Solution

PROBABILITY

Class 10 - Mathematics

Section A

1. **(a)** $\frac{1}{6}$

   Explanation:

   Here 2 dice are thrown together.

   ∴ Number of total outcomes = $6 \times 6 = 36$

   Number which should come together are (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6) = 6 pairs

   Therefore, probablity = $\frac{1}{6}$

2. **(b)** $\frac{8}{75}$

   Explanation:

   Number of possible outcomes = {1, 4, 9, 16, 25, 36, 49, 64} = 8

   Number of Total outcomes = 75

   ∴ Probability (of getting a perfect square) = $\frac{8}{75}$

3. **(c)** $\frac{1}{2}$

   Explanation:

   Number of possible outcomes (getting M) = 3

   Number of total outcomes = 6

   ∴ Required Probability = $\frac{3}{6} = \frac{1}{2}$

4. **(b)** $\frac{1}{3}$

   Explanation:

   Number of composite numbers on a dice = {4, 6} = 2

   Number of possible outcomes = 2

   Number of Total outcomes = 6

   ∴ Required Probability = $\frac{2}{6} = \frac{1}{3}$

5. **(b)** $\frac{5}{9}$

   Explanation:

   Numbers x = 1, 2, 3 and y = 1, 4, 9

   Now xy = {1, 4, 9, 2, 8, 18, 3, 12, 27} = 9

   ∴ n = 9

   and xy < 9 are 1, 2, 3, 4, 8

   ∴ m = 5

   ∴ P(xy < 9) = $\frac{5}{9}$

6. **(c)** $\frac{1}{52}$

   Explanation:

   A card is drawn at random from a pack of well shuffled 52 playing cards. 'S' is the sample space.

   ∴ n(S) = 52

   Event A: The card drawn is an ace of spade

   ∴n(A) = 1

∴ P(A) = $\frac{n(A)}{n(S)}$

= $\frac{1}{52}$

7.

(d) $\frac{1}{2}$

Explanation:

Total outcomes = = {HHH, TTT, HHT, HTH, HTT, THH, THT, TTH} = 8

Number of possible outcomes (at least two tails) = 4

∴ Required Probability = $\frac{4}{8} = \frac{1}{2}$

8.

(c) $\frac{13}{25}$

Explanation:

Total number of balls = 25

Number of Green and White balls = 4 + 8 = 12

Number of balls neither green nor white = 25 - 12 = 13

Number of possible outcomes = 13

Number of total outcomes = 25

∴ Required Probability = $\frac{13}{25}$

9.

(b) $\frac{1}{5}$

Explanation:

Total outcomes = 15

(∵ 15 numbers are given)

Favourable outcomes for a multiple of 4 = 3 (i.e. 4, 8, 12)

∴ Probability of selecting a number which is a multiple of 4 = $\frac{3}{15} = \frac{1}{5}$

10. **(a)** $\frac{1}{2}$

Explanation:

Number of possible outcomes = {6, 7, 8, 9, 10} = 5

Number of total outcomes = 10

∴ Required Probability = $\frac{5}{10} = \frac{1}{2}$

11.

(d) $\frac{4}{45}$

Explanation:

Number of disc in a box = 90

Numbered on it are 1 to 90 Prime numbers less than 23 are = 2, 3, 5, 7, 11, 13, 17, 19 = 8

Probability of a number being a prime less than $23 = \frac{8}{90} = \frac{4}{45}$

12. **(a)** $\frac{2}{5}$

Explanation:

Total number of cards = 15 - 5 = 10.

Number of cards with number less than 10 = 4.

P (getting a card with number less than 10) = $\frac{4}{10} = \frac{2}{5}$.

13.

(c) $\frac{1}{2}$

Explanation:

Even number on a die are 2,4,6.

∴ Probability P = $\frac{3}{6} = \frac{1}{2}$

14.

(d) $\frac{1}{2}$

Explanation:

Number of all possible outcomes = 6.

Even numbers are 2,4, 6. Their number is 3.

$\therefore$ P (getting an even number) = $\frac{3}{6} = \frac{1}{2}$

15.

(b) $\frac{2}{3}$

Explanation:

$\because$ A dice has 6 numbers

$\therefore$ n = 6

Numbers greater than 2 are 3, 4, 5, 6

$\therefore$ m = 4

Probability = $\frac{m}{n} = \frac{4}{6} = \frac{2}{3}$

16. **(a) $\frac{6}{13}$**

Explanation:

Vowels present in the given word are A, A, I, A, I, O = 6

Number of possible outcomes = {A, A, I, A, I, O} = 6

Number of total outcomes = 13

Required Probability = $\frac{6}{13}$

17.

(d) $\frac{5}{26}$

Explanation:

We know that "A, E, I, O, U" are vowels

Number of vowels = 5

Number of possible outcomes = 5

Number of total outcomes = 26

$\therefore$ Required Probability = $\frac{5}{26}$

18. **(a) $\frac{1}{4}$**

Explanation:

Favourable case = 1 (HH)

Total case = 4

P(getting two heads) = $\frac{1}{4}$

19.

