CBSE Test Paper 02

CH-16 Probability

1. An unbiased dice is rolled four times. The probability that the minimum number on any toss is not less than 3 is

   a. $\frac{16}{81}$

   b. $\frac{1}{81}$

   c. $\frac{65}{81}$

   d. $\frac{80}{81}$

2. 8 coins are tossed at a time. The probability of getting 6 heads up is

   a. 229/ 256

   b. 37/ 256

   c. 57/ 64

   d. 7/ 64

3. Two persons A and B appear in an interview for two vacancies. If the probabilities of their selection are $\frac{1}{4}$ and $\frac{1}{6}$ respectively, then the probability that none of them is selected is

   a. $\frac{19}{12}$

   b. $\frac{5}{12}$

   c. $\frac{5}{8}$

   d. $\frac{1}{24}$

4. The probability of having at least one tail in 4 throws with a coin is

   a. 1

b. $\frac{1}{4}$

c. $\frac{1}{16}$

d. $\frac{15}{16}$

5. The probability that a teacher will give an unannounced test during any class is $\frac{1}{5}$. If a student is absent twice, then the probability that he misses at least one test is

a. $\frac{2}{5}$

b. $\frac{7}{25}$

c. $\frac{9}{25}$

d. $\frac{4}{5}$

6. Fill in the blanks:

If an event has more than one sample point it is called a ________ event.

7. Fill in the blanks:

The chances that a particular event will occur when we perform an experiment is called the ________ of occurrence of that event.

8. The probability of two events A and B are 0.21 and 0.53 respectively. The probability of their simultaneous occurrence is 0.18. Find the probability that neither A nor B occurs.

9. One die of red colour, one of white colour and one of blue colour are placed, in a bag. One die is selected at random and rolled, its colour and the number on its upper most face is noted. Describe the sample space.

10. A coin is tossed. If the outcome is a head, a die is thrown. If the die shows up an even number, the die is thrown again. What is the sample space for the experiment?

11. A coin is tossed twice. If the second throw results in a tail, a die is thrown. Describe the sample space for this experiment.

12. In class XI of a school, 40% of the students study Mathematics and 30% study Biology, 10% of the class study both Mathematics and Biology. If a student is selected at random from the class, find the probability that he will be studying Mathematics or Biology.

13. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that
(i) The student opted for NCC or NSS
(ii) The student has opted neither NCC nor NSS.
(iii) The student has opted NSS but not NCC.

14. Three coins are tossed once. Let A denotes the event three heads show, B denotes the event two heads and one tail show, C denotes the event three tails show and D denotes the event ahead shows on the first coin. Find that which are,

    i. mutually exclusive events.
    ii. simple events.
    iii. compound events.

15. A die is thrown. Find

    i. P(a prime number)
    ii. P(a number $\geq$ 3)
    iii. P(a number $\leq$ 1)
    iv. P(a number more than 6)
    v. P(a number less than 6)

Solution

1. (a) $\frac{16}{81}$

   Explanation: Probability that the outcome of a single throw of a die is any one of 4, 3, 4, 5 and 5 is equal to $\frac{4}{6} = \frac{2}{3}$ of the die is rolled four times, the required probability is equal to

2. (d) 7/ 64
   Explanation: Total ways of getting 6 heads out of 8 toss of coins is 28.

   Total number of outcome is 2^8 = 256

   Therefore probability is $\frac{28}{256} = \frac{7}{64}$

3. (c) $\frac{5}{8}$
   Explanation: Required probability $= P\left[\bar{A} \cap \bar{B}\right]$

   $= P\left[\bar{A}\right] . P\left[\bar{B}\right]$ $(\because \bar{A}$ and $\bar{B}$ are independent)

   $= [1 - P(A)].[1 - P(B)]$

   $= \left(1 - \frac{1}{4}\right) . \left(1 - \frac{1}{6}\right) = \frac{3}{4} \times \frac{5}{6}$

   $= \frac{5}{8}$

4. (d) $\frac{15}{16}$
   Explanation: Required probability = 1 - (Probability of getting no tail in 4 throws of a coin)

   $= 1 - \frac{1}{2^4} = 1 - \frac{1}{16}$

   $= \frac{15}{16}$

5. (c) $\frac{9}{25}$

Explanation: Required probability = 1 - P[student does not miss any test]

= 1 - P[teacher does not take test when the student was absent]

$= 1 - \left[1 - \frac{1}{5}\right] \times \left[1 - \frac{1}{5}\right]$

$= 1 - \frac{4}{5} \times \frac{4}{5} = 1 - \frac{16}{25}$

$= \frac{9}{25}$

6. compound

7. probability

8. Here P(A) = 0.21, P(B) = 0.53 and $P(A \cap B) = 0.18$
   Now $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
   = 0.21 + 0.53 - 0.18 = 0.56
   Now $P(\bar{A} \cap \bar{B}) = (\overline{A \cup B}) = 1 - P(A \cup B)$
   = 1 - 0.56 = 0.44

9. Let the dice of red colour, white colour and blue colour be denoted by R, W and B.
   Faces of each die are marked 1, 2, 3, 4, 5 and 6.
   ∴ When a die is selected at random and rolled, then the sample space (S) of the experiment
   is given by S= { R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, W6, B1, B2, B3, B4, B5, B6 }

10. When a coin is tossed then outcomes are H, T.
    When the coin shows T, then there is no action.
    When the coin shows H, a die is thrown then outcomes will be 1, 2, 3, 4, 5, 6.
    When the die shows 1, 3, 5, then there is no action.
    When the die shows 2, 4, 6, a die is thrown again and then outcomes are 1, 2, 3, 4, 5, 6.
    Hence the required sample space (S) is given by,
    S = {T, H1, H3, H5, H21, H22, H23, H24, H25, H26, H41, H42, H43, H44, H45, H46, H61, H62, H63, H64, H65, H66}

11. When a coin is tossed two times, then we have the following possibilities:
    HH, TT, TH and TT

Now, according to the question, when we have a tail in 2nd throw, then a dice is thrown.

