Probability

Quick Revision

Probability is the study of the chances (or likelihood) of events happening. By means of probability, the chance (or likelihood) of events is measured by a number lying from 0 to 1.

Experiment

An operation which produces some well defined outcomes, is called an experiment.

e.g. Tossing a coin, throwing a dice, etc.

(i) **Random experiment** If an experiment is repeated under identical conditions and they do not produce the same outcomes every time, then it is said to be random (or probabilistic) experiment.

(ii) **Deterministic experiment** If an experiment is repeated under identical conditions and they produce the same outcomes every time, then it is is said to be deterministic experiment.

An event for an experiment is the collection of some outcomes of the experiment. We generally denote it by capital letter E.
e.g. Getting an even number in a single throw of a die is an event. This event would consist of three outcomes, namely 2, 4 and 6.

Elementary Event

An event having only one outcome of the random experiment is called an elementary event. e.g. In tossing of a coin, the possible outcomes are head (H) and tail (T). Getting H or T are known as elementary events.

Occurrence of an Event

An event E associated to a random experiment is said to be occur (or happen) in a trial, if the outcome of trial is one of the outcomes that favours E.

e.g. If a die is rolled and the outcome of a trial is 4, then we say that event getting an even number has happened (or occurred).

Probability of an Event (or Probability of occurrence of an Event)

If E is an event associated with a random experiment, then probability of E, denoted by $P(E)$, represents the chance of occurrence of event E.

e.g. If E denotes the event of getting an even number in a single throw of a die, then $P(E)$ represents the chance of occurrence of event E, i.e. the chance of getting 2, 4 or 6.

Compound Event

A collection of two or more elementary events associated with an experiment is called a compound event. e.g. In the random experiment of tossing of two coins simultaneously, if we define the event of getting exactly one head, then it is a collection of elementary events (or outcomes) HT and TH. So, it is a compound event.

Equally Likely Outcomes

The outcomes of a random experiment are said to be equally likely, when each outcome is as likely to occur as the other, i.e. when we have no reason to believe that one is more likely to occur than the other. e.g. When a die is thrown, all the six outcomes, i.e. 1, 2, 3, 4, 5 and 6 are equally likely to appear. So, the outcomes 1, 2, 3, 4, 5 and 6 are equally likely outcomes.

Favourable Outcomes

The outcomes which ensure the occurrence of an event are called favourable outcomes to the event. e.g. The favourable outcomes to the event of getting an even number when a die is thrown are 2, 4 and 6.

Complement of an Event/Negation of an Event

Let E be an event associated with a random experiment. Then, we can define the complement of event E or negation of event E, denoted by $\overline{E}$, as an event which occurs if and only if E does not occur.

e.g. Let E be the event of getting an even number in a single throw of a die. Then, its complement can be define as event $\overline{E}$ of getting an odd number, as E is consisting 2, 4 and 6. Therefore, $\overline{E}$ would consist 1, 3 and 5.

Note E and $\overline{E}$ are called **complementary events**.

Theoretical (Classical) Definition of Probability

Let us assume all the outcomes of an experiment are equally likely and E is an event associated with the experiment, then the theoretical probability (or classical probability) of the event E is given by

$$P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Total number of outcomes}} = \frac{n(E)}{n(S)}$$

(i) Probability of an event can never be negative.
(ii) The sum of the probabilities of complementary events of an experiment is 1.

i.e. If E and $\overline{E}$ are complementry events.
Then, $P(E) + P(\overline{E}) = 1$ or $P(\overline{E}) = 1 - P(E)$
or $\quad P(E) = 1 - P(\overline{E})$
where, $P(E)$ represents the probability of occurrence of an event E and $P(\overline{E})$ represents the probability of non-occurrence of an event E.

Impossible Event

An event which is impossible to occur, is called an impossible event and probability of impossible event is always zero.

e.g. In throwing a die, there are only six possible outcomes 1, 2, 3, 4, 5 and 6. Let we are interested in getting a number 7 on throwing a die. Since, no face of the die is marked with 7. So, 7 cannot come in any throw. Hence, getting 7 is an impossible event.

Then, $P\,(\text{getting a number } 7) = \frac{0}{6} = 0$

Sure Event or Certain Event

An event which is sure to occur, is called a sure event or certain event and probability of sure event is always 1. e.g. Suppose we want to find the probability of getting a number less than 7 in a single throw of a die having numbers 1 to 6 on its six faces.

We are sure that, we shall always get a number less than 7, whenever we throw a die. So, getting a number less than 7 is a sure event.

Then, $P\,(\text{getting a number less than } 7) = \frac{6}{6} = 1$

Objective Questions

Multiple Choice Questions

1. The experiments which when repeated under identical conditions produce the same results or outcomes are known as

(a) random experiments
(b) probabilistic experiment
(c) elementary experiment
(d) deterministic experiment

2. An outcome of a random experiment is called an ……… event.

(a) elementary (b) complementary
(c) equally-likely (d) None of these

3. An event associated to a random experiment is a compound event if it is obtained by combining two or more elementary events associated to the random experiment

(a) True (b) False
(c) Can't say (d) Partially true/False

4. The sum of probabilities of all the outcomes of an experiment is greater than one

(a) True (b) False
(c) Can't say (d) Partially true/False

5. The sum of the probability of all elementary events of an experiment is p, then

(a) $0 < p < 1$ (b) $0 \le p < 1$
(c) $p = 1$ (d) $p = 0$

6. For an event E, $P(E) + P(\overline{E}) = q$, then

(a) $0 \le q < 1$ (b) $0 < q \le 1$
(c) $0 < q < 1$ (d) None of these

7. If $P(E) = 0.05$, the probability of 'not E' is ……… .

(a) 0.85 (b) 0.95
(c) 0.25 (d) None of these

8. If an event cannot occur, then its probability is ***[NCERT Exemplar]***

(a) 1 (b) $\frac{3}{4}$
(c) $\frac{1}{2}$ (d) 0

9. Which of the following cannot be the probability of an event?

(a) 1.5 (b) $\frac{3}{5}$
(c) 25% (d) 0.3

10. An event is very unlikely to happen. Its probability is closest to ***[NCERT Exemplar]***

(a) 0.0001 (b) 0.001
(c) 0.01 (d) 0.1

11. A number x is chosen at random from the numbers $-4, -3, -2, -1, 0, 1, 2, 3, 4$. What is the probability that $|x| < 1$?

