CBSE Test Paper 05
CH-16 Probability

1. From a pack of 52 cards, the cards are drawn one by one till an ace appears. The chance that an ace does not come up in first 26 cards is
   a. 23/ 27
   b. none of these
   c. 46/ 153
   d. 109/ 153
2. Five letters are sent to different persons and addresses on the five envelopes are written at random. The probability that all the letters reach correct destiny is
   a. none of these
   b. $\frac{44}{120}$
   c. $\frac{1}{5}$
   d. $\frac{1}{120}$
3. Mean number of 'sixes' in four throws of a fair dic is
   a. $\frac{4}{6}$
   b. $\frac{6}{4}$
   c. $\frac{1}{4}$
   d. 1
4. Two dice are thrown. The number of sample points in the sample space when 6 does not appear on either dice is
   a. 30

b. 18

c. 25

d. 11

5. The letters of the word ‘ ORIENTAL ‘ are arranged in all possible ways. The chance that the consonants and vowels occur alternately is

   a. 1/ 35

   b. 1/ 70

   c. 2/ 35

   d. none of these

6. Fill in the blanks:

   The sample space of the event 'Tossing a coin' is ________.

7. Fill in the blanks:

   Two events A and B are said to be ________ , if the occurrence of one of them does not depend upon the occurrence of the other.

8. A box contains 1 red, one 3 identical white balls. Two balls are drawn at random in succession without replacement. Write the sample space for this experiment.

9. An experiment consists of tossing a coin and, then throwing it second time if a head occurs. If a tail occurs on the first toss, then a die is rolled, once. Find the sample space.

10. One coin and one die are tossed simultaneously. Find the sample space.

11. A coin is tossed twice, what is the probability that at least one tail occurs?

12. Let S be the sample space and E be an event. Then, prove the following

    i. P(E) $\geq$ 0
    ii. P(ϕ)= 0

iii. P(S) = 1

13. A die is thrown, find the probability of following events:

    i. A prime number will appear
    ii. A number greater than or equal to 3 will appear
    iii. A number less than or equal to 1 will appear
    iv. A number of more than 6 will appear
    v. A number of less than 6 will appear.

14. In a race, the odds in favour of horses A, B, C, D are 1:3,1:4,1:5 and 1:6 respectively. Find the probability that one of them wins the race.

15. A class consists of 10 boys and 8 girls. Three students are selected at random. What is the probability that the selected group has

    i. all boys?
    ii. all girls?
    iii. 1 boy and 2 girls?
    iv. at least one girl?
    v. at most one girl?

Solution

1. (b) none of these

   Explanation: We know that probability having first success at the r^{th} trial = pq^{r-1}

   Here. r = 27 & p = probability of getting ace $= \frac{4}{52}$

   q = probability of not getting ace $= \frac{48}{52}$

   $\therefore$ Required probability $= \frac{4}{52} \times \left(\frac{48}{52}\right)^{26}$

2. (d) $\frac{1}{120}$
   Explanation: Let A denotes the event that all the letters reach correct destiny. Then,

   n(A) = 1

   Also, five letters can be sent of different persons in 5! ways

   $\therefore$ Required probability $= P(A) = \frac{1}{5!} = \frac{1}{120}$

3. (a) $\frac{4}{6}$
   Explanation: Let X be a random variable denoting the no. of sixes. Then X follows B(4, P)

   Here, p denotes the probability of getting a six in a single throw of a die

   $\therefore$Required probability = nP

   $= 4 \times \frac{1}{6} = \frac{4}{6}$

4. (c) 25

   Explanation: total no. of outcomes=6^2=36

   The pair which shows 6 on either dice are {(6,1),(6,2),(6,3),(6,4),(6,5),(1,6),(2,6),(3,6),(4,6),(5,6),(6,6)}=11

So total number of sample points in sample space when 6 on either dice do not appear=36-11=25

5. (a) 1/ 35

   Explanation: v Consonants can be place in 4! ways.

   Vowels can be placed in between consonants in 4! ways

   $\therefore$ Total no. of ways in which the consonants & vowels occur alternatively = $2 \times 4! \times 4!$

   Also, total no. of ways in which the letters of the word 'ORIENTAL' can be arranged = 8!

   $\therefore$ Required probability $= \frac{2 \times 4! \times 4!}{8!} = \frac{1}{35}$

6. S = {H, T}

7. independent

8. The four balls in the box are R, W, W, W.
   When two balls are drawn at random without replacement.
   then the sample space is given by S = {RW, WR, WW}

9. A coin is tossed then outcomes are H, T
   If H comes again thown, then outcomes are H, T.
   When a die is rolled then outcomes are 1, 2, 3, 4, 5, 6
   Hence in this experiment the required sample space (S),
   is given by S= **{HH, HT, T1, T2, T3, T4, T5, T6}**.