(c) $\frac{3}{7}$

Explanation:

Total possible number of events (n) = 7

Now |x| < 2

x < 2 or -x < 2

$\Rightarrow$ x > -2

$\therefore$ x

$\Rightarrow$ x = 1, 0, -1, -2, -3 or x = -1, 0, 1, 2, 3

$\therefore$ x = -1, 0, 1

$\therefore$ m = 3

$\therefore$ Probability = $\frac{m}{n} = \frac{3}{7}$

20.

(c) $\frac{1}{3}$

Explanation:

Total number of lottery tickets = 8 + 16 = 24.

Number of prizes = 8.

∴P (getting a prize) = $\frac{8}{24} = \frac{1}{3}$

21. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

22. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

23.

(d) A is false but R is true.

Explanation:

A is false but R is true.

24. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

$P(A \cap B) = \left(\frac{2}{5}\right)\left(\frac{3}{5}\right) = \frac{6}{25}$

25. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

26.

(d) A is false but R is true.

Explanation:

A is false but R is true.

27.

(c) A is true but R is false.

Explanation:

When two dice are tossed. Total possible outcomes = 36

n(S) = 36

and total favourable outcomes (doublet) = {(1, 1)(2, 2)(3, 3)(4, 4)(5, 5)(6, 6)}

n(E) = 6

Probability = $\frac{6}{36} = \frac{1}{6}$ and

we know that $0 \leq$ P(E) ≤ 1.

28. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

29. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

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30. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

Section B

31. 8

Explanation:

A bag contains 18 balls out of which x balls are red.

The total number of balls = 18.

Number of red balls = x.

P(getting a red ball) = $\frac{\text{Number of favorable outcomes}}{\text{Number of all possible outcomes}} = \frac{x}{18}$

If two more red balls are put in the bag.

Now, total number of balls = 18 + 2 = 20.

Number of red balls now = x + 2.

P(getting a red ball) = $\frac{\text{Number of favorable outcomes}}{\text{Number of all possible outcomes}} = \frac{x+2}{20}$

Since, it is given that probability of drawing a red ball in case 2 is 9/8 times the probability of drawing a red ball in case 1.

Thus, $\frac{x+2}{20} = \frac{9}{8} \times \frac{x}{18}$

$\Rightarrow$ 144(x + 2) = 180x

$\Rightarrow$ 144x + 288 = 180x

$\Rightarrow$ 36x = 288

$\Rightarrow$ x = $\frac{288}{36}$ = 8

Thus, the value of x is 8.

32. 3

Explanation:

There are 12 balls in the box.

Therefore, the total number of favourbale outcomes = 12

The number of favourable outcomes = x

Proabibilty of the event = $\frac{Number\ of\ favourble\ outcomes}{Total\ number\ of\ possible\ outcomes}$

Therefore P_1 = P (Getting a black ball) = $\frac{x}{12}$

If 6 more balls put in the box, then

Total number of favourable outcomes = 12 + 6 = 18

And Number of favourable outcomes = x + 6

$\therefore$ P_2 = P (Getting a black ball) = $\frac{x+6}{12}$

According to question, $P_2 = 2P_1$

$\frac{x+6}{18} = 2 \times \frac{x}{12}$

$\frac{x+6}{18} \times \frac{12}{x} = 2$

x = 3

33. 15

Explanation:

Let blue balls = x and red balls = 5

Total balls = 5 + x

P(red ball) = $\frac{5}{5+x}$

P(blue ball) = $\frac{x}{5+x}$

$\therefore \quad \frac{x}{5+x} = 3\frac{5}{5+x}$

$\frac{x}{(5+x)} = \frac{15}{(5+x)}$

$\frac{(x \times (5+x))}{(5+x)} = \frac{15}{1}$

x = 15

34. 45

Explanation:

Let there be x black balls and 15 white balls.

Total balls = n(S) = 15 + x

Probability of black balls = $\frac{x}{(15+x)}$

probability of white balls = $\frac{15}{(15+x)}$

By given condition

$\frac{x}{(15+x)} = 3 \times \frac{15}{(15+x)}$

x = 45

∴ There are 45 black balls in the bag.

35. 45

Explanation:

Let there be x black balls and 15 white balls.

Total balls = n(S) = 15 + x

Probability of black balls = $\frac{x}{(15+x)}$

probability of white balls = $\frac{15}{(15+x)}$

By given condition

$\frac{x}{(15+x)} = 3 \times \frac{15}{(15+x)}$

x = 45

∴ There are 45 black balls in the bag.

36. 10

Explanation:

Number of red balls in a bag = 5

Suppose, the number of blue balls in the bag = x

Total number of balls in the bag = 5 + x

P(red ball) = $\frac{5}{5+x}$, P(blue ball) = $\frac{x}{5+x}$

Now,

P(blue ball) = 2P(red ball) [Given]

$\Rightarrow \frac{x}{5+x} = 2 \times \frac{5}{5+x} \Rightarrow$ x = 10

Therefore, the number of blue balls in the bag are 10.

37. 24

Explanation:

It is given that,

P(getting a red ball) = 14 and P(getting a blue ball) = 13

Let P(getting an orange ball) be x.