(a) 1 (b) 0
(c) $\frac{2}{9}$ (d) $\frac{1}{9}$

12. A letter is chosen at random from the word 'MATHEMATICS'. What is the probability that it will be a vowel?

(a) $\frac{1}{2}$ (b) $\frac{3}{8}$
(c) $\frac{3}{11}$ (d) $\frac{4}{11}$

13. The probability that an ordinary year contains 53 Sundays is

(a) $\frac{2}{7}$ (b) $\frac{1}{7}$
(c) $\frac{7}{53}$ (d) $\frac{7}{52}$

14. A letter is chosen at random from the letters of the word 'ASSASSINATION', then the probability that the letter chosen is a vowel and is in the form of $\frac{6}{2x+1}$, then x is equal to

(a) 5 (b) 6
(c) 7 (d) 8

15. A con is tossed twice. The probability of getting both heads is

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$
(c) $\frac{1}{4}$ (d) 1

16. Two unbiased coins are tossed simultaneously then the probability of getting no head is $\frac{A}{B}$, then $(A+B)^2$ is equal to

(a) 1 (b) 4
(c) 5 (d) 25

17. A coin and a die is tossed simultaneously. The probability of the event that 'tail' and a prime number turns up

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) $\frac{1}{3}$ (d) $\frac{2}{3}$

18. Three unbiased coins are tossed together, then which of the following is true?

(a) the probability of getting exactly 2 heads is 1/2
(b) the probability of getting atleast one head is 5/8
(c) the probability of getting atmost 2 tails is 3/8
(d) the probability of getting exactly one tail is 3/8

19. If three different coins are tossed together, then the probability of getting two heads is

(a) $\frac{1}{8}$ (b) $\frac{3}{8}$
(c) $\frac{5}{8}$ (d) None of these

20. Three coins are tossed together. The possible outcomes are no head, 1 head, 2 head and 3 heads. So, I say that probability of no head is $\frac{1}{4}$

(a) True (b) False
(c) Can't say (d) Partially true/False

21. A die is thrown once, the probability of getting a prime number is ....

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$
(c) $\frac{2}{3}$ (d) $\frac{1}{2}$

22. On a single roll of a die, the probability of getting a number less than 7 is ....

(a) 1 (b) 0
(c) $\frac{2}{3}$ (d) None of these

23. A die is thrown once. The probability of getting a number which is not a factor of 36 is

(a) $\frac{1}{6}$ (b) $\frac{2}{3}$
(c) $\frac{1}{5}$ (d) 0

24. A fair dice is rolled. Probability of getting a number x such that $1 \le x \le 6$, is

(a) 0 (b) >1
(c) between 0 and 1 (d) 1

25. In a throw of a pair of dice. What is the probability of getting a doublet?

(a) $\frac{1}{2}$ (b) $\frac{1}{6}$
(c) $\frac{2}{3}$ (d) $\frac{1}{3}$

26. Two dice are thrown together. The probability that sum of the two numbers will be a multiple of 4, is

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$
(c) $\frac{1}{8}$ (d) $\frac{1}{4}$

27. Two dice are rolled once. Then, the probability of getting such numbers on the two dice, whose product is 12 is

(a) $\frac{1}{9}$ (b) $\frac{2}{9}$

(c) $\frac{4}{9}$ (d) $\frac{5}{9}$

28. Two dice are thrown at the same time the probability that, the sum of two numbers appearing on the top of the dice is greater than 6 but less than 9, is

(a) $\frac{12}{13}$ (b) $\frac{11}{36}$

(c) $\frac{14}{13}$ (d) $\frac{9}{5}$

29. Two dice are thrown simultaneously. Select the correct option.

(a) the probability of not getting doublet is $\frac{5}{6}$

(b) the probability of getting a total of at least 10 is 1/6

(c) the probability of not getting a total as a perfect square is 29/36

(d) All of the above

30. Three dice are thrown once. The probability that all the dice show different faces is

(a) $\frac{5}{18}$ (b) $\frac{2}{9}$

(c) $\frac{8}{15}$ (d) $\frac{5}{9}$

31. A card is selected at random from a well shuffled deck of 52 playing cards. The probability of its being a face card is $\frac{3}{13}$.

(a) True

(b) False

(c) Can't say

(d) Partially true/False

32. A card is selected from a deck of 52 cards, then the probability of its being a red face card is ***[NCERT]***

(a) $\frac{3}{26}$ (b) $\frac{3}{13}$

(c) $\frac{2}{13}$ (d) $\frac{1}{2}$

33. A card is drawn from a deck of 52 cards. The event E is that card is not an ace of hearts. The number of outcomes favourable to E is ***[NCERT]***

(a) 4 (b) 13

(c) 48 (d) 51

34. One card is drawn from a well-shuffled deck of 52 cards. Then, the probability of getting a king of red colour is ***[NCERT]***

(a) $\frac{1}{14}$ (b) $\frac{12}{24}$

(c) $\frac{1}{8}$ (d) $\frac{1}{26}$

35. One card is drawn from a well shuffled deck of 52 cards, then which of the following is true?

(a) the probability that the card will be diamond is 1/2

(b) the probability of an ace of heart is 1/52

(c) the probability of not a heart is 1/4

(d) the probability of king or queen is 1/26

36. From a well shuffled pack of cards, a card is drawn at random. The probability of getting a black queen is

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

(b) $\frac{1}{12}$

(c) $\frac{1}{26}$

(d) None of the above

37. A bag contains 5 red balls and some blue balls. If the probability of drawings a blue ball is double that of a red ball, the number of blue balls in the bag is 10.

(a) True

(b) False

(c) Can't say

(d) Partially true/False

38. A bag contains 8 red balls and some blue balls. If the probability of drawing a blue ball is three times of a red ball, then the number of blue balls in the bag

(a) 12 (b) 18
(c) 24 (d) 36

39. A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the ball drawn is not black, is ***[CBSE 2020]***

(a) $\frac{1}{3}$ (b) $\frac{9}{15}$
(c) $\frac{5}{10}$ (d) $\frac{2}{3}$

40. The probability of getting a defective bulb in a lot of 500 bulbs is 0.290. Then, the number of defective bulbs in the lot is

(a) 140 (b) 145
(c) 50 (d) 100

41. Someone is asked to make a number from 1 to 100. The probability that it is a prime is ………

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$
(c) $\frac{1}{4}$ (d) $\frac{2}{3}$

42. If a number x is chosen at random from the numbers $-2, -1, 0, 1, 2$. Then, the probability that $x^2 < 2$ is

(a) $\frac{2}{5}$ (b) $\frac{4}{5}$
(c) $\frac{1}{5}$ (d) $\frac{3}{5}$

43. A number x is selected from the numbers 1,2,3 and then a second number y is randomly selected from the numbers 1,4,9, then the probability that the product xy of the two numbers will be less than 9 is

