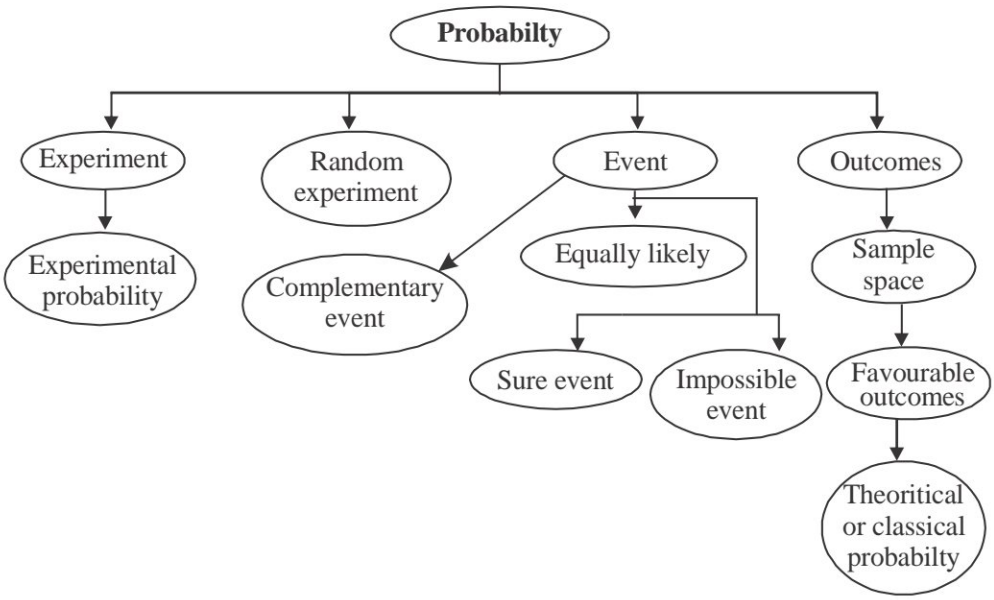
CHAPTER

14 Probability



KEY POINTS:

1. Probability is a quantitative measure of likelihood of occurrence of an event.
2. Probability of an event $(E) = \frac{\text{Number of outcomes favourable to E}}{\text{Total number of possible outcomes}} = \frac{N(E)}{N(S)}$
3. $0 \le P(E) \le 1$
4. If $P(E) = 0$, then it is an impossible event.
5. If $P(E) = 1$, then it is sure event.
6. If E is an event, then not $E(\bar{E})$ is called complementary event.
7. $P(\bar{E}) = 1 - P(E) \Rightarrow P(E) + P(\bar{E}) = 1$
8. Probability of an event is never negative.
9. Sample space (S) : The collection of all possible outcomes of random experiment.

Examples of Sample space

1. When one coin is tossed, then S = {H, T}
2. When two coins are tossed, then S = {HH, TT, HT, TH}
3. When three coins are tossed, then S = {HHH, TTT, HTT, THT, TTH, THH, HTH, HHT}
4. When four coins are tossed, then S = {HHHH, TTTT, HTTT, THTT, TTHT, TTTH, HHHT, HHTH, HTHH, THHH, HTHT, THTH, TTHH, HHTT, THHT, HTTH}.

1 coin	2coins	3 coins	4 coins
2 outcomes	2×2 outcomes	$2 \times 2 \times 2 = 8$ outcomes	$2 \times 2 \times 2 \times 2 = 16$ outcomes

1. When a die is thrown once, then S = 1, 2, 3, 4, 5, 6, n(S) = 6
2. When two dice are thrown together or A die is thrown twice, then

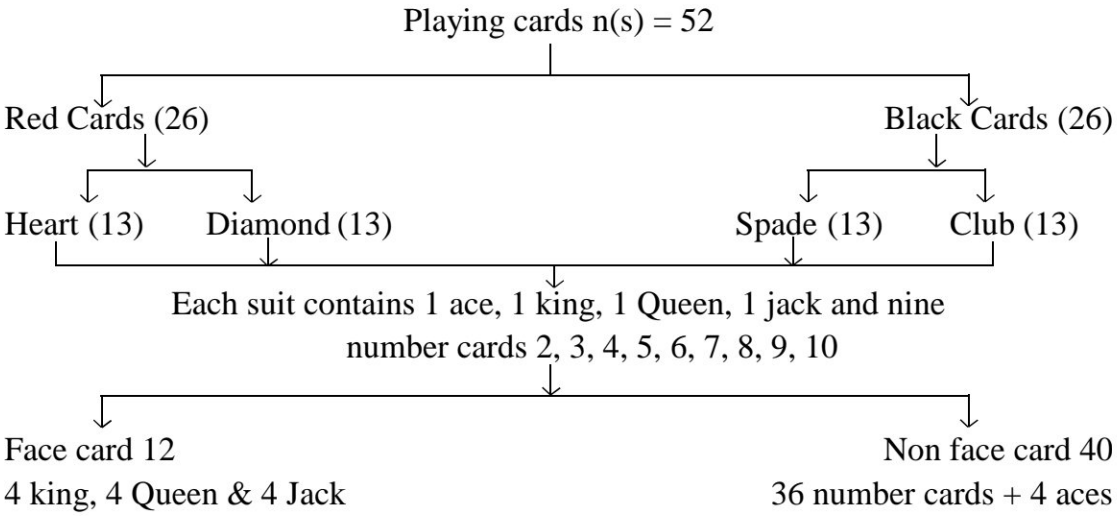
$$S = \{(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\}$$

