Probability

IIT Foundation Material

Section - I

Straight Objective Type

- Let S and R denotes the events that Sangeeta wins the match and Reshma wins the match, respectively The probability of Sangeeta's winning = P(S) = 0.62 (given) The probability of Reshma's winning = P(R)=1-P(S)=1-0.62=0.38 (:: R and S are complementary events) Hence (**B**) is the correct option.
- 2. If Hamida's birth day is different from Savita's, the number of favourable outcomes for her birthday is 365 1 = 364. So P(Hamida's birth day is different from Savita's birth day) $= \frac{364}{365}$ Hence (c) is the correct option.
- **3.** Let E be the event that 'the music is stopped within first half-minute.

The outcomes favourable to e are points on the number line from

0 to $\frac{1}{2}$.

Since all the outcomes are equally likely, we can argue that, of the

total distance of 2, the distance favourable to the event e is $\frac{1}{2}$.

Distance favourable to the event E

Total distance in which outcomes can lie

 $=\frac{\frac{1}{2}}{\frac{2}{2}}=\frac{1}{4}$

Hence (a) is the correct option.

$$\therefore P(\mathrm{E} = \frac{n(\mathrm{E})}{n(\mathrm{S})} = \frac{9}{25}$$

Required probability

$$=1-P(\mathbf{E})=1-\frac{9}{25}=\frac{16}{25}$$

Hence (b) is the correct option.

6. Total number of outcomes of throwing a die = 6 Number of outcomes of falling even number i.e. 2, 4, 6 = 3 The required probability = $\frac{3}{6} = \frac{1}{2}$ Hence (a) is the correct option.

7. Total number of possible outcomes of throwing two dice = 6 6 = 36Number of outcomes of getting 9 i.e., (3 + 6), (4 + 5), (5 + 4), (6 + 3) = 4 \therefore The required probability Number of favourable outcomes

Total number of possible outcomes

$$=\frac{4}{36}=\frac{1}{9}.$$

Hence (a) is the correct option.

8. There are 26 red cards (including 2 red queens) and 2 more queens are there.

Thus, we have to set aside 28 cards and, we have to draw 1 card out of the remaining (52 - 28) = 24 cards.

: Required probability =
$$\frac{24}{52} - \frac{6}{13}$$
.

Hence (a) is the correct option.

9. There are 4 numbers which are less than 5
i.e., 1, 2, 3 and 4
Number of such favourable outcomes = 4
∴ The number of marked on all the faces of a die are 1, 2, 3, 4, 5 and 6
∴ The number of possible outcomes = 6

$$\therefore$$
 P (a number less than 5) = $\frac{4}{6} = \frac{2}{3}$.

Hence (a) is the correct option.

Let H denotes head and T denotes tail
 ∴ on tossing two coins simultaneously, all the possible outcomes are

HH, HT, TH, TT

The probability of getting two heads = P(HH)

Events of occurence of two heads

Total number of possible outcomes

 $=\frac{1}{4}$

Hence (b) is the correct option.

12. Let H denotes Head and T denotes Tail on tossing three coins at a time

(i) All possible out comes = {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}

These are the 8 possible out comes.

(ii) An event of occurrence of 3 heads = $\{H, H, H\}$ =1

Now probability of getting 3 heads = P(HHH)

 $=\frac{\text{Events of occurrence of two heads}}{\text{Total number of possible outcomes}} = \frac{1}{8}$

Hence (a) is the correct option.

- 13. Total number of lottery tickets = 1000
 - \therefore Total number of possible outcomes = 1000 Number of prizes on these tickets = 5

Number of such favourable outcomes = 5

 \therefore P (winning a prize)

= Number of favourable outcomes

Total number of possible outcomes

 $=\frac{5}{1000}=0.005$ Hence (a) is the correct option.