Since, there are only 3 types of balls in the jar, the sum of probabilities of all the three balls must be 1.

Therefore, $\frac{1}{4} + \frac{1}{3}$ + x = 1

$\Rightarrow$ x = $1 - \frac{1}{4} - \frac{1}{3}$

$\Rightarrow$ x = $\frac{12-3-4}{12}$

$\Rightarrow$ x = $\frac{5}{12}$

Therefore, P(getting an orange ball) = $\frac{5}{12}$.

Let the total number of balls in the jar be n.

Therefore, P(getting an orange ball) = $\frac{10}{n}$

$\Rightarrow \frac{10}{n} = \frac{5}{12}$

$\Rightarrow$ n = 24

Thus, the total number of balls in the jar is 24.

38. 12

Explanation:

Suppose no. of blue balls = x

Total no. of balls = (x + 6)

Probability of blue balls = $\frac{x}{x+6}$

Probability of red balls = $\frac{6}{x+6}$

According to, question,

$\frac{x}{6+x} = 2 \cdot \frac{6}{6+x}$

$\Rightarrow$ x = 12

Hence, no. of blue balls = 12

39. Number of all possible outcomes = 36

i. Favourable outcomes are (2,2),(2,4),(2,6),(4,2),(4,4),(4,6) ,(6,2),(6,4), (6,6)

Number of favourable outcomes = 9

Hence, Probability = $\frac{9}{36} = \frac{1}{4}$

ii. Favourable outcomes are (1,4),(2,3),(3,2),(4,1)

Number of favourable outcomes = 4

Hence, Probability = $\frac{4}{36} = \frac{1}{9}$

40. Total number of cards = 52

Total number of heart cards are 13 and king are 4 in which king of heart is also included.

Total number of cards that are a heart and a king is equal to 13 + 3 = 16

Hence Total number of cards that are neither a heart nor a king = 52 - 16 = 36

We know that PROBABILITY $= \frac{\text{Number of favourable event}}{\text{Total number of event}}$

Hence the probability of getting cards neither a heart nor a king = $\frac{36}{52} = \frac{9}{13}$

41. Let blue balls = x and red balls = 5

Total balls = 5 + x

P(red ball) = $\frac{5}{5+x}$

P(blue ball) = $\frac{x}{5+x}$

$\therefore \quad \frac{x}{5+x} = 3\frac{5}{5+x}$

$\frac{x}{(5+x)} = \frac{15}{(5+x)}$

$\frac{(x \times (5+x))}{(5+x)} = \frac{15}{1}$

x = 15

42. Total number of slips $= 25 + 50 = 75$

Number of slips marked with Rs 1 $= 19 + 45 = 64$

Number of slips marked other than 1 $= 75 - 64 = 11$

Required Probability = $\frac{11}{75}$

43. Clearly, number x can take any one of the five given values.

So, total number of elementary events = 5

We observe that $x^2 < 2$ when x takes any one of the following three values - 1, 0 and 1.

So, favourable number of elementary events = 3

Hence, $P\left(x^2 < 2\right) = \frac{3}{5}$

44. Total outcomes =(1, 2,3,4,5,6)

i. Composite numbers on a die are 4 and 6

$\therefore$ P(composite number) = $\frac{2}{6} = \frac{1}{3}$

ii. outcomes which are prime = (2,3,5)

Probability of gettting a prime number = $\frac{number\ of\ outcomes\ where\ prime\ number\ comes}{Total\ number\ of\ outcomes}$

= $\frac{3}{6} = \frac{1}{2}$

45. When three coins are tossed then the total outcome will be

TTT, THT, TTH, THH, HTT, HHT, HTH, HHH.

Hence the total number of outcome is 8.

For exactly two head we get favourable outcome as THH, HHT, HTH

Hence total number of favourable outcome i.e. exactly two head = 3

We know that PROBABILITY $= \frac{\text{Number of favourable event}}{\text{Total number of event}}$

Hence probability of getting exactly two head is $\frac{3}{8}$

46. Total no. of pens = 144

Number of defective pens = 20

Number of good pens = 144 - 20 = 124

i. Probability (she will buy) $= \frac{124}{144} = \frac{31}{36}$

ii. Probability (she will not buy)$= \frac{20}{144} = \frac{5}{36}$

47. Number of all possible outcome (1, 2, 3, 4, 5, 6) = 6

i. Let E be the event of getting a prime number. Then, the outcomes favourable to E are 2, 3 and 5.

Therefore, the number outcomes favourable to E is 3.

So, $\mathrm{P(E)} = \frac{\text{Number of outcomes favourable to E}}{\text{Number of all possible outcomes}} = \frac{3}{6} = \frac{1}{2}$

ii. Let E be the event of getting a number lying between 2 and 6.

Then, the outcomes favourable to E are 3, 4, and 5. Therefore, the number of outcomes favourable to E is 3.

So, $\mathrm{P(E)} = \frac{\text{Number of outcomes favourable to E}}{\text{Number of all possible outcomes}} = \frac{3}{6} = \frac{1}{2}$

iii. Let E be the event getting an odd number.

Then, the outcomes favourable to E are 1, 3, and 5. Therefore, the number of outcomes favourable to E is 3.