So, the total number of elementary events associated with this experiment are $2+2\times 6=14$ and the sample space will be

S = {H H,T H,(H T, 1),(H T, 2),(H T, 3),(H T, 4),(H T, 5),(H T, 6), (T T, 1),(T T, 2),(T T, 3),(T T, 4),(T T, 5),(T T, 6)}

12. Let A denotes the event that the student is studying Mathematics

and B denotes the event that the student is studying Biology.

Given, P(A) = 40% = $\frac{40}{100}$, P(B)= $\frac{30}{100}$ and $P(\ A\cap B\ )=10\%=\frac{10}{100}$

Since, $P(\ A\cup B\ )=P(A)+P(B)-P(A\cap B)$

$\therefore$ Probability(A or B)

$$=P(\ A\cup B\ )=\frac{40}{100}+\frac{30}{100}-\frac{10}{100}=\frac{40+30-10}{100}=\frac{60}{100}=\frac{3}{5}.$$

Hence the probability that the selected student will be studying Mathematics or Biology is $\frac{3}{5}$.

13. Here total number of students n(S) = 60

Let A be the event that students opted for NCC and B be the event that the students opted for NSS.

Then, n(A) = 30, n(B) = 32 and $n(A\cap B)=24$

Thus $P(A)=\frac{n(A)}{n(S)}=\frac{30}{60}=\frac{1}{2}$

$P(B)=\frac{n(B)}{n(S)}=\frac{32}{60}=\frac{8}{15}$

$P(A\cap B)=\frac{n(A\cap B)}{n(S)}=\frac{24}{60}=\frac{2}{5}$

We know that $P(A\cup B)=P(A)+P(B)-P(A\cap B)$

(i) P (Student opted for NCC or NSS)

$=\frac{1}{2}+\frac{8}{15}-\frac{2}{5}=\frac{15+16-12}{30}=\frac{19}{30}$

(ii) P (Student has opted neither for NCC nor NSS)

$=P(A'\cap B')=P(A\cup B)'=1-P(A\cup B)$ [By De Morgan's law, $(A'\cap B')=(A\cup B)'$]

$=1-\frac{19}{30}=\frac{11}{30}$

(iii) Number of students who opted for NSS but not for NCC

= (number of student opted for NSS) – (number of students opted for both NCC and NSS)

= $n(B) \; - \; n(A \cap B) = 32 - 24 = 8$

∴ P (Selected student has opted for NSS but not for NCC)

= $\frac{number\ of\ student\ opted\ for\ NSS\ but\ not\ for\ NCC}{Total\ number\ of\ students}$ = $\frac{8}{60} = \frac{2}{15}$

14. When three coins are tossed, then the sample space is

S = $\{HHH, HHT, HTH, THH, HTT, THT, TTH, TTT\}$

Given, event A = Three heads show = $\{HHH\}$

event B = Two heads and one tail show = $\{HHT, HTH, THH\}$

event C = Three tails show = $\{TTT\}$

events D = A head shows on the first coin = $\{HHH, HHT, HTH, HTT\}$

i. $A \cap \; B = \{HHH\} \cap \{HHT, HTH, THH\}$= ϕ

   $A \; \cap \; C = \{HHH\} \cap \{TTT\}$ = ϕ

   $B \cap C = \{HHT, HTH, THH\} \cap \{TTT\}$ = ϕ

   $C \cap \;\; D = \{TTT\} \cap \{HHH, HHT, HTH, HTT\}$ = ϕ

   and $A \; \cap \; B \; \cap \; C$

   = $\{HHH\} \cap \{HHT, HTH, THH\} \cap \{TTT\}$ = ϕ

   So, A and B; A and C; B and C; C and D; A,B and C are mutually exclusive events.

ii. A and C are simple events, since both have only one sample point.

iii. B and D are compound event, since they have more than one sample point.

15. S= $\{1, 2, 3, 4, 5, 6\}$

$\therefore n(S) = 6$

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

   Then, $A = \{2, 3, 5\}$

   $\therefore n(A) = 3$

   Now, probability of event of getting prime number,

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

ii. Suppose event B = Getting a number $\geq$ 3. Then,

   $B = \{3, 4, 5, 6\}$

$\therefore n(B) = 4$

Now, probability of event B,

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

iii. Suppose E_1 be the event of getting a number ≤ 1. Then,

$E_1 = \{1\}$

$\therefore n(E_1) = 1$

Now, probability of event E_1,

$P(E_1) = \frac{n(E_1)}{n(S)} = \frac{1}{6}$

iv. Suppose E_2 be the event of getting a number more than 6.

Then,

$E_2 = \{\ \} = \phi$

$\Rightarrow$ E_2 is an impossible event.

$\therefore$ Probability of event getting a number more than 6,

$P(E_2) = \frac{n(E_2)}{n(S)} = \frac{0}{6} = 0$

v. Suppose E_3 be the event of getting a number less than 6. Then,

$E_3 = \{1, 2, 3, 4, 5\}$

$\therefore n(E_3) = 5$

Now, probability of event E_3,

$P(E_3) = \frac{n(E_3)}{n(S)} = \frac{5}{6}$