(a) $\frac{3}{7}$ (b) $\frac{4}{9}$
(c) $\frac{5}{9}$ (d) $\frac{7}{9}$

44. A man is known to speak truth 3 out of 4 times. He throws a die and a number other than six comes up. Find the probability that he reports it is a six

(a) $\frac{3}{4}$ (b) $\frac{1}{4}$
(c) $\frac{1}{2}$ (d) 1

45. There are 1000 sealed envelopes in a box, 10 of them contain a cash prize of ₹ 100 each, 100 of them contain a cash prize of ₹ 50 each and 200 of them contain a cash prize of ₹ 10 each and rest do not contain any cash prize. If they are well-shuffled and an envelope is picked up out, then the probability that is contains no cash prize is

(a) 0.65 (b) 0.69
(c) 0.54 (d) 0.57

46. Tickets numbered from 1 to 20 are mixed up together and then a ticket is drawn at random, then the probability that the ticket has a number which is a multiple of 3 or 7 is

(a) $\frac{2}{5}$ (b) $\frac{3}{5}$
(c) $\frac{4}{5}$ (d) $\frac{1}{5}$

47. Ramesh buys a fish from a shop for his aquarium. The shopkeeper takes out one fish at random a tank containing 5 male fish and 9 female fish. Then, the probability that the fish taken out is a male fish, is

(a) $\frac{5}{13}$ (b) $\frac{5}{14}$
(c) $\frac{6}{13}$ (d) $\frac{7}{13}$

48. In a family having three children, there may be no girl, one girl, two girls or three girls. So, the probability of each is $\frac{1}{4}$. Is it true?

(a) True (b) False
(c) Data insufficient (d) None of these

49. Match option of Column I with the appropriate option of Column II.

	Column I		Column II
A.	Probability of getting number 5 in throwing a dice.	p.	0
B.	Probability of obtaining three heads in a single throw of a coin.	q.	$\frac{1}{6}$
C.	Probability of getting the sum of the numbers as 7, when two dice are thrown	r.	1
D.	Probability of occurrence of two sure independent events.	s.	$\frac{6}{36}$

Codes

	A	B	C	D
(a)	p	q	s	r
(b)	q	p	s	r
(c)	q	r	p	s
(d)	p	q	s	r

50. Match option of Column I with the appropriate option of Column II.

	Column I		Column II
A.	The probability of a sure event is	p.	0
B.	The probability of impossible event is	q.	1
C.	Number of face cards in the pack of cards is	r.	$\frac{2}{7}$
D.	Probability of occuring 53 Sundays in a leap year is	s.	12

Codes

	A	B	C	D
(a)	q	p	s	r
(b)	p	s	r	q
(c)	p	r	q	s
(d)	q	p	r	s

Assertion-Reasoning MCQs

Directions (Q.Nos. 51-60) Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) If both Assertion and Reason are true and Reason is not the correct explanation of Assertion.
(c) If Assertion is true but Reason is false.
(d) If Assertion is false but Reason is true.

51. **Assertion** The probability of winning a game is 0.4, then the probability of losing it, is 0.6.

Reason $P(E) + P(\text{not } E) = 1$.

52. **Assertion** If the probability of an event is P, then probability of its complementary event will be $1 - P$.

Reason When E and $\overline{E}$ are complementary events, then $P(E) + P(\overline{E}) = 1$.

53. **Assertion** An event is very unlikely to happen. Its probability is 0.0001.

Reason If $P(A)$ denote the probability of an event A, then $0 \leq P(A) \leq 1$.

54. **Assertion** When two coins are tossed simultaneously then the probability of getting no tail is $\frac{1}{4}$.

Reason The probability of getting a head (i.e., no tail) in one toss of a coin is $\frac{1}{2}$.

55. **Assertion** In rolling a dice, the probability of getting number 8 is zero.

Reason Its an impossible event.

56. **Assertion** If a die is thrown, the probability of getting a number less than 3 and greater than 2 is zero.

Reason Probability of an impossible event is zero.

57. **Assertion** The probability of getting a prime number. When a die is thrown once is $\frac{2}{3}$.

Reason Prime numbers on a die are 2, 3, 5.

58. **Assertion** In a simultaneously throw a pair of dice. The probability of getting a double is $\frac{1}{6}$.

Reason Probability of an event may be negative.

59. **Assertion** Card numbered as 1, 2, 3 ...... 15 are put in a box and mixed throughly, one card is then drawn at random. The probability of drawing an even number is $\frac{1}{2}$.

Reason For any event E, we have $0 \le P(E) \le 1$.

60. **Assertion** If a box contains 5 white, 2 red and 4 black marbles, then the probability of not drawing a white marble from the box is $\frac{5}{11}$.

Reason $P(\overline{E}) = 1 - P(E)$, where E is any event.

Case Based MCQs

61. On a weekend Rani was playing cards with her family. The deck has 52 cards. If her brother drew one card.

[CBSE Question Bank]

(i) Find the probability of getting a king of red colour.

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$

(c) $\frac{1}{52}$ (d) $\frac{1}{4}$

(ii) Find the probability of getting a face card.

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$

(c) $\frac{2}{13}$ (d) $\frac{3}{13}$

(iii) Find the probability of getting a jack of hearts.

(a) $\frac{1}{26}$ (b) $\frac{1}{52}$

(c) $\frac{3}{52}$ (d) $\frac{3}{26}$

(iv) Find the probability of getting a red face card.

(a) $\frac{3}{13}$ (b) $\frac{1}{13}$

(c) $\frac{1}{52}$ (d) $\frac{3}{26}$

(v) Find the probability of getting a spade.

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$

(c) $\frac{1}{52}$ (d) $\frac{1}{4}$

62. In a play zone, Sujesa is playing arcade arcade game which consists of 50 teddy bears, 40 pokemons, 30 tigers and 60 monkeys. Sujesa picks a puppet at random. Now, find the probability of getting

(i) a tiger

(a) $\frac{1}{15}$ (b) $\frac{1}{7}$

(c) $\frac{1}{6}$ (d) $\frac{1}{8}$

(ii) a monkey

(a) $\frac{1}{5}$ (b) $\frac{1}{3}$

(c) $\frac{1}{6}$ (d) $\frac{1}{8}$

(iii) a teddy bear

(a) $\frac{5}{18}$ (b) $\frac{1}{6}$

(c) $\frac{1}{3}$ (d) $\frac{1}{7}$

(iv) not a monkey

(a) $\frac{1}{25}$ (b) $\frac{2}{3}$

(c) $\frac{1}{5}$ (d) $\frac{17}{25}$

(v) not a pokemon

(a) $\frac{7}{9}$ (b) $\frac{1}{18}$

(c) $\frac{61}{100}$ (d) $\frac{79}{100}$

63. Teacher wants to distribute chocolates in his class on farewell party. The chocolates are of three types : Milk chocolate, White chocolate and Dark chocolate. If the total number of students in the class is 66 and everyone gets a chocolate, then answer the following questions.

