

Chapter : *Fifteen*

Probability



Competency Based Questions



◆ Multiple Choice Questions

1. The probability of getting exactly one head in tossing a pair of coins is

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

Ans. (d) $\frac{1}{2}$

Explanation: $S = [HH, HT, TH, TT] = 4$

$$\therefore P(\text{exactly 1 head}) = \frac{2}{4} = \frac{1}{2}$$

2. The probability of getting a spade card from a well shuffled deck of 52 cards is

(a) $\frac{1}{13}$ (b) $\frac{1}{4}$ (c) $\frac{12}{13}$ (d) $\frac{3}{4}$

Ans. (b) $\frac{1}{4}$

Explanation: Total cards = 52,

$$\text{Spade cards} = 13 \therefore P(\text{a spade card}) = \frac{13}{52} = \frac{1}{4}$$

3. The probability of getting less than 3 in a single throw of a die is

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

Ans. (a) $\frac{1}{3}$

Explanation: Here $S = 6^1 = 6$ and $E = (\text{less than 3}) = [1, 2] = 2$

$$\therefore P(\text{Less than 3}) = \frac{2}{6} = \frac{1}{3}$$

4. The total number of events of throwing 10 coins simultaneously is

(a) 1024 (b) 512 (c) 100 (d) 10

Ans. (a) 1024

Explanation: Total events = $2^{10} = 1024$

5. Which of the following can be the probability of an event?

(a) -0.4 (b) 1.004 (c) $\frac{18}{23}$ (d) $\frac{10}{7}$

Ans. (c) $\frac{18}{23}$

Explanation: Event can neither be a -ve, nor it can be >1 .

6. Three coins are tossed simultaneously. The probability of getting all heads is

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

Ans. (d) $\frac{1}{8}$

Explanation: Here $S = [HHH, HHT, HTH, THH, HTT, THT, TTH, TTT] = 8$

$$\therefore P(\text{all heads}) = \frac{1}{8}$$

7. One card is drawn from a well shuffled deck of 52 cards. The probability of getting a king of red colour is

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$ (c) $\frac{1}{4}$ (d) $\frac{1}{2}$

Ans. (a) $\frac{1}{26}$

Explanation: Total cards = 52

$\therefore$ Total events $n(S) = 52$ and A king of red colour = 2

$$\therefore P(\text{a king of red colour}) = \frac{2}{52} = \frac{1}{26}$$

8. One card is drawn from a well shuffled deck of 52 playing cards. The probability of getting a non-face card is

(a) $\frac{3}{13}$ (b) $\frac{10}{13}$ (c) $\frac{7}{13}$ (d) $\frac{4}{13}$

Ans. (b) $\frac{10}{13}$

Explanation: Total cards = 52, Total Face cards = 12

$\therefore$ Non-face cards = $52 - 12 = 40$

$$\therefore P(\text{a non-face card}) = \frac{40}{52} = \frac{10}{13}$$

9. The chance of throwing 5 with an ordinary die is

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

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

Explanation: Here $S = [1, 2, 3, 4, 5, 6]$ $\therefore n(S) = 6$
 $\therefore P(\text{throwings}) = \frac{1}{6}$

10. The letters of the word SOCIETY are placed at random in a row. The probability of getting a vowel is

- (a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c) $\frac{3}{7}$ (d) $\frac{4}{7}$

Ans. (c) $\frac{3}{7}$

Explanation: Total letters = 7; No. of vowels = O, I, E = 3
 $\therefore P(\text{a vowel}) = \frac{3}{7}$

11. Cards bearing numbers 3 to 20 are placed in a bag and mixed thoroughly. A card is taken out from the bag at random. The probability that the number on the card taken out is an even number, is

- (a) $\frac{1}{20}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$

Ans. (d) $\frac{1}{2}$

Explanation: Total cards = 18
 Cards with even no. are 4, 6, 8, 10, 12, 14, 16, 18, 20 = 9
 $\therefore P(\text{even number}) = \frac{9}{18} = \frac{1}{2}$

12. The total events to throw three dice simultaneously is

- (a) 6 (b) 18 (c) 81 (d) 216

Ans. (d) 216

Explanation: Total cards = $(6)^3 = 216$

13. The probability of getting a consonant from the word MAHIR is

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

Ans. (b) $\frac{3}{5}$

Explanation: Total characters in MAHIR = 5
 Consonants are M, H, R i.e., 3
 $\therefore P(\text{getting a consonant}) = \frac{3}{5}$

14. A girl calculates that the probability of her winning the first prize in a lottery is $\frac{8}{100}$. If 6,000 tickets are sold, how many tickets has she bought?

