(A)}{\sum_{i=1}^{n}P(B_i)P_{B_i}(A)}$ is *Bayes's formulas*

69. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3 forming a complete group will occur, P (A) is calculated by the following formula: $P(A)=P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)$

70. Electric lamps are made at two factories, and the first of them delivers 60%, and the second – 40% of all consumed production. 80 of each hundred lamps of the first factory are standard on the average, and 60 – of the second factory. Find probability that a bought lamp will be standard.

0.6*08 + 0.4*0.6 = 0.72

71. If an event A can happen only provided that one of incompatible events B_1, B_2, B_3, B_4 forming a complete group will occur, $P_A(B_2)$ is calculated by the following formula:

$$P_A(B_i)=\frac{P(B_i)\cdot P_{B_i}(A)}{P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\ldots+P(B_n)\cdot P_{B_n}(A)}$$

72. The probability of hit in 10 aces for a given shooter at one shot is 0,9. Find probability that for 10 independent shots the shooter will hit in 10 aces exactly 6 times. C(6, 10) * 0.9^6 * 0.1^4 = 0.0111

73. There are 6 children in a family. Assuming that probabilities of birth of boy and girl are equal, find the probability that there are 4 girls and 2 boys in the family. C(4, 6) * 0.5 ^4 * 0.5^2 = 15/64

74. It is known that 15 % of all radio lamps are non-standard. Find probability that among 5 randomly taken radio lamps appears no more than 1 non-standard. C(0, 5)*0.15^0 * 0.85^5 + C(1, 5)*0.15^1 * 0.85^4 = 0.8355

75. 10 buyers came in a shop. What is the probability that 4 of them will do shopping if the probability to make purchase for each buyer is equal to 0,2?

C (4, 10) * 0.2 ^ 4 * 0.8^6 = 0.088

76. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2
P	1/3	1/3	1/6	1/6

Find mathematical expectation M(X).

-4/3

77. Distribution of a discrete random variable X is given by the table

X	-3	-2	0	2
P	1/3	1/3	1/6	1/6

Find dispersion D (X).

M(x) = -4/3

M(x^2) = 5

D(x) = 5 – (4/3)^2 = 3, (2)

78. We say that a discrete random variable X is distributed under the binomial law (binomial distribution) if P (*X* = *k*) =

$$P(X=m)=C_n^m p^m q^{n-m}$$

79. We say that a discrete random variable X is distributed under Poisson law with parameter λ (Poisson distribution) if *P(X = k) =*

$$P(X=m)=\frac{\lambda^m e^{-\lambda}}{m!}$$

80. We say that a discrete random variable X is distributed under the geometric law (geometric distribution) if P*(X=k)* =

P(X = m) = pq^{m-1}

81. A random variable X is distributed under Poisson law with parameter λ (Poisson distribution). Find M (X) =λ

82. A random variable X is distributed under the binomial law: P *(X=k)* = $C_n^k p^k q^{n-k}$ (0 <*p* <1, *q* =1-*p*; *k=1*, 2, 3, …, *n*). Find M(X) = np

83. Dispersion of a discrete random variable X is D(x) = $D(X)=M[X^2]-(M(X))^2$

84. Dispersion of a constant C is D(C) = 0

85. The law of distribution of a discrete random variable *X* is given. Find *Y*.

X	–2	4	6
P	0.3	0.6	*Y*

Y = 0.1

86. The law of distribution of a discrete random variable *X* is given, M (X) = 5. Find x_1.

X	x_1	4	6
P	0.2	p_2	0.3

P2 = 0.5

X1 = 11

87. Mathematical expectations $M(X)=5, M(Y)=4{,}3$ are given for independent random variables *X* and *Y*. Find $M(X \cdot Y)$ 21.5

88. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	0,1	0,3	p_3	0.2

Then the probability p_3 is equal to: 0.4

89. A discrete random variable X is given by the law of distribution:

X	x_1	x_2	x_3	x_4
P	p_1	0.1	0.4	0.3

Then the probability p_1 is equal to: 0.2

90. For an event – dropping two tails at tossing two coins – the opposite event is: 2 heads

91. 4 independent trials are made, and in each of them an event A occurs with probability p. Probability that the event A will occur at least once is: 1 – q*(m);

92. Show the Bernoulli formula

$$P(X = m) = C_n^m p^m q^{n-m}$$

93. Show mathematical expectation of a discrete random variable X:

$$M(X) = \sum_{i=1}^{\infty} x_i p_i$$

94. Show the Chebyshev inequality

$P(|X - a| > \varepsilon) \leq D(X)/\varepsilon^2$

95. An improper integral of density of distribution in limits from $-\infty$ till ∞ is equal to **1**

96. The random variable *X* is given by an integral function of distribution: $F(x) = \begin{cases} 0 \quad if \quad x \leq -2, \\ \dfrac{1}{4}x + \dfrac{1}{2} \quad if \ -2 < x \leq 2, \\ 1 \quad if \quad x > 2. \end{cases}$

Find probability of hit of the random variable *X* in an interval (1; 1,5): = 1/8

97. Show one of true properties of mathematical expectation (C is a constant): $M(C) =$ C

98. Let M(X) = 5. Find M(X – 4) = 1

99. Let M(X) = 5. Find M(4X). = 20

100. Let D(X) = 5. Then D(X – 4) is equal to 5

101. Let D(X) = 5. Then D(4X) is equal to 80

102. Random variables *X* and *Y* are independent. Find dispersion of the random variable $Z = 4X - 5Y$ if it is known that D(X) = 1, D(Y) = 2.

*16*1 + 25*2 = 66*

103. A random variable *X* is given by density of distribution of probabilities: $f(x) = \begin{cases} 0 \text{ if } & x \le 0, \\ 1 \text{ if } & 0 < x \le 1, \\ 0 \text{ if } & x > 1 \end{cases}$

Find the function of distribution F(x).

F(x) = x   0<x<1.....

104. Let $f(x)$ be a density of distribution of a continuous random variable X. Then function of distribution is:

$$F(x) = \int_{-\infty}^{x} \varphi(t)dt$$

105. Function of distribution of a random variable X is:

F(x) = P(X < x),

106. If dispersion of a random variable D(X) = 5 then D(5X) is equal to 25*5 = 125

107. Differential function f(x) of a continuous random variable X is determined by the equality:

$$\varphi(x) = F'(x)$$

108. If F(x) is an integral function of distribution of probabilities of a random variable X then P(a < X < b) is equal to

$$P(a \le X \le b) = \int_{a}^{b} \varphi(x)dx$$

109. Show the formula of dispersion

$$D(X) = \int_{-\infty}^{+\infty} (x-a)^2 \varphi(x)dx$$

110. Which equality is true for dispersion of a random variable? $D(CX) =$ C^2 * D(x)

111. The probability that a continuous random variable X will take on a value belonging to an interval (a, b) is equal to $P(a < X < b) =$ $P(a \le X \le b) = \int_{a}^{b} \varphi(x)dx$

112. A random variable X is distributed under an exponential law with parameter λ = 2. Find the dispersion of X:

1/4

113. Show a differential function of the law of uniform distribution of probabilities

$$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 & if \quad x < a \text{ or } x > b. \end{cases}$$

114. Mathematical expectation of a continuous random variable X of which possible values belong to an interval [a, b] is

(a+b)/2

115. Mean square deviation of a random variable X is determined by the following formula

$$a = M(X) = \int_{-\infty}^{+\infty} x\varphi(x)dx$$

116. Dispersion D(X) of a continuous random variable X is determined by the following equality

$$D(X) = \int_{-\infty}^{+\infty} (x-a)^2 \varphi(x)dx$$

117. Function of distribution of a random variable X is given by the formula $F(x) = \begin{cases} 0 & if \quad x \le 0 \\ \sin 2x \text{ if } 0 < x \le \pi/4 \\ 1 & \text{if} \quad x > \pi/4 \end{cases}$. Find density of distribution f(x).

Тупо производная

118. Distribution of probabilities of a continuous random variable X is exponential if it is described by the density

$$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for\ x \ge 0, \\ 0 & for \quad x < 0. \end{cases}$$

119. A random variable X is normally distributed with the parameters *a* and σ^2 if its density $f(x)$ is:

$$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

120. Function of distribution of the exponential law has the following form:

$$F(x) = \begin{cases} 0 & for\ x < 0, \\ 1 - e^{-\lambda x} & for\ x \ge 0. \end{cases}$$

121. Mathematical expectation of a random variable X uniformly distributed in an interval (0, 1) is equal to

1/2

122. A random variable X $\in (-\infty, \infty)$ has normal density of distribution $f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-3)^2}{32}}$ Find the value of paramек σ. 4

123. A random variable X $\in (-\infty, \infty)$ has normal density distribution $f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-2)^2}{8}}$. Find the value of parameter σ. 2

124. Mathematical expectation of a normally distributed random variable X is a = 4, and mean square deviation is σ =5. Write the density of distribution X.

$$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

125. It is known that M (X) = - 3 and M (Y) = 5. Find M (3X – 2Y). = 1

126. Random variables X and Y such that Y =4X – 2 and D(X) = 3 are given. Find D(Y). 48

127. The number of allocations of n elements on m is equal to: $A_n^m = \frac{n!}{(n-m)!}$

128. The number of permutations of n elements is equal to: $P_n = n!$

129. How many various 7-place numbers are possible to make of digits 1, 2, 3, 4, 5, 6, 7 if digits are not repeated?

7! = 5040

130. How many ways is there to choose two employees on two various positions from 8 applicants?

A(2 , 8)

131. The number of combinations of n elements on m is equal to:

$$C_n^m = \frac{n!}{m!(n-m)!}$$

132. 3 dice are tossed. Find probability that each die lands on 5:

1/216

133. 2 dice are tossed. Find probability that the same number of aces will appear on each of the dice: 1/6

134. The pack of 52 cards is carefully hashed. Find probability that a randomly extracted card will be an ace: 4/36

135. The pack of 52 cards is carefully hashed. Find probability that two randomly extracted cards will be aces: C(2 , 4) / C(2,52)

136. How many ways are there to choose 3 books from 6? C(3, 6)

137. There are 60 identical details in a box, and 8 of them are painted. One takes out randomly one detail. Find probability that a randomly taken detail will be painted: 8/60

138. How many 4-place numbers can be composed of digits 1, 3, 9, 5? 4^4

139. Dialing the phone number, the subscriber has forgotten one digit and has typed it at random. Find probability that the necessary digit has been typed: 1/10

140. The urn contains 4 white and 6 black balls. One extracts by one randomly two balls without replacement. What is the probability that both balls will be black: 6/10 * 5/9

141. The urn contains 4 white and 6 black spheres. Two balls are randomly extracted from the urn. What is the probability that these balls will be of different color: 4*6/C(2, 10)

142. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that both of them will have the first sort: 3/ 7 * 2/6

143. In a batch of 7 products 3 of them have the first sort, and 4 – the second sort. One takes randomly 2 products. Find probability that they have the same sort: 3/7 * 2/6 + 4/7*3/6

144. A student knows 25 of 30 questions of the program. Find probability that the student knows offered by the examiner 3 questions. 25/30 * 24/29 * 23/28

145. A random variable X is distributed under an exponential law with parameter λ = 2. Find the mathematical expectation of X:

$M(x) = \lambda = 2$

146. Two shooters shoot on a target. The probability of hit in the target by the first shooter is 0,8, by the second – 0,9. Find probability that only one of shooters will hit in the target: 0.8 * 0.1 + 0.9* 0.2

147. A coin is tossed 5 times. Find probability that heads will land 3 times: C(3, 5) * 0.5 ^ 3 * 0.5 ^2

148. A coin is tossed 5 times. Find probability that heads never will land: C(0.5)*0.5^5

149. A coming up seeds of wheat makes 90 %. Find probability that 4 of 6 sown seeds will come up: C(4,6) * 0.9^4 * 0.1 ^2

150. A coming up seeds of wheat makes 90 %. Find probability that only one of 6 sown seeds will come up: C(6, 6) * 0.9 ^6

151. Identical products of three factories are delivered in a shop. The 1-st factory delivers 60 %, the 2-nd and 3-rd factories deliver 20 % each. 70 % of the 1st factory has the first sort, 80% of both the 2nd and the 3rd factories have the first sort. One product is bought. Find probability that it has the first sort: 0.74

152. The dispersion *D(X)* of a random variable *X* is equal to 1,96. Find σ(X): 1.4

153. Find dispersion *D(X)* of a random variable *X*, knowing the law of its distribution

x_i	1	2	3
p_i	0,2	0,5	0,3

M(x) = 0.2 + 1 + 0.9 = 2.1

M(x^2) = 0.2 + 2 + 2.7 = 4.9

D(x) = 0.49

154. If incompatible events **A**, **B** and **C** form a complete group, and P(**A**) + P(**B**) = 0,6 then P(**C**) is equal to: 0.4

155. Let **A** and **B** be events connected with the same trial. Show the event that means an appearance of **A** and a non-appearance of **B**. P(ABс чертой)

156. Let $\mathbf{A_1}, \mathbf{A_2}, \mathbf{A_3}$ be events connected with the same trial. Let **A** be the event that means occurrence only two of events $\mathbf{A_1}, \mathbf{A_2}$ and $\mathbf{A_3}$. Express the event **A** by the events $\mathbf{A_1}, \mathbf{A_2}$ and $\mathbf{A_3}$.

157. Let M be the number of all outcomes, and S be the number of non-favorable to the event **A** outcomes (S < M). Then P(A) is equal to: (M-S)/M

158. Five events form a complete group if they are: Some events form a *complete group* if in result of a trial at least one of them will appear.

159. There are 4000 tickets in a lottery, and 200 of them are winning. Two tickets have been bought. What is the probability that both tickets are winning? 200/4000 * 199/3999

160. If X is uniformly distributed over (0, 7), calculate the probability that X < 2: 2/7

161. If X is uniformly distributed over (0, 7), calculate the probability that X > 6: 1/7

162. There are 23 white, 35 black, 27 yellow and 25 red balls in an urn. One ball has been extracted from the urn. Find the probability that the extracted ball is white or yellow. 27/110

163. There are 15 red and 10 yellow balls in an urn. 6 balls are randomly extracted from the urn.

What is the probability that all these balls are red? C(6, 15)/ C(6, 25)

164. One letter has been randomly chosen from the word "STATISTICS". What is the probability that the chosen letter is "S"? 0.3

165. One letter has been randomly chosen from the word "PROBABILITY". What is the probability that the chosen letter is "I"? 2/11

166. How many 6-place phone numbers are there if only the digits “1”, “3” or “5” are used on the first place? 3*10^5

167. 150 shots have been made, and 25 hits have been registered. Find the relative frequency of hits in a target. 1/6

168. A point is thrown on an interval of length 3. Find the probability that the distance from the point to the ends of the interval is more than 1. 1/3

169. Two dice are tossed. What is the probability that the sum of aces will be more than 8?10/36

170. There are 4 children in a family. Assuming that the probabilities of births of boy and girl are equal, find the probability that the family has four boys: C(0, 4)*0.5^4

171. An urn contains 3 yellow and 6 red balls. Two balls have been randomly extracted from the urn. What is the probability that these balls will be of different color: 3*6/C(2, 9)

172. There are 5 books on mathematics and 8 books on biology in a book shelf. 3 books have been randomly taken. Find the probability that these books are on mathematics. 5/13 *4/12 *3 /11

173. There are 7 standard and 3 non-standard details in a box. 3 details have been randomly taken. Find the probability that only one of them is standard. C(1, 3) * C(2, 7)/ C(2, 10)

174. Three shooters shoot in a target. The probability of hit in the target at one shot by the 1st shooter is 0,8; by the 2^{nd} – 0,75 and by the 3^{rd} – 0,7. Find the probability of hit by all the shooters. 0.8*0.75*0.7 = 0.42

175. A student knows 17 of 25 questions of examination. Find the probability that he (or she) knows 3 randomly chosen questions. 17/25 * 16/24 * 15/23

176. One die is tossed. Find the probability that the number of aces doesn’t exceed 3. 1/2

177. Show the Markov inequality:

$$P(X > A) \leq M(X)/A$$

178. Two shooters shoot in a target. The probability of hit by the first shooter is 0,85, and by the second – 0,9. Find the probability that only one of the shooters will hit in the target. 0.85*0.1 + 0.9 * 0.15 = 0.22

179. Three dice are tossed. Find the probability that the sum of aces will be 9. 1/9

180. At shooting by a gun the relative frequency of hit in a target is equal to 0,9. Find the number of misses if 300 shots have been made. 300*0.9 = 270

181. A point is put on an interval of length 2. Find the probability that the distance from the point to the ends of the interval is more than 3/4. 2/8

182. There are 6 yellow and 6 red balls in an urn. 2 balls have been randomly taken. What is the probability that both balls are red? 6/12 * 5/11

183. Events A_1, A_2, A_3, A_4, A_5 are called independent in union if: Several events are *independent in union* (or just *independent*) if each two of them are independent and each event and all possible products of the rest events are independent.

