CBSE Test Paper 01

CH-16 Probability

1. In a certain town, 40% persons have brown hair, 25% have brown eyes, and 15% have both. If a person selected at random has brown hair, the chance that a person selected at random with brown hair is with brown eyes
   a. 1/3
   b. 3/20
   c. 3/ 8
   d. 2/3
2. 8 coins are tossed at a time. The probability of getting at least 6 heads up is
   a. 57/ 64
   b. 229/ 256
   c. 37/ 256
   d. 1/ 64
3. Let A be set of 4 elements. From the set of all functions from A to A, a function is chosen at random. The chance that the selected function is an onto function is
   a. 29/ 32
   b. none of these
   c. 1/ 64
   d. 3/ 32
4. The probability of having at least one tail in five throws with a coin is
   a. $\frac{1}{5}$

b. $\frac{1}{32}$

c. $\frac{31}{32}$

d. 1

5. In a single throw of two dice, the probability of getting a total of 7 or 9 is

    a. $\frac{1}{3}$

    b. $\frac{5}{18}$

    c. none of these

    d. $\frac{4}{18}$

6. Fill in the blanks:

    A ________ is the set of all possible outcomes of an experiment.

7. Fill in the blanks:

    If A and B are any two events in a sample space S, the probability that at least one of the events A or B will occur is given by P(A ∪ B) = ________.

8. If a coin is tossed two times, describe the sample space associated to this experiment.

9. A coin is tossed and then a die is thrown. Describe the sample space for this experiment.

10. An experiment consists of rolling a die and then tossing a coin once if the number on the die is even. If the numbers on the die is odd, then coin is tossed twice. Write the sample space for this experiment.

11. In a simultaneous throw of a pair of dice, find the probability of getting a doublet.

12. A card is picked up from a deck of 52 playing cards.

    i. What is the sample space of the experiment?
    ii. What is the event that the chosen card is a black-faced card?

13. A committee of two persons is selected from two men and two women. What is the probability that the committee will have:

    i. no man?
    ii. one man?
    iii. two men?

14. Two dice are thrown. Find the odds in favour of getting the sum

    i. 4
    ii. 5
    iii. What are the odds against getting the sum 6?

15. Calculate the mean and standard deviation of the following cumulative data.

Wages (in Rs.)	0-15	15-30	30-45	45-60	60-75	75-90	90-105	105-120
Number of workers	12	30	65	107	157	202	222	230

Solution

1. (c) 3/ 8
   Explanation: Let A be the event that a person has brown hair, B be the event that a person has brown eyes. Then,

   $$P(A) = \frac{40}{100}, P(B) = \frac{25}{100}, P(A \cap B) = \frac{15}{100}$$

   Required probability $= P\left(\frac{B}{A}\right) = \frac{P(A \cap B)}{P(A)} = \frac{\frac{15}{100}}{\frac{40}{100}} = \frac{3}{8}$

2. (c) 37/256
   Explanation: Let A be the event getting at least 6 heads up, then,

   $n(A) = \frac{8!}{6! \times 2!} + \frac{8!}{7! \times 1!} + 1$ [Using permutation of like letters]

   = 37

   Also, Total no. of outcomes = 2^8 = 256

   $\therefore$ Required probability $= \frac{37}{256}$

3. (d) 3/32

   Explanation: No. of function from A to A = 4^4

   No. of onto function from A to A = 4!

   $\therefore$ Required probability $= \frac{4!}{4^4} = \frac{3}{32}$

4. (c) $\frac{31}{32}$
   Explanation: Required probability = 1 - P [not getting any tail in five throws with a coin]

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

$= 1 - \frac{1}{2^6} = 1 - \frac{1}{32} = \frac{32}{3}$

5. (b) $\frac{5}{18}$
   Explanation: A = getting a total of 7

   B = getting a total of 9

   Then, A = {(6,1), (1, 6), (4, 3), (3, 4)}

   B = {(6, 3), (3, 6), (5, 4), (4, 5)}

   ∴ Required probability $= \ P(A \ \cup \ B)$

   = P(A) + P(B)

