PROBABILITY

1. A shop sells 10 tube lights, out of which 3 are defective. Salman buys four tube lights. Find the probability that all of Salman's tube lights work.

A. 1/15
B. 1/25
C. 1/30
D. None

$\frac{35}{210}$ $\frac{1}{6}$

2. From a box containing 8 yellow and 5 white pens, three are drawn one after the other. Find the probability of all three pens being yellow if the pens drawn are not replaced?

A. 336/1716
B. 128/429
C. 113/1716
D. 336/2197

$\frac{8}{13} * \frac{7}{12} * \frac{6}{11} = \frac{336}{1716}$

3. A box contains 4 white, 6 green, 2 red and 5 yellow pens. If 4 pens are picked at random, what is the probability that one of them is green, 2 are white and 1 is yellow?

A. 3/169
B. 9/119
C. 9/13
D. None

4. There are three identical boxes, A, B, and C. Box A contains 3 red balls and 2 blue balls. Box B contains 2 red and 5 blue balls and Box C contains 2 blue, 1 red and 1 white ball. One ball is drawn from one of the boxes at random. . Find the probability that it is red.

A. 53/140
B. 53/100
C. 3/70
D. 7/19

5. A basket contains 3 blue, 2 green and 5 red bottles. If three bottles are picked at random, what is the probability that at least one is red?

A. 1/2
B. 7/12
C. 11/12
D. 1/5

6. Three dice are thrown together. Find the probability of getting a total of at least 6 ?

A. 103/216
B. 103/208
C. 103/108
D. 36/103

7. In a box there are 10 apples and 2/5th of the apples are rotten. If three apples are taken out from the box, what will be the probability that at least one apple is rotten.

A. 3/4
B. 5/6
C. 9/10
D. 8/13

8. A box contains 2 pink pens, 3 violet pens and 4 green pens. Find the probability of selecting 3 pens from the box such that at least 1 pen is green?

A. 12/40
B. 29/31
C. 23/28
D. 37/42

9. Probability of grasshopper eating grass = 1/5

Probability of frog eating grasshopper = 1/6

Probability of snake eating frog = 1/7

Probability of hawk eating snake = 1/8

Probability of man eating hawk = 1/9

What is the probability of a man eating a hawk who has eaten a snake which had consumed a frog who ate a grasshopper which didn't eat grass?

A. 1/756
B. 1/3780
C. 1/4096
D. 1/2048

10. There are 50 students in a class. 40% of the students like Orange and 50% of the students like Mango. If 10 students like both of them, then how many students like either Orange or Mango or both of them?

A. 30

B. 45
C. 40
D. 35

11. A box contains slips with numbers from 1 to 50 written on them. A slip is drawn and replaced. Then another slip is drawn and after replacing another slip is drawn. What is the probability that an even number appears on the first draw, an odd number on the second draw and a number divisible by 3 on the third draw?

A. 1/25
B. 2/25
C. 8/25
D. 4/25

12. When 4 fair coins are tossed together what is the probability of getting at least 3 heads?

A. 1/4
B. 3/4
C. 5/16
D. 3/8

13. A committee of 3 members is to be made out of 6 men and 5 women. What is the probability that the committee has at least two women?

A. 10/33
B. 14/33
C. 14/15
D. 13/25

14. 12 marbles are selected at random from a large collection of white, red, green and yellow marbles. The number of marbles of each colour is unlimited. Find the probability that the selection contains atleast one marble of each colour?

A. 34/91
B. 33/91
C. 36/91
D. 23/91

15. If in a round table conference n persons were asked to seated on a round table, then the probability that two named individuals will be neighbours :

A. 2(n-1)
B. 2/(n-1)

C. (n-1)
D. 1/(n-1)

16. The names of 5 students from section A, 6 students from section B and 7 students from section C were selected. The age of all the 18 students was different. Again, one name was selected from them and it was found that it was of section B. What was the probability that it was the youngest student of the section B?

A. 1/18
B. 1/15
C. 1/6
D. 1/12

17. Ram and Shyam are playing chess together. Ram knows the two rows in which he has to put all the pieces in but he doesn't know how to place them. What is the probability that he puts all the pieces in the right place?

A. 8!/16!
B. 8!/(2x15!)
C. 8!/15!
D. (2x8!)/16!

18. Aarti gave her project assignment to a shopkeeper for binding. There were 19 pages including a cover page, 12 pages of theory and 6 pages of drawings. She told the shopkeeper that the theory pages are in a particular order and the drawing pages can be arranged anywhere provided they are together. If the cover page is always kept first what is the probability that rest of the pages are arranged as per requirement?

A. 12C1 × 6! /18!
B. 13C1 × 6! /19!
C. 13 × 40 / 17!
D. 13! × 6! /18!

19. If the letters of the word "CRACKJACK" are rearranged in a random manner, what is the probability that vowels are neither together nor at the ends?