184. There are 12 sportsmen in a group, and 8 of them are masters of sport. 6 sportsmen have been randomly selected. Find the probability that there are 2 masters of sport among the selected sportsmen. C(2, 8) * C(4, 12)/ C(2, 20)

185. A pack of 52 cards is carefully shuffled. Find the probability that three randomly extracted cards will be kings:

C(3,4)/ C(3, 52)

186. A circle of radius 4 cm is placed in a big circle of radius 8 cm. Find the probability that a randomly thrown point in the big circle will get as well in the small circle. 16/64 = 1/4

187. There are 7 yellow and 5 black balls in an urn. The event A consists in that the first randomly taken ball is black and the event B – the second randomly taken ball is yellow. Find P(AB). = 5/12 * 7/11

188. The probability to fail exam for the first student is 0,3; for the second – 0,4; for the third – 0,2. What is the probability that only one of them will pass the exam? 0.7 * 0.4 * 0.2 + 0.3 * 0.6 * 0.2 + 0.3 * 0.4 * 0.8

189. The probability of delay for the train №1 is equal to 0,15; and for the train №2 – 0,25. Find the probability that at least one train will be late. 1 – 0.85 * 0.25 = 0.7875

190. The probability of delay for the train №1 is equal to 0,15, and for the train №2 – 0,25. Find the probability that both trains will be late. 0.15 * 0.25 = 0.0375

191. The events A and B are independent, P(A) = 0,6; P(B) = 0,8. Find $P(\bar{A}B)$. 0.4 *0.8 = 0.32

192. Two independent events A and B are compatible, P(A) = 0,6; and P(B) = 0,75. Find $P(\bar{A}+\bar{B})$ = 0.4 + 0.25 – 0.4 * 0.25

193. Details are made at two factories, and the first of them delivers 70%, and the second - 30% of all consumed production. 90 of each hundred details of the first factory are standard on the average, and 80 – of the second factory. Find the probability that a randomly taken detail will be standard. 0.7 * 0.9 + 0.3*0.8 = 0.87

194. The probability of hit in 10 aces for a shooter at one shot is 0,8. Find the probability that for 15 independent shots the shooter will hit in 10 aces exactly 8 times. C(8, 10) * 0.8^8 * 0.2^2

195. It is known that 25 % of all details are non-standard. 8 details have been randomly taken. Find the probability that there is no more than 2 non-standard detail of the taken.

C(0, 8) * 0.25 ^8 + C(1, 8)*0.25^1*0.75^7 + C(2, 8)* 0.25 ^2* 0.75 ^6

196. For an event – appearance of four tails at tossing four coins - the opposite event is:

4 heads

197. A random variable X is given by the integral function of distribution:

$$F(x)=\begin{cases}0 \quad if \quad x\le 0,\\ \frac{1}{6}x \quad if \quad 0<x\le 6,\\ 1 \quad if \quad x>6.\end{cases}$$

Find the probability of hit of the random variable X in the interval (3; 5):

5/6 – 3/6 = 2/6 = 1/3

198. A random variable X is given by the density of distribution of probabilities:

$$f(x)=\begin{cases}0 \text{ if } \quad x\le 0,\\ x/4 \text{ if } 0<x\le 2\sqrt{2}\\ 0 \text{ if } \quad x>2\sqrt{2}\end{cases}$$

Find the function of distribution F(x). первообразная

199. The function of distribution of a random variable X is given by the formula:

$$F(x)=\begin{cases}0 & if \quad x\le 0\\ \cos^2 4x \text{ if } 0<x\le \pi/4\\ 1 & \text{if} \quad x>\pi/4\end{cases}.$$

Find the density of distribution f(x). производная

200. A die is tossed before the first landing 3 aces. Find the probability that the first appearance of 3 will occur at the fourth tossing the die. 0,096

1812. The probability that a day will be rainy is *p = 0,75*. Find the probability that a day will be clear.

0,25

0,3

0,15

0,75

1

1813. Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,4; and by the third – 0,9. What is the probability that the exam will be passed on "excellent" by only one student?

0,424

0,348

0,192

0,208

0,992

1814. If D(X)=3, find D(-3X+4).

12

-5

19

27

-9

1815. The table below shows the distribution of a random variable X. Find M[x] and D(X).

X	-2	0	1
P	0.1	0.5	0.4

M[X]= 0,2; D(X) =0.8

M[X]= 0,3; D(X) =0.27

M[X]= 0,2; D(X) =0.76

M[X]= 0,2; D(X) =0.21

M[X]= 0,8; D(X) =0.24

1816. Let *X* be a continuous random variable with density function $f(x)=\begin{cases}\frac{|x|}{10} & for -2 \le x \le 4\\ 0 & otherwise\end{cases}$ **Calculate the expected value of *X*.**

1/5

3/5

1

28/15

12/15

1817. If P(E) is the probability that an event will occur, which of the following must be false?

P(E)=1

P(E)=1/2

P(E)=1/3

P(E)= - 1/3

P(E)=0

1818. A movie theatre sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?

1

3

9

27

62

1819. The probability is p = 0.85 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

40

20

8

34

124

1820. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

0.99

0.25

0.49

0.45

0.01

1821. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	**Did not pass**
Female	**430**	**60**
Male	**410**	**100**

If one person is selected randomly, what is the probability that it did not pass given that it is male.

0.17

0.21

0.42

0.08

0.196

1822. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

0.98

0.02

0.28

0.53

None of the shown answers

1823. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

0.9995

0,00005

0.15

0.6

0.5220

1824. Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 3?

1/6

1/5

1/3

5/6

1/18

1825. A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be Spades?

4/17

1/17

2/17

1/4

4/17

1826. In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?

0.2995

0.699

0.23336

1/4

0.4999

1827. Table shows the cumulative distribution function of a random variable X. Determine $P(X > 4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

1/8

1

1/2

3/4

0

1828. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?

1/3

3/8

5/8

1/8

1

1829. A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.

512/3375

28/65

8/15

1856/3375

36/65

1830. We are given the probability distribution functions of two random variables X and Y shown in the tables below.

X	1	3	Y	2	4
P	0.4	0.6	P	0.2	0.8

Find M[X+Y].

5,8

2,2

2

8,8

10

1831. In each of the 20 independent trials the probability of success is 0.2. Find the dispersion of the number of successes in these trials.

0

1

10

3.2

0.32

1832. A coin tossed three times. What is the probability that head appears three times?

1/8

0

4:1

1

8:1

There are 10 white, 15 black, 20 blue and 25 red balls in an urn. One ball is randomly extracted. Find the probability that the extracted ball is blue or red.

5/14

1/70

1/7

9/14

3/98

A random variable *X* has the following law of distribution:

x_i	0	1	2	3
p_i	1/30	3/10	½	1/6

Find the mathematical expectation of *X*.

1

1,5

2

1,8

2,3

A random variable *X* is given by the integral function of distribution:

$$F(x) = \begin{cases} 0 \quad if \quad x \le 2, \\ \frac{1}{2}x - 1 \quad if \quad 2 < x \le 4, \\ 1 \quad if \quad x > 4. \end{cases}$$

Find the probability of hit of the random variable *X* into the interval (2; 3).

0,25

0,5

1/3

2/3

1

An urn contains 5 red, 3 white, and 4 blue balls. What is the probability of extracting a black ball from the urn?

1/3

0

0,25

0,5

5/12

1833. A class in probability theory consists of 3 men and 12 women. They passed exam, took their score. Assume that no two students took the same score. How many different scores (rankings) are possible?

- Answer: 15!=1 307 674 368 000

1834. Ms. Jones has 15 books that she is going to put on her bookshelf. Of these, 4 are math books, 3 are chemistry books, 6 are history books, and 2 are language book. Ms. Jones wants to arrange her books so that all the books dealing with the same subject are together on the shelf. How many different arrangements are possible?

- Answer: 4!4!3!6!2!=4 976 640

1835. How many different signals, each consisting of 9 flags hung in a line, can be made from a set of 4 white flags, 3 red flags, and 2 blue flags if all flags of the same color are identical?

- Answer: 9! / 4!3!2!=1260

1836. A student has to answer to 10 questions in an examination. How many ways to answer exactly to 4 questions correctly?

- Answer:

1837. A bag contains six Scrabble tiles with the letters A-K-T-N-Q-R. You reach into the bag and take out tiles one at a time exactly six times. After you pick a tile from the bag, write down that letter and then return the tile to the bag. How many possible words can be formed?

1838. Mark is taking four final exams next week. His studying was erratic and all scores A, B, C, D, and F are equally likely for each exam. What is the probability that Mark will get at least one F?

- Answer: 1-(4/5)^4

1839. Using the given data, answer the following question

	COURSE PASS	COURSE FAIL
FINAL PASS	142	34
FINAL FAIL	89	56

What is the probability that a student, taken at random from teacher's class, would have succeded the course, given that they succeeded the final?

1840. At a certain gas station 40% of the customers request regular gas, 35% request unleaded gas, and 25% request premium gas. Of those customers requesting regular gas, only 30% fill their tanks fully. Of those customers requesting unleaded gas, 60% fill their tanks fully, while of those requesting premium, 50% fill their tanks fully. If the next customer fills the tank, what is the probability that regular gas is requested.

- Answer: 0.25

1841. Insurance predictions for probability of auto accident.

	Under 25	25-39	Over 40
P	0.11	0.03	0.02

Table gives an insurance company's prediction for the likelihood that a person in a particular age group will have an auto accident during the next year. The company's policyholders are 25% under the age of 25, 25% between 25 and 39, and 50% over the age of 40. What is the probability that a random policyholder will have an auto accident next year?

1842. A friend who works in a big city owns two cars, one small and one large. Three-quarters of the time he drives the small car to work, and one-quarter of the time he drives the large car. If he takes the small car, he usually has little trouble parking, and so is at work on time with probability 0.8. If he takes the large car, he is at work on time with probability 0.7. What is the probability that he will not be at work on time tomorrow?

1843. A fair six-sided die is tossed. You win \$3 if the result is a «5», you win \$2 if the result is a «6», but otherwise you lose \$1. Let X be the amount you win. What is the mathematical expectation of X?

1844. A fair six-sided die is tossed. You win \$3 if the result is a «1», you win \$1 if the result is a «6», but otherwise you lose \$1. Let X be the amount you win. What is the dispersion of X?

1845. Two independent random variables X and Y are given by the following tables of distribution:

X	2	3	4
P(X)	0.7	0.2	0.1

Y	-3	-1	0
P(Y)	0.3	0.5	0.2

Find the mathematical expectation/ mean square (standard) deviation of X+Y?

- Answer: E[X+Y]=1 Var(X+Y)=1,68 sqrt(Var(X+Y))=1.2961

1846. A set of families has the following distribution on number of children:

X	x_1	x_2	2	3	4
P(X)	0.1	0.2	0.4	0.2	0.1

Determine x_1, x_2, if it is known that $M(X) = 3, D(X) = 1.5$?

1847. **The lifetime of a machine part has a continuous distribution on the interval (0, 30) with probability density function** $f(x) = c(10 + x)^{-2}$, $f(x) = 0$ **otherwise. Calculate the probability that the lifetime of the machine part is less than 5.**

1848. **A random variable** ***X*** **is given by the (probability) density function of distribution:**

$$f(x) = \begin{cases} 0 \quad if \quad x < 1 \ \text{ or } \ 7 \le x, \\ \dfrac{x-1}{9} \ if \ 1 \le x < 4, \\ \dfrac{7-x}{9} \ if \ 4 \le x < 7. \end{cases}$$

Find the cumulative distribution function of the random variable X?

- Answer
- $$F(x) = \begin{cases} 0 \quad if \quad x < 1, \\ \dfrac{(x-1)^2}{18} \ if \ 1 \le x < 4, \\ \dfrac{18-(7-x)^2}{18} \ if \ 4 \le x < 7, \\ 1 \quad if \quad 7 \le x. \end{cases}$$

1849. **A random variable** ***X*** **is given by the cumulative distribution function:**

$$F(x) = \begin{cases} 0 \quad if \quad x \le 0, \\ \dfrac{Cx^3}{125} \ if \ 0 \le x < 5, \\ 1 \quad if \quad 5 \le x. \end{cases}$$

Find the mathematical expectation/dispersion of the random variable X?

1850. **The probability that a shooter will beat out 10 points at one shot is equal to 0.1 and the probability to beat out 9 points is equal to 0.3. Find the probability of the event A – the shooter will beat out 6 or less points.**

1851. **Three students pass an exam. Let A_i be the event «the exam will be passed on "excellent" by the i-th student» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event: «only one student will pass the exam on "excellent"». Here $\overline{A} = A^c$.**

- $A_1\overline{A}_2\overline{A}_3 + \overline{A}_1 A_2 \overline{A}_3 + \overline{A}_1\overline{A}_2 A_3$

1852. **A random variable *X* is given by the cumulative distribution function:**

$$F(x) = \begin{cases} 0 & if \quad x < 10, \\ \dfrac{x-10}{10} & if \;\; 10 \le x < 20, \\ 1 & if \quad 20 \le x. \end{cases}$$

Find P (8 < X < 16).

1853. **A random variable X is given by the cumulative distribution function:**

$$F(x) = \begin{cases} 0 & if \quad x \le 2, \\ \dfrac{1}{2}x - 1 & if \;\; 2 < x \le 4, \\ 1 & if \quad x > 4. \end{cases}$$

Find the probability of hit of the random variable X into the interval (2.5; 4).

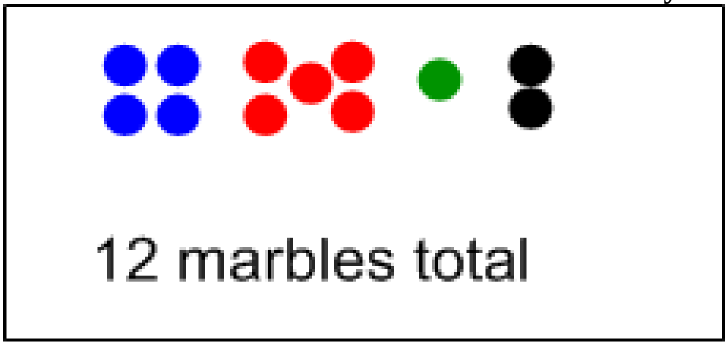
1854. **The probability that a shooter hit in a target at one shot is equal to 0.8. The shooter has made 3 shots. Find the probability of the event – shooter hit in a target at least one time. (exact value)**

1855. **All of the letters that spell STUDENT are put into a bag. Choose the correctly calculated probability of events.**

- P(drawing a S, and then drawing a T)=1/21
- P(drawing a T, and then drawing a D)=1/42
- P(selecting a vowel, and then drawing a U)=1/42
- P(selecting a vowel, and then drawing a K)=1/42
- P(selecting a vowel, and then drawing a T)=3/42

1856. **A jar of marbles contains 4 blue marbles, 5 red marbles, 1 green marble, and 2 black marbles. A marble is chosen at random from the jar. After returning it again, a second**

marble is chosen. Choose the correctly calculated probability of events.



● P(green, and then red)=5/144

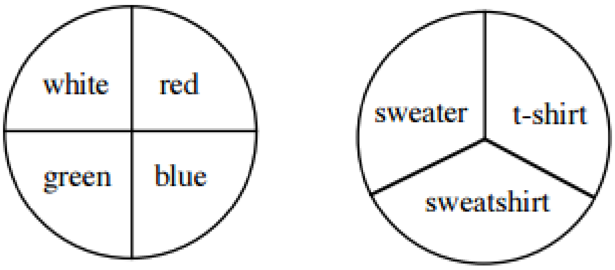
○ P(black, and then black)=1/12

○ P(red, and then black)=7/72

○ P(green, and then blue)=1/72

○ P(blue, and then blue)=1/6

1857.If each of the regions in each spinner is the same size.



Choose the correctly calculated probability of spinning each spinner.

● P(getting a red sweater)=1/12

○ P(getting a white sweatshirt)=1/6

○ P(getting a white sweater)=5/12

○ P(getting a blue sweatshirt)=7/12

○ P(getting a blue t-shirt)=1/6

1858.Find the Bernoulli formula.

● $$P_n(k)=\frac{n!}{k!(n-k)!}\cdot p^k\cdot(1-p)^{n-k}$$

○ $$P(B|A)=\frac{P(B)\cdot P(A|B)}{P(A)}$$

- ○ $$P(B|A)=\frac{P(AB)}{P(A)}$$
- ○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot e^{-2pq}$$
- ○ $$P_n(k)=\frac{1}{\sqrt{npq}}\cdot \Phi\left(\frac{k-np}{\sqrt{npq}}\right)$$

1859.A coming up a grain stored in a warehouse is equal to 50%. What is the probability that the number of came up grains among 100 ones will make from a up to b pieces?

- ● $a=5, b=10, P=\Phi\left(\frac{10-100*0,5}{\sqrt{100*0,5*0,5}}\right)-\Phi\left(\frac{5-100*0,5}{\sqrt{100*0,5*0,5}}\right)$

1860.Find the right statements.

- ○ $D(X)=\int_{-\infty}^{+\infty} x^2 f(x)dx$
- ● $M(X)=\int_{-\infty}^{+\infty} xf(x)dx$
- ○ $F(x)=f'(x)$
- ○ $D(X)=\int_{-\infty}^{+\infty} x^2 f(x)dx-M(X)$
- ○ $P(X>A)>\frac{M(X)}{A}$

1861.Find the false statements.

- ○ $0\le F(x)\le 1$
- ○ $F(-\infty)=0$
- ● $F(+\infty)=0$
- ○ $F(x)=P(X<x)$
- ○ $\int_{-\infty}^{+\infty} f(x)dx=1$

1862. Let a series of distribution of a random variable be given:

$$X=\begin{pmatrix} 1 & 2 & 3 & 4 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{pmatrix}.$$ **What does this tell us about the random variable X?**

- $$F(x)=\begin{cases}0 & if \quad x\le 1,\\ 0.1 & if \quad 1<x\le 2,\\ 0.3 & if \quad 2<x\le 3,\\ 0.6 & if \quad 3<x\le 4,\\ 1 & if \quad 4<x.\end{cases}$$
- $$F(x)=\begin{cases}0 & if \quad x\le 1,\\ 0.1 & if \quad 1<x\le 2,\\ 0.2 & if \quad 2<x\le 3,\\ 0.3 & if \quad 3<x\le 4,\\ 0.4 & if \quad 4<x.\end{cases}$$
- $M(X) = 1$
- $M(X^2) = 9$
- $D(X) = 10$

1863. The probability of working each of four combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What are the possible values of X?