So, $\mathrm{P(E)} = \frac{\text{Number of outcomes favourable to E}}{\text{Number of all possible outcomes}} = \frac{3}{6} = \frac{1}{2}$

48. Let the number of black balls be n.

Number of white balls = 5

Total number of balls = 5 + n

P(Drawing black ball) = $\frac{n}{5}$ + n

P(Drawing white ball) = $\frac{5}{5}$ +n

From given condition,

$\frac{n}{5}$ +n = 2 (5/5+n)

n = 10

So, the number of black balls is 10.

Section C

49. Possible outcomes when a coin is tossed 3 times:

$HHH, HHT, HTH, THH, TTH, THT, HTT, TTT$

$\Rightarrow$ Total number of outcomes = 8

(i) Shweta will lose the entry fee if she gets 'TTT'.

P(Shweta losses the entry fee) = $\frac{1}{8}$

(ii) Shweta will get double the entry fee if she gets HHH,

P(Shweta will get double the entry fee) = $\frac{1}{8}$

(iii) Shweta will get her entry fee, if she gets one head or two heads

P(Shweta will get her entry fee) = P(getting one head) + P(getting two heads) $= \frac{3}{8} + \frac{3}{8} = \frac{6}{8} = \frac{3}{4}$

50. Total number of cards = 52.

i. Number of kings = 4

$\therefore$ P(drawing a king) = $\frac{4}{52} = \frac{1}{13}$

ii. Number of red eight = 2

$\therefore$ P(drawing a red eight) = $\frac{2}{52} = \frac{1}{26}$

iii. Number of spades = 13

$\therefore$ P(drawing a spade) = $\frac{13}{52} = \frac{1}{4}$

51. OABC is the square dart board such that OA = AB = BC = OC = 6 units

$\therefore$Area of the square dart board = $(\text{side})^2 = (\text{CB})^2 = (6)^2 = 36$ square units.

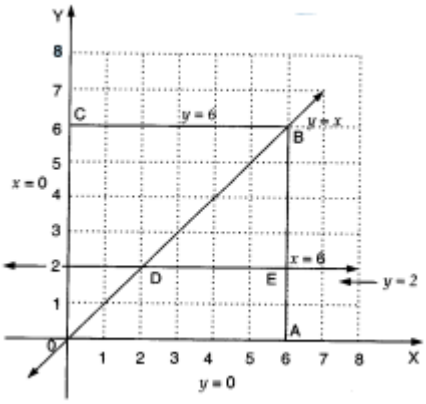
BED is a right triangle formed by the lines y = 2, x = 6 and y = x.

We have, DE = 4 unit and BE = 4 unit

$\therefore$ Area of triangle BED$= \frac{1}{2}(base \times height) = \frac{1}{2}(DE \times BE) = \frac{1}{2}(4 \times 4) = 8\text{sq. units.}$

Probability = $\frac{Number\ of\ favourable\ outcome}{Total\ Number\ of\ outcomes}$

Hence, P(Dart lands in the triangular region) $= \frac{\text{Area of } \Delta BED}{\text{Area of square OABC}} = \frac{8}{36} = \frac{2}{9}$



52. Total number of days to visit the shop = 6

Two customers can visit the shop on two days in 6 × 6 = 36 ways

So total number of outcomes = 36

i. Two customers can visit the shop on same day of the week in 6 ways i.e.
(M, M), (T, T), (W, W), (Th, Th), (F, F), (S, S)
Favourable number of ways = 6
∴P(both will reach on same day) = $\frac{6}{36} = \frac{1}{6}$

ii. We know, Probability of occurrence of an event + Probability of non occurrence of event = 1
i.e. P(E) + $P(\overline{E})$ = 1
P(both will reach on same day) = $\frac{1}{6}$
$\Rightarrow \frac{1}{6} + P(\overline{E}) = 1$
$\Rightarrow P(\overline{E}) = 1 - \frac{1}{6}$
$\Rightarrow P(\overline{E}) = \frac{5}{6}$
Hence, P(both will reach on different day) = $\frac{5}{6}$

iii. Two customers can visit the shop on consecutive days in 5 ways i.e.
(M, T), (T, W), (W, Th), (Th, F), (F, S)
Favourable number of ways = 5
P(both will reach on consecutive days) = $\frac{5}{36}$.

53. When 3 coins are tossed simultaneously, all possible outcomes are HHH, HHT, HTH, THH, HTT, THT, TTH, TTT.

Total number of possible outcomes = 8.

i. Let E_1 be the event of getting exactly 2 heads.

Then, the favourable outcomes are HHT, HTH, THH.
Number of favourable outcomes = 3.
∴ P(getting exactly 2 heads) $= P(E_1) = \frac{3}{8}$.

ii. Let E_2 be the event of getting at least 2 heads.

Then, E_2 is the event of getting 2 or 3 heads.

So, the favourable outcomes are
HHT, HTH, THH, HHH.
Number of favourable outcomes = 4.
∴ P(getting at least 2 heads) = $\frac{4}{8} = \frac{1}{2}$.

iii. Let E_3 be the event of getting at most 2 heads.