(i) If the probability of distributing milk chocolates is $\frac{1}{3}$, then the number of milk chocolates Teacher has, is

(a) 18 (b) 20

(c) 22 (d) 30

(ii) If the probability of distributing dark chocolate is $\frac{5}{11}$ then the number of dark chocolates Teacher has, is

(a) 18 (b) 25

(c) 24 (d) 30

(iii) The probability of distributing white chocolates is

(a) $\frac{7}{33}$ (b) $\frac{8}{21}$

(c) $\frac{1}{9}$ (d) $\frac{2}{9}$

(iv) The probability of distributing both milk and white chocolates is

(a) $\frac{6}{17}$ (b) $\frac{3}{17}$

(c) $\frac{6}{11}$ (d) $\frac{5}{11}$

(v) The probability of distributing all the chocolates is

(a) 0 (b) 1

(c) $\frac{1}{2}$ (d) $\frac{3}{4}$

64. Rahul and Ravi planned to play Business (board game) in which they were supposed to use two dice.

CBSE Question Bank

(i) Ravi got first chance to roll the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is 8?

(a) $\frac{1}{26}$ (b) $\frac{5}{36}$

(c) $\frac{1}{18}$ (d) 0

(ii) Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is 13?

(a) 1 (b) $\frac{5}{36}$

(c) $\frac{1}{18}$ (d) 0

(iii) Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is less than or equal to 12 ?

(a) 1 (b) $\frac{5}{36}$

(c) $\frac{1}{18}$ (d) 0

(iv) Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is equal to 7 ?

(a) $\frac{5}{9}$ (b) $\frac{5}{36}$

(c) $\frac{1}{6}$ (d) 0

(v) Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is greater than 8 ?

(a) 1 (b) $\frac{5}{36}$

(c) $\frac{1}{18}$ (d) $\frac{5}{18}$

65. Two friends were playing a game with two dice. Pratima has a blue dice and Riya has a grey dice. They decided to throw both the dice simultaneously and note down all the possible outcomes appearing on the top of both the dice.

On the basis of above information, answer the following questions.

(i) The total number of possible outcomes they noted, is

(a) 24 (b) 36

(c) 18 (d) 6

(ii) The probability of getting the sum of numbers on two dice is 19 is

(a) 1 (b) $\frac{5}{36}$

(c) 0 (d) $\frac{18}{35}$

(iii) The probability that both the numbers are odd numbers, is

(a) 0 (b) $\frac{1}{2}$

(c) $\frac{1}{4}$ (d) $\frac{1}{8}$

(iv) The probability that sum of two numbers is even is

(a) 1 (b) $\frac{1}{2}$

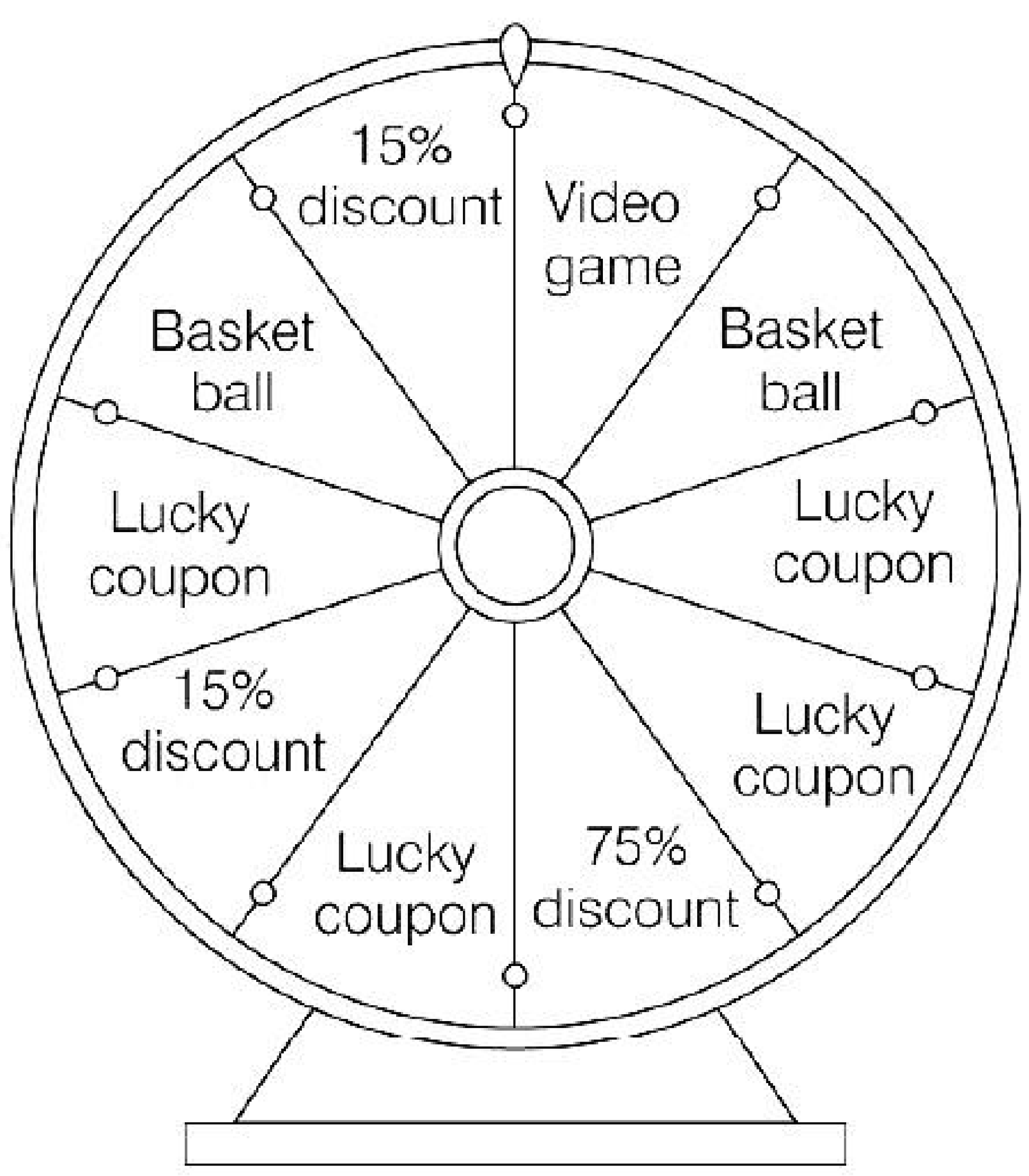
(c) $\frac{1}{4}$ (d) $\frac{1}{8}$

(v) The probability that difference between numbers is one, is

(a) $\frac{2}{21}$ (b) $\frac{3}{4}$

(c) $\frac{5}{16}$ (d) $\frac{5}{18}$

66. In a toy shop, there is a spinning wheel for their customers. The spinning wheel has different types of prizes as shown in figure. A customer can only spin the wheel after buying something from the shop.