- 2
- -1
- 5
- 6
- -2

1864. The probability of working each of 3 combines without breakages during a certain time is equal to 0,9. The random variable *X* – the number of combines working trouble-free. What does this tell us about the random variable X?

- $P(X = 2) = 0.243$
- $P(X = 3) = 0.001$
- $P(X = 1) = 0.009$
- $P(X = 2) = 0.081$
- $P(X = 0) = 0.1$

1865. **Suppose that the random variable X is the number of typographical errors on a single page of book has a Poisson distribution with parameter $\lambda = \frac{1}{4}$. What does this tell us about the random variable X?**

- $M(X) = 0.25$
- $M(X) = 2$
- D(X)= - 8
- M(X) = 1
- $D(X) = 4$

1866.Assuming that the height of men of a certain age group is a normally distributed random variable X with the parameters $a = 173$, $\sigma^2 = 36$. Find the correctly calculated probabilities of the events.

- $P(|X - 173| \le 3) = 2\Phi\left(\frac{1}{2}\right)$

1867.Assuming that the height of men of a certain age group is a random variable X uniformly distributed over $(0; 10)$. Find the correctly calculated probabilities of the events.

1868.The time (in hours) required to repair a machine is an exponentially distributed random variable with parameter λ. Find the correctly calculated probabilities of the events.

1869.Which of the following is a discrete random variable?

- The time of waiting a train.
- The number of boys in family having 4 children.
- A time of repair of TVs.
- The velocity in any direction of a molecule in gas.
- The height of a man.

1870. How would it change the expected value of a random variable X if we multiply the X by a number k.

1871. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

- Answer: $$f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$$

1872. Find the density function of random variable $X \sim U[a, b]$

$$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 & if \quad x < a \ or \ x > b. \end{cases}$$

1873. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

- 1/4, always
- 1/4, if A and B are independent
- 1/2, always
- 1/2, if A and B are independent
- None of the given answers

1874. Given a normal distribution with μ=90 and σ=10, what is the probability that X>75?

- Φ(1.5)

1875. The cumulative distribution function for continuous random variable X is given by

$$F(x) = \begin{cases} 0, \ x < 0 \\ x/2, \ 0 \le x \le 2 \\ 1, \ x > 2 \end{cases}$$ **. Find the variance Var(X).**

Answer: $\frac{1}{3}$

1876. If the probability density function of a continuous random variable X is

$$f(x) = \begin{cases} kx^2 & 0 \le x \le 3 \\ 0 & otherwise \end{cases}$$ **then the value of k is**

1877. If E(X)=3, E(Y)=2 and X and Y are independent, find E(-3X+2Y-1).

1878. The table below shows the distribution of a random variable X. Find E[x^2].

X	-2	0	1
P	0.1	0.5	0.4

100. Events are *equally possible* if … **two probability equally**

101. The probability of the event *A* is determined by the formula **P(A)=m/n**

102. The probability of a reliable event is equal to … 1 или universal

103. The probability of an impossible event is equal to … **0** **or null**

104. The relative frequency of the event *A* is defined by the formula: **W(A)=m/n**

105. There are 50 identical details (and 5 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted. **1/10**

106. A die is tossed. Find the probability that an even number of aces will appear. **1/2**

107. Participants of a toss-up pull a ticket with numbers from 1 up to 60 from a box. Find the probability that the number of the first randomly taken ticket contains the digit 3. **1/4**

108. In a batch of 10 details the quality department has found out 3 non-standard details. What is the relative frequency of appearance of non-standard details equal to? **0.3**

109. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,35. Find the number of hits if 20 shots were made. **7**

110. Two dice are tossed. Find the probability that the same number of aces will appear on both dice **1/6**

111. An urn contains 15 balls: 4 white, 6 black and 5 red. Find the probability that a randomly taken ball will be white. **4/15**

112. 12 seeds have germinated of 36 planted seeds. Find the relative frequency of germination of seeds. 2.**1/3**

113. A point *C* is randomly appeared in a segment *AB* of the length 3. Determine the probability that the distance between *C* and *B* doesn't exceed 1. **1/3**

114. A point *B(x)* is randomly put in a segment *OA* of the length 8 of the numeric axis *Ox*. Find the probability that both the segments *OB* and *BA* have the length which is greater than 3. **1/4**

115. The number of all possible permutations **Pn=n!**

116. How many two-place numbers can be made of the digits 2, 4, 5 and 7 if each digit is included into the image of a number only once? **12**

117. The number of all possible allocations **An'm=n!/(n-m)!**

118. How many signals is it possible to make of 5 flags of different color taken on 3? **60**

119. The number of all possible combinations **Cnm=n!/m!(n-m)!**

120. **How many ways are there to choose 2 details from a box containing 13 details? 78**

121. **The numbers of allocations, permutations and combinations are connected by the equality An"m=Pm*Cn'm**

122. **4 films participate in a competition on 3 nominations. How many variants of distribution of prizes are there, if on each nomination are established different prizes. 64**

123. **If some object *A* can be chosen from the set of objects by *m* ways, and another object *B* can be chosen by *n* ways, then we can choose either *A* or *B* by … ways. n+m**

124. **There are 200 details in a box. It is known that 150 of them are details of the first kind, 10 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the second kind from the box are there? 25 (C150"1+C10"1)**

125. **If an object *A* can be chosen from the set of objects by *m* ways and after every such choice an object *B* can be chosen by *n* ways then the pair of the objects (*A*, *B*) in this order can be chosen by ... ways. n*m**

126. **There are 15 students in a group. It is necessary to choose a leader, its deputy and head of professional committee. How many ways of choosing them are there? 2730**

127. **6 of 30 students have sport categories. What is the probability that 3 randomly chosen students have sport categories? 1/203**

128. **A group consists of 10 students, and 5 of them are pupils with honor. 3 students are randomly selected. Find the probability that 2 pupils with honor will be among the selected. 1/12 это ответ апайки, мой 5/12**

129. **It has been sold 15 of 20 refrigerators of three marks available in quantities of 5, 7 and 8 units in a shop. Assuming that the probability to be sold for a refrigerator of each mark is the same, find the probability that refrigerators of one mark have been unsold. Апайкин: 0,0016, мой: 0,005**

130. **A shooter has made three shots in a target. Let A_i be the event «hit by the shooter at the *i*-th shot» (i = 1, 2, 3). Express by A_1, A_2, A_3 and their negations the following event *A* – «only two hit».**

F.

G.

H.

I.

J.

131. **A randomly taken phone number consists of 5 digits. What is the probability that all digits of the phone number are different. It is known that any phone number does not begin with the digit zero.** **Апайкин: 0,0001, мой: 0,3204**

132. **The probability of appearance of any of two incompatible events is equal to the sum of the probabilities of these events: P(A+B)=P(A)+P(B)**

133. **A shooter shoots in a target subdivided into three areas. The probability of hit in the first area is 0,5 and in the second – 0,3. Find the probability that the shooter will hit at one shot either in the first area or in the third area. 0.7**

134. **The sum of the probabilities of events $A_1, A_2, A_3, \ldots, A_n$ which form a complete group is equal to … 1**

135. **Two uniquely possible events forming a complete group are …**

F. Opposite

G. Same

H. Identically distributed

I. Sample

J. Density function

136. **The sum of the probabilities of opposite events is equal to … 1**

137. ***The conditional probability* of an event *B* with the condition that an event *A* has already happened is equal to: Pa(B)=P(AB)/P(A)**

138. **There are 4 conic and 8 elliptic cylinders at a collector. The collector has taken one cylinder, and then he has taken the second cylinder. Find the probability that the first taken cylinder is conic, and the second – elliptic. 8/33**

139. **The events *A, B, C* and *D* form a complete group. The probabilities of the events are those: $P(A) = 0{,}01$; $P(B) = 0{,}49$; $P(C) = 0{,}3$. What is the probability of the event *D* equal to? 0.2**

140. **For independent events theorem of multiplication has the following form: P(AB)=P(A)*P(B)**

141. **The probabilities of hit in a target at shooting by three guns are the following: $p_1 = 0{,}6$; $p_2 = 0{,}7$; $p_3 = 0{,}5$. Find the probability of at least one hit at one shot by all three guns. 0.94**

142. **Three shots are made in a target. The probability of hit at each shot is equal to 0,6. Find the probability that only one hit will be in result of these shots. 0.288**

143. **Three students pass an exam. The probability that the exam will be passed on "excellent" by the first student is equal to 0,3; by the second – 0,5; and by the third –**

0,8. What is the probability that the exam will be passed on "excellent" by neither of the students? 0.07

144. 10 of 20 savings banks are located behind a city boundary. 5 savings banks are randomly selected for an inspection. What is the probability that among the selected banks appears inside the city 3 savings banks? Апайкин: 9/38, мой: 225/646

145. A problem in mathematics is given to three students whose chances of solving it are 2/3, 3/4, 2/5. What is the probability that the problem will be solved ? 19/29

146. An urn contains 10 balls: 3 red and 7 blue. A second urn contains 6 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.54 . Calculate the number of blue balls in the second urn. 9

147. A bag contains 7 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue. 4/165

148. Find the Bernoulli formula Pn(K)=n!/k!(n-k)!*PkQn-k

149. Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?

F. $A+B+C$

G. $A \cdot B \cdot C$

H. $A \cdot B^c \cdot C^c + A^c \cdot B \cdot C^c + A^c \cdot B^c \cdot C$

I. $(A+B+C)^c$

J. $AB+AC+BC$

○

150. Find the dispersion for the given probability distribution.

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

151.

○

○ 2.85

152. How would it change the dispersion of a random variable X if we add a number a to the X.

F. D(X+a)=D(X)+a

G. D(X+a)=D(X)+a^2

H. D(X+a)=D(X)

I. D(X+a)= $a \cdot$D(X)

J. D(X+a)= a^2D(X)

153. **The cumulative distribution function of a discrete random variable X is given by**

$$F(x) = \begin{cases} 0 & if\ x \le 2 \\ 0.5 & if\ 2 < x \le 5 \\ 0.8 & if\ 5 < x \le 8 \\ 1 & if\ x > 8 \end{cases}$$

Find P{3<X<9}. 0,5

154. **Find the expectation of a random variable X if the cumulative distribution function**

$$F(x) = \begin{cases} 1 - e^{-x/4}, x \ge 0 \\ 0, \quad x < 0 \end{cases}$$

. 4

155. **If the dispersion of a random variable X is given D(X)=4. Then D(2X) is D(2x)=16**

156. **Indicate the expectation of a Poisson random variable X with parameter λ. λ**

157. **The lifetime of a machine part has a continuous distribution on the interval (0, 20) with probability density function $f(x) = c(10 + x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5. 0.5**

158. **What kind of distribution is given by the density function $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{(x-\mu)^2}{2\sigma^2}}$ ($-\infty < x < \infty$)?**

F. Poisson distribution

G. Normal distribution

H. Uniform distribution

I. Bernoulli distribution

J. Exponential distribution

159. **Suppose the test scores of 10000 students are normally distributed with an expectation of 76 and mean square deviation of 8. The number of students scoring between 60 and 82 is: 7065,6 or 71%**

160. **The distribution of weights in a large group is approximately normally distributed. The expectation is 80 kg. and approximately 68,26% of the weights are between 70 and 90 kg. The mean square deviation of the distribution of weights is equal to: 0,3413**

161. **A continuous random variable *X* is uniformly distributed over the interval [15, 21]. The expected value of *X* is 18**

162. The cumulative distribution function for continuous random variable X is given by

$$F(x) = \begin{cases} 0, \ x < 0 \\ x/2, \ 0 \le x \le 2 \\ 1, \ x > 2 \end{cases}$$

. Find the standard deviation $\sigma(X)$ **. Апайкин: 1/3, мой: 1/sqrt3**

163. A continuous random variable X is exponentially distributed with the density

$$f(x) = \begin{cases} 3e^{-3x}, \ x \ge 0 \\ 0, \ x < 0 \end{cases}$$

. What is the M[X] and D(X)? MX=1/3 DX=1/9

164. How many different 5-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?6!

165. A fair coin is thrown in the air five times. If the coin lands with the head up on the first four tosses, what is the probability that the coin will land with the head up on the fifth toss? 1/2

166. A random variable Y has the following distribution:

○ Y	○ -1	○ 0	○ 1	○ 2
○ P(Y)	○ C	○ 4C	○ 0.4	○ 0.1

167.

1879. The value of the constant C is:0.1

168. Which one of these variables is a continuous random variable?

F. The time it takes a randomly selected student to complete an exam.

G. The number of tattoos a randomly selected person has.

H. The number of women taller than 68 inches in a random sample of 5 women.

I. The number of correct guesses on a multiple choice test.

J. The number of 1's in N rolls of a fair die

169. Heights of college women have a distribution that can be approximated by a normal curve with an expectation of 65 inches and a mean square deviation equal to 3 inches. About what proportion of college women are between 65 and 68 inches tall? 0,34134 Ф(1)-Ф(0)

170. A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...

F. Probability distribution

G. The expected value

H. The standard deviation

I. Coefficient of variation

J. Correlation

171. For a continuous random variable X, the probability density function f(x) represents

F. the probability at a fixed value of X

G. the area under the curve at X

H. the area under the curve to the right of X

I. the height of the function at X

J. the integral of the cumulative distribution function

172. Two events each have probability 0.3 of occurring and are independent. The probability that neither occur is Апайкин: 0,51, мой: 0,49

173. Suppose that 10% of people are left handed. If 6 people are selected at random, what is the probability that exactly 2 of them are left handed? 0,0984

174. Which of these has a Geometric model?

F. the number of aces in a five-card Poker hand
G. the number of people we survey until we find two people who have taken Statistics
H. the number of people in a class of 25 who have taken Statistics
I. the number of people we survey until we find someone who has taken Statistics

J. the number of sodas students drink per day

175. In a certain town, 55% of the households own a cellular phone, 40% own a pager, and 25% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is 30%

176. A probability function is a rule of correspondence or equation that:

F. Finds the mean value of the random variable.

G. Assigns values of x to the events of a probability experiment.

H. Assigns probabilities to the various values of x.

I. Defines the variability in the experiment.

J. None of the given answers is correct.

177. Which of the following is an example of a discrete random variable?

F. The distance you can drive in a car with a full tank of gas.

G. The weight of a package at the post office.

H. The amount of rain that falls over a 24-hour period.

I. The number of cows on a cattle ranch.

J. The time that a train arrives at a specified stop.

178. **Which of the following is the appropriate definition for the union of two events A and B?**

F. The set of all possible outcomes.

G. The set of all basic outcomes contained within both A and B.

H. The set of all basic outcomes in either A or B, or both.

I. None of the given answers

J. The set of all basic outcomes that are not in A and B.

179. **What is the probability of drawing a Diamond from a standard deck of 52 cards?**

1880. **What is the probability of drawing a diamond from a standard deck of 52 cards?**

- 1/52
- 13/39
- 1/13
- 1/4
- 1/2

180. **The probability density function of a random variable X is given by**

$$f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$$

.

1881. **What are the values of μ and σ?**

- $\mu = 1, \sigma = 4$
- $\mu = -1, \sigma = 4$
- $\mu = -1, \sigma = 2$
- $\mu = 1, \sigma = 8$
- $\mu = 1, \sigma = 2$

181. **The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=4. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:**

1882. **Апайкин: 0.14, мой: 0.24**

182. Table shows the cumulative distribution function of a random variable X. Determine

X	1	2	3	4
F(X)	3/8	1/8	3/4	1

183.

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3
- Ответ 5/8 я решила апай подтвердила

184. Which of the following statements is always true for A and A^C ?

F. $P(AA^c)=1$

G. $P(A^c)=P(A)$

H. $P(A+A^c)=0$

I. $P(AA^c)=0$

J. None of the given statements is true

185. If P(A)=1/6 and P(B)=1/3 then $P(A \cap B)$ =

F. 1/18, always

G. 1/18, if A and B are independent

H. 1/6, always

I. 1/2, if A and B are independent

J. None of the given answers

186. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

- 24/75
- 24/35
- 6/35
- 12/75
- None of the given answers
-

187. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$ **.**

F. $\lambda = np \sim const$, $n \to \infty,\ p \to 0$

G. $\lambda = \dfrac{n}{p}$, $n \to \infty$

H. $\lambda = ep$, $n \to \infty$

I. $\lambda = n^p$, p is const

J. None of the given answers is correct

188. The probability density function of a random variable X is given by

$$f(x) = \begin{cases} \dfrac{1}{\gamma - 2{,}5}, & if \ \ x \in (1{,}5;\, 3) \\ 0, & otherwise \end{cases}$$

. Calculate the parameter γ. 4

189. Probability density function of the normal random variable X is given by

$$f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-3)^2}{50}}$$

. What is the mean square deviation?

- 5
- 3
- 25
- 50
- 9

190. The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.

F. p^5

G. $1 - (1-p)^5$ correct

H. $(1-p)^5$

I. $1 - p^5$

J. None of the given answers is correct

191. Choose the density function of random variable

F. $$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \ge 0, \\ 0 \quad for & x < 0. \end{cases}$$

G. $$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 \quad if & x < a \ or \ \ x > b. \end{cases}$$

H. $$F(x) = \begin{cases} 0 & for \ x < 0, \\ 1 - e^{-\lambda x} & for \ x \ge 0. \end{cases}$$

I. $$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

J. $$P(X = m) = \frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$$

192. Choose the probability distribution function of random variable

F. $$P(X = m) = \frac{\lambda^m e^{-\lambda}}{m!}$$

G. $$P(X = m) = \frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$$

H. $$P(X = m) = C_n^m p^m q^{n-m}$$

I. $$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

J. $$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \ge 0, \\ 0 \quad for & x < 0. \end{cases}$$

193. Choose the probability density function of random variable

F. $$\varphi_N(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-a)^2}{2\sigma^2}}$$

G. $$\varphi(x) = \begin{cases} \lambda e^{-\lambda x} & for \ x \ge 0, \\ 0 \quad for & x < 0. \end{cases}$$

H. $$\varphi(x) = \begin{cases} \dfrac{1}{b-a} & if \quad a \le x \le b, \\ 0 \quad if & x < a \ or \ \ x > b. \end{cases}$$

I. $$F(x) = \begin{cases} 0 & for \ x < 0, \\ 1 - e^{-\lambda x} & for \ x \ge 0. \end{cases}$$

J. $P(X=m)=C_n^m p^m q^{n-m}$

194. The mathematical expectation and dispersion of a random variable *X* distributed under the binomial law are …, respectively.