- (a) 400 (b) 750 (c) 480 (d) 240

Ans. (c) 480

Explanation: No. of tickets sold = $\frac{8}{100} \times 6000 = 480$

15. A card is drawn from a well shuffled deck of 52 cards. The probability of a seven of spade is

- (a) $\frac{1}{26}$ (b) $\frac{1}{52}$ (c) $\frac{3}{52}$ (d) $\frac{1}{13}$

Ans. (b) $\frac{1}{52}$

Explanation: Total cards = 52, A seven of spade = 1
 $\therefore P(\text{a seven of spade}) = \frac{1}{52}$

16. A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. The probability that a red ball drawn is

- (a) $\frac{3}{8}$ (b) $\frac{1}{2}$ (c) $\frac{5}{8}$ (d) $\frac{3}{4}$

Ans. (a) $\frac{3}{8}$

Explanation: Total balls = 3 + 5 = 8

Here, Total events = 8 $\therefore P(\text{a red ball}) = \frac{3}{8}$

17. A child has a die whose six faces show the letters as given below. The die is thrown once.

A	B	C	D	E	F
---	---	---	---	---	---

The probability of getting a 'D' is

- (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

Ans. (d) $\frac{1}{6}$

Explanation: Sample Space, $S = [A, B, C, D, E, F] = 6$
 $\therefore n(S) = 6$ $\therefore P(\text{getting D}) = \frac{1}{6}$

18. One card is drawn from a well-shuffled deck of 52 cards. The probability that the card will not be an ace is

- (a) $\frac{1}{13}$ (b) $\frac{4}{13}$ (c) $\frac{12}{13}$ (d) $\frac{3}{13}$

Ans. (c) $\frac{12}{13}$

Explanation: Total cards = 52; No. of ace cards = 4
 $\therefore$ Non-ace cards = 52 - 4 = 48
 $\therefore P(\text{not an ace}) = \frac{48}{52} = \frac{12}{13}$

19. A lot consists of 144 ball pens of which 20 are defective and the others are good. Tanu will buy a pen if it is good but will not buy if it is defective. The shopkeeper draws one pen at random and gives it to her. The probability that she will buy that pen is

- (a) $\frac{5}{36}$ (b) $\frac{20}{36}$ (c) $\frac{31}{36}$ (d) $\frac{31}{144}$

Ans. (c) $\frac{31}{36}$

Explanation: Total pens = 144; Defective pens = 20
 Now, Good ball pens = 144 - 20 = 124

$\therefore P(\text{she will buy a pen}) = P(\text{good ball pen}) = \frac{124}{144} = \frac{31}{36}$

20. A ticket is drawn at random from a bag containing tickets numbered from 1 to 40. The probability that the selected ticket has a number which is a multiple of 5 is

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

Ans. (b) $\frac{1}{5}$

Explanation: Total number = 40

No. of favourable events are 5, 10, 15, 20, 25, 30, 35, 40 = 8

$$\therefore \text{Probability (multiple of 5)} = \frac{8}{40} = \frac{1}{5}$$

◆ Assertion-Reason Questions

Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- (a) Both Assertion (A) & Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
 (b) Both Assertion (A) & Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
 (c) Assertion (A) is true but Reason (R) is false.
 (d) Assertion (A) is false but Reason (R) is true.

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

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

Ans. (a) Both A and R are true and R is the correct explanation of A.

Explanation: Given. $P(E) = 0.4$... where $[E = \text{event of winning}]$
 $\therefore P(\text{Not } E) = 1 - P(E) = 1 - 0.4 = 0.6$

2. **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.

Ans. (d) Assertion (A) is false but Reason (R) is true.

Explanation: Given. Total outcomes = 6
 and prime numbers = {2, 3, 5} = 3.

$$\therefore P(\text{Prime number}) = \frac{3}{6} = \frac{1}{2}$$

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

Reason: Probability of an impossible event is zero.

Ans. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Explanation: Both statements are correct. Event given in Assertion is an impossible event.

4. **Assertion:** Card numbered as 1, 2, 3 15 are put in a box and mixed thoroughly, one card is then drawn at random. The probability of drawing an even number is $\frac{7}{15}$.

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

Ans. (c) Assertion (A) is true but Reason (R) is false.

Explanation: For any event E, we have, $0 \leq P(E) \leq 1$.

5. **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: $P(\bar{E}) = 1 - P(E)$, where E is any event.

Ans. (d) Assertion (A) is false but Reason (R) is true.

Explanation:

$$P(\text{white marble}) = \frac{\text{Possible outcomes}}{\text{Total outcomes}} = \frac{5}{5+2+4} = \frac{5}{11}$$

$$\therefore P(\text{not white marble}) = 1 - \frac{5}{11} = \frac{11-5}{11} = \frac{6}{11}$$

◆ Case Based Questions

- I. Rohit wants to distribute chocolates in his class on his birthday. The chocolates are of three types: Milk chocolate, White chocolate and Dark chocolate. If the total number of students in the class is 54 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 Rohit has, is

- (a) 18 (b) 20 (c) 22 (d) 30

Ans. (a) 18

Explanation: Since, every student gets one chocolate. So, number of chocolates Rohit has is equal to the Number of students in the class i.e., 54

Let number of milk chocolates Rohit has = x

$$\text{Probability (milk chocolates)} = \frac{1}{3}$$

$$\Rightarrow \frac{x}{54} = \frac{1}{3} \quad \Rightarrow \quad x = \frac{54}{3} = 18$$