On the basis of above information, answer the following questions.

(i) If Mr. Mehta spins the wheel, then the probability that he gets 15% discount is

(a) 0 (b) $\frac{1}{10}$

(c) $\frac{1}{5}$ (d) $\frac{1}{4}$

(ii) If Rita spins the wheel, then the probability of getting video game

(a) $\frac{1}{10}$ (b) $\frac{1}{5}$

(c) $\frac{3}{10}$ (d) $\frac{2}{5}$

(iii) Deepak spins the wheel. The probability that the wheel stops at basket ball is

(a) $\frac{1}{10}$ (b) $\frac{1}{5}$

(c) $\frac{3}{10}$ (d) $\frac{2}{5}$

(iv) The probability that one customer wins 75% discount is

(a) $\frac{1}{10}$ (b) $\frac{1}{5}$

(c) $\frac{3}{10}$ (d) $\frac{2}{5}$

(v) The probability of getting a Lucky coupon

(a) $\frac{1}{10}$ (b) $\frac{1}{5}$

(c) $\frac{3}{10}$ (d) $\frac{2}{5}$

ANSWERS

Multiple Choice Questions

1. (d)	2. (a)	3. (a)	4. (b)	5. (c)	6. (d)	7. (b)	8. (d)	9. (a)	10. (a)
11. (d)	12. (d)	13. (b)	14. (b)	15. (c)	16. (d)	17. (b)	18. (d)	19. (b)	20. (b)
21. (d)	22. (a)	23. (a)	24. (d)	25. (b)	26. (d)	27. (a)	28. (b)	29. (d)	30. (d)
31. (a)	32. (a)	33. (d)	34. (d)	35. (b)	36. (c)	37. (a)	38. (c)	39. (d)	40. (b)
41. (c)	42. (d)	43. (c)	44. (b)	45. (b)	46. (a)	47. (b)	48. (b)	49. (b)	50. (a)

Assertion-Reasoning MCQs

51. (a)	52. (a)	53. (b)	54. (b)	55. (a)	56. (a)	57. (d)	58. (c)	59. (d)	60. (d)

Case Based MCQs

61. (i) - (a); (ii) - (d); (iii) - (b); (iv) - (d); (v) - (d)
62. (i) - (c); (ii) - (b); (iii) - (a); (iv) - (b); (v) - (a)
63. (i) - (c); (ii) - (d); (iii) - (a); (iv) - (c); (v) - (b)
64. (i) - (b); (ii) - (d); (iii) - (a); (iv) - (c); (v) - (d)
65. (i) - (b); (ii) - (c); (iii) - (c); (iv) - (b); (v) - (d)
66. (i) - (c); (ii) - (a); (iii) - (b); (iv) - (a); (v) - (d)

SOLUTIONS

1. The experiments which when repeated under identical conditions produce the same results or outcomes are known as deterministic experiments.

2. An outcome of a random experiment is known as elementary event.

3. (True) An event to a random experiment is a compound even if it is obtained by combining two or more elementary events associated to the random experiments.

4. (False) The sum of probabilities of all the outcomes of an experiment is equal to one.

5. The probability p of any event must be greater than or equal to 0.

$$0 \le p \le 1$$

Since, 1 is the maximum limit all probabilities must be less than or equal to 1.

The sum of the probabilities of all the elementary events of an experiment is 1.

6. Given, $P(E) + P(\overline{E}) = q$

We know that, total probability of possible outcomes is 1

$$P(\overline{E}) = 1 - P(E)$$

The value of $q = 1$

7. $P(E) = 0.05$

$P(\overline{E}) = 1 - P(E)$

$= 1 - 0.05 = 0.95$

8. If an event is not occuring then it has the probability of occurence as 0.

9. Probability of any event cannot be more than 1. 1.5 cannot be the probability of any event.

10. The probability of any event which is very unlikely to happen is closest to zero and form the given options 0.0001 is closest to zero.

11. Number of all possible outcomes = 9

Numbers favourable to $|x| < 1$ are 0.

$\therefore$ Number of favourable outcomes = 1

So, required probability $= \dfrac{1}{9}$

12. Total number of letters in the word 'MATHEMATICS' = 11

Number of vowels = 4

i.e., (A, E, A,I)

$\therefore$ Required probability $= \dfrac{4}{11}$

13. There are 365 days in an ordinary year.
Number of full weeks in 365 days
$= 52\ [365 = 7 \times 52 + 1]$
The remaining 1 day can be any one of the seven week days.
Thus, the probability of this day to be Sunday $= \frac{1}{7}$

14. There are 13 letters in the word 'ASSASSINATION' out of which one letter can be chosen in 13 ways.
$\therefore$ Total number of outcomes $= 13$
There are 6 vowels in the word 'ASSASSINATION'. So, there are 6 ways of selecting a vowel.
$\therefore$ Required probability $= \frac{6}{13}$
But given that,
$$\frac{6}{2x+1} = \frac{6}{13}$$
$\Rightarrow \quad 2x + 1 = 13$
$\Rightarrow \quad 2x = 12$
$\Rightarrow \quad x = 6$

15. Sample space $= \{HH, HT, TH, TT\}$
Number of total possible outcomes $= 4$
Number of favourable outcomes $= 1$
$$P(E) = \frac{1}{4}$$

16. If two unbiased coins are tossed simultaneously we obtain possible outcomes.
HH, HT, TH, TT
$\therefore$ Total number of outcomes $= 4$
No head is obtained if the event TT occurs.
$\therefore$ Number of favourable outcomes $= 1$
$\therefore$ Required probality $= \frac{1}{4}$
But, given probability $= \frac{A}{B}$
So, $A = 1$ and $B = 4$
Therefore, $(A + B)^2 = (1 + 4)^2$
$= (5)^2 = 25$