A. **11/18**
B. **1/2**
C. **7/36**
D. **5/12**

20. A basketball game is played between team Blue and Red. There are a total of 9 players in each team and 5 will play in the game. Ankit is in team blue and Vaibhav is in team Red. What is the probability that at least one of ankit or vaibhav is in playing five?

A. 125/153
B. 65/81
C. 56/81
D. 72/81

Answer:

1. D

Solution: $n(S) = {}^{10}C_4 = 210$

7 of the 10 lamps are not defective.

∴ If T is the event that all of Salman's tube lights work,

$n(T) = {}^{7}C_4 = 35$

∴ Probability that all of Salman's tube lights work = 35/210 = 1/6

We need the probability that at least two of his tube lights work.

The event that less than two of his tube lights work, and the event that at least two of his tube lights work, are exhaustive. So, we calculate the probability that less than two of his tube lights work and subtract it from 1.

The probability that none of Salman's tube lights work = 0 as there are only 3 defective tube-lights and he buys 4. If K is the probability that only one of Salman's tube lights works,

$n(K) = {}^{7}C_1 \times {}^{3}C_3 = 7$

∴ Probability that less than two of Salman's tube lights work = 7/210 = 1/30

∴ Probability that at least two of Salman's tube lights work = 1 – (1/30) = 29/30

2. A

Solution: If the pens are being drawn one after another, the probability of drawing any color of pens for every fresh draw changes.

∴ Reqd probability = 8/13 × 7/12 × 6/11 = 336/1716

3. B

Solution: Reqd probability p(E) = n(E)/n(S)

∴ Number of sample space $n(S) = {}^{17}C_4$

= (17 × 16 × 15 × 14) / (1 × 2 × 3 × 4)

= 57120/24 = 2380

Number of events n(E) = ${}^{6}C_1 \times {}^{4}C_2 \times {}^{5}C_1 = 6 \times 3 \times 2 \times 5 = 180$

p(E) = 180/2380 = 18/238 = 9/119

4. A

Solution: The ball is drawn from box A or Box B or Box C.

The probability that a ball drawn from Box A is red is 3/5.

The probability that a ball drawn from box B is red is 2/7

The probability that a ball drawn from box C is red is 1/4

Probability of selecting any one of the three boxes = 1/3

∴ Probability that the ball is red is

1/3((3/5) + (2/7) + (1/4)) = 53/140

5. C

Solution: Total number of outcomes = ${}^{10}C_3 = 120$

Number outcomes not containing red bottles = ${}^{5}C_3 = 10$

∴ Probability that at least one is red

= 1 – 10/120

= 11/12

6. C

Solution: Since one die can be thrown in six ways to obtain any one of the six numbers marked on its six faces

⇒ Total number of elementary events = 6 x 6 x 6 = 216

Let A be the event of getting a total of at least 6.Then $\bar{A}$ denotes the event of getting a total of less than 6 i.e. 3, 4, 5.

⇒ $\bar{A}$ = { (1,1,1), (1,1,2), (1,2,1), (2,1,1), (1,1,3),(1,3,1), (3,1,1), (1,2,2), (2,1,2), (2,2,1) }

So, favorable number of cases = 10

⇒ $P(\bar{A}) = 10/216$

⇒ 1 – P (A) = 10/216

⇒ P(A) = 1 – (10/216)

= 103/108

7. B

Solution: Let rotten apples = 10 × (2/5) = 4, others = 6

If 1 apple is rotten + 2 apples are other

= 4C1 × 6C2 = 60

If 2 apples are rotten + 1 apple is other

= 4C2 × 6C1 = 36

If 3 apples are rotten = 4C3 = 4

Total outcomes = 10C3 = 120

Probability = (60 + 36 + 4) / 120

= 100/120

= 5/6

8. D

Solution: Probability that at least 1 pen is green = 1 – Probability that none of the selected pens is green

Now, number of ways in which no green pen is selected = $^5C_3$ (as there are five non-green pens)

And, number of ways of selecting three pens out of nine = $^9C_3$

P(atleast 1 green pen)

= 1 – ($^5C_3$/$^9C_3$)

= 1 – (10/84)

= 74/84

= 37/42

9. B

Solution: Probability of grasshopper not eating grass = 1 – (1/5) = 4/5

Reqd. probability = (1/9) × (1/8) × (1/7) × (1/6) × (4/5) = 1/3780

10. D

Solution: The distribution of the fruits are given below:

The number students who like only Mangoes- 40% of 50 = 20

The number students who like only Oranges- 50% of 50 = 25

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Therefore, the number of students who like either Orange or Mango or both of them = 20 + 25 – 10 = 35

11. B

Solution: The probability of an even number appearing on the first draw is 1/2(since there are 25 even numbers in counting of 1 to 50).