$$n(S) = 6 \times 6 = 36$$

3. When 3 dice are thrown or a die is thrown thrice then

$$n(S) = 6 \times 6 \times 6 = 216,$$

$n(S) \rightarrow$ no. of outcomes in sample space



VERY SHORT ANSWER TYPE QUESTIONS

1. Multiple Choice Questions

(i) Which of the following cannot be the probability of an event? **[NCERT]**

(a) 0.7 (b) $\frac{2}{3}$ (d) – 1.5 (d) 15%

(ii) Which of the following can be the probability of an event?

[NCERT Exemplar]

(a) – 0.04 (b) 1.004 (c) $\frac{18}{23}$ (d) $\frac{8}{7}$

(iii) 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

(iv) Out of one digit prime numbers, one number is selected at random. The probability of selecting an even number is:

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{4}{9}$ (d) $\frac{2}{5}$

(v) When a die is thrown, the probability of getting an odd number less than 3 is:

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

(vi) Rashmi has a die whose six faces show the letters as given below:

A	B	C	D	A	C

If she throws the die once, then the probability of getting C is:

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$ (c) $\frac{1}{5}$ (d) $\frac{1}{6}$

(vii) A card is drawn from a well shuffled pack of 52 playing cards. The event E is that the card drawn is not a face card. The number of outcomes favourable to the event E is:

(a) 51 (b) 40 (c) 36 (d) 12

2. Choose the correct answer from the given four options

(i) If the probability of an even is 'p' then probability of its complementary event will be:

(a) p – 1 (b) p (c) 1 – p (d) $1-\frac{1}{p}$

(ii) P(Winning) = $x/12$, P(Losing) = 1/3. Find x **[CBSE 2014]**

(a) 6 (b) 8 (c) 7 (d) 9

(iii) The probability of a number selected at random from the numbers 1, 2, 3, ... 15 is a multiple of 4 is: **(CBSE 2020)**

(a) $\frac{4}{15}$ (b) $\frac{2}{15}$ (c) $\frac{1}{15}$ (d) $\frac{1}{5}$

(iv) The probability that a non-leap year selected at random will contains 53 Mondays is:

(a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c) $\frac{3}{7}$ (d) $\frac{5}{7}$

(v) A bag contains 6 red and 5 blue balls. One ball is drawn at random. The probability that the ball is blue is:

(a) $\frac{2}{11}$ (b) $\frac{5}{6}$ (c) $\frac{5}{11}$ (d) $\frac{6}{11}$

(vi) One alphabet is chosen from the word MATHEMATICS. The probability of getting a vowel is:

(a) $\frac{6}{11}$ (b) $\frac{5}{11}$ (c) $\frac{3}{11}$ (d) $\frac{4}{11}$

(vii) Two coins are tossed simultaneously. The probability of getting at most one head is

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

3. A card is drawn at random from a pack of 52 playing cards. Find the probability that the card drawn is neither an ace nor a king.

4. Out of 250 bulbs in a box, 35 bulbs are defective. One bulb is taken out at random from the box. Find the probability that the drawn bulb is not defective.

5. Non Occurance of any event is 3:4. What is the probability of Occurance of this event?

6. If 29 is removed from (1, 4, 9, 16, 25, 29), then find the probability of getting a prime number.

7. A card is drawn at random from a deck of playing cards. Find the probability of getting a face card.

8. In 1000 lottery tickets, there are 5 prize winning tickets. Find the probability of winning a prize if a person buys one ticket.

9. One card is drawn at random from a pack of cards. Find the probability that it is a black king. **(CBSE 2020)**

10. A die is thrown once. Find the probability of getting a perfect square.

11. Two dice are rolled simultaneously. Find the probability that the sum of the two numbers appearing on the top is more than and equal to 10.