F.

G.

H.

I.

J.

195. The mathematical expectation and the dispersion of a random variable distributed under the Poisson are …, respectively.

F.

G.

H.

I.

J.

196. The probability distribution function of random variable is

F.

G. $P(X=m)=\frac{\lambda^m e^{-\lambda}}{m!}$

H. $P(X=m)=\frac{C_M^m C_{N-M}^{n-m}}{C_N^n}$

I. $P(X=m)=C_n^m p^m q^{n-m}$

J. $\varphi_N(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$

197. The mathematical expectation and dispersion of a random variable *X* having the geometrical distribution with the parameter *p* are …, respectively.

F.

G.

H.

I.

J.

198. The mathematical expectation and dispersion of a random variable *X* having the uniformly distribution on [a,b] are …, respectively.

F.

G.

H.

I.

J.

199. A normally distributed random variable *X* is given by the differential function:

$$f(x) = \frac{1}{\sqrt{2\pi}} \cdot e^{-\frac{x^2}{2}}$$

. Find the interval in which the random variable *X* will hit in result of trial with the probability 0,9973. (-3,3)

200. Write the density of probability of a normally distributed random variable *X* if *M(X)* = 5, *D(X)* = 16.

F. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+3)^2}{18}}$

G. $f(x) = \frac{1}{4\sqrt{2\pi}} e^{-\frac{(x-5)^2}{32}}$

H. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{8}}$

I. $f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+5)^2}{16}}$

J. $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-4)^2}{16}}$

x_i	2	3	6	9
p_i	0,1	0,4	0,3	0,2

201. A discrete random variable X is given by the following law of distribution:

○

○

○

-
- **By using Chebyshev inequality estimate the probability that |X-M(X)|>3.1/3**

1883. The probabilities that three men hit a target are respectively 1/6, 1/4 and 1/3. Each man shoots once at the target. What is the probability that exactly one of them hits the target?

1/6*3/4*2/3+5/6*1/4*2/3+5/6*3/4*1/3

- ○ 11/72
- ○ 21/72
- ● 31/72
- ○ 3/4
- ○ 17/72

1884. A problem in mathematics is given to three students whose chances of solving it are 1/3, 1/4, 1/5. What is the probability that the problem will be solved?

- ○ 0.2
- ○ 0.8
- ○ 0.4
- ● 0.6
- ○ 1

1885. You are given $P[A \cup B] = 0.7$ and $P[A \cup B^c] = 0.9$. Determine $P[A]$.

- ○ 0.2
- ● 0.3
- ○ 0.4
- ○ 0.6
- ○ 0.8

1886. An urn contains 10 balls: 4 red and 6 blue. A second urn contains 16 red balls and an unknown number of blue balls. A single ball is drawn from each urn. The probability that both balls are the same color is 0.44 . Calculate the number of blue balls in the second urn.

4/10*16/20+6/10*4/20=(64+24)/200=88/200=44/100=0.44

- ● 4
- ○ 20
- ○ 24

- 44
- 64

1887. The probability that a boy will not pass an examination is 3/5 and that a girl will not pass is 4/5. Calculate the probability that at least one of them passes the examination.

3/5*1/5+2/5*4/5+2/5*1/5= (3+8+2)/25=13/25

- 11/25
- 13/25
- 1/2
- 7/25
- 16/25

1888. A bag contains 5 red discs and 4 blue discs. If 3 discs are drawn from the bag without replacement, find the probability that all three are blue.

4/9*3/8*2/7=24/504=1/21

- 1/21
- 2/21
- 1/7
- 4/21
- 1/3

1889. Find the variance for the given probability distribution.

X	0	2	4	6
P(x)	0.05	0.17	0.43	0.35

(4*0.17+16*0.43+36*0.35)-(2*0.17+4*0.43+6*0.35)^2

- 1.5636
- 2.8544
- 1.6942
- 2.4484
- 1.7222

1890. A bag contains 5 white, 7 red and 8 black balls. Four balls are drawn one by one with replacement, what is the probability that at least one is white?

- $1-\left(\frac{1}{4}\right)^4$
- $1-\left(\frac{3}{4}\right)^4$
- $\left(\frac{3}{4}\right)^4$
- 0.7182

- ○ $\left(\frac{1}{4}\right)^4$

1891. Формулой Бернулли называется формула

- ○ $P_n(k)=\frac{1}{\sqrt{npq}}\cdot\varphi(x)$
- ● $P_n(k)=\binom{n}{k}\cdot p^k\cdot(1-p)^{n-k}$
- ○ $P_n(k)=\frac{\lambda^k e^{-\lambda}}{k!}$
- ○ $P(B|A)=\frac{P(B)\cdot P(A|B)}{P(A)}$
- ○ $P_n(k)=\frac{1}{\sqrt{npq}}\cdot e^{-2p(1-p)}$

1892. Indicate the formula of computing variance of a random variable X with expectation μ.

- ● $Var(X)=E(X^2)-\mu^2$
- ○ $Var(X)=E(X-\mu)$
- ○ $Var(X)=(E(X^2)-\mu)^2$
- ○ $Var(X)=E(X^2)-\mu$
- ○ $Var(X)=E(X^2)$

1893. How would it change the variance of a random variable X if we add a number a to the X?

- ○ Var(X+a)=Var(X)+a
- ○ Var(X+a)=Var(X)+a²
- ● Var(X+a)=Var(X)
- ○ Var(X+a)= $a^2\cdot$Var(X)
- ○ Var(X+a)=Var(X)+a²

1894. How would it change the expected value of a random variable X if we multiply the X by a number k.

- ● $E[kX]=k\cdot E[X]$
- ○ $E[kX]=|k|\cdot E[X]$
- ○ $E[kX]=E[X]$
- ○ $E[kX]=E[X]+k$

- ○ $E[kX]=k^2\cdot E[X]$

1895. Which of the following expressions indicates the occurrence of exactly one of the events A, B, C?

- ○ $A+B+C$
- ○ $A\cdot B\cdot C$
- ● $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $AB+AC+BC$

1896. Which of the following expressions indicates the occurrence of at least one of the events A, B, C?

- ● $A+B+C$
- ○ $A\cdot B\cdot C$
- ○ $A\cdot B^c\cdot C^c+A^c\cdot B\cdot C^c+A^c\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $A^c\cdot B^c\cdot C^c$

1897. Which of the following expressions indicates the occurrence of all three events A, B, C simultaneously?

- ○ $A+B+C$
- ● $A\cdot B\cdot C$
- ○ $A\cdot B\cdot C^c+A^c\cdot B\cdot C+A\cdot B^c\cdot C$
- ○ $(A+B+C)^c$
- ○ $A^c\cdot B^c\cdot C^c$

1898. Which of the following expressions indicates the occurrence of exactly two of events A, B, C?

- ○ $(A+B)\cdot C^c$
- ○ $AB+AC+BC$
- ○ $(A+B)(B+C)(A+C)$
- ● $A\cdot B\cdot C^c+A^c\cdot B\cdot C+A\cdot B^c\cdot C$
- ○ $A\cdot B\cdot C^c$

1899. Conditional probability P(A|B) can be defined by

- ○ $P(A|B)=P(A)\cdot P(B)$
- ● $P(A|B)=\dfrac{P(A\cdot B)}{P(B)}$

- $P(A|B)=\frac{P(A\cdot B)}{P(A)}$
- $P(A|B)=P(A)-P(B)$
- $P(A|B)=P(A)+P(B)-P(A\cdot B)$

1900. Urn I contains a white and b black balls, whereas urn II contains c white and d black balls. If a ball is randomly selected from each urn, what is the probability that the balls will be both black?

- $\frac{b}{a}+\frac{d}{c}$
- $\frac{b}{a+b}\cdot\frac{d}{c+d}$
- $\frac{b}{a+b}+\frac{d}{c+d}$
- $\frac{b}{a}\cdot\frac{d}{c}$
- $\frac{b+d}{a+b+c+d}$

1901. The table below shows the probability mass function of a random variable X.

x_i	**0**	**x_2**	**5**
p_i	**0.1**	**0.2**	**0.7**

If E[X]=5,5 find the value of x_2.

5.5-(5*0.7)=x2*0.2

2=x2*0.2

X2=2/0.2

X2=10

- 3
- 1
- 12
- 0.8
- 10

1902. The probability of machine failure in one working day is equal to 0.01. What is the probability that the machine will work without failure for 5 days in a row.

(1-0.01)^5

- 0.99999
- 0.95099

○ 1

○ 0.05

○ 0.55

1903. The cumulative distribution function of a discrete random variable X is given by

$$F(x)=\begin{cases}0 & if\ x\le 2\\ 0.4 & if\ 2<x\le 5\\ 0.9 & if\ 5<x\le 8\\ 1 & if\ x>8\end{cases}$$

Find P{3<X<9}.

1-0.4

○ 0,4

○ 0,5

● 0,6

○ 0,9

○ 1

1904. A fair die is rolled three times. A random variable X denotes the number of occurrences of 6's. What is the probability that X will have the value which is not equal to 0.

P(# of 6's is not 0)
= 1 - P(# of 6's is 0)

= 1 - (5/6)^3
= 0.4213=91/216

● 91/216

○ 125/216

○ 25/216

○ 1/216

○ 215/216

1905. Find the expectation of a random variable X if the cdf $F(x)=\begin{cases}1-e^{-x/5}, x\ge 0\\ 0, \quad x<0\end{cases}$.

○ -5

○ e^{-5}

● 5

○ 6

○ 1/5

1906. Compute the mean for continuous random variable X with probability density function $f(x=\begin{cases}2(1-x), & if\ 0\le x\le 1\\ 0, & otherwise\end{cases}$.

- 2/3
- 0
- 1/3
- 1
- Mean does not exist

1907. If the variance of a random variable X is given Var(X)=3. Then Var(2X) is

2^2*3=12

- 12
- 6
- 3
- 1
- 9

1908. Indicate the expectation of a Poisson random variable X with parameter λ.

- 0
- λ
- $1/\lambda$
- $\lambda(1-\lambda)$
- λ^2

1909. Indicate the variance of a Poisson random variable X with parameter λ.

- λ
- 0
- $\frac{1}{\lambda}$
- $\lambda(1-\lambda)$
- λ^2

1910. Indicate the formula for conditional expectation.

- $E[E[X \mid Y] = E[X \mid Y]$
- $E[E[X \mid Y] = E[X]$
- $E[E[X \mid Y] = \{E[X \mid Y]\}^2$
- $E[E[X \mid Y] = E[X] \cdot E[Y]$
- $E[E[X \mid Y] = E[XY]$

1911. The table below shows the pmf of a random variable X. What is the Var(X)?

X	-2	1	2
P	0,1	0,6	0,3

4*0.1+1*0.6+4*0.3-(-2*0.1+1*0.6+2*0.3)^2=1.2

- ○ 0.5
- ○ 1.67
- ○ 4.71
- ● 1.2
- ○ 4.7

1912. The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 6.

- ○ 0.04
- ○ 0.15
- ● 0.47
- ○ 0.53
- ○ 0.94

1913. The lifetime of a machine part has a continuous distribution on the interval (0, 40) with probability density function $f(x) = c(10+x)^{-2}$. Calculate the probability that the lifetime of the machine part is less than 5.

- ○ 0.03
- ○ 0.13
- ● 0.42
- ○ 0.58
- ○ 0.97

1914. If Var(X)=2, find Var(-3X+4).

(-3)^2*2

- ○ 12
- ○ 10
- ○ 9
- ● 18
- ○ 3

1915. The table below shows the pmf of a random variable X. Find E[X] and Var(X).

X	-1	0	1
P	0.2	0.3	0.5

0.7-0.09=0.61

- ○ E[X]= 0,7; Var(X) =0.24

- E[X]= 0,3; Var(X) =0.27
- E[X]= 0,3; Var(X) =0.61
- E[X]= 0,8; Var(X) =0.21
- E[X]= 0,8; Var(X) =0.24

1916. What kind of distribution is given by the density function $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ **(** $-\infty < x < \infty$ **)?**

- Poisson distribution
- Normal distribution
- Uniform distribution
- Bernoulli distribution
- Exponential distribution

1917. If a fair die is tossed twice, the probability that the first toss will be a number less than 4 and the second toss will be greater than 4 is

3/6*2/6=6/36=1/6

- 1/3
- 5/6
- 1/6
- 3/4
- 0

1918. A class consists of 490 female and 510 male students. The students are divided according to their marks

	Passed	Did not pass
Female	**430**	**60**
Male	**410**	**100**

If one person is selected randomly, the probability that it did not pass given that it is female is:

(60/1000)/(490/1000)=0.12

- 0.06
- 0.12
- 0.41
- 0.81
- none of the shown answers

1919. Marks on a Chemistry test follow a normal distribution with a mean of 65 and a standard deviation of 12. Approximately what percentage of the students have scores below 50?

(z<50)=z<(50-65)/12=z<-1.25=0.105 == 11%

- 11%
  - 89%
  - 15%
  - 18%
  - 39%

1920. Suppose the test scores of 600 students are normally distributed with a mean of 76 and standard deviation of 8. The number of students scoring between 70 and 82 is:

70<z<82= (82-76)/8-((70-76)/8)=0.77-0.22=0.5

600*0.5

Vrode tak hz primernye cifry vzyalW

  - 272
  - 164
  - 260
  - 136
- 328

1921. The distribution of weights in a large group is approximately normally distributed. The mean is 80 kg. and approximately 68% of the weights are between 70 and 90 kg. The standard deviation of the distribution of weights is equal to:

  - 20
  - 5
  - 40
  - 50
- 10

1922. The probability density function of a continuous random variable *X* is

$$f(x) = \begin{cases} 0.5x & 0 \le x \le 2 \\ 0 & otherwise \end{cases} \quad \textbf{Find } P\{0 \le x \le 1.5\}.$$

Интеграл мутим 0,5x

И будет ½ * (x^2)/2 = x^2/4=1.5^2/4=2.25/4=0.56

- 0.5625
  - 0.3125
  - 0.1250
  - 0.4375
  - 0.1275

1923. Let *X* be a continuous random variable with density function

$$f(x) = \begin{cases} \frac{|x|}{10} & for\ -2 \le x \le 4 \\ 0 & otherwise \end{cases} \quad \textbf{Calculate the expected value of } \boldsymbol{X}.$$

Tak kak zdes abs(x) to berem integral ot 2 do 4 (x*x/10 dx) = x3/30 ot 4 do 2 = 64/30-8/30=56/30=28/15

- ○ 1/5
- ○ 3/5
- ○ 1
- ● 28/15
- ○ 12/5

1924. The probability density function of a continuous random variable X is $f(x) = \begin{cases} kx^2 & 0 \le x \le 2 \\ 0 & otherwise \end{cases}$. **Find the value of k.**

K * integral ot 0 do 2 (x^2) =1

k* x^3/3 ot 0 do 2 = 1

8/3=1/k

K=3/8=0.375

- ○ 2
- ○ 0.25
- ● 0.375
- ○ 2.25
- ○ Any positive value greater than 2

1925. A continuous random variable *X* is uniformly distributed over the interval [10, 16]. The expected value of *X* is

(a+b)/2=(10+16)/2=13

- ○ 16
- ● 13
- ○ 10
- ○ 7
- ○ 6

1926. If X and Y are independent random variables with $p_X(0)=0.5$, $p_X(1)=0.3$, $p_X(2)=0.2$ **and** $p_Y(0)=0.6$, $p_Y(1)=0.1$, $p_Y(2)=0.25$, $p_Y(3)=0.05$. **Then** $P\{X \le 1 \, and \, Y \le 1\}$ **is**

(0.5+0.3)*(0.6+0.1)=0.8*0.7=0.56

- ○ 0.30
- ● 0.56
- ○ 0.70
- ○ 0.80
- ○ 1

1927. How many different three-member teams can be formed from six students?

C (3,6) = 6!/(6-3)!3! = 20

- 20
  - 120
  - 216
  - 720
  - 6

1928. **How many different 6-letter arrangements can be formed using the letters in the word ABSENT, if each letter is used only once?**

6!