14. Random drawing of balls ensures equally likely outcomes. The total number of faces = 6The Number of faces representing A = 2Total number of possible out comes =6P (A)

Number of favourable outcomes Total number of possible outcomes

 $=\frac{2}{6}=\frac{1}{3}$ Hence (b) is the correct option. 15. Number of black balls in the bag = 5Number of red balls in the bag = 7and The Number of white balls in the bag = 3.:. Total Number of balls in the bag = 5 + 7 + 3 = 15 \therefore Total Number of possible outcomes = 15 Hence, the Number of such favourable out come = 7, as there are 7 red balls. ... The probability that the ball drawn is red P(red ball) Number of favourable outcomes Total number of possible outcomes $=\frac{7}{15}$ Hence (a) is the correct option. 16. Total Number of balls in the bag = 5 + 8 + 4 + 7 = 24 \therefore Total Number of possible outcomes = 24 There are 7 black balls, hence the number of such favourable out comes = 7Probability of drawing black ball = P(black ball) $=\frac{\text{Number of favourable outcomes}}{\text{T}}$ Total number of possible outcomes $=\frac{7}{24}$ Hence (a) is the correct option.

17. Random drawing of cards ensures equally likely outcomes.

The Number of face cards (ACe, king, queen and Jack of each suits) $=4 \times 4$ = 16Total number of cards in a deck = 52.:. Total Number of possible outcomes = 52P (drawing a face card) = $\frac{16}{52} = \frac{4}{12}$ Hence (b) is the correct option. There are 2 '10' of black suits (i.e. spade and club) \therefore The Number of favourable outcomes = 2 Total Number of possible outcomes = 52P ('10'of a black suit) = $\frac{2}{52} = \frac{1}{26}$ Hence (c) is the correct option. Let the number of blue balls = xNumber of red balls = 5Total Number of balls in the bag = 5 + xDrawing balls randomly from bag are equally likely outcomes. Total Number of outcomes = 5 + xNumber of favourable outcomes of drawing a blue ball = xP (getting blue ball) = Number of favourable outcomes Total number of possible outcomes $=\frac{x}{5+x}$ Number of favourable outcomes of drawing a red ball = 5P (getting red ball) = $\frac{x}{5+r}$ P (getting blue ball) = 2 P (getting red ball)

18.

19.

$$\frac{x}{5+x} = 2\left(\frac{5}{5+x}\right) \Longrightarrow x = 10$$

Hence (b) is the correct option.

Since cards are marked from 2 to 101 Therefore, total number of 20. cards = 100 Drawing cards ensure the equally likely outcomes \therefore Total Number of possible outcomes = 100 Now, there are fifty cards marked with even number from 2 to 101.

Hence, the number of such favourable out comes = 50

... Probability that the card drawn is an even number

Number of favourable outcomes

Total number of possible outcomes

 $=\frac{50}{100}=\frac{1}{2}$

Hence (a) is the correct option.

SECTION - II

Assertion - Reason Questions

21.	P(Girl) – Number of girls
	Number of total students
	_ 7
	$=\frac{12}{12}$

Hence (a) is the correct option.

22. Favourable outcome = 5, 6P (5 or 6)

Number of favourable outcomes Total number of possible outcomes

Favourable out comes = (4, 5) (5, 4) (3, 6) (6, 3)

$$P(9) = \frac{4}{36} = \frac{1}{9}$$

Hence (b) is the correct option.

23. Favourable out comes = 2, 4, 6 P (even number) = $\frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}}$ Favourable out comes = 4, 5 $P(4,5) = \frac{2}{6} = \frac{1}{3}$ Hence (b) is the correct option. 24. P(Saurav Ganguly) = $\frac{1}{5}$

Hence (b) is the correct option.

25. The Sum of the probabilities all elementary events of are experiment is 1.

Total Number of outcomes = 6 + 7 + 2 = 15Number of favourable outcomes = 7

$$\therefore$$
 P (Red). $\frac{7}{15}$

Hence (b) is the correct option.

SECTION - III

Linked Comprehension Type

26. There are 12 cards on which marked numbers are less than 14. Hence the number of such favourable out comes = 12 \therefore Probability that t- number on card drawn is less than $14r = \frac{12}{3} = \frac{3}{3} = 0$

$$14x = \frac{1}{10} = \frac{1}{25} \Theta \therefore \phi \Rightarrow$$

Hence (b) is the correct option.