12. Find the probability of multiples of 7 in 1, 2, 3, ...,33, 34, 35.

13. If a pair of dice is thrown once, then what is the probability of getting a sum of 8? **(CBSE 2020)**

14. A letter of English alphabet is chosen at random. Determine the probability that chosen letter is a consonant. **(CBSE 2020)**

15. If the probability of winning a game is 0.07, what is the probability of losing it? **(CBSE 2020)**

SHORT ANSWER TYPE QUESTIONS-I

16. Two unbiased coins are tossed simultaneously. If the probability of getting no head is $\frac{a}{b}$ then find $(a + b)^2$? **[CBSE 2016]**

17. Two different dice are rolled together. Find the probability
(a) of getting a doublet,
(b) of getting a sum of 10, of the numbers on the two dice. **[CBSE 2018]**

18. A box contains 12 balls of which some are red in colour. If 6 more red balls are put in the box and a ball is drawn at random, the probability of drawing a red ball doubles than what it was before. Find the number of red balls in the box. **[CBSE 2018]**

19. An integer is chosen random between 1 and 100. Find the probability that (i) it is divisible by 8, (ii) Not divisible by 8. **[CBSE 2018]**

20. Three different coins are tossed together. Find the probability of getting (i) exactly two heads, (ii) at least two heads. (iii) at most one Head

21. Card from 11 to 30, are put in a box and mixed thoroughly. A card is then drawn from the box at random. Find the probability that the number on the drawn card is a prime number.

22. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball at random from the bag is three times that of a red ball, find the number of blue balls in the bag. **(CBSE 2020)**

23. Two different dice are thrown together, find the probability that the sum of the numbers appeared is less than 5. **(CBSE 2020)**

24. Find the probability that 5 sundays occurs in the month of November of a randomly selected year. **(CBSE 2020)**

25. In a family of three children. Find the probability of having at least two boys. **(CBSE 2020)**

26. In a family of two children. Find the probability of having at most one girl.

27. Two dice are thrown at the same time. Find the probability of getting different numbers on the two dice. **(CBSE 2020)**

28. If a number x is chosen at random from the numbers –3, –2, –1, 0, 1, 2, 3. What is probability that $x^2 \leq 4$? **(CBSE 2020)**

SHORT ANSWER TYPE QUESTIONS-II

29. A number x is selected at random from the numbers 1, 2, 3. Another number y is selected at random from the numbers 1, 4, 9. Find the probability that the product of x and y is less than 9.

30. Two dice are thrown at the same time. Determine the probability that the difference of the numbers on the two dice is 2.

31. An integer is chosen between 0 and 100. What is the probability that it is

(i) divisible by 7?

(ii) not divisible by 7?

32. Two dice are rolled once. Find the probability of getting such numbers on the two dice,

(a) whose product is 12.

(b) Sum of numbers on the two dice is atmost 5.

33. Card with number 2 to 101 are placed in a box. A card is selected at random. Find the probability that the card has (i) an even number (ii) a square number.

34. In a lottery, there are 10 prizes and 25 are empty. Find the probability of getting a prize. Also verify $P(E) + P(\overline{E}) = 1$ for this event. **[CBSE 2020]**

35. $P(\text{winning}) = \frac{x}{12}$, $P(\text{Losing}) = \frac{1}{3}$. Find x.

LONG ANSWER TYPE QUESTIONS

36. Cards marked with numbers 3, 4, 5, ...,50 are placed in a box and mixed thoroughly. One card is drawn at random from the box, find the probability that the number on the drawn card is

(i) divisible by 7 (ii) a two digit number (iii) perfect square

37. A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. One ball is drawn at random from the bag. Find the probability that the balls drawn is

(i) White or blue (ii) red or black

(iii) not white (iv) neither white nor black

38. The king, queen and jack of diamonds are removed from a pack of 52 playing cards and the pack is well shuffled. A card is drawn from the remaining cards.

Find the probability of getting a card of

(i) diamond (ii) a jack

39. The probability of a defective egg in a lot of 400 eggs is 0.035. Calculate the number of defective eggs in the lot. Also calculate the probability of taking out a non defective egg from the lot.

40. Slips marked with numbers 3,3,5,7,7,7,9,9,9,11 are placed in a box at a game stall in a fair. A person wins if the mean of numbers are written on the slip. What is the probabilty of his losing the game?

41. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears

(i) a two digit number (ii) a perfect square number

(iii) a number divisible by 5.

42. A card is drawn at random from a well shuffled deck of playing cards. Find the probability that the card drawn is

(i) a card of spade or an ace (ii) a red king

(iii) neither a king nor a queen (iv) either a king or a queen

43. A card is drawn from a well shuffled deck of playing cards. Find the probability that the card drawn is

(i) a face card (ii) red colour face card

(iii) black colour face card

44. Ramesh got ₹ 24000 as Bonus. He donated ₹ 5000 to temple. He gave ₹ 12000 to his wife, ₹ 2000 to his servant and gave rest of the amount to his daughter. Calculate the probability of

(i) wife's share (ii) Servant's Share

(iii) daughter's share.

45. 240 students reside in a hostel. Out of which 50% go for the yoga classes early in the morning, 25% go for the Gym club and 15% of them go for the morning walk. Rest of the students have joined the laughing club. What is the probability of students who have joined laughing club?

46. A box contains cards numbered from 11 to 123. A card is drawn at random from the box. Find the probability that the number on the drawn card is:

[CBSE 2018]

(i) A square number (ii) a multiple of 7.

47. A die is thrown twice. Find the probability that:

(i) 5 will come up at least once

(ii) 5 will not come up either time **[CBSE 2019]**