  - 6
  - 36
- 720
  - 46.656
  - 72

1929. **If P(E) is the probability that an event will occur, which of the followings must be false?**

  - P(E)=1
  - P(E)=1/2
  - P(E)=1/3
- P(E)= -1
  - P(E)=0

1930. **A die is rolled. What is the probability that the number rolled is greater than 2 and even? Only 4 and 6**

2/6=1/3

  - 1/2
- 1/3
  - 2/3
  - 5/6
  - 0

1931. **A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?**

1 4   4 1   3 2   2 3   5 5   4 6   6 4   so 7/36

Complement will be 29/36

  - 2/36
  - 12/36
- 29/36
  - 32/36
  - 9/36

1932. The cumulative distribution function for continuous random variable X is given by $F(x)=\begin{cases} 0,\ x<0 \\ x,\ 0\le x\le 1 \\ 1,\ x>1 \end{cases}$**. Find the standard deviation** $\sigma(X)$**.**

Expectation : Integral from 0 to 1 xdx= x^2/2 ot 0 do 1= ½

Variance: integral from 0 to 1 (x- 1/2)^2 dx = 1/12

- ○ $\frac{1}{\sqrt{6}}$
- ○ $\frac{1}{6}$
- ● $\frac{1}{\sqrt{12}}$
- ○ $\frac{1}{4}$
- ○ $\frac{1}{12}$

1933. A continuous random variable X uniformly distributed on [-2;6]. Find E[X] and Var(X).

(A+b)/2 = -2+6 / 2 = 2

(b-a)^2 / 12 = 64 / 12= 16/3

- ○ 4 and $\frac{4}{3}$
- ○ $\frac{16}{3}$ and 2
- ● 2 and $\frac{16}{3}$
- ○ $\frac{2}{3}$ and 2
- ○ 2 and $\frac{4}{3}$

1934. A continuous random variable X is exponentially distributed with the density $f(x)=\begin{cases} 2e^{-2x},\ x\ge 0 \\ 0,\ x<0 \end{cases}$**. What is the E[X] and Var(X)?**

Tut lambda = 2

So, mean = 1/lambda

Variance = 1/ lambda^2

- ○ $\frac{1}{6}$ and $\frac{1}{2}$
- ○ $\frac{1}{4}$ and $\frac{1}{2}$

- $\frac{1}{2}$ and $\frac{1}{4}$
- $\frac{1}{2}$ and $\frac{1}{6}$
- $\frac{1}{4}$ and $\frac{1}{6}$

1935. The expression $\binom{9}{2}$ is equivalent to

- $\frac{9!}{7!}$
- $\frac{9!}{2!}$
- $\frac{9!}{7!\cdot 2!}$
- $\frac{9}{14}$
- $\frac{9!\cdot 2!}{7!}$

1936. Evaluate 1!+2!+3!

- 5
- 6
- 9
- 10
- 12

1937. A pair of dice is rolled. A possible event is rolling a multiple of 5. What is the probability of the complement of this event?

- 2/36
- 12/36
- 29/36
- 32/36
- 1/36

1938. Your state issues license plates consisting of letters and numbers. There are 26 letters and the letters may be repeated. There are 10 digits and the digits may be repeated. How many possible license plates can be issued with two letters followed by three numbers?

26*26*10*10*10

- 25000
- 67600

- ○ 250000
- ● 676000

- ○ 2500

1939. **A random variable X has the cumulative distribution function**

$$F(x) = \begin{cases} 0 & for\ x < 1 \\ \dfrac{x^2 - 2x + 2}{2} & for\ 1 \le x < 2 \\ 1 & for\ x \ge 2 \end{cases}$$

Compute the expectation of X.

- ○ 7/72
- ○ 1/8
- ● 5/6
- ○ 4/3
- ○ 23/12

1940. **A fair coin is thrown in the air four times. If the coin lands with the head up on the first three tosses, what is the probability that the coin will land with the head up on the fourth toss?**

- ○ 0
- ○ 1/16
- ○ 1/8
- ● 1/2
- ○ 1/4

1941. **A movie theater sells 3 sizes of popcorn (small, medium, and large) with 3 choices of toppings (no butter, butter, extra butter). How many possible ways can a bag of popcorn be purchased?**

3*3

- ○ 1
- ○ 3
- ● 9
- ○ 27
- ○ 62

1942. **A random variable Y has the following distribution:**

Y | -1 0 1 2

P(Y)	**3C**	**2C**	**0.4**	**0.1**

The value of the constant C is:

(1-0.5)=5c

0.5=5c

C=0.1

- 0.1
- 0.15
- 0.20
- 0.25
- 0.75

1943. A random variable X has a probability distribution as follows:

X	0	1	2	3
P(X)	2k	3k	13k	2k

Then the probability that P(X < 2.0) is equal to

5k/20k=0.25k

- 0.90
- 0.25
- 0.65
- 0.15
- 1

1944. Which one of these variables is a continuous random variable?

- The time it takes a randomly selected student to complete an exam.
- The number of tattoos a randomly selected person has.
- The number of women taller than 68 inches in a random sample of 5 women.
- The number of correct guesses on a multiple choice test.
- The number of 1's in N rolls of a fair die

1945. Heights of college women have a distribution that can be approximated by a normal curve with a mean of 65 inches and a standard deviation equal to 3 inches. About what proportion of college women are between 65 and 67 inches tall?

65<z<67

(67-65)/3 – (65-65)/3= 0.74-0.5= 0.25

- 0.75
- 0.5
- 0.25
- 0.17
- 0.85

1946. The probability is p = 0.80 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

40*0.8=32

- ○ 40
- ○ 20
- ○ 8
- ● 32
- ○ 124

1947. A medical treatment has a success rate of 0.8. Two patients will be treated with this treatment. Assuming the results are independent for the two patients, what is the probability that neither one of them will be successfully cured?

1-0.8=0.2

0.2*0.2=0.04

- ○ 0.5
- ○ 0.36
- ○ 0.2
- ● 0.04
- ○ 0.4

1948. A set of possible values that a random variable can assume and their associated probabilities of occurrence are referred to as ...

- ● Probability distribution
- ○ The expected value
- ○ The standard deviation
- ○ Coefficient of variation
- ○ Correlation

1949. Given a normal distribution with μ=100 and σ=10, what is the probability that X>75?

1-z<75= 1 – (z<(75-100)/10)=1- z(-2.5)= 1- 0.006=0.99

- ● 0.99
- ○ 0.25
- ○ 0.49
- ○ 0.45
- ○ 0

1950. Which of the following is not a property of a binomial experiment?

- ○ the experiment consists of a sequence of n identical trials
- ○ each outcome can be referred to as a success or a failure
- ● the probabilities of the two outcomes can change from one trial to the next
- ○ the trials are independent

- binomial random variable can be approximated by the Poisson

1951. Which of the following random variables would you expect to be discrete?

- The weights of mechanically produced items
- The number of children at a birthday party
- The lifetimes of electronic devices
- The length of time between emergency arrivals at a hospital
- The times, in seconds, for a 100m sprint

1952. Two events each have probability 0.2 of occurring and are independent. The probability that neither occur is

0.8*0.8 = 0.64

- 0.64
- 0.04
- 0.2
- 0.4
- none of the given answers

1953. A smoke-detector system consists of two parts A and B. If smoke occurs then the item A detects it with probability 0.95, the item B detects it with probability 0.98 whereas both of them detect it with probability 0.94. What is the probability that the smoke will not be detected?

- 0.01
- 0.99
- 0.04
- 0.96
- None of the given answers

1954. A class consists of 490 female and 510 male students. The students are divided according to their marks Passed and Did not pass

	Passed	Did not pass
Female	430	60
Male	410	100

If one person is selected randomly, what is the probability that it did not pass given that it is male.

(100/1000)/(510/1000) = 0.196

- 0.066
- 0.124
- 0.414
- 0.812

- 0.196

1955. A company which produces a particular drug has two factories, A and B. 30% of the drug are made in factory A, 70% in factory B. Suppose that 95% of the drugs produced by the factory A meet specifications while only 75% of the drugs produced by the factory B meet specifications. If I buy the drug, what is the probability that it meets specifications?

0.3*0.95+0.7*0.75=0.81

- ○ 0.95
- ● 0.81
- ○ 0.75
- ○ 0.7
- ○ 0.995

1956. Twelve items are independently sampled from a production line. If the probability any given item is defective is 0.1, the probability of at most two defectives in the sample is closest to …

p(0) + p(1) + p(2)
p(0) = c(12,0) * .1^0 * .9^12 = .2824
p(1) = c(12,1) * .1^1 * .9^11 = .3766
p(2) = c(12,2) * .1^2 * .9^10 = .2301

add them up and you get .8891

- ○ 0.3874
- ○ 0.9872
- ○ 0.7361
- ● 0.8891
- ○ None of the shown answers

1957. A student can solve 6 from a list of 10 problems. For an exam 8 questions are selected at random from the list. What is the probability that the student will solve exactly five problems?

C(5,6)*c(3,4)/c(8,10)=

Or

C(5,6)/c(8,10)=0.133

- ○ 0.282
- ○ 0.02
- ○ 0.376
- ● 0.133
- ○ None of the shown answers

1958. Suppose that 10% of people are left handed. If 8 people are selected at random, what is the probability that exactly 2 of them are left handed?

8c2*0,1^2*0.9^6

- ○ 0.0331
- ○ 0.0053
- ● 0.1488
- ○ 0.0100
- ○ 0.2976

1959. Suppose a computer chip manufacturer rejects 15% of the chips produced because they fail presale testing. If you test 4 chips, what is the probability that not all of the chips fail?

1- 0.15^4

- ● 0.9995
- ○ 5.06 × 10-4
- ○ 0.15
- ○ 0.6
- ○ 0.5220

1960. Which of these has a Geometric model?

- ○ the number of aces in a five-card Poker hand
- ○ the number of people we survey until we find two people who have taken Statistics
- ○ the number of people in a class of 25 who have taken Statistics
- ● the number of people we survey until we find someone who has taken Statistics
- ○ the number of sodas students drink per day

1961. In a certain town, 50% of the households own a cellular phone, 40% own a pager, and 20% own both a cellular phone and a pager. The proportion of households that own neither a cellular phone nor a pager is

0.5*(1-0.4)

- ○ 90%
- ○ 70%
- ○ 10%
- ● 30%.
- ○ 25%

1962. Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that the first and third selected are women?

7/12*6/11*5/10+7/12*5/11*6/10= (7*6*5) / (12*11*10)   * 2 =0.3182

- ● 0.3182
- ○ 0.5817
- ○ 0.78
- ○ 0.916
- ○ 0.1211

1963. Twenty percent of the paintings in a gallery are not originals. A collector buys a painting. He has probability 0.10 of buying a fake for an original but never rejects an original as a fake, What is the (conditional) probability the painting he purchases is an original?

- 1/41
- 40/41
- 80/41
- 1
- 40/100

1964. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{t \le 0\}$.

- 0.8
- 0.5
- 0.3
- 0.2
- 0.1

1965. A probability function is a rule of correspondence or equation that:

- Finds the mean value of the random variable.
- Assigns values of x to the events of a probability experiment.
- Assigns probablities to the various values of x.
- Defines the variability in the experiment.
- None of the given answers is correct.

1966. Which of the following is an example of a discrete random variable?

- The distance you can drive in a car with a full tank of gas.
- The weight of a package at the post office.
- The amount of rain that falls over a 24-hour period.
- The number of cows on a cattle ranch.
- The time that a train arrives at a specified stop.

1967. Which of the following is the appropriate definition for the union of two events A and B?

- The set of all possible outcomes.
- The set of all basic outcomes contained within both A and B.
- The set of all basic outcomes in either A or B, or both.
- None of the given answers
- The set of all basic outcomes that are not in A and B.

1968. Johnson taught a music class for 25 students under the age of ten. He randomly chose one of them. What was the probability that the student was under twelve?

- 1
  - 0.5
  - 1/25
  - 0
  - 0.25

1969. **The compact disk Jane bought had 12 songs. The first four were rock music. Tracks number 5 through 12 were ballads. She selected the random function in her CD Player. What is the probability of first listening to a ballad?**

8/12=2/3

  - 1/3
- 2/3
  - 1/2
  - 1/6
  - 1/12

1970. **Two fair dice, one red and one blue, each have numbers 1-6. If a roll of the two dice totals 6, what is the probability that the red die is showing a 5?**

1 5   5 1   4 2   2 4   3 3   1/5

  - 1/6
- 1/5
  - 1/3
  - 5/6
  - 1/18

1971. **A regular deck of 52 cards contains 4 different suits (Spades, Hearts, Diamonds, and Clubs) that each have 13 cards. If you randomly choose two cards from the deck, what is the probability that both cards will all be hearts?**

13/52*12/51

  - 4/17
- 1/17
  - 2/17
  - 1/4
  - 4/17
  - 33/68

1972. **What is the probability of drawing a diamond from a standard deck of 52 cards?**

13/52=1/4

  - 1/52
  - 13/39
  - 1/13
- 1/4

- 1/2

1973. **One card is randomly selected from a shuffled deck of 52 cards and then a die is rolled. Find the probability of obtaining an Ace and rolling an odd number.**

4/52*3/6=1/26

- 1/104
- 7/13
- 1/39
- 1/26
- 1/36

1974. **The probability that a particular machine breaks down on any day is 0.2 and is independent of the breakdowns on any other day. The machine can break down only once per day. Calculate the probability that the machine breaks down two or more times in ten days.**

Chance of exactly 0 breakdowns in 10 days: 0.8^10 = 0.1073741824
Chance of exactly 1 breakdown in 10 days: 0.8^9 * 0.2^1 * C(10,1) = 0.268435456
Chance of 2 or more breakdowns in 10 days: 1 - 0.1073741824 - 0.268435456 = 0.6241903616

- 0.0175
- 0.0400
- 0.2684
- 0.6242
- 0.9596

1975. **Let A, B and C be independent events such that P(A) = 0.5, P(B) = 0.6 and P(C) = 0.1. Calculate** $P(A^c \cup B^c \cup C)$

0.5+0.4-0.5*0.4 = 0.7

0.7+0.1-0.7*0.1=0.73

- 0.69
- 0.71
- 0.73
- 0.98
- 1

1976. **The pdf of a random variable X is given by** $f(x) = \frac{1}{\sqrt{8\pi}} e^{-\frac{(x+1)^2}{8}}$.

What are the values of μ and σ?

x-a po formule

2 * sigma^2=8

Sigma=2

- $\mu = 1, \sigma = 4$

- $\mu = -1, \sigma = 4$
- $\mu = -1, \sigma = 2$
- $\mu = 1, \sigma = 8$
- $\mu = 1, \sigma = 2$

1977. What quantity is given by the formula $\frac{Cov(X,Y)}{\sqrt{Var(X) \cdot Var(Y)}}$?

- Covariance of the random variables X and Y
- Correlation coefficient
- Coefficient of symmetry
- Conditional expectation
- None of the given answers is correct

1978. In the first step, Joe draws a hand of 5 cards from a deck of 52 cards. What is the probability that Joe has exactly one ace?

C(4,1)*c(48,4) / c(52,5) =

- 0.2995
- 0.699
- 0.23336
- 1/4
- 0.4999

1979. The number of clients arriving each hour at a given branch of a bank asking for a given service follows a Poisson distribution with parameter λ=3. It is assumed that arrivals at different hours are independent from each other. The probability that in a given hour at most 2 clients arrive at this specific branch of the bank is:

$$P(X = x) = e^{-\lambda}\frac{\lambda^x}{x!} \qquad x = 0, 1, 2, 3, 4, \ldots$$

E^(-3)*3^2/2! +e^(-3)*3+e^-3= 0.42319

- 0.64726
- 0.81521
- 0.42319
- 0.18478
- 0.08391

1980. Table shows the cumulative distribution function of a random variable X. Determine $P(X \geq 2)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 7/8
- 1/2
- 3/4
- 1/3

1981. Table shows the cumulative distribution function of a random variable X. Determine $P(X>4)$.

X	1	2	3	4
F(X)	1/8	3/8	3/4	1

- 1/8
- 1
- 1/2
- 3/4
- 0

1982. Which of the following statements is always true for A and A^C ?

- $P(AA^c)=1$
- $P(A^c)=P(A)$
- $P(A+A^c)=0$
- $P(AA^c)=0$
- None of the given statements is true

1983. Consider the universal set U and two events A and B such that $A \cap B = \varnothing$ and $A \cup B = U$. We know that P(A)=1/3. Find P(B).

- 2/3
- 1/3
- 4/9
- Cannot be determined
- 1

1984. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?

- 1/3
- 3/8
- 5/8
- 1/8
- 1

1985. If P(A)=1/2 and P(B)=1/2 then $P(A \cap B) =$

○ 1/4, always

● 1/4, if A and B are independent

○ 1/2, always

○ 1/2, if A and B are independent

○ None of the given answers

1986. Suppose that P(A|B)=3/5, P(B)=2/7, and P(A)=1/4. Determine P(B|A).

$$\mathbb{P}(A \mid B) = \frac{\mathbb{P}(A \cap B)}{\mathbb{P}(B)},$$

X / (2/7) = 3/5

X= 2/7 * 3/5 = 6/35

6/35 / 1/ 4 = p B | A

6/35* 4/1 = 24/35

○ 24/75

● 24/35

○ 6/35

○ 12/75

○ None of the given answers

1987. A class contains 8 boys and 7 girls. The teacher selects 3 of the children at random and without replacement. Calculate the probability that the number of boys selected exceeds the number of girls selected.

((c(8,2)*c(7,1) + c(8,3)*c(7,0)))/ (15,3)=

○ 512/3375

● 28/65

○ 8/15

○ 1856/3375

○ 36/65

1988. If the variance of a random variable X is equal to 3, then Var(3X) is :

3^2*3

○ 12

○ 6

○ 3

● 27

○ 9

1989. Let X and Y be continuous random variables with joint cumulative distribution function $F(x,y)=\frac{1}{250}\left(20xy-x^2y-xy^2\right)$ for $0\le x\le 5$ and $0\le y\le 5$. Find P(X>2).

- ○ 3/125
- ○ 11/50
- ● 12/25
- ○ $1-\frac{1}{250}\left(36y-2y^2\right)$
- ○ $\frac{1}{250}\left(39y-3y^2\right)$

1990. Indicate the correct statement related to Poisson random variable $P(X=i)=\frac{\lambda^i}{i!}e^{-\lambda}$.

- ● $\lambda=np\sim const$, $n\to\infty,\ p\to 0$
- ○ $\lambda=\frac{n}{p}$, $n\to\infty$
- ○ $\lambda=ep$, $n\to\infty$
- ○ $\lambda=n^p$, p is const
- ○ None of the given answers is correct

1991. Let X be a continuous random variable with PDF f(x) = cx (0 ≤ x ≤ 1), where c is a constant. Find the value of constant c.