27. Those number from 2 to 101 which are perfect squares 4, 9, 16, 25, 36, 49, 64, 81, 100 i.e., squares of 2, 3, 4, 5, 6, 7, 8, 9, 10 respectively. Total number of cards marked with such numbers = 9 ∴ Probability that the number marked on the card is a perfect square = $\frac{9}{100}$ Hence (c) is the correct option.

28. The Prime numbers which are less than 20 and starting from 2 are 2, 3, 5, 7, 11, 13, 17 and 19 Hence the number of such favourable out comes = 8 P (Prime less than 20) = $\frac{8}{100} = \frac{2}{25}$ Hence (d) is the correct option.

29. Total number of out comes = $6 \times 6 = 36$ Number of favourable outcomes = 4 [(3, 5) (5, 3) (2, 6) (6, 2) (4, 4)] $P(8) = \frac{5}{36}$

Hence (b) is the correct option.

- **30.** Favourable out comes = 0 Total number of out comes = $6 \times 6 = 36$ $P(0) = \frac{0}{36} = 0$ Hence (c) is the correct option.
- Favourable outcomes = (6, 6) (5, 5)
 (4, 4) ----- (1, 1)
 Number of favourable out comes = 36
 Number of Total out comes = 36
 ∴ Probability that the sum of the two numbers appearing on the

top of the dice is less than or equal to 12 is $=\frac{36}{36}=1$ Hence (a) is the correct option.

32. Total number of balls =
$$5 + 6 + 7 = 18$$

P (white ball) = $\frac{7}{18}$
Hence (a) is the correct option.

33. P (green) = $\frac{5}{18}$ P (black ball) = $\frac{6}{18}$ (green) \cap (black ball) = f P (green or black ball) = P (green) + P (black) = $\frac{5}{18} + \frac{6}{18} = \frac{11}{18}$ Hence (b) is the correct option.

34. P (black ball) = 1 – P (black)
=
$$1 - \frac{6}{18}$$

= $1 - \frac{1}{3}$
= $\frac{2}{3}$

Hence (c) is the correct option.

35. Total number of balls = 12 \therefore Total Number of possible outcomes = 12Number of white balls = $3(\because x = 3)$

: P (white) =
$$\frac{3}{12} = \frac{1}{4}$$

Hence (a) is the correct option.

If 6 more white balls are put in the bag then the total number of 36. white balls = x+6Total Number of balls in the bag = 12 + 6 = 18P (white)

Number of favourable outcomes Total number of possible outcomes

 $=\frac{x+6}{18}$

According to the question probability of drawing white ball in second case $= 2 \times probability$ drawing white ball in second case

$$=\frac{x+6}{18} = 2\left(\frac{x}{12}\right) \Rightarrow \frac{x+6}{18} = \frac{x}{6}$$
$$\Rightarrow 6x+36 = 18 \Rightarrow x = 3$$

Hence (a) is the correct option.

 $P(\overline{white \ ball}) = 1 - P(white)$ 37. $=1-\frac{1}{4}=\frac{3}{4}$ Hence (b) is the correct option.

38. Total number of fruits = 6 + 7 + 11 = 24P (Orange) = $\frac{6}{24} = \frac{1}{4}$ Hence (a) is the correct option.

39. Total number of fruits = 24Number of mangoes = 11P (Mangoes) = $\frac{11}{24}$ Hence (b) is the correct option.

40. Total number of fruits = 24 Number of apples = 7 Number of mangoes = 11 $(apples) \cap (mangoes) = \phi$ $\Rightarrow P (apples or Mangoes) =$ P (apples) + P (Mangoes) $= \frac{7}{24} + \frac{11}{24}$ $= \frac{18}{24} = \frac{3}{4}$

Hence (c) is the correct option.

SECTION - IV Matrix - Match Type

41.



42.



43.



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