17. Total number of outcomes $= 2 \times 6 = 12$
Favourable outcomes are $\{T2, T3, T5\}$
i.e. 3 in number.
$\therefore$ Required probability $= \frac{3}{12} = \frac{1}{4}$

18. Three coins tossed $= \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$
(a) P (exactly 2 heads) $= 3/8$
(b) P (atleast one head) $= 7/8$
(c) P (atmost 2 tails) $= 7/8$
(d) P (exactly one tail) $= 3/8$

19. Three coins tossed together possible outcomes.
$\{HHH, HHT, HTH, THH, TTT, TTH, THT, HTT\}$.
Number of two head together $= 3$
Probability of getting two head $= \frac{3}{8}$

20. No, the outcomes are not equally likely, because outcome 'no head' means 'TTT'; and outcome 'one head' means THT, HTT, TTH and so on $P(TTT) = \frac{1}{8}$, which is not equal to $\frac{1}{4}$

21. Number of prime number (2, 3 and 5) = 3
Number of total outcomes = 6
$$P(E) = \frac{3}{6} = \frac{1}{2}$$

22. Total number less than 7 on a dice are 6
i.e. 1, 2, 3, 4, 5, 6
Total possible outcomes = 6
$$P(E) = \frac{6}{6} = 1$$

23. Number of all possible outcomes (1, 2, 3, 4, 5, 6) $= 6$
Number of favourable outcome $= 1$ (i.e., number 5)
$\therefore$ Required Probability $= \frac{1}{6}$

24. A fair dice has 6 faces and each face have a unique digit from 1 to 6.

Now, favourable case to get a number (x) between 1 to 6 = 6 and total case = 6

Then, probability $= \dfrac{\text{Favourable case}}{\text{Total case}}$

$$P(E) = \frac{6}{6} = 1$$

25. Total number of possible outcomes

$$= 6 \times 6 = 36$$

Favourable outcomes = (1, 1), (2, 2), (3, 3) (4, 4), (5, 5) and (6, 6).

Total number of favourable outcomes = 6

$$P(E) = \frac{6}{36} = \frac{1}{6}$$

26. Here, $S = \{(3,1), (2,2), (1,3), (6,2), (5,3), (4,4), (3,5), (2,6), (6,6)\}$.

Total number of possible outcomes = 36

Number of favourable outcomes = 9

$\therefore P$ (sum of two numbers will be multiple of 4)

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

27. Total number of elementary outcomes = 36

Favourable outcomes are (4, 3), (3, 4), (6, 2), (2, 6) i.e. 4 in number.

$\therefore$ Required probability $= \dfrac{4}{36} = \dfrac{1}{9}$

28. Total favourable outcomes are (6, 1), (6, 2), (5, 2), (5, 3), (4, 3), (4, 4), (3, 4), (3, 5), (2, 5), (2, 6), (1, 6).

P (sum is greater than 6 but less than 9)

$$= \frac{11}{36}$$

29. Two dice are thrown simultaneously

Total number of outcomes = 36

Doublet = {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}

Total of atleast 10 = {(4, 6), (5, 5), (6, 4), (5, 6), (6, 5), (6, 6)}

Total is perfect square = {(1, 3), (2, 2), (3, 1), (3, 6), (4, 5), (5, 4), (6, 3)}

(a) P (doublet) $= 6/36 = 1/6$,

P (not doublet) $= 1 - \dfrac{1}{6} = \dfrac{5}{6}$

(b) P (getting total of atleast 10)

$= 6/36 = 1/6$

(c) P (perfect square) $= 7/36$,

P (not a perfect square) $= 1 - \dfrac{7}{36} = \dfrac{29}{36}$

30. Total number of outcomes $= 6 \times 6 \times 6 = 216$

Number of favourable outcomes

$= 6 \times 5 \times 4 = 120$

$\therefore$ Required probability $= \dfrac{120}{216} = \dfrac{5}{9}$

31. Total face cards (king, queen and jack)

$= 3 \times 4 = 12$

P (Face card) $= \dfrac{\text{Total Face Cards}}{\text{Total cards}}$

$= \dfrac{12}{52} = \dfrac{3}{13}$

32. In a deck of 52 cards, there are 12 face cards i.e., 6 red and 6 black cards.

$\therefore$ So, probability of getting a red face card

$= \dfrac{6}{52} = \dfrac{3}{26}$

33. In a deck of 52 cards, there are 13 cards of heart and 1 is ace of heart.

$\therefore$ The number of outcomes favourable to $E = 51$

34. Total number of cards in one deck of cards, $n(S) = 52$

Let E_1 = Event of getting a king of red colour

$\therefore \quad n(E_1) = 2$

($\because$ In a deck of cards, 26 cards are red and 26 cards are black. There are four kings in a deck in which two are red and two are black)

Probability of getting a king of red colour

$$= \frac{n(E_1)}{n(S)} = \frac{2}{52} = \frac{1}{26}$$

35. Total number of cards = 52

Total number of diamond cards = 13

(a) P (diamond cards) $= 13/52 = 1/4$

(b) P (an ace of heart) $= 1/52$

(c) P (not heart) $= 1 - \frac{1}{4} = \frac{3}{4}$

(d) P (king or queen) $= \frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$

36. Total number of outcomes = 52

Number of favourable outcomes = 2

$P(E) = \frac{2}{52} = \frac{1}{26}$

37. Number of red balls = 5

Let the number of blue balls in the bag $= x$

$\therefore$ Total number of balls $= x + 5$

$\therefore$ Probability of red ball $= \frac{5}{5 + x}$

and probability (blue balls) $= \frac{x}{5 + x}$

According to question, $\frac{x}{5 + x} = 2 \times \frac{5}{5 + x}$

$x = 10$

38. Let there be x blue balls in the bag.

$\therefore$ Total number of balls in the bag $= (8 + x)$

and Now, P_1 = Probability of drawing a blue ball $= \frac{x}{8 + x}$

and P_2 = Probability of drawing a red ball $= \frac{8}{8 + x}$

It is given that,

$$P_1 = 3P_2$$

$$\Rightarrow \frac{x}{8 + x} = 3 \times \frac{8}{(8 + x)}$$

$$\Rightarrow \frac{x}{8 + x} = \frac{24}{8 + x}$$

$$\Rightarrow x = 24$$

Hence, there are 24 blue balls in the bag.

39. Total number of balls in a bag = 3 + 5

$\therefore$ Total number of possible outcomes is 15.

