Preliminary version of the Midterm Exam Spring 2019

1. Ten passengers are taking seats in 3 train cars. What is the probability that 5 passengers will take seats in one car, 3 passengers will take seats in the second car and 2 passengers will take seats in the third car.
2. There are 20 radio valves in the first box and 18 of them are standard. 10 radio valves are in the second box and 9 of them are standard. One radio valve was selected randomly from the second box and put it into first box. Find probability that radio valve which is selected randomly from the first box will be standard.
3. There are 6 different keys and you can open the door with only one of them. You will randomly select a key and try to open the door. If this key doesn't fit you put it out and never use it again Find probability that you can open the door by using not more than 2 keys.
4. Kate has 4 history books, 5 English books and 6 Math. books. How many ways you can arrange these books on the shelf if books which belong to the same subject must be placed together.
5. We have 8 different flags. The signal on the flagstaff consists of 2 or 3 flags. How many ways you can give a signal on the flagstaff if the order of flags is important.
6. One card is randomly selected from the deck of 52 cards. What is the probability that it is Ace or red color card.
7. Find probability that 3 randomly selected people on the street were born on different months of the year.
8. Three shots to target were done. Probability to hit the target from the first shot is $P_1 = 0.4$. Probability to hit the target from the second shot is $P_2 = 0.5$ and the third attempt probability is $P_3 = 0.7$. Find probability that after these three shots it will be a) one hole on the target b) at least one hole on the target?
9. If you switch an engine it will start to work with the probability 0.7. What is the probability that it is necessary not more than 2 switches in order to engine will start to work?
10. A firm produces 2 different signaling systems A and B. System A in case of fire will work with probability 0.86 and costs 2 times cheaper than system B. System B will give signal in case of fire with probability 0.99. You decided to set signaling system at home. What is better: to set two systems A or to set only one system B?
11. Firm gives cars for the rent and need to know how many cars they should have in order to get maximum profit. Every car which is given to the rent will give $100 profit per day and if the car is not demanded it will be loss of $30 per day. It is known that 5, 6, 7, and 8 cars will be demanded with the probabilities 0.2, 0.4, 0.3 and 0.1 correspondingly. How many cars a firm should have in order to get maximum profit?
12. Ten True-False questions are offered to the students. In order to get a good grade a student should give not less than 80% of correct answers. What is the probability to have a good grade if a student decided to guess?
13. There are 10 details and 3 of them are non standard. Three details are randomly selected. Find probability distribution of the random variable X, where X is the number of non standard details among selected details. Find mean and standard deviation of this variable.
14. Automatic machine stamps details. Probability that detail is standard is 0.9. Find probability distribution of the random variable X where X is number of standard details among selected 4 details. Find mean and standard deviation.
15. The unfair die (six points side occurs three times more than other sides) is included into the box with 3 other standard dice. One die is randomly selected from the box and rolled. What is the probability that six points side will occur?
16. A die is rolling 3 times. What is the probability that 5 points side will appear 3 times if it's known that 5 points side has appeared at least one time?
17. In a certain state, 40% of the voters are Democrats. If five voters are randomly selected for an exit poll, what is probability of getting at least one Democrat? Find the mean and standard deviation of random variable X – number of Democrats out of 200 selected voters.
18. There are 6 couples in the club. Six people are randomly selected. What is probability that only two couples out of them are there?

19. Determine if a probability distribution has been given. If so, find its mean and standard deviation:
    a) Number of tails out of five flips:

x	0	1	2	3	4	5
p	0.03125	0.15625	0.3125	0.3125	0.15625	0.03125

    b) Number of goals out of six shots:

x	0	1	2	3	4	5	6
p	0.0012	0.1254	0.3620	0.2540	0.1890	0.0710	0.0015

20. A technician is launching fireworks near the end of a show. Of the remaining fourteen fireworks, nine are blue and five are red. If she launches six of them in a random order, what is the probability that exactly four of them are blue ones?
21. In a high school class, 35% of the students take Spanish as a foreign language, 15% take French as a foreign language, and 40% take at least one of these languages. What is the probability that a randomly chosen student takes French given that the student takes Spanish?

22. Three cards are drawn successively, without replacement from a pack of 52 well shuffled cards. What is the probability that first two cards are queens and the third card drawn is an ace?

23. Marie is getting married tomorrow, at an outdoor ceremony in the desert. In recent years, it has rained only 5 days each year. Unfortunately, the weatherman has predicted rain for tomorrow. When it actually rains, the weatherman correctly forecasts rain 90% of the time. When it doesn't rain, he incorrectly forecasts rain 10% of the time. What is the probability that it will rain on the day of Marie's wedding?
24. A clothing store has determined that 30% of the people who enter the store will make a purchase. Eight people enter the store during a one-hour period. Find the probability that (a) exactly four people will make a purchase, and (b) at least one person will make a purchase.
25. Suppose three positions are open in a company for which eight men and seven women have applied for. Assuming each applicant is equally qualified for either position, what is the probability that three men were selected for the position?
26. A club contains 50 members; 20 are men and 30 are women. A committee of 10 members is chosen at random.
    (a) Give the mean and standard deviation of the number of women on the committee.
    (b) Give the mean and standard deviation of the number of men on the committee.
    (c) Find the probability that at least 2 women in the committee.
    (d) Find the probability that more than 1 men in the committee.
27. How much money will an insurance company charge for the policy, if they make off on average $655 of a 1-year life insurance policy worth $15,000, and you have a 0.997 probability of surviving the year?
28. Average number of phone calls to the station is 2 during 1 minute. Find probability that during 4 minutes it will be 3 phone calls to the station.
29. It is known that 0.2% of produced calculators are defected. A firm bought 2000 calculators. What is the probability that 5 or more calculators will have defect?

Answers

1.0.0427; **2.**0.9; **3.**1/3; **4.**12441600; **5.**392; **6.** 0.5385; **7.**0.764; **8.**a) 0.36, b)0.91; **9.**0.91; **10.** one system B is better; **11.** for x=7 expected profit is maximum; **12.**0.055; **13.** 0.9 and 0.7; **14.** 0.36 and 0.6; **15.**0.219; **16.**0.011; **17.** 0.922; 80 and 6.93; **18.** 0.3896; **19.** a) Yes, 2.5 and 1.12; b) No; **20.** 41.958%; **21**. 0.29; **22**.2/5525; **23.** 0.111; **24.** (a) 0.136. (b) 0.942 ; **25.** 0.123; **26.** (a) 6 and 1.4 (b) 4 and 1.4 (c) 0.999 (d)0.969; **27.** $700; **28.**0.0286; **29.**0.371