Then, E_3 is the event of getting 0 or 1 head or 2 heads.

So, the favourable outcomes are
TTT, HTT, THT, TTH, HHT, HTH, THH.
Number of favourable outcomes = 7.
∴ P(getting at most 2 heads) $= P(E_3) = \frac{7}{8}$.

54. The person having higher probability of getting the number 25 has the better chance.

When a pair of dice is thrown, there are 36 elementary events which are as follows:

(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)

Therefore, the product of numbers on two dice can take values 1, 2, 3, ..., 36.

We observe that the product of two numbers on two dice will be 25 if both the dice show number 5. Therefore, there is only one elementary event, viz., (5, 5), which is favourable for getting 25.

p_1 = Probability that Peter throws $25 = \frac{1}{36}$

Rina throws a die on which she can get any one of the six numbers 1, 2, 3, 4, 5, 6 as an outcome. If she gets number 5 on the upper face of the die thrown,then the square of the number is 25.

p_2 = Probability that the square of number obtained is$25 = \frac{1}{6}$

Therefore, $p_2 > p_1$. Therefore, Rina has better chance to get the number 25.

55. Total no of cards = 49

Total outcomes = 49

i. Let A be event of getting an odd number

Total odd numbers = 1, 3.....49

This is an A.P. with first term = 1, common difference = 2 and last term = 49

We need to find, number of terms = n

Applying the formula for nth terms of an A.P,

$a_n = a + (n – 1)d$

49 = 1 + (n – 1)2

2n – 2 + 1 = 49

2n – 1 = 49

2n = 50

n = 25

So, number of favourable outcomes = 25

P(A) = $\frac{25}{49}$

ii. Let B be event of getting a multiple of 5

No. of a perfect square from 1 to 49 are = 9

Favouring outcomes = 9

P(B) = $\frac{9}{49}$

iii. Let C be event of getting a perfect square

No. of a perfect square from 1 to 49 are = 1,4,9,16,25,36,49

Favouring outcomes = 7

P(C) = $\frac{7}{49} = \frac{1}{7}$

iv. Let D be event of getting an even prime number.

No. of an even prime number from 1 to 49 are = 1 (2 only)

Favouring outcomes = 1

P(D) = $\frac{1}{49}$

56. Total number of possible outcomes when two dice are thrown = $6 \times 6 = 36$

+	1	2	2	3	3	6
1	2	3	3	4	4	7
2	3	4	4	5	5	8
2	3	4	4	5	5	8
3	4	5	5	6	6	9
3	4	5	5	6	6	9

6	7	8	8	9	9	12

i. Total times when the sum is even = 18

P (getting an even number) = $\frac{\text{Favourabe outcomes}}{\text{Total outcomes}}$

$= \frac{18}{36}$

$= \frac{1}{2}$

Total times when the sum is 6 = 4

ii. P (getting sum as 6) = $\frac{\text{Favourabe outcomes}}{\text{Total outcomes}}$

$= \frac{4}{36}$

$= \frac{1}{9}$

iii. Total times when the sum is at least 6 (i.e., greater than 5) = 15

P (getting sum at least 6) = $\frac{\text{Favourabe outcomes}}{\text{Total outcomes}}$

$= \frac{15}{36}$

$= \frac{5}{12}$

57. According to the question,

All possible outcomes are $11, 12, 13, \ldots, 60$.

Total number of possible outcomes $= (60 - 10) = 50$.

i. Suppose, E_1 be the event that the number on the drawn card is an odd number.

$\Rightarrow$ the favourable outcomes are $11, 13, 15, \ldots, 59$.

Clearly, these numbers form an AP with a = 11 and d=2.

$T_n = 59 \Rightarrow 11 + (n-1) \times 2 = 59 \Rightarrow (n-1) \times 2 = 48 \Rightarrow (n-1) = 24 \Rightarrow n = 25$

So, the number of favourable outcomes $= 25$.

$\therefore$ P(getting an odd number) = $P(E_1) = \frac{25}{50} = \frac{1}{2}$.

ii. Suppose, E_2 be the event that the number on the drawn card is a

perfect square number.

$\Rightarrow$ the favourable outcomes are $16, 25, 36, 49$.

The number of favourable outcomes = 4.

$\therefore$ P(getting a perfect square number) $P(E_2) = \frac{4}{50} = \frac{2}{25}$ ..

iii. Suppose, E_3 be the event that the number on the drawn card is divisible by 5.

$\Rightarrow$ the favourable outcomes are $15, 20, 25, \ldots, 60$.

Clearly, these numbers form an AP with a = 15 and d=5.

$T_{\mathrm{m}} = 60 \Rightarrow 15 + (m-1) \times 5 = 60 \Rightarrow (m-1) \times 5 = 45 \Rightarrow m - 1 = 9 \Rightarrow m = 10$

So, the number of favourable outcomes $= 10$.

P(getting a number divisible by 5) $= P(E_3) = \frac{10}{50} = \frac{1}{5}$

iv. Suppose, E_4 be the event that the number on the drawn card is a prime number less than 20.

$\Rightarrow$ the favourable outcomes are $11, 13, 17, 19$.

So, the number of favourable outcomes $= 4$.