C * x^2/2 ot 0 do 1 = 1

C=1 / ½

C =2

- ○ 1
- ● 2
- ○ 1/2
- ○ 3/2
- ○ 4

1992. We are given the pmf of two random variables X and Y shown in the tables below.

X	1	3
p_x	0,4	0,6

y	2	4
p_y	0,2	0,8

Find E[X+Y].

0.4+0.6*3+0.2*2+0.8*4

- ● 5,8
- ○ 2,2

- 2
- 8,8
- 10

1993. The pdf of a random variable X is given by $f(x)=\begin{cases}\dfrac{1}{\gamma-2{,}5}, & if \quad x\in(1{,}5;\,3),\\ 0, & otherwise\end{cases}$**.**

Calculate the parameter γ **.**

- 0
- 4
- 1,5
- 2
- 3,5

1994. Four persons are to be selected from a group of 12 people, 7 of whom are women. What is the probability that three of those selected are women?

(7/12*6/11*5/10*5/9)* 4

- 0.35
- 0.65
- 0.45
- 0.25
- 0.1211

1995. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Find $P\{T \geq 0 \; and \; T < 2\}$**.**

0.5+0.3

- 0.8
- 0.5
- 0.3
- 0.2
- 0.1

1996. Suppose that the random variable T has the following probability distribution:

t	0	1	2
P(T = t)	.5	.3	.2

Compute the mean of the random variable T.

0.3+0.2*2

- 0.8

- 0.5
- 0.7
- 0.1
- 1

1997. Three dice are rolled. What is the probability that the points appeared are distinct.

- 1
- 5/9
- 2
- 1/3
- 1/2

1998. Probability density function of the normal random variable X is given by $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{(x-3)^2}{50}}$ **. What is the standard deviation?**

50=2*sigma^2

Sigma = 5

- 5
- 3
- 25
- 50
- 9

1999. The event A occurs in each of the independent trials with probability p. Find probability that event A occurs at least once in the 5 trials.

- p^5
- $1-(1-p)^5$
- $(1-p)^5$
- $1-p^5$
- None of the given answers is correct

2000. The cdf of a random variable X is given by $F(x) = \begin{cases} 0 & if \quad x \le 3/2 \\ 2x-3 & if \quad 3/2 < x \le 2 \\ 1 & if \quad x > 2. \end{cases}$ **Find the probability P(1.7<X<1.9).**

Z(1.9)-z(1.7)=1.9*2-3 - (2*1.7-3)

- 0,16
- 0,8

- 1
- 0,4
- 0.6

2001. In each of the 20 independent trials the probability of success is 0.2. Find the variance of the number of successes in these trials.

Variance= sigma^2

Sigma= sqrt(npq)

So 20*0.2*0.8

- 0
- 1
- 10
- 3.2
- 0.32

2002. A coin tossed twice. What is the probability that head appears in the both tosses.

HH th ht tt

- 1/2
- 1/4
- 0
- 4:1
- 1

2003. Continuous random variable X is normally distributed with mean=1 and variance=4. Find P(4≤x≤6).

Z((6-1 / 4) – z((4-1)/ 4)=0.89-0.77=

- 0,0606
- 0,202
- 0,0305
- 0,0484
- 0,0822

2004. Random variable X is uniformly distributed on the interval [-2, 2]. Indicate the right values for E[X] and Var(X).

(A+b)/2=mean

(b-a)^2 / 12= 16/12

- E[X]=0 and Var(X)=4
- E[X]=0 and Var(X)=1.33
- E[X]=0.5 and Var(X)=1.33
- E[X]=0 and Var(X)=0
- No right answer

2005. Expectation and standard deviation of the normally distributed random variable X are respectively equal to 15 and 5. What is the probability that in the result of an experiment X takes on the value in interval (5, 20)?

- ○ Φ(20) – Φ(5)
- ○ Φ(5) + Φ(10)
- ○ Φ(1) – Φ(0)
- ○ Φ(20) + Φ(5)
- ● Φ(1) + Φ(2)-1
- ○ Φ(2) – Φ(1)

2006. Normally distributed random variable X is given by density $f(x)=\frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$. Find the mean.

- ○ -1/2
- ○ 1/2
- ○ 1/4
- ● 0
- ○ 1

2007. Indicate the density function of the normally distributed random variable X when mean=2 and variance=9.

Variance=sigma^2

- ○ $\varphi(x)=\frac{1}{9\sqrt{2\pi}}e^{-\frac{(x-2)^2}{18}}$
- ○ $\varphi(x)=\frac{1}{2\sqrt{2\pi}}e^{-\frac{(x-9)^2}{8}}$
- ● $\varphi(x)=\frac{1}{3\sqrt{2\pi}}e^{-\frac{(x-2)^2}{18}}$
- ○ $\varphi(x)=\frac{1}{6\sqrt{2\pi}}e^{-\frac{(x-a)^2}{72}}$
- ○ $\varphi(x)=-\frac{1}{\sigma\sqrt{2\pi}}e^{\frac{(x-a)^2}{2\sigma^2}}$

2008. Indicate the PDF for standard normal random variable.

- ○ $f(x)=\lambda x^{-\lambda x}$, $x\geq 0$
- ○ $f(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-a)^2}{2\sigma^2}}$
- ○ $f(x)=\frac{1}{b-a}$, $a\leq x\leq b$

- $f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$
  - $f(x) = -\lambda e^{-\lambda x}$, $x \geq 0$

2009. Random variable X is uniformly distributed in interval [0, 3]. What is the variance of X?

(b-a)^2 / 12 = 9/12

- 0.75
  - 1.5
  - 3
  - 0.25
  - 1

2010. Random variable X is uniformly distributed in interval [0, 15]. What is the expectation of X?

15/2

  - 15
  - 3.75
- 7.5
  - 30
  - 0

2011. Random variable X is uniformly distributed in interval [-2, 1]. What is the distribution of the random variable Y=2X+2?

2*-2+2=-2

2*1+2=4

Просто закидываем А потом Б вместо икса

  - Y is normally distributed in the interval [-4, 2]
- Y is uniformly distributed in the interval [-2, 4]
  - Y is normally distributed in the interval [-2, 4]
  - Y is exponentially distributed in the interval [-4, 2]
  - Y has other type of distribution

2012. Random variable X is uniformly distributed in interval [-11, 26]. What is the probability P(X> - 4)?

  - 29/38
  - 29/37
- 30/37
  - 15/19
  - 0

2013. Random variable X is uniformly distributed in interval [1, 3]. What is the distribution of the random variable Y=3X+1?

3*1+1=4

3*3+1=10

- Y is normally distributed in the interval [3, 9]
- Y is uniformly distributed in the interval [4, 10]
- Y is normally distributed in the interval [4, 10]
- Y is exponentially distributed in the interval [4, 10]
- Y has other type of distribution

2014. Random variable X is uniformly distributed in interval [-11, 20]. What is the probability $P(X \leq 0)$?

- 11/32
- 5/16
- 10/31
- 11/31
- 0

2015. Random variable X is given by density function f(x) in the interval (0, 1) and otherwise is 0. What is the expectation of X?

- $\int_{-\infty}^{+\infty} xf(x)dx$
- $\int_{-\infty}^{+\infty} f(x)dx$
- $\int_{0}^{1} xf(x)dx$
- $\int_{0}^{1} f(x)dx$
- E[X]=0

2016. Random variable X is given by density function f(x) = x/2 in the interval (0, 2) and otherwise is 0. What is the expectation of X?

Integral ot 0 do 2 x * x/2 = x^3 / 6 ot 0 do 2 = 8/6=4/3

- 1/2
- 1
- 4/3
- 2/3
- 0

2017. Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the expectation of X?

Integral ot 0 do 1 x * 2x = 2x^3 /3 ot 0 do 1 = 2/3

- 1/2

- 1
- 4/3
- 2/3
- 0

2018. Random variable X is given by density function f(x) = 2x in the interval (0, 1) and otherwise is 0. What is the probability P(0 < X < 1/2) ?

Integral ot 0 do ½ 2x = x^2 ot 0 do ½ = ½ ^ 2 = ¼

- 1/2
- 1/4
- 0
- 1/8
- 0
- None of these

2019. Indicate the function that can be CDF of some random variable.

- $F(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 0, & x>2\end{cases}$
- $F(x)=\begin{cases}0, & x\le 1\\ 2-x, & 1<x\le 2\\ 1, & x>2\end{cases}$
- $F(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$
- $F(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 4\\ 0, & x>4\end{cases}$
- None of these

2020. Indicate the function that can be PDF of some random variable.

- $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 0, & x>2\end{cases}$
- $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

○ $f(x)=\begin{cases}0, & x\le 1\\ x-1/2, & 1<x\le 4\\ 0, & x>4\end{cases}$

○ $f(x)=\begin{cases}0, & x\le 1\\ 1/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

○ $f(x)=\begin{cases}0, & x\le 1\\ x/2, & 1<x\le 2\\ 1, & x>2\end{cases}$

2021. Continuous random variable X has the following CDF:

$F(x)=\begin{cases}0, & x\le 0\\ \frac{x}{2}, & 1<x\le 2\\ 1, & x>2\end{cases}$ **. What is the PDF of X in the interval 1<X≤2?**

2/2 – ½

- 1/2

○ 0

○ 1

○ $X^2/4$

○ x

2022. Continuous random variable X is given in the interval [0, 100]. What is the probability P(X=50)?

- 0

○ 1

○ 0.5

○ 0.75

○ 0.25

2023. CDF of discrete random variable X is given by

$F(x)=\begin{cases}0, & x\le 1\\ 0{,}3, & 1<x\le 2\\ 0{,}5, & 2<x\le 3\\ 1, & x>3\end{cases}$ **What is the probability P{1.3<X≤2.3}?**

0.5-0.3

○ 0.8

- 0.2

○ 0

○ 0.6

○ 0.4

2024. PMF of discrete random variable is given by

X	0	2	4
P	0,1	0,5	0,4

Find the value of CDF of X in the interval (2, 4].

- 0.4
  - 0.5
  - 0.2
- 0.6
  - 1

2025. PMF of discrete random variable is given by

X	0	2	4
P	0,3	0,1	0,6

Find F(2).

0.3+0.1

- 0.4
  - 0.6
  - 0.3
  - 0.7
  - 0.1

2026. PMF of discrete random variable X is given by

X	-1	5
P	0,4	0,6

Find standard deviation of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

Variance = sigma^2

Sigma= 2.93

  - 15.4
  - 8.64
  - 2.6
- 2.9393
  - 3.3333

2027. PMF of discrete random variable X is given by

X	-1	5
P	0,4	0,6

Find variance of X.

Variance = (1*0.4+25*0.6)-(-1*0.4+5*0.6)^2=8.64

- ○ 15.4
- ● 8.64
- ○ 2.6
- ○ 2.93
- ○ 3.33

2028. PMF of discrete random variable X is given by

X	0	5	x_3
P	0,6	0,1	0,3

If E[X]=3.5 then find the value of x_3.

5*0.1+x3*0.3=3.5

x3*0.3=3

x3=10

- ● 10
- ○ 6
- ○ 8
- ○ 12
- ○ 24

2029. Probability of success in each of 100 independent trials is constant and equals to 0.8. What is the probability that the number of successes is between 60 and 88?

Mean = 80

Sigma=sqrt(100*0.8*0.2)=4

(88-80 / 4) – (60-80 / 4)= 2 - -5

- ○ $P_{100}(60 \le m \le 88) \approx \Phi(88) - \Phi(60)$
- ● $P_{100}(60 \le m \le 88) \approx \Phi(2) - \Phi(-5)$
- ○ $P_{100}(60 \le m \le 88) \approx \Phi(88) + \Phi(60)$
- ○ $P_{100}(60 \le m \le 88) \approx \Phi(2) + \Phi(5)$
- ○ $P_{100}(60 \le m \le 88) \approx \Phi(8) + \Phi(20)$

2030. A man is made 10 shots on the target. Assume that the probability of hitting the target in one shot is 0,7. What is the most probable number of hits?

- ○ 8
- ● 7
- ○ 6
- ○ 5
- ○ 9

2031. Consider two boxes, one containing 4 white and 6 black balls and the other - 8 white and 2 black balls. A box is selected at random, and a ball is drawn at random from the selected box. If the ball occurs to be white, what is the probability that the first box was selected?

P(B|A)=p(A|B)*p(B)/p(A)

- ○ 0.4
- ○ 0.6
- ○ 0.8
- ● 1/3
- ○ 2/3

2032. Each of two boxes contains 6 white and 4 black balls. A ball is drawn from 1st box and it is replaced to the 2nd box. Then a ball is drawn from the 2nd box. What is the probability that this ball occurs to be white?

(7/11+6/11) * ½

- ○ 0.3
- ○ 0.4
- ○ 0.5
- ● 0.6
- ○ 0.8

2033. Consider two boxes, one containing 3 white and 7 black balls and the other – 1 white and 9 black balls. A box is selected at random, and a ball is drawn at random from the selected box. What is the probability that the ball selected is black?

(7/10 + 9/10) * ½ =8/10 =0.8

- ● 0.8
- ○ 0.2
- ○ 0.4
- ○ 1.6
- ○ 0.9

2034. Urn I contains 4 black and 6 white balls, whereas urn II contains 3 white and 7 black balls. An urn is selected at random and a ball is drawn at random from the selected urn. What is the probability that the ball is white?

(6/10 + 3/10) * ½ = 9/10* ½ = 0.45

- 0.45
  - 0.15
  - 0.4
  - 0.9
  - 1

2035. A coin is tossed twice. Event A={ at least one Head appears}, event B={at least one Tail appears}. Find the conditional probability P(B|A).

A= HT TH HH=3/4

B= TT HT TH=3/4

2/3 sovpadenie

- 2/3
  - 1/3
  - 1/2
  - 3/4
  - 0

2036. A coin is tossed twice. Event A={ Head appears in the first tossing}, event B={at least one Tail appears}. Find the conditional probability P(B|A).

A=**HT** HH

B=**HT** TH TT

  - 1/4
- 1/2
  - 1/3
  - 2/3
  - 3/4

2037. Probability that each shot hits a target is 0.9. Total number of shots produced to the target is 5. What is the probability that at least one shot hits the target?

  - $1\text{-}0{,}9^5$
  - $0{,}9^5$
  - 1-5·0,9
- $1\text{-}0{,}1^5$
  - $0{,}1^5$
  - 1-5·0,1

2038. An urn contains 1 white and 9 black balls. Three balls are drawn from the urn without replacement. What is the probability that at least one of the balls is white? *

9/10*8/9*1/8 * 3= 0.3

  - 0.7
- 0.3

- 0.4
- 0.2
- 0.6

2039. **Four independent shots are made to the target. Probability of missing in the first shot is 0.5; in the second shot – 0.3; in the 3^{rd} – 0.2; in the 4^{th} – 0.1. What is the probability that the target is not hit.**

0.5*0.3*0.2*0.1=0.003

- 1.1
- 0.03
- 0.275
- 0.003
- 1.01

2040. **Probability of successful result in the certain experiment is 3/4. Find the most probable number of successful trials, if their total number is 10.**

¾*10=7.5

- 6
- 7
- 8
- 5
- 10

2041. **Let E and F be two mutually exclusive events and P(E)=P(F)=1/3. The probability that none of them will occur is:**

- No correct answer
- $P((E \cup F)^c) = 1 - (P(E) + P(F)) = 1 - \frac{1}{3} - \frac{1}{3} = \frac{1}{3}$
- $P(E \cup F) = P(E) + P(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
- $P(E \cap F) = P(E) + P(F) = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
- $P(E^c \cup F^c) = P(E^c)P(F^c) = \frac{2}{3}\frac{2}{3} = \frac{4}{9}$

2042. **Let E and F be two events. If $P(E) = \frac{3}{4}$, $P(F) = \frac{1}{2}$, $P(E \cup F) = 1$ and $P(E \cap F) = \frac{1}{4}$, then the conditional probability of E given F is:**

¼ / ½ = ½

- $P(E|F) = \frac{1}{4}$
- $P(E|F) = \frac{3}{4}$
- $P(E|F) = \frac{1}{2}$
- $P(E|F) = \frac{1}{3}$
- No correct answer

2043. **Given that Z is a standard normal random variable. What is the value of Z if the area to the left of Z is 0.9382?**

- ○ 1.8
- ● 1.54
- ○ 2.1
- ○ 1.77
- ○ 3

2044. **At a university, 14% of students take math and computer classes, and 67% take math class. What is the probability that a student takes computer class given that the student takes math class?**

P(AB)=0.14

P(A)=0.67

P(B|A)=p(BA)/p(A)=0.14/0.67=0.21

- ○ 0.81
- ● 0.21
- ○ 0.53
- ○ No correct answer
- ○ 0.96

2045. **Let** $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, **be the joint p.d.f. of X and Y. Find the marginal PDF of X.**

X+y^2/2 ot 0 do 1 dlya Y= x + 1/2

- ○ x
- ● x+1/2
- ○ y+1/2
- ○ x^2+1
- ○ x^2+y^2

2046. **If two random variables X and Y have the joint density function,** $f_{X,Y}(x,y)=\begin{cases} xy & \text{for } 0<x<1,\ 0<y<2 \\ 0 & \text{elsewhere} \end{cases}$**, find the probability P(X+Y<1).**

- ● 1/24
- ○ 1/12
- ○ 5/12
- ○ 1/4
- ○ 0.003

2047. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases}\frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1\\ 0 & \text{elsewhere}\end{cases}$**, find the conditional PDF** $f_{X|Y}(x|y)$**.**

- ○ $\frac{(x+y^2)}{1+y^2}$
- ● $\frac{2(x+y^2)}{1+2y^2}$
- ○ $\frac{5(x+y^2)}{12}$
- ○ $\frac{\frac{6}{5}(x+y^2)}{1+y^2}$
- ○ None of these

2048. If two random variables X and Y have the joint density function, $f(x,y)=\begin{cases}\frac{6}{5}(x+y^2) & \text{for } 0<x<1, 0<y<1\\ 0 & \text{elsewhere}\end{cases}$**, find the conditional PDF** $f_{Y|X}(y|x)$**.**

- ○ $\frac{(x+y^2)}{1+x}$
- ○ $\frac{3(x+y^2)}{x}$
- ● $\frac{3(x+y^2)}{1+3x}$
- ○ $\frac{\frac{6}{5}(x+y^2)}{1+3x}$
- ○ None of these

2049. A basketball player makes 90% of her free throws. What is the probability that she will miss for the first time on the seventh shot?