- (ii) If the probability of distributing dark chocolates is $\frac{4}{9}$, then the number of dark chocolates Rohit has, is

- (a) 18 (b) 25 (c) 24 (d) 36

Ans. (c) 24

Explanation: Let number of dark chocolates Rohit has = y

$$P(\text{dark chocolates}) = \frac{4}{9} \quad \Rightarrow \quad \frac{y}{54} = \frac{4}{9} = 24$$

- (iii) The probability of distributing white chocolates is

- (a) $\frac{11}{27}$ (b) $\frac{8}{21}$ (c) $\frac{1}{9}$ (d) $\frac{2}{9}$

Ans. (d) $\frac{2}{9}$

Explanation: No. of white chocolates = $54 - (18 + 24) = 12$

$$\therefore \text{Required probability} = \frac{12}{54} = \frac{2}{9}$$

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

- (a) $\frac{3}{17}$ (b) $\frac{5}{9}$ (c) $\frac{1}{3}$ (d) $\frac{1}{27}$

Ans. (b) $\frac{5}{9}$

Explanation: Total no. of milk & white choc. = $18 + 12 = 30$

$$\therefore \text{Required probability} = \frac{30}{54} = \frac{5}{9}$$

(v) The probability of distributing all the chocolates is

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

Ans. (b) 1

Explanation: Since every student gets one chocolate each.

$\therefore$ Required probability = $\frac{54}{54} = 1$

II. In a party, some children decided to play a game of musical chairs. In the game the person playing the music has been advised to stop the music at any time in the interval of 3 minutes after he starts



the music in each turn. On the basis of the given information, answer the following questions.

(i) What is the probability that the music will stop within first 30 seconds after starting?

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

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

Explanation: Total time = 3 mins = 3×60 secs = 180 secs

$\therefore$ Required probability = $\frac{30}{180} = \frac{1}{6}$

(ii) The probability that the music will stop within 45 seconds after starting is

- (a) $\frac{1}{4}$ (b) $\frac{1}{5}$ (c) $\frac{1}{6}$ (d) $\frac{1}{8}$

Ans. (a) $\frac{1}{4}$

Explanation: Required probability = $\frac{45}{180} = \frac{1}{4}$

(iii) The probability that the music will stop after 2 minutes after starting is

- (a) $\frac{1}{8}$ (b) $\frac{1}{5}$ (c) $\frac{1}{4}$ (d) $\frac{1}{3}$

Ans. (d) $\frac{1}{3}$

Explanation: Required probability = $\frac{120}{180} = \frac{2}{3}$

$\therefore$ P(music will stop after 2 minutes) = $1 - \frac{2}{3} = \frac{1}{3}$

(iv) The probability that the music will not stop within first 60 seconds after starting is

- (a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) $\frac{4}{5}$ (d) $\frac{8}{9}$

Ans. (b) $\frac{2}{3}$

Explanation: Required Probability = $1 - \frac{60}{180} = 1 - \frac{1}{3} = \frac{2}{3}$

(v) The probability that the music will stop within first 82 seconds after starting is

- (a) $\frac{11}{30}$ (b) $\frac{41}{90}$ (c) $\frac{31}{45}$ (d) $\frac{82}{90}$

Ans. (b) $\frac{41}{90}$

Explanation: Required probability = $\frac{82}{180} = \frac{41}{90}$

III. Three persons toss 3 coins simultaneously and note the outcomes. Then, they ask few questions to one another. Help them in finding the answer of the following questions:



(i) The probability of getting at most one tail is

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

Ans. (c) $\frac{1}{2}$

Explanation: Total number of events = {HHH, HHT, HTT, TTH, THH, HTH, THT, TTT} = 8

Let A be the event of getting at most one tail,

$\therefore A = \{HHH, HHT, HTH, THH\}$

$\Rightarrow n(A) = 4$ $\therefore$ Required probability = $\frac{4}{8} = \frac{1}{2}$

(ii) The probability of getting exactly 1 head is

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

Ans. (d) $\frac{3}{8}$

Explanation: Let B be the event of getting exactly 1 head.

$\therefore B = \{HTT, THT, TTH\}$

$\Rightarrow n(B) = 3$ $\therefore$ Required probability = $\frac{3}{8}$

(iii) The probability of getting exactly 3 tails is

- (a) 0 (b) 1 (c) $\frac{1}{4}$ (d) $\frac{1}{8}$

Ans. (d) $\frac{1}{8}$

Explanation: C = exactly 3 tails = {TTT} $\Rightarrow n(C) = 1$

$\therefore$ Required Probability = $\frac{1}{8}$

(iv) The probability of getting at most 3 heads is

- (a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $\frac{1}{8}$

Ans. (b) 1

Explanation: D = (at most 3 heads) = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT} i.e., 8

$\therefore$ Required Probability = $\frac{8}{8} = 1$

(v) The probability of getting at least two heads is

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

Ans. (c) $\frac{1}{2}$

Explanation: E = {HHT, HTH, THH, HHH} i.e., 4

$\therefore$ Required probability = $\frac{n(E)}{n(S)} = \frac{4}{8} = \frac{1}{2}$