The number of favourable outcomes of drawing non-black ball is 10.

$\therefore$ Required probability

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{10}{15} = \frac{2}{3}$$

40. Let the number of defective bulbs $= x$

Probability of getting a defective bulb $= \frac{x}{500}$

According to question, $\frac{x}{500} = 0.290$

$\Rightarrow x = 0.290 \times 500 = 145$

41. Prime number between 1 to 100

= 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

31, 37, 41, 43, 47, 53, 59, 61

67, 71, 73, 79, 83, 89, 97 = 25

Total outcomes = 100

$$P(E) = \frac{25}{100} = \frac{1}{4}$$

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

So, total number of possible outcomes = 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, $P(x^2 < 2) = \frac{3}{5}$

43. Number x can be selected in three ways and corresponding to each such way there are three ways of selecting number y.

Therefore, two numbers can be selected in 9 ways as listed below

(1, 1), (1,4), (1,9), (2, 1), (2, 4), (2,9), (3,1), (3,4), (3,9)

So, total numbers of possible outcomes = 9

The product xy will be less than 9, if x and y are chosen in one of the following ways

(1, 1), (1,4), (2, 1), (2, 4), (3,1)

$\therefore$ Favourable number of elementary events = 5

Hence, required probability $= \frac{5}{9}$

44. As given that a number other than six has appeared.

So, the man repeating it to be six means he is speaking false. Effectively the question is asking the probability

P (He will lie) $= 1 - \frac{3}{4} = \frac{1}{4}$

Hence, probability that he reports it is a six is $\frac{1}{4}$

45. Total number of envelopes in the box

$= 1000$

Number of envelopes containing cash prize

$= 10 + 100 + 200 = 310$

Number of envelopes containing no cash prize $= 1000 - 310 = 690$

$\therefore$ Required probability $= \frac{690}{1000} = 0.69$

46. Out of 20 tickets numbered from 1 to 20, one can be chosen in 20 ways. So, total number of possible outcomes associated with the given random experiment is 20. Out of 20 tickets numbered 1 to 20, tickets bearing numbers which are multiple of 3 or 7 bear numbers 3, 6, 7, 9, 12, 14, 15 and 18.

$\therefore$ Favourable number of elementary events

$= 8$

Hence, required probability $= \frac{8}{20} = \frac{2}{5}$

47. There are $14 = (5 + 9)$ fish out of which one can be chosen in 14 ways.

$\therefore$ Total numbers of possible outcomes $= 14$

There are 5 male fish out of which one male fish can be chosen in 5 ways.

$\therefore$ Favourable number of elementary events $= 5$

Hence, required probability $= \frac{5}{14}$

48. Let boys be B and girl be G

Outcomes can be BBB, GGG, BBG, BGB, GBB, GGB, GBG, BGG

Then, probability of 3 girls $= \frac{1}{8}$

Probability of 0 girls $= \frac{1}{8}$

Probability of 2 girls $= \frac{3}{8}$

Probability of 1 girls $= \frac{3}{8}$

49. (A) Probability of getting number 5 in throwing a dice $= \frac{1}{6}$

(B) Probability of getting three heads in a single throw of coin $= 0$

(C) Probability of getting the sum of the number as 7 [(3, 4), (4, 3), (1, 6), (6, 1), (2, 5), (5, 2)] when two dice are thrown $= \frac{6}{36}$

(D) Probability of occurence of two sure independent events is 1

50. (A) The probability of sure event is 1.

(B) The probability of impossible event is 0.

(C) Number of face cards in the pack of cards is $(3 \times 4) = 12$

(D) Probability of occuring 53 Sundays in a leap year is $\frac{2}{7}$.

51. We have, $P(E) = 0.4$,

where E = event of winning

$P(\text{Not } E) = 1 - P(E)$

$= 1 - 0.4 = 0.6$

Hence, both Assertion and Reason are true and Reason is the correct explanation of Assertion.

52. If the probability of an event is P, the probability of its complementary will be $1 - P$.

$\Rightarrow$ Sum of probability of an event and its complementary event $= 1$

$\Rightarrow \quad P(E) + P(\overline{E}) = 1$

$\Rightarrow \quad P(\overline{E}) = 1 - P(E)$

Hence, both Assertion and Reason are true and Reason is the correct explanation of Assertion.

53. The probability of an event to be unlikely if the probability is near to '0'.

As 0.0001 is near to 0, the occuring of event is unlikely.

Now, we know probability of an event lies in between 0 and 1 because total possibilities will be always greater than equal to favourable outcomes.

Hence, both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

54. Probability of getting no tail when two coins tossed simultaneously i.e., both are head.

Probability of both head

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

Hence, both Assertion and Reason are true and Reason is not the correct explanation of Assertion.

55. As, dice is only have 6 number, it is impossible to show as 8-digit. Hence, only reason is true 8-digit never comes in dice.

Hence, both Assertion and Reason are true and Reason is the correct explanation of Assertion.

56. Now, where dice is thrown the possible outcomes are {1, 2, 3, 4, 5, 6}, Now, if you see the outcomes getting a number greater than "2" and less than "3" is impossible

∴ Probability is zero

The probability of an impossible event

= '0'

Hence, both Assertion and Reason are true and Reason is the correct explanation of Assertion.

57. When a die is thrown once, total possible outcomes = 6

and prime numbers in it are {2, 3, 5}

Total favourable outcomes = 3

Probability of getting a prime $= \frac{3}{6} = \frac{1}{2}$

Hence, Assertion is false but Reason is true.

58. 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, $0 \le P(E) \le 1$

Hence, Assertion is true but Reason is false.

59. Total possible outcomes = 15.

$$n(S) = 15$$

Total favourable numbers are 2, 4, 6, 8, 10, 12, 14.

$$E = \{2, 4, 6, 8, 10, 12, 14\}$$

$$n(E) = 7$$

∴ Probability of drawing an even number $= \frac{7}{15}$

Hence, Assertion is false but Reason is true

60. P (white marble) $= \frac{5}{5+2+4} = \frac{5}{11}$

P (not white marble) $= 1 - \frac{5}{11}$

$$= \frac{11-5}{11} = \frac{6}{11}$$

Hence, Assertion is false but Reason is true.