0.9^6*0.1

- ○ 0.0001
- ● 0.053
- ○ 0.002
- ○ 0.001
- ○ 0.01

2050. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}2(1-x) & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Then find P(Y>0.5).

- 0.5
- 0.25
- 0.75
- 1
- 1.5

2051. Let X be a continuous random variable with probability density given by $f(x)=\begin{cases}\frac{x}{12} & \text{for } 1<x<5\\ 0 & \text{elsewhere}\end{cases}$.

Let Y=2X-3. Find P(Y≥4).

- 0.3438
- 0.53125
- 0.0625
- 0.1563
- 0

2052. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find $P(-0.8\le X\le 0.8)$**.**

- 0.31
- 0.428
- 0.512
- 0
- 0.78

2053. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find E[X].

- 0
- 1
- 2
- 3
- 4

2054. Random variable X has the following PDF $f(x)=\frac{3x^2}{2}, -1\le x\le 1.$

Find Var[X].

- 0
- 1
- 0.6

- 0.8
- 0.4

2055. Random variable X has the following PDF $f(x)=\dfrac{3x^2}{2}, -1\le x\le 1.$

Find $E\left[\dfrac{1}{X}\right]$**.**

- 4
- 0
- 2
- 1
- -2

2056. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the marginal density function for X.

- 6y
- $6y^2$
- $6x^2$
- $3x^2$
- $3x^3$

2057. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the marginal density function for Y.

- $3x^2$
- 6y
- 2y
- $2y^2$-1
- y+6

2058. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the E[X].

- 0.25
- 0.75
- 0.5
- 0.95

- None of these

2059. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}6x^2y & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Find the E[Y].

- 1
- 2/3
- 1/3
- 0.5
- 0.25

2060. Assume that Z is standard normal random variable. What is the probability P(|Z|>2.53)?

- 0.9943
- 0.0114
- 0.0057
- 0.9886
- None of these

2061. If Z is normal random variable with parameters μ=0, σ^2=1 then the value of c such that P(|Z|<c)=0.7994 is

- 1.28
- 0.84
- 1.65
- 2.33
- None of these

2062. The random variable X has the continuous CDF

$$F(x)=\begin{cases}0, & x<0\\ \frac{x^2}{9}, & 0\le x<3\\ 1, & 3\le x\end{cases}$$

. Find P(2≤X≤4).

- 16/9
- 4/3
- 4/9
- 5/9
- 2/3

2063. Let X be the random variable for the life in hours for a certain electronic device. The probability density function is

$$f(x) = \begin{cases} \dfrac{200{,}000}{x^3} & \text{for } x > 100 \\ 0 & \text{elsewhere} \end{cases}$$. **Find the expected life for a component.**

- 2000 hours
- 1000 hours
- 100 hours
- 200 hours
- None of these

2064. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x, y) = \begin{cases} x + y & \text{if} \quad 0 \le x \le 1, 0 \le y \le 1 \\ 0, & \text{otherwise} \end{cases}$$

. Find E[X-Y].

- 0
- 7/6
- 2/3
- 1/6
- None of these

2065. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x, y) = \begin{cases} x + y & \text{if} \quad 0 \le x \le 1, 0 \le y \le 1 \\ 0, & \text{otherwise} \end{cases}$$

. Find E[X+Y].

- 1/6
- 6/7
- 7/6
- 5/6
- 0

2066. The joint density function for the random variables X and Y is given by

$$f_{X,Y}(x, y) = \begin{cases} xe^{-x(1+y)} & \text{if} \quad x \ge 0, \ y \ge 0 \\ 0, & \text{otherwise} \end{cases}$$

. Find E[X].

- 0
- 1
- 1.4142
- 2
- None of these

2067. A box contains 15 balls, 10 of which are black. If 3 balls are drawn randomly from the box, what is the probability that all of them are black?

10/15*9/14*8/13=0.26

- 0.26
- 0.52

- 0.1
- None of these
- 0.36

2068. The Cov(aX,bY) is equal to

- $aCov(X,Y)+bCov(X,Y)$
- $aCov(X,Y)-bCov(X,Y)$
- $abCov(X,Y)$
- $a^2b^2Cov(X,Y)$
- $\frac{a}{b}Cov(X,Y)$

2069. If A and B are two mutually exclusive events with P(A) = 0.15 and P(B) = 0.4, find the probability P(A and B^c) (i.e. probability of A and B complement).

0.15*0.6

- 0.4
- 0.15
- 0.85
- 0.6
- 0.65

2070. From a group of 5 men and 6 women, how many committees of size 3 are possible with two men and 1 woman if a certain man must be on the committee?

- $\binom{5}{1}\times\binom{6}{1}$
- $\binom{4}{1}\times\binom{1}{1}\times\binom{6}{1}$
- $\binom{1}{1}\times\binom{6}{1}$
- $\binom{5}{2}\times\binom{6}{1}$
- None of these

2071. Let $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, be the joint PDF of X and Y. Find the marginal PDF of Y.

- y+1/2
- y
- 1/2y
- $y^2/2$
- 1/2

2072. Let $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, be the joint PDF of X and Y. Compute E[X].

- ○ 0.2
- ● 0.823
- ○ 0.583
- ○ 1
- ○ 0

2073. Let $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, be the joint PDF of X and Y. Compute E[Y].

- ○ 0.2
- ● 0.823
- ○ 0.583
- ○ 1
- ○ 0

2074. Let $f(x,y)=x+y$, $0\le x\le 1$, $0\le y\le 1$, be the joint PDF of X and Y. Compute E[2X].

- ● 7/6
- ○ 0
- ○ 1
- ○ 7/12
- ○ 1/6

2075. Let X be continuous random variable with probability density function $f(x)=\begin{cases}\frac{x}{6}, & if\ 2<x<4\\ 0, & otherwise\end{cases}$. Find the expected value of random variable X.

- ○ 19/3
- ○ 13/3
- ○ 12/7
- ● 28/9
- ○ 27/4

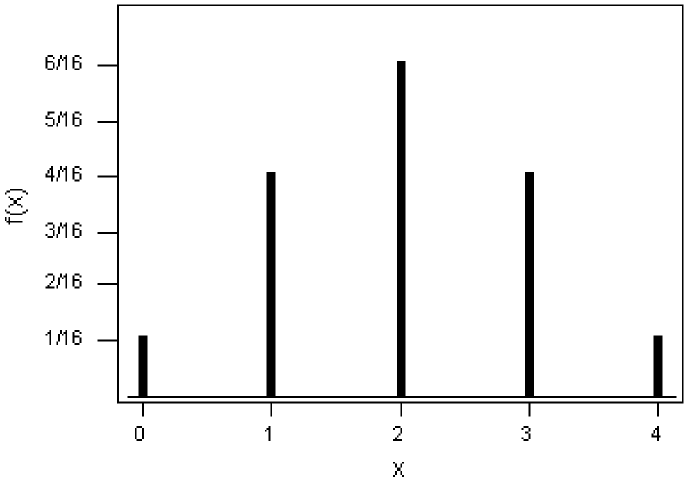
2076. The joint distribution for two random variables X and Y is given by

$$f_{X,Y}(x,y)=\begin{cases}2(1-x) & if \quad 0\le x\le 1, 0\le y\le 1\\ 0, & otherwise\end{cases}$$

. Then find P(X>0.5).

- ○ 0.5
- ● 0.25
- ○ 0.15
- ○ 0.75
- ○ 0.1

2077. Probability mass function for discrete random variable X is represented by



the

graph. Find Var(X).

- 1
  - 4
  - 5
  - 2
  - 6

2078. Two dice are rolled, find the probability that the sum is less than 13.

- 1
  - 1.2
  - 0.5
  - 0.6
  - 0.8

2079. A bag has six red marbles and six blue marbles. If two marbles are drawn randomly from the bag, what is the probability that they will both be red?

C(2,6)/c(2,12)

- 1/2
- 11/12
- 5/12

- 5/22
  - 1/3

2080. A man can hit a target once in 4 shots. If he fires 4 shots in succession, what is the probability that he will hit his target?

$$1-\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)\cdot\left(\frac{3}{4}\right)=1-\left(\frac{3}{4}\right)^4=1-\frac{81}{256}=\frac{256}{256}-\frac{81}{256}=\frac{175}{256}$$

- 175/256
  - 1
  - 1/256
  - 81/256
  - 144/256

2081. Let random variable *X be normal with parameters mean=5, variance=9*. Which of the following is a standard normal variable?

  - Z=(X-5)/5
  - Z=(X-3)/5
- Z=(X-5)/3
  - Z=(X-3)/3
  - None of these

2082. A coin is tossed 6 times. What is the probability of exactly 2 heads occurring in the 6 tosses.

- $\binom{6}{2}\left(\frac{1}{2}\right)^6$
  - $\left(\frac{1}{2}\right)^6$
  - $\left(\frac{1}{3}\right)^6$
  - $\binom{6}{2}\left(\frac{1}{3}\right)^6$
  - None of these

1. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

   A)1/2

   B)2/5

   C)8/15

   D)9/20

2. What is the probability of getting a sum 9 from two throws of a dice?

   A)1/6

   B)1/8

   C)1/9

   D)1/12

3. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

   A)1/6

   B)1/8

   C)4/7

   D)1/12

4. Two brother X and Y appeared for an exam. The probability of selection of X is 1/7 and that of B is 2/9. Find the probability that both of them are selected.

   A)1/63

   B)2/35

   C)2/63

   D)9/14

5. Four dice are thrown simultaneously. Find the probability that all of them show the same face.

   A)1/216

   B)1/36

   C)4/216

   D)3/216

6. A die is rolled, find the probability that an even number is obtained.

A)1/2

B)2/3

C)1/6

D)5/6

7. Two coins are tossed, find the probability that two heads are obtained.

A)1/4

B)2/3

C)1/6

D)5/6

8. Which of these numbers cannot be a probability?

A) -0.00001

B) 0.5

C) 0

D) 1

9. Which of these numbers cannot be a probability?

A) 20%

B) 0.5

C) 0

D) 1.0001

10. A coin is tossed twice. Find the probability that the coin lands on “tails” in both times.

A) 1/2

B) 3/4

C) 1

D)1/4

11. One letter is randomly chosen from the word “UNIVERSITY”. What is the probability that this letter is “A”?

A) 0.6

B)1/6

C)1/2

D) 0

12. Three shooters shoot in a target. The probability of hit in the target at one shot for the 1st shooter is 0.75; for the 2nd -0.8 and for the 3rd -0.2. Find the probability that at least one of the shooters will hit in the target.

A) 0.995

B) 0.96

C) 0.95

D) 0.65

13. The probability of delay for the train #1 is equal to 0.2 and for the train #2 is equal 0.64.Find the probability that only one train will be late.

A) 0.615

B) 0.584

C) 0.715

D) 0.9

14. A committee consisting of 6 members has to elect a president and a treasurer. In how many ways can they do this?

A) 15

B) 30

C) 10

D) 25

15. In a class of 30 students 15 are taking French and 20 are taking Spanish. What is the probability that a student who is selected at random from this class is taking both French and Spanish?

A) 1/5
B) 1/6
C) 1/3
D) 1/4

16. There are 50 identical details (and 5 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted.

A) 1/10

B) 1/50

C) 5/55

D) 1/5

17. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,85. Find the number of hits if 120 shots were made.

A)102

B)240

C)0.007

D)141

18. Participants of a toss-up pull a ticket with numbers from 1 up to 100 from a box. Find the probability that the number of the first randomly taken ticket does not contain the digit 5.

A)0,81

B)0,24

C)0.007

D)0,141

19. The probability of a reliable event is equal to:

A) 0

B) 2

C) 1

D) -1

20. Participants of a toss-up pull a ticket with numbers from 1 up to 100 from a box. Find the probability that the number of the first randomly taken ticket does not contain the digit 5.

A) 81/100

B)19/100

C)1/10

D)9/10

21. In a batch of 100 details the quality department has found out 5 non-standard details. What is the probability of appearance of non-standard details equal to?

A) 1/20

B) 5/105

C) 1/100

D)5/25

22. Two dice are tossed. Find the probability that the same number of aces will appear on both dice.

A) 1/6

B) 5/36

C) 9/36

D)1/36

23. An urn contains 12 balls: 3 white, 4 black and 5 red. Find the probability that a randomly taken ball will be black.

A) ¼

B) 1/3

C) 5/12

D)7/12

24. The first box contains 5 balls with numbers from 1 up to 5, and the second – 5 balls with numbers from 6 up to 10. It has been randomly extracted on one ball from each box. Find the probability that the sum of numbers of the extracted balls will be equal to 11.

A) 0.6

B) 0.9

C) 0.2

D) 0.4

25. The relative frequency of workers of an enterprise having a higher education is equal to 0,18. Determine the number of workers having a higher education if the total number of workers of the enterprise is 350.

A)58

B)63

C)45

D)65

26. 78 seeds have germinated of 100 planted seeds. Find the relative frequency of germination of seeds.

A) 39/50

B) 22/50

C) 7/100

D) 3/100

27. A box contains 5 red, 3 green and 2 blue pencils. 3 pencils are randomly extracted from the box. Find the probabilities that all the extracted pencils are different color.

A) 0.25

B) 0.3

C) 0.5

D)0.1

28. A box contains 5 red, 3 green and 2 blue pencils. 3 pencils are randomly extracted from the box. Find the probabilities that all the extracted pencils are the same color;

A) 0.2

B) 0.092

C) 0.01

D) 0.6

29. A box contains 5 red, 3 green and 2 blue pencils. 3 pencils are randomly extracted from the box. Find the probabilities that one blue pencil among the extracted;

A) 0.56

B) 0.658

C) 0.01

D) 0.6

30. The probability that a shooter hit in a target at one shot is equal to 0,9. The shooter has made 3 shots. Find the probability that all 3 shots will strike the target.

A)0.729

B)0.81

C)0.27

D)0.022

31. The first brigade has 6 tractors, and the second – 9. One tractor demands repair in each brigade. A tractor is chosen at random from each brigade. What is the probability that both chosen tractors are serviceable.

A) 20/27

B) 19/27

C)1/27

D)18/27

32. The first brigade has 6 tractors, and the second – 9. One tractor demands repair in each brigade. A tractor is chosen at random from each brigade. What is the probability that one of the chosen tractors demands repair.

A) 11/54

B) 4/55

C) 4/57

D) 13/54

33. There are details in two boxes: in the first – 10 (3 of them are standard), in the second – 15 (6 of them are standard). One takes out at random on one detail from each box. Find the probability that both details will be standard.

A) 0.12

B) 0.5

C) 0.8

D) 0.36

34. There are 3 television cameras in a TV studio. For each camera the probability that it is turned on at present, is equal to p = 0,6. Find the probability that at least one camera is turned on at present

A) 0.936

B) 0.754

C) 0.369

D) 0.367

35. The dispersion of the number of occurrence of an event A for n independent trials in each of which the probability of occurrence of the event A is p, is equal to:

A) $D(X) = np$

B) $D(X) = nq$

C) $D(X) = \sqrt{npq}$

D) $D(X) = npq$

36.The random variable X and Y are independent . Find the dispersion of the random variable

$Z = 3 \cdot X + 4 \cdot Y$. If its known that $D(X) = 2, D(Y) = 6$.

A)30

B)12

C)78

D)114

37. Let A and B be events connected with the same trial. Show the event that means occurrence of at least one of the events A and B.

A) $A\bar{B} + \bar{A}B$

B) AB

C) $A + B$

D) $A\bar{B} + \bar{A}B + AB$

38. Let A_1, A_2, A_3 be events connected with the same trial. Let A be the event that means occurrence of exactly two of the events A_1, A_2 and A_3. Express the event A by the events A_1, A_2 and A_3.

A)$A = A_1A_2A_3$

B) $A = A_1A_2 + A_2A_3 + A_1A_3$

C) $A = \overline{A_1}A_2A_3 + A_1\overline{A_2}A_3 + A_1A_2\overline{A_3}$

D) $A = A_1 + A_2 + A_3$

39. A coin is tossed twice. Find the probability that the coin lands on "tails" in both times.

A) ½

B) 3/4

C) 1

D) ¼

40. One letter is randomly chosen from the word "APPLE". What is the probability that this letter is "N"?

A) 0.6

B) 1

C)0.9

D) 0

41. One letter is randomly chosen from the word "EXAM". What is the probability that this letter is "H"?

A) 0.6

B) 1

C)0.9

D) 0

42. There are 5 white and 5 black balls in an urn. What is the probability of extracting a red ball from the urn?

A)1

B)0

C)1/2

D)1/3

43. A random variable X has the following density of distribution:

$f(x) = \frac{1}{3\sqrt{2\pi}} e^{\frac{(x+3)^2}{18}}$. Find the mathematical expectation and the dispersion $D(X)$.

A) $M(X) = -3, D(X) = 3$
B) $M(X) = 3, D(X) = 3$
C) $M(X) = -3, D(X) = 9$
D) $M(X) = 0, D(X) = 1$

44. A shooter makes 3 shots in a target. The probability of hit in the target at one shot is equal to 0.7. Find the probability that at least one shot will hit in the target.