10. Sample space for one coin = {H,T} and for one die = {1,2,3,4,5,6}
    since, both are tossed simultaneously.
    So, required sample space is
    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)}.

11. Since a coin tossed twice,
    so the sample space (S) is given by S= {HH, HT, TH, TT}
    $\therefore$ Total number of possible out comes n (S) = 4

Let E be the event of getting at least one tail

∴ n(E) = 3

∴ Probability of getting at least one tail $P(E) = \frac{n(E)}{n(S)} = \frac{3}{4}$

12. i. E is an event. Then, $n(E) \geq 0$.

    $\therefore P(E) = \frac{n(E)}{n(S)} \geq 0$

    ii. P(ϕ) = $\frac{n(\phi)}{n(S)} = \frac{0}{n(S)} = 0$

    iii. $P(S) = \frac{n(S)}{n(S)} = 1$

13. Here the sample space S = {1, 2, 3, 4, 5, 6}

    ∴ n(S) = 6

    i. Let A be the event of getting a prime number

       A = {2, 3, 5} ⇒ n(A) = 3

       Thus $P(A) = \frac{n(A)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

    ii. Let B be the event of getting a number greater than or equal to 3

       B = {3, 4, 5, 6} ⇒ n (B) = 4

       Thus $P(B) = \frac{n(B)}{n(S)} = \frac{4}{6} = \frac{2}{3}$

    iii. Let C be the event of getting a number less than or equal to 1

       C = {1} ⇒ n(C) = 1

       Thus $P(C) \frac{n(C)}{n(S)} = \frac{1}{6}$

    iv. Let D be the event of getting a number more than 6

       D = ϕ ⇒ n(D) = 0

       Thus P(D) $= \frac{n(D)}{n(S)} = \frac{0}{6} = 0$

    v. Let E be the event of getting a number less than 6

       E = {1, 2, 3, 4, 5} ⇒ n(E) = 5

       Thus $P(E) = \frac{n(E)}{n(S)} = \frac{5}{6}$

14. We have,

    $P(A) : P(\overline{A}) = 1 : 3$

    Now, P($\overline{A}$) = 1 - P(A)

    $\Rightarrow P(A) = \frac{1}{4}$

$P(B) : P(\overline{B}) = 1 : 4$

Now, P($\overline{B}$) = 1 - P(B)

$\Rightarrow P(B) = \frac{1}{5}$

$P(C) : P\ (\overline{C}) = 1 : 5$

Now, P($\overline{C}$) = 1 - P(C)

$\Rightarrow P(C) = \frac{1}{6}$

$P(D) : P\ (\overline{D}) = 1 : 6$

Now, P($\overline{D}$) = 1 - P(D)

$\Rightarrow$ P (D) = $\frac{1}{7}$

$\therefore$ the probability that at least one of them wins is given by P $(A \cup B \cup C \cup D)$

$= P(A) + P(B) + P(C) + P(D)$

= $\frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7}$

= $\frac{319}{420}$

15. Given: 10 boys, 8 girls

    Three students are selected at random,

    $n(S) = {}^{18}C_3$

    i. E be the event that the group has all boys.

       $\therefore n(E) = {}^{10}C_3$

       $\therefore P(E) = \frac{{}^{10}C_3}{{}^{18}C_3}$

       = $\frac{10 \times 9 \times 8}{18 \times 17 \times 16}$

       = $\frac{5}{34}$

    ii. E be the event that the group has all girls.

       $\therefore n(E) = {}^{8}C_3$

       $\therefore P(E) = \frac{{}^{8}C_3}{{}^{18}C_3}$

       = $\frac{8 \times 7 \times 6}{18 \times 17 \times 16}$

       = $\frac{7}{102}$

    iii. E be the event that the group has one boy and two girls.

       $\therefore n(E) = {}^{10}C_1 \times {}^{8}C_2$

       $\therefore P(E) = \frac{{}^{10}C_1 \times {}^{8}C_2}{{}^{18}C_3}$ = $\frac{10 \times 8 \times 7 \times 3 \times 2}{2 \times 18 \times 17 \times 16}$

       = $\frac{35}{102}$

    iv. E be the event that at least one girl in the group.

Probability of all boys, p(e) = $\frac{^{10}C_3}{^{18}C_3}$

So, P(E) = 1 - p(e) = 1 - $\frac{^{10}C_3}{^{18}C_3}$ = 1 - $\frac{10\times9\times8}{18\times17\times16}$

= $\frac{29}{34}$

v. E be the event that at most one girl in the group.

$\therefore$ E = {0, 1} girls

$\therefore n(E) = {}^8C_0 \times {}^{10}C_3 + {}^8C_1 \times {}^{10}C_2$

P (E) = $\frac{^{10}C_3+8\times^{10}C_2}{^{18}C_3}$

= $\frac{10}{17}$