61. Total number of cards in one deck of cards is 52.

∴ Total number of outcomes = 52

(i) Let E_1 = Event of getting a king of red colour

∴ Number of outcomes favourable to $E_1 = 2$

[∵ there are four kings in a deck of playing cards out of which two are red and two are black]

Hence, probability of getting a king of red colour,

$$P(E_1) = \frac{2}{52} = \frac{1}{26}$$

(ii) Let E_2 = Event of getting a face card

$\therefore$ Number of outcomes favourable to $E_2 = 12$

[$\because$ in a deck of cards, there are 12 face cards, namely 4 kings, 4 jacks, 4 queens]

Hence, probability of getting a face card,

$$P(E_2) = \frac{12}{52} = \frac{3}{13}$$

(iii) Let E_3 = Event of getting a jack of heart

$\therefore$ Number of outcomes favourable to $E_3 = 1$

[$\because$ there are four jack cards in a deck, namely 1 of heart, 1 of club,1 of spade and 1 of diamond]

Hence, probability of getting a jack of heart,

$$P(E_3) = \frac{1}{52}$$

(iv) Let E_4 = Event of getting a red face card.

$\therefore$ Number of outcomes favourable to $E_4 = 6$

[$\because$ in a deck of cards, there are 12 face cards out of which 6 are red cards]

Hence, probability of getting a red face card,

$$P(E_4) = \frac{6}{52} = \frac{3}{26}$$

(v) Let E_5 = Event of getting a spade

$\therefore$ Number of outcomes favourable to $E_5 = 13$ [$\because$ in a deck of cards, there are 13 spades, 13 clubs, 13 hearts and 13 diamonds]

Hence, probability of getting a spade,

$$P(E_5) = \frac{13}{52} = \frac{1}{4}$$

62. Total number of Puppet in Arcade game

$$= 50 + 40 + 30 + 60 = 180$$

(i) P (Picking a tiger) $= \frac{30}{180} = \frac{1}{6}$

(ii) P (Picking a monkey) $= \frac{60}{180} = \frac{1}{3}$

(iii) P (Picking a teddy bear) $= \frac{50}{180} = \frac{5}{18}$

(iv) P (Picking a monkey) $= \frac{1}{3}$

$$P(\text{Not a monkey}) = 1 - \frac{1}{3} = \frac{2}{3}$$

(v) P (Picking a pokemon) $= \frac{40}{180} = \frac{2}{9}$

$$P(\text{Not a pokemons}) = 1 - \frac{2}{9} = \frac{7}{9}$$

63. Since every student got one chocolate. So, number of chocolates teacher has is equal to the number of student in the class.

(i) Let number of milk chocolates teacher has = x

Probability of distributing milk chocolate $= \frac{1}{3}$

$$\Rightarrow \quad \frac{x}{66} = \frac{1}{3}$$

$$\therefore \quad x = \frac{66}{3} = 22$$

(ii) Let number of dark chocolates teacher has = y

Probability of distributing dark chocolates $= \frac{5}{11}$

$$\frac{y}{66} = \frac{5}{11}$$

$$y = 5 \times 6 = 30$$

(iii) Number of white chocolate teacher has

$= 66 - (22 + 30)$

$= 66 - 52 = 14$

$\therefore$ Required probability $= \frac{14}{66} = \frac{7}{33}$

(iv) Total number of milk and white chocolates $= 22 + 14$

$\therefore$ Required probability $= \frac{36}{66} = \frac{18}{33} = \frac{6}{11}$

(v) Since all students gets one chocolate.

So total number of chocolates distributed = 66

$\therefore$ Required probability $= \frac{66}{66} = 1$

64. Total number of out comes = $6 \times 6 = 36$

(i) Let E_1 = Event of getting sum 8

$\therefore$ Number of favourable outcomes to $E_1 = 5$

i.e. (2, 6), (3, 5), (4, 4), (5, 3), (6, 2)

$$\therefore \quad P(E_1) = \frac{5}{36}$$

(ii) Let E_2 = Event of getting sum 13.

Since, we can't get sum more than 12.

$$\therefore \quad P(E_2) = 0$$

(iii) Let E_3 = Event of getting sum less than or equal to 12.

$\therefore$ Number of favourable outcomes = 36

As sum of all the out comes is less than or equal to 12

$$\therefore \quad P(E_3) = \frac{36}{36} = 1$$

(iv) Let E_4 = Event of getting sum 7.

$\therefore$ Number of favourable outcomes to $E_2 = 6$

i.e. (1, 6), (2, 5), (3, 4), (4, 3), (5, 2) (6, 1)

$$\therefore \quad P(E_4) = \frac{6}{36} = \frac{1}{6}$$

(v) Let E_5 = Event of getting sum greater than 8 i.e. getting sum equal to 8, 9, 10, 11, 12

$\therefore$ Favourable outcomes = 10 i.e. (3, 6), (4, 5), (5, 4), (6, 3), (4, 6), (5, 5), (6, 4), (5, 6), (6, 5), (6, 6).

$$\therefore \quad P(E_5) = \frac{10}{36} = \frac{5}{18}$$

65. (i) Total number of possible outcomes on throwing two dice simultaneously $= 6 \times 6 = 36$.

(ii) As we know, that maximum sum of numbers on two dice $= 6 + 6 = 12$

$\therefore$ It is an impossible event so required probability = 0

(iii) The probability that both the odd number

(1, 1), (1, 3), (1, 5), (3, 1), (3, 3), (3, 5), (5, 1), (5, 3), (5, 5)

Probability that both the odd number is $= \frac{9}{36} = \frac{1}{4}$

(iv) Let B the event that sum of two numbers is even

$\therefore$ B = (1, 1), (1, 3), (1, 5), (2, 2), (2, 4), (2, 6), (3, 1), (3, 3), (3, 5), (4, 2), (4, 4), (4, 6), (5, 1), (5, 3), (5, 5), (6, 2), (6, 4), (6, 6)

$n(B) = 18$

$$p(B) = \frac{18}{36} = \frac{1}{2}$$

(v) Let C be the event of difference between number is one.

(3, 2), (2, 1), (1, 2), (2, 3), (4, 3), (3, 4), (5, 4), (4, 5), (6, 5), (5, 6)

$n(C) = 10$

$$p(C) = \frac{10}{36} = \frac{5}{18}$$

66. Total number of possible outcomes = 10

(i) Total number of 15% discount event = 2

$$P(\text{getting 15\% discount}) = \frac{2}{10} = \frac{1}{5}$$

(ii) $P(\text{getting a video game}) = \frac{1}{10}$

(iii) $P(\text{getting a basket ball}) = \frac{2}{10} = \frac{1}{5}$

(iv) $P(\text{getting a 75\% discount}) = \frac{1}{10}$

(v) $P(\text{getting a lucky coupon}) = \frac{4}{10} = \frac{2}{5}$