A) 0.973

B) 0.027

C) 0.316

D) 0.3

45. Find the mathematical expectation $M(X)$ of a random variable , knowing its law of distribution:

X	6	3	1
P	0.2	0.3	0.5

A) $M(X) = -2.6$
B) $M(X) = 3{,}88$
C) $M(X) = -1$
D) $M(X) = 0$

46. Find the mathematical expectation $M(X)$ of a random variable , knowing its law of distribution:

X	1	2	3
P	0.1	0.6	0.8

A) $M(X) = -3.7$
B) $M(X) = 3{,}88$
C) $M(X) = -1$
D) $M(X) = 0$

47. Find the mathematical expectation $M(X)$ of a random variable , knowing its law of distribution:

X	0	1	2

P	0.2	0.3	0.5

A) $M(X) = 1.3$
B) $M(X) = 3,88$
C) $M(X) = -1$
D) $M(X) = 0$

48.Find the mathematical expectation $M(X)$ of a random variable , knowing its law of distribution:

X	0	1	2
P	0.7	0.3	0.7

A) $M(X) = 1.7$
B) $M(X) = 1$
C) $M(X) = 1.7$
D) $M(X) = 1.7$

49. The law of distribution of a discrete random variable X is given by the following table:

X	-1	*Y*
P	0.4	0.6

It is known that $M(X) = 2.6$. Find Y.

A) 1
B) 2
C) 3
D) 5

50. The law of distribution of a discrete random variable X is given by the following table:

X	-1	*Y*
P	0.5	0.2

It is known that $M(X) = 2$. Find Y.

A) 12.5
B) 2.5
C) 3
D) 5

51. A discrete random variable X is given by the following law of distribution:

X	1	2	3
P	0.1	0.6	0.2

Find the mathematical expectation $M(X)$.

A) 1.9
B) 2.5
C) 3
D) 5

52. . A discrete random variable X is given by the following law of distribution:

X	1	2
P	0.1	0.6

Find the mathematical expectation $M(X)$.

A) 1.3
B) 2.5
C) 3
D) 5

53. A bag contains 9 black and 3 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

A) 1/4
B) 2/5
C) 3/4
D) ½

54. Two brother X and Y appeared for an exam. The probability of selection of X is 7/8 and that of B is 4/5. Find the probability that both of them are selected.

A) 7/10
B) 2/9
C) 3/4
D) 5/9

55. A discrete random variable *X* has *a binomial law of distribution* if $P(X = m)$ is equal to:

A) $P(X = m) = C_n^m p^m q^{n-m}$
B) $P(X = m) = C_n^m p q^{n-m}$
C) $P(X = m) = C_n^m p^m q$
D) $P(X = m) = p^m q^{n-m}$

56. A discrete random variable *X* has *the law of Poisson distribution* if $P(X = m)$ is equal to:

A) $P(X = m) = \frac{\lambda^m e^{-\lambda}}{m!}$
B) $P(X = m) = \frac{\lambda e^{-\lambda}}{m!}$
C) $P(X = m) = C_n^m p^m q$
D) $P(X = m) = p^m q^{n-m}$

57. A discrete random variable *X* has *a geometric distribution* if $P(X = m)$ is equal to:

A) $P(X = m) = \frac{\lambda^m e^{-\lambda}}{m!}$
B) $P(X = m) = p q^{m-1}$
C) $P(X = m) = C_n^m p^m q$
D) $P(X = m) = p^m q^{n-m}$

58. A discrete random variable *X* has *a hypergeometric distribution* if $P(X = m)$ is equal to:

A) $P(X = m) = \frac{C_M^m \cdot C_{N-M}^{n-m}}{C_N^n}$

B) $P(X = m) = p q^{m-1}$

C) $P(X = m) = C_n^m p^m q$

D) $P(X = m) = p^m q^{n-m}$

59. The sum of the probabilities of events $A_1, A_2, A_3, \ldots, A_n$ which form a complete group is equal to:

A) 1

B) 0
C) -1
D) n

60. The sum of the probabilities of opposite events is equal to:

A) 1
B) 0
C) -1
D) n

61. *The conditional probability* of an event *B* with the condition that an event *A* has already happened is equal to:

A) $P_A(B) = \frac{P(AB)}{P(A)}$
B) $P_A(B) = \frac{P(B)}{P(A)}$
C) $P_A(B) = \frac{P(AB)}{P(B)}$
D) $P(B) = \frac{P(AB)}{P(B)}$

62. For a random variable *X,* the function *F* defined by:

A) $F(x) = P(X < x)$
B) $F(x) = P(X\ )$
C) $F(x) = P(X > x)$
D) $F(x) = P(x)$

63. *The probability density* (*distribution density* or simply *density*) $\varphi(x)$ of a continuous random variable *X* is equal to:

A) $\varphi(x) = F'(x)$
B) $\varphi(x) = \frac{x-a}{b-a}$
C) $\varphi(x) = \frac{1}{x}$
D) $\varphi(x) = \frac{b-x}{a}$

64. For independent events theorem of multiplication $P(AB) = P(A) \cdot P_A(B)$ has the following form:

A) $P(AB)=P(A)P(B)-P(AB)$
B) $P(AB) = P(A) \cdot P(B)$
C) $P(AB)= P(A) \cdot P(B)+P(AB)$
D) $P(AB) = P(A) +P(B)$

65. The probability of appearance of at least one of the events $A_1, A_2, \ldots, A_n$ independent in union is equal to:

A) $P(AB)=P(A)P(B)-P(AB)$
B) $P(AB) = P(A) \cdot P(B)$
C) $P(A) = 1 - q_1q_2\ldots q_n$
D) $P(A) = \frac{m}{n}$

66. Which one of the following is a continuous random variable?

A) Exponential random variable

B) Geometric random variable

C) Poisson random variable

D) All if the above

67. Classical definition of probability is equal to:

A) $P(A) = pq^{m-1}$

B) $P(A) = \frac{m}{n}$

C) $P(A) = C_m^n p^n q^{m-n}$

D) $P(A) = 1 - P(\bar{A})$

68. How many three-place numbers can be made of the digits 1, 2, 3 if each digit is included into the image of a number only once?

A) 5

B) 7

C) 6

D) 9

69. The sum of the probabilities of opposite events is equal to:

A) -1

B) 2

C) 0

D) 1

69. The probability that a day will be rainy is $p = 0,7$. Find the probability that a day will be clear.

A) 0.3

B) 0.1

C) 0.2

D) 0.5

70.The probabilities of hit in a target at shooting by three guns are the following: $p_1 = 0,8$; $p_2 = 0,7$; $p_3 = 0,9$. Find the probability of at least one hit (the event *A*) at one shot by all three guns.

A) 0.022

B) 0.994

C) 0.36

D) 0.01

71. There are 4 flat-printing machines at typography. For each machine the probability that it works at the present time is equal to *0,9*. Find the probability that at least one machine works at the present time (the event *A*).

A) 0.9999

B) 0.252

C) 0.369

D) 0.354

72. Formula of total probability is equal to :

A) $P(A)=P(B_1)\cdot P_{B_1}(A)+P(B_2)\cdot P_{B_2}(A)+\cdots+P(B_n)\cdot P_{B_n}(A)$

B) $P(A)=C_m^n p^n q^{m-n}$

D) $P(A)=1-P(\bar{A})$

A) $P(A)=pq^{m-1}$

73. There are 6 motors in a shop. For each motor the probability that it is turned (switched) on at present time is equal to 0,8. Find the probability that at present 4 motors are turned on.

A) 0.7

B) 0.246

C) 0.009

D) 0.001

74. There are 6 motors in a shop. For each motor the probability that it is turned (switched) on at present time is equal to 0,8. Find the probability that at present all motors are turned on.

A) 0.1

B) 0.9

C) 0.26

D) 0.7

75. There are 6 motors in a shop. For each motor the probability that it is turned (switched) on at present time is equal to 0,8. Find the probability that at present all motors are turned off.

A) 0.000064

B) 0.055

C) 0.003

D) 0.699

76. The quality department has detected 3 non-standard details in a group consisting of 80 randomly selected details. The probability of appearance of non-standard details is:

A) 1/80

B) 9/80

C) 3/80

D) 3/83

77. There have been made 24 shots in a target, and 19 hits were registered. The probability of hit in the target is:

A) 19/24

B) 24/43

C) 2/19

D) 3/19

78. (Mathematical) expectation of a discrete random variable is equal to:

A) $M(X) = \sum_{x,p(x)>0} x \cdot p(x)$

B) $M(X) = x \cdot p(x)$

C) $M(X) = a + b$

D) $M(X) = x + p(x)$

79. The dispersion (variance) of X is defined by:

A) $D(X) = M(X^2) - (M(X))^2$

B) $D(X) = M(X^2) + (M(X))^2$

C) $D(X) = M(X^2) \cdot (M(X))^2$

D) $D(X) = M(X^2)/(M(X))^2$

80. In a batch of 20 details the quality department has found out 5 non-standard details. What is the probability of appearance of non-standard details equal to?

A) 20/25

B) 1/5

C) 1/6

D) ¼

81. In a batch of 25 details the quality department has found out 5 non-standard details. What is the probability of appearance of non-standard details equal to?

A) 1/5

B) 5/36

C) 1/6

D) ½

82. At shooting by a rifle the relative frequency of hit in a target has appeared equal to 0,8. Find the number of hits if 120 shots were made.

A) 96

B) 120

C) 80

D) 105

83. A random variable X has the following density of distribution:

$f(x) = \frac{1}{3\sqrt{2\pi}} e^{-\frac{(x+3)^2}{18}}$. Find the mathematical expectation $M(X)$ and the dispersion $D(X)$.

A) $M(X) = -3, D(X) = 3$
B) $M(X) = 3, D(X) = 3$
C) $M(X) = -3, D(X) = 9$
D) $M(X) = 0, D(X) = 1$

84. If a continuous random variable X is uniformly distributed over (a,b), then the density has the following form:

A) $f(x) = \begin{cases} 0 & x \notin (a,b) \\ \frac{1}{b-a}, & x \in (a,b) \end{cases}$

B) $f(x) = \begin{cases} 0 & x \in (a,b) \\ \frac{1}{b-a}, & x \notin (a,b) \end{cases}$

C) $f(x) = \begin{cases} 0 & a < x < b \\ \frac{1}{b-a}, & x < a \cup x > b \end{cases}$

D) $f(x) = \begin{cases} 0 & a < x < b \\ b - a, & x < a \cup x > b \end{cases}$

85. The dispersion of the number of occurrence of the event A for n independent trials in each of which the probability of occurrence of the event A is p, is equal to:

A) $D(X) = np$

B) $D(X) = nq$

C) $D(X) = npq$

D) $D(X) = n/pq$

86. The random variable X and Y are independent. Find the dispersion of the random variable $Z = 3 \cdot X + 4 \cdot Y$ if its known that $D(X) = 2, D(Y) = 6$.

A) 30

B) 12

C) 78

D) 114

87. Find the mathematical expectation $M(X)$ of a random variable X, knowing its law of distribution:

x_i	6	3	1
p_i	0.2	0.3	0.5

A) 3.4
B) 2.8
C) 2.6
D) 2.4

88. Show one of the properties of mathematical expectation (C is a constant):

A) $M(CX) = M(C) + M(X)$

B) $M(CX) = M(X)$

C) $M(CX) = CM(X)$

D) $M(CX) = M(C) - M(X)$

89. The probability of distorting a sign at transmitting a message is equal to 0.01. Find the probability that a transmitted message consisting of 10 signs contains exactly 3 distortions.

A) $C_{10}^{3}(0.01)^3$

B) $C_{10}^{7}(0.01)^7(0.99)^3$

C) 0.013

D) $C_{10}^{3}(0.01)^3(0.99)^7$

90. The probability of delay for the train #1 is equal to 0.2, and for the train #2 -0.64. Find the probability that only one train will be late.

A) 0.584

B) 0.715

C) 0.615

D) 0.9

91. Two shots are made in a target by two guns. The probability of hit from the first gun is 0.8, from the second gun -0.9. Find the probability of only one hit in the target.

A) 0.1

B) 0.26

C) 0.72

D) 0.5

92. Show one of the properties of dispersion (k is a constant):

A) $D(kX) = k^2 D(X)$

B) $D(kX) = kD(X)$

C) $D(kX) = k + D(X)$

D) $D(kX) = k^2 - D(X)$

93. The mathematical expectation of a random variable *X* distributed under a binomial law is:

A) *M(X) = np*

B) *M(X) = nq*

C) M(X) = 0

D) M(X) = 1

94. The mathematical expectation and the dispersion of a random variable distributed under a Poisson law is:

A) $M(X) = \lambda, D(X) = \lambda$

B) $M(X) = 0, D(X) = 1$

C) $M(X) = npq, D(X) = pq$

D) $M(X) = 1, D(X) = 0$

95. The mathematical expectation of a random variable X having a geometrical distribution with parameter p is:

A) $M(X) = 1/p, D(X) = q/p^2$

B) $M(X) = 0, D(X) = 1$

C) $M(X) = npq, D(X) = pq$

D) $M(X) = 1, D(X) = 0$

96. The mean square deviation (the standard deviation) σ(X) of a random variable X is equal to:

A) $\sigma(X) = \sqrt{D(X)}$

B) $\sigma(X) = D(X)$

C) $\sigma(X) = a - b/2$

D)$\sigma(X) = a + b$

97. The dispersion of a constant is equal to:

A) $D(C) = 0$

B) $D(C) = 1$

C) $D(C) = -1$

D) $D(C) = C$

98. An integral function of distribution $F(x)$ is:

A) decreasing

B) periodic

C) even

D) non-decreasing

99. The probability density is:

A) a non-negative function

B) a decreasing function

B) a periodic function

C) an even function

100. There are 300 details in a box. It is known that 150 of them are details of the first kind, 120 – the second kind, and the rest – the third kind. How many ways of extracting a detail of the first or the second kind from the box are there?

A) 270

B) 300

C) 150

D) 120

101. A winner of a competition is rewarded: by a prize (the event *A*), a money premium (the event *B*), a medal (the event *C*).

What do the following events represent: *A + B*

A) The event $A + B$ consists in rewarding the winner by a prize, or a money premium, or simultaneously both a prize and a money premium.
B) The event $A + B$ consists in rewarding the winner by a prize, a money premium and a medal simultaneously.
C) The event $A + B$ consists in rewarding the winner by both a prize and a medal simultaneously without giving a money premium.
D) The event $A + B$ consists in rewarding the winner by a medal and a money premium.

102. The probability that a day will be rainy is *p = 0,6*. Find the probability that a day will be clear.

A) 0.9

B) 0.4

C) 0.1

D) 0.7

103. The probability that a day will be rainy is *p = 0,1*. Find the probability that a day will be clear.

A) 0.9

B) 0.6

C) 0.3

D) 0.25

104. The distribution function of a random variable *X* has the following form:

$$F(x)=\begin{cases} 0 & if \quad x\le 0, \\ x/2 & if \quad 0<x\le 2, \\ 1 & if \quad x>2. \end{cases}$$

Find the probability that the random variable will take on a value in the interval [1; 3).

A) ½
B) 1/3
C) ¼
D) 1/5

105. The quality department has detected 7 non-standard details in a group consisting of 50 randomly selected details. The probability of appearance of non-standard details is:

A) 7/50

B) 7/57

C) 7/10

D) 1/50

106. A point at random thrown on the interval [0; 2]. What is the probability of its occurrence in the interval [0.5; 1.4]?

A) 0.45

B) 0.9

C) 0.25

D) 0.75

107. A point at random thrown on the interval [0; 2]. What is the probability of its occurrence in the interval [0.5; 1]?

A) 0.1

B) 0.25

C) 0.6

D) 0.75

108. An urn contains 12 balls: 3 white, 4 black and 5 red. Find the probability that a randomly taken ball will be black.

A) 1/3

B) 1/5

C) 1/8

D) 1/9

109. 78 seeds have germinated of 100 planted seeds. Find the relative frequency of germination of seeds.

A) 78/100

B) 100/178

C) 1/178

D) 1/100

110. 5 seeds have germinated of 20 planted seeds. Find the relative frequency of germination of seeds.

A) 1/9

B) ¼

C) 2/5

D) 6/7

111. The relative frequency of workers of an enterprise having a higher education is equal to 0,18. Determine the number of workers having a higher education if the total number of workers of the enterprise is 350.

A) 6300

B) 6200

C) 5800

D) 1800

112. A coin is tossed twice. Find the probability that the coin lands on heads in both times.

A) 1/9

B) 1/8

C) ¼

D) ½

113. A die is tossed. Find the probability that the upper side of the die shows six aces:

A) 1/6

B) 2/3

C) 6/7

D) 2/9

114. A die is tossed. Find the probability that the upper side of the die shows five aces:

A) 1/8

B) 2/3

C) 1/6

D) 1/7

115. In box 10 red and 5 blue buttons. Removed at random two buttons. What is the probability that the buttons are the same color?

A) 0.524

B) 0.699

C) 0.366

D) 0.698

116. There are 70 identical details (and 5 of them are painted) in a box. Find the probability that the first randomly taken detail will be painted.

A) 5/90

B) 1/25

C) 6/85

D) 1/14

117. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

A)1/10

B)2/5

C)2/7

D)5/7

118. The probability of an impossible event is equal to:

A) 0

B) -1

C) 1

D) 2

119. Two concentric circles of which the radiuses are 5 and 10 cm respectively are drawn on the plane. Find the probability that the point thrown at random in the large circle will hit in the ring formed by the constructed circles. It is assumed that the probability of hit of a point in a flat figure is proportional to the area of this figure and does not depend on its disposition concerning the large circle.

A) 0.75

B) 0.55

C) 0.69

D) 0.85

120. A die is tossed. Find the probability that the upper side of the die shows an odd number:

A) ½

B) 1/3

C) 1/6

D) 5/6