$\therefore$ P(getting a prime number less than 20) $= P(E_4) = \frac{4}{50} = \frac{2}{25}$

58. Given, 17 cards numbered 1, 2, 3, 4, ..., 17 are put in a box and mixed thoroughly. A card is drawn at random from the box.

Therefore, total number of cards = 17.

i. Let E_l be the event of choosing an odd number.

These numbers are 1,3,5,..., 17.

Let their number be n. Then,

$T_n = 17 \Rightarrow 1 + (n-1) \times 2 = 17 \Rightarrow n = 9$

$\therefore P(E_1) = \frac{9}{17}$

ii. Let E_2 be the event of choosing a number divisible by 5. Numbers divisible by 5 are 5,10,15. Their number is 3.

$\therefore P(E_2) = \frac{3}{17}$

Section D

59. i. Since, Total angle in a pie chart is 360^o

So, Total no. of Sample Space = 360

Let 'E' be the event of having 'White' as favourite colour.

P(E) = $\frac{favourable\ outcome}{Total\ Outcome}$

= $\frac{120}{360}$

= $\frac{1}{3}$

ii. P(Blue or Green) = $\frac{60+60}{360}$

= $\frac{120}{360}$ = $\frac{1}{3}$

iii. Since, Yellow represent 90^o in the Pie Chart

90^o = 15 Students

360^o = $\frac{15}{90}$ × 360 = 60 students

Hence, 60 Students participated in the survey.

OR

P(Red or Blue) = $\frac{30+60}{360}$

= $\frac{90}{360}$ = $\frac{1}{4}$

60. Total number of teachers = 75.

i. The number of teachers who are 40 or more than 40 years old = 37 + 8 = 45.

Therefore, Required probability = $\frac{45}{75}$ = $\frac{3}{5}$

ii. Number of teachers of an age lying between 30 - 39 years (including both) = 27.

Therefore, Required probability = $\frac{27}{75}$ = $\frac{9}{25}$

iii. Number of teachers 18 years or more and 49 years or less = 3 + 27 + 37 = 67.

Therefore, Required probability = $\frac{67}{75}$

iv. Number of teachers 18 years or more old = 3 + 27 + 37 + 8 = 75

Therefore, Required probability = $\frac{75}{75}$ = 1

61. i. P(travelling by bus or ship) $= \frac{36+33}{360} = \frac{69}{360}$ or $\frac{23}{120}$

ii. Car

Number of people who used car $= \frac{177}{360} \times 120 = 59$

iii. a. P(person used train) $= 1 - \frac{4}{5} = \frac{1}{5}$

$\therefore$ Number of people who used train $= \frac{120}{5} = 24$

OR

b. Number of people who used aeroplane = $\frac{7}{60} \times 120 = 14$

$\therefore$ Revenue generated = 14 × 5000 = ₹ 70,000

62. i. P(2 or 3 children) = $\frac{19+7}{100}$

= $\frac{26}{100}$ or $\frac{13}{50}$

ii. P(more than one child) = $\frac{19+7+3}{100}$

= $\frac{29}{100}$

iii. a. P(less than 3 children) = $\frac{51+20+19}{100}$

= $\frac{90}{100}$ or $\frac{9}{10}$

OR

b. P(more than 2 children) = $\frac{7+3}{100}$

= $\frac{1}{10}$

63. i. **All possible outcomes of the game:**

Since each color on 1st spinner can combine with each of the 3 colors on 2nd spinner.

Therefore, possible combinations by Red color: RR, RB, RG

Possible combinations by Green color: GR, GB, GG

Possible combinations by Yellow color: YR, YB, YG

Hence, total combinations = 3 × 3 = 9

ii. **Probability of making purple:**

Since, it is given that purple color is made by combinations of RB, there is 1 such combination.

The probability of making purple = $\frac{\text{Favourable Outcomes}}{\text{Total Outcomes}} = \frac{1}{9}$

iii. **Fund collected at ₹ 10 as winning amount:**

Since the probability of winning (i.e. making purple) = $\frac{1}{9}$

Hence, number of participants who won the game = $99 \times \frac{1}{9} = 11$

Participants who lost the game = 99 - 11 = 88

Therefore, the fund collected =

$5 \times 88 - 10 \times 11$ = ₹ 330

OR

Fund collected at ₹ 5 as winning amount:

If winning amount is also 5 , then fund collected =

$5 \times 88 - 5 \times 11$ = ₹ 385

64. i. P(type O) = $\frac{21}{50}$

ii. No. of people with AB type blood group = 50 - (21 + 22 + 5) = 2

P(type AB) = $\frac{2}{50}$ or $\frac{1}{25}$

iii. P(neither type A nor type B) = $\frac{21+2}{50} = \frac{23}{50}$

OR

P(type A or type B or type O) = $\frac{21+22+5}{50} = \frac{24}{25}$

65. i. P (more than 100 computers) = $\frac{80}{1000}$ or 0.08

ii. 50 or fewer computers = 250 + 200 + 290 = 740

Required probability = $\frac{740}{1000}$ or 0.74

iii. No more than 20 computers = 250 + 200 = 450

Required probability = $\frac{450}{1000}$ = 0.45

OR

P (10 or less than 10 computer) = $\frac{250}{1000}$ or 0.25

Section E

66. No. of all possible outcomes = 90

i. Discs with two digit number are 10 to 90

No. of discs with two digits numbers = 90 - 10 +1 = 81

∴ No of favourable outcomes = 81

P(a disc with two digit number) $= \frac{\text{No. of favourable outcomes}}{\text{No. of all possible outcomes}} = \frac{81}{90} = \frac{9}{10}$

ii. The numbers having 0 or 5 at its once place are divisible by 5 = 5,10,15.....90