   $= \ \frac{4}{6^2} \ + \ \frac{4}{6^2} \ = \ \frac{8}{6^2} = \ \frac{8}{36} \ = \ \frac{4}{18}$
6. sample space
7. P(A) + P(B) - P (A ∩ B)
8. Two coins are tossed, the possibilities are either both coin shows head or tail, or one shows head and other shows tailor vice-versa.
   ∴ the sample space is given by,
   S = { HT,TH,HH,TT}
9. ∵ When a coin is tossed, either tail or head will turn up, whereas when a dice is thrown, we have one face with either of 1,2,3,4,5 or 6.
   So, the total number of elementary events associated with this experiment is $2 \times 6 = 12$ and the sample space will be
   S = {(H,1), (H,2), (H,3), (H,4), (H,5), (H,6), (T,1), (T,2), (T,3), (T,4), (T,5), (T,6) }
10. When a die is rolled then outcomes are 1, 2, 3, 4, 5, 6.
    On getting even numbers 2, 4, 6 on die, a coin is tossed once, then outcomes are H, T .
    On getting odd numbers 1, 3, 5 on die, then a coin is tossed twice,
    then the outcomes are HH, HT, TH, TT.
    ∴ The required sample space(S) is given by
    S = {2H, 2T, 4H, 4T, 6H, 6T, 1HH, 1HT, 1TH, 1TT, 3HH, 3HT, 3TH, 3TT, 5HH, 5HT, 5TH,

5TT}.

11. Suppose E be the event that a doublet appears on the faces of dice,

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

    $\Rightarrow n(E) = 6$

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

12. i. Set of 52 cards itself is the Sample space for picking up a card from a set of 52 cards.

       S: {52 cards}

    ii. For an event of the chosen card to be a black-faced card, the event is a set of jack, king, queen of spades and clubs.

       A: {JS, QS, KS, JC, KC, QC}

13. Given, there are two men and two women.

    Now, a committee of two persons is selected.

    $\therefore n(S) = {}^4C_2 = \frac{4\times3}{2} = 6$

    i. Let E be the event that no man is to be in the committee

       $\therefore n(E) = {}^2C_2 = 1$ [Only women will be in the committee]

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

    ii. Let E be the event that one man is in the committee

       $\therefore n(E) = {}^2C_1 \times {}^2C_1$

       $= 2 \times 2 = 4$

       $\therefore P(E) = \frac{4}{6} = \frac{2}{3}$

    iii. Let E be the event that two men in the committee

       $\therefore n(E) = {}^2C_2 = 1$

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

14. Two dice are thrown,

    $\therefore n(s) = 6^2 = 36$

    i. Let E be the event that total sum is 4 on two dice.

       E = {(1,3), (2,2), (3,1)}

       $\Rightarrow n(E) = 3$

       $\therefore P(E) = \frac{3}{36} = \frac{1}{12}$

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

= 1 - $\frac{1}{12}$

= $\frac{11}{12}$

Odds in favour of getting sum as 4 is P(E) : P($\overline{E}$) $= 1 : 11$

ii. Let E be the event of getting the sum as 5 on two dice.

E = {(1,4), (2,3), (3,2), (4,1)}

$\Rightarrow n(E) = 4$

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

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

= $\frac{8}{9}$

$\therefore$ Odds in favour of getting the sum as 5 is,

P(E) : P($\overline{E}$) = 1 : 8

iii. Let E be the event of getting sum 6.

E = {(1,5), (2,4), (3,3), (4,2), (5,1)}

$\Rightarrow n(E) = 5$

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

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

= $\frac{31}{36}$

$\therefore$ Odds against getting the sum as 6 is,

P ($\overline{E}$) : P (E) $= 31 : 5$

15.

Class interval	cf	Mid value (x_i)	f_i	$u_i = \frac{x_i - 67.5}{15}$	f_iu_i	$f_iu_i^2$
0-15	12	7.5	12	-4	-48	192
15-30	30	22.5	18	-3	-54	162
30-45	65	37.5	35	-2	-70	140
45-60	107	52.5	42	-1	-42	42
60-75	157	67.5	50	0	0	0
75-90	202	82.5	45	1	45	45
90-105	222	97.5	20	2	40	80
105-120	230	112.5	8	3	24	72

Total			230		-105	733

Here, a = 67.5, b = 15, N = $\sum f_i = 230$, $\sum f_i u_i = -105$ and $\sum f_i u_i^2 = 733$

$\therefore$ Mean = $a + b\left(\frac{1}{N}\sum f_i u_i\right)$ = $67.5 + 15\left(\frac{-105}{230}\right) = 67.5 - 6.85 = 60.65$

and Variance $\left(\sigma^2\right) = b^2\left[\frac{1}{N}\sum f_i u_i^2 - \left(\frac{1}{N}\sum f_i u_i\right)^2\right]$

= $225\left[\frac{733}{230} - \left(-\frac{105}{230}\right)^2\right]$

= $225\left[3.187 - (0.45)^2\right]$

= $225(3.187 - 0.2025) = 671.51$

$\therefore$ Standard deviation = $\sqrt{Variance}$ = $\sqrt{671.51}$ = 25.91