The probability of an odd number appearing on the second draw is 1/2(since there are 25 odd numbers in counting of 1 to 50).

The probability of a number divisible by 3 appearing on the third draw is 16/50 (Since there are 16 numbers that are divisible by 3 while counting from 1 to 50.) Since all these events have no relation with each other and no dependence either, and the slips are replaced, we can directly multiply the individual probabilities to get the resultant probability.

So, the probability of all the events taking place is

$(1/2) \times (1/2) \times (16/50)$

$= 2/25$

12. C

Solution: When 4 fair coins are tossed simultaneously, the total number of outcomes is $2^4 = 16$

At least 3 heads implies that one can get either 3 heads or 4 heads.

One can get 3 heads in ${}^4C_3 = 4$ ways and can get 4 heads in ${}^4C_4 = 1$ ways.

∴ Total number of favourable outcomes = 4 + 1 = 5

∴ The required probability = 1/4

13. B

Solution: Number of possible combination of 3 persons in which 2 have to be women = (2 Women out of 5 x 1 Man out of 6) or (3 Women out of 5) = ${}^5C_2 \times {}^6C_1 \times {}^5C_3$

Total possible outcomes = ${}^{11}C_3$

= ((5!/(2!×3!)) × (6!/(2!×3!)) × (5!/(3!×2!))) / (11!/(3!×8!))

= 70/(11×15)

= 14/33

14. B

Solution: Let W, R, G, Y represents no. of white, red, green and yellow coloured marbles contained in the selection of 12 marbles.

No. of ways of selecting 12 marbles is equal to the no. of non-negative integral solutions of

W + R + G + Y = 12

Total no. of ways = C (12 + 4 – 1, 4 – 1) = C (15 , 3)

The no. of selections that contain at least one marble of each colour is equal to the number of positive integral solutions of W + R + G + Y = 12

= C (12 – 1, 4 – 1) = C (11 , 3)

Required Probability = C (11 , 3)/C (15 , 3)

= 33/91

15. B

Solution: Total number of ways in which n persons can sit on a round table is (n – 1)!

⇒ Total number of elementary events = (n – 1)! Consider two named individuals as one person

Then there will be (n – 1) persons who can sit on a round table in (n – 2)! Ways

Also that two named individuals can be seated together in 2! Ways

Thus favorable number of elementary elements = (n – 2)! × 2! So , required probability

= favorable number of elementary elements / total number of elementary events

= ((n – 2)! × 2!) / (n – 1)!

= 2 / (n – 1)

16. C

Solution: The total number of students = 18

When 1 name was selected from 18 names, the probability that he was of section B

= 6/18

= 1/3

But from the question, there are 6 students from the section B and the age of all 6 are different therefore, the probability of selecting one i.e. youngest student from 6 students will be 1/6.

17. B

Solution: Total boxes = 16

Total pieces = 16

Similar pieces = 8 pawns, 2 bishops, 2 rooks, 2 knights

Total ways of arranging these 16 pieces in 16 boxes

= 16! / (8! 2! 2! 2!)

= 16! / (8 × 8!)

Ways of correct arrangement = 1

Probability of correct arrangement = 1 / (16! / (8 × 8!))

= (8 × 8!) / 16!

= 8! / (2 × 15!)

18. C

Solution: Pages = 1 cover page, 12 theory pages, 6 pictures page

Except cover page

Ways of arranging 12 + 6 pages = 18!

Ways of arranging so that the theory pages are in order and drawing pages come together= $^{13}C_1 \times 6!$

(As there are 13 gaps between 12 pages where 6 pages can be kept)

Probability = $(^{13}C_1 \times 6!)/18!$

= 13 × 40/17!

19. D

Solution: Total characters = 9, vowels = 2, consonants = 7

Except the end places, vowels can be arranged at 7 places

No of ways = 7C2 – 6 (minus 6 for the chances when both vowels are together) = 15

No of ways of arranging the 7 consonants = 7! / (3! × 2!)

Letters are K – 3, A – 2, C – 2, R, and J

No of arrangement with restriction = 15! / 3! × 2!

Total no of arrangements = 9! / (3! × 2! × 2!)

Probability = (15 × 7!/ 3! × 2!) / (9!/3! × 2! × 2!)

= 5/12

20. B

Solution: Total number of ways to select team blue without any restriction = ${}^{9}C_5$ Similarly, team Red can be selected in ${}^{9}C_5$ ways

Total number of ways to select both the teams = ${}^{9}C_5 \times {}^{9}C_5$

P (at least one of them plays) = 1 – P (none of them plays)

Total number of ways of selecting team without selecting Ankit and Vaibhav = ${}^{8}C_5 \times {}^{8}C_5$

P (at least one of them plays)= $1 - (({}^{8}C_5 \times {}^{8}C_5)/({}^{9}C_5 \times {}^{9}C_5))$

= 65/81