Total no. of favourable outcomes = 18

P(a disc with a number divisible by 5) = $\frac{18}{90} = \frac{1}{5}$

67. The houses are numbered consecutively from 1 to 49.

1, 2, 3.....(x - 1), x, (x+1).....49

Sum of number of houses preceding x numbered house = Sum of number following x

Sum of number of houses preceding x numbered house=

$S_1 = \frac{x-1}{2} \times (1 + x - 1) = \frac{x(x-1)}{2} - - - - - - - (1)$

Sum of number following x=

$S_2 = (1 + 2 + 3 + \ldots\ldots\ldots 49) - \frac{x}{2} \times (x + 1)$

$= \frac{49 \times 50}{2} - \frac{x^2+x}{2} = \frac{2450-x^2-x}{2} - - - - - (2)$

As $S_1 = S_2$

$\frac{2450-x^2-x}{2} = \frac{x(x-1)}{2}$

$2450 - x^2 - x = x^2 - x$

$2x^2 = 2450$

$x^2 = 1225$

$x = 35$

Hence sum of numbers of houses proceeding the house numbered 35 is equal to sum of the numbers of houses following 35

68. Total cards having number divisible by 7 are 7,14, 21, 28,35, 42,49

Hence m=7

So P(E)=$\frac{m}{n}$ = $\frac{7}{48}$

Number of cards having a perfect square are = 4,9,16, 25,36,49

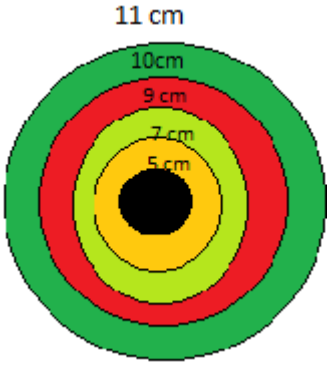
Hence m=6

So P(E) =$\frac{m}{m}$ $\frac{6}{48} = \frac{1}{8}$

Number of multiples of 6 from 3 to 50 are = 6,12,18, 24,30,36,42,48

Hence m=8

So P(E) =$\frac{m}{n}$= $\frac{8}{48} = \frac{1}{6}$

69. 

Area of circle (with r = 11 cm) = $\pi \times (11)^2 = 121\pi$ cm^2

Total area of outcome = 121π cm^2

Area of region 1 = $\pi \times (11^2 - 10^2) = 21\pi$ cm^2

Area of region 2 = $\pi \times (10^2 - 9^2) = 19\pi$ cm^2

Area of region 3 = $\pi \times (9^2 - 7^2) = 32\pi$ cm^2

Area of region 4 = $\pi \times (7^2 - 5^2) = 24\pi$ cm^2

Probability of hitting region 1, $P_1 = \frac{21\pi}{121\pi} = \frac{21}{121}$

Probability of hitting region 2, $P_2 = \frac{19\pi}{121\pi} = \frac{19}{121}$

Probability of hitting region 3, $P_3 = \frac{32\pi}{121\pi} = \frac{32}{121}$

Probability of hitting region 4,,$P_4 = \frac{24\pi}{121\pi} = \frac{24}{121}$

If number of shots are 121 then expectation of hitting in the following regions:

Region 1: $\frac{21}{121} \times 121 = 21$

Region 2:$\frac{19}{121} \times 121 = 19$

Region 3: $\frac{32}{121} \times 121 = 32$

Region 4: $\frac{24}{121} \times 121 = 24$

To improve his performance one needs to practice more.

70. Total no. of outcomes = (1,1), (1,4), (1,9), (1,16), (2,1), (2,4), (2,9), (2,16), (3,1), (3,4), (3,9), (3,16), (4,1), (4,4), (4,9), (4,16)

Total possible outcome = 16

Total favorable event having product less than 16 = (1,1), (1,4), (1,9), (2,1), (2,4), (3,1), (3,4), (4,1)

Probability = $\frac{\text{Favourable event outcome}}{\text{Total event}}$

P(E) = $\frac{8}{16} = \frac{1}{2}$

71. Here, all face cards of spades are removed from a deck of 52 playing cards.

So, remaining cards in deck = 52 - 3 = 49

∴ Total number of outcomes n = 49

i. We know that there are 6 black face cards in a deck of cards. Afte removing face cards of spades only 3 face cards of club are left.

so number of favorable outcomes m= 3

∴ Required Probability = $P(E) = \frac{m}{n} = \frac{3}{49}$

ii. There are 4 queens in a deck . After removing a queen of spade, we are left with 3 queens.
Then, number of favorable outcomes m= 3
∴ Required Probability = P(E)=$\frac{m}{n}$ = $\frac{3}{49}$

iii. There are 26 black cards in a regular deck of cards.
After removing 3 face cards of spades , there are only 23 black cards.
Then, number of favorable outcomes m= 23
∴ Required Probability = P(E)=$\frac{m}{n}$ = $\frac{23}{49}$

iv. There are 13 cards of spade in a deck.After removing 3 face cards of spade only 10 spades cards are left .
So number of favorable outcomes m= 10
∴ Required Probability = P(E) =$\frac{m}{n}$= $\frac{10}{49}$

72. Total number of cards in a deck of playing cards = 52
∴ Number of all possible outcomes = 52

$$Proabibilty\ of\ the\ event = \frac{Number\ of\ favourble\ outcomes}{Total\ number\ of\ possible\ outcomes}$$

i. Let E be the event that the card drawn is a king or jack.
Then, the number of outcomes favourable to E is 4 + 4 = 8
So, P(E) = P (a king or Jack)=$\frac{8}{52} = \frac{2}{13}$

ii. Let E be the event that the card drawn is a non-ace.
Then, the number of outcomes favourable to E is 52 - 4 = 48.
So, P(E) = P (a non-ace) =$\frac{48}{52} = \frac{12}{13}$

iii. Let E be the event that the card drawn is a red card.
Then, the number of outcomes favourable to E is 13 + 13 = 26.
So, P(E) = P (a red-card)=$\frac{26}{52} = \frac{1}{2}$

iv. Let E be the event that the card drawn is neither a king nor a queen.
Then, the number of outcomes favourable to E is 52 - (4 + 4) = 44.
So, P(E) = P (neither a king nor a queen)=$\frac{44}{52} = \frac{11}{13}$

73. No of cards removed=3
No. of all possible outcomes n = 52 - 3 = 49

i. No, of face cards left = 12 - 3 = 9 so m=9
$so\ P(E) = \frac{m}{n} = \frac{9}{49}$

ii. No. of cards of heart in the deck = 13 so m=13
$so\ P(E) = \frac{m}{n} = \frac{13}{49}$

iii. No. of cards of clubs = 13 - 3 = 10
$so\ P(E) = \frac{m}{n} = \frac{10}{49}$

iv. There is only one queen of diamond so m=1
$so\ P(E) = \frac{m}{n} = \frac{1}{49}$

74. Number of white balls in the bag = 4
Number of red balls in the bag = 6
Number of black ball in the bag = 7
Number of blue balls in the bag = 3
∴ Total number of balls in the bag = 4 + 6 + 7 + 3 = 20
∴ Number of all possible outcomes = 20

$$Proabibilty\ of\ the\ event = \frac{Number\ of\ favourble\ outcomes}{Total\ number\ of\ possible\ outcomes}$$

i. Let E be the event that the ball drawn is white.
Then, the number of outcomes favourable to E is 4.
So, P(E) = P (white)= $\frac{4}{20} = \frac{1}{5}$

ii. Let E be the event that the ball drawn is no black.
Then, the number of outcomes favourable to E is 4 + 6 + 3 = 13.
So, P(E) = P(not black)=$\frac{13}{20}$

iii. Let E be the event that the ball drawn is neither white nor black.
Then, the number of outcomes favourable to E is 6 + 3 = 9.
So, P(E) = P (neither white nor black)= $\frac{9}{20}$

iv. Let E be the event that the ball drawn is red or white.

Then, the number of outcomes favourable to E is 6 + 4 = 10.

So, P(E) = P (red or white) = $\frac{10}{20} = \frac{1}{2}$

75. Total favourable outcomes associated to the random experiment of visiting a particular shop in the same week (Tuesday to Saturday) by two customers Shyam and Ekta are:

(T, T) (T, W) (T, TH) (T, F) (T, S)

(W, T) (W, W) (W, TH) (W, F) (W, S)

(TH, T) (TH, W) (TH, TH) (TH, F) (TH, S)

(F, T) (F, W) (F, TH) (F, F) (F, S)

(S, T) (S, W) (S, TH) (S, F) (S, S)

∴Total number of favourable outcomes = 25

i. The favourable outcomes of visiting on the same day are (T, T), (W, W), (TH, TH), (F, F) and (S, S).

∴Number of favourable outcomes = 5

Hence required probability = $\frac{Number\ of\ favorable\ outcomes}{Number\ of\ total\ outcomes} = \frac{5}{25} = \frac{1}{5}$

ii. The favourable outcomes of visiting on consecutive days are (T, W), (W, T), (W, TH), (TH, W), (TH, F), (F, TH), (S, F) and (F, S).

∴ Number of favourable outcomes = 8

Hence required probability = $\frac{Number\ of\ favorable\ outcomes}{Number\ of\ total\ outcomes} = \frac{8}{25}$

iii. Number of favourable outcomes of visiting on different days are 25 - 5 = 20

∴Number of favourable outcomes = 20

Hence required probability = $\frac{Number\ of\ favorable\ outcomes}{Number\ of\ total\ outcomes} = \frac{20}{25} = \frac{4}{5}$