Probability

Assertion & Reason Type Questions

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option:

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

b. Both Assertion (A) and 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

Q 1. Assertion (A): When two coins are tossed together then the probability of getting no tail is $\frac{1}{4}$.

Reason (R): The probability of getting a head (*i.e.*, no tail) in one toss of a coin is $\frac{1}{2}$.

Answer : (b) **Assertion (A):** Total possible outcomes=2x2=4 Number of favourable outcomes of getting no tail = 1 (ie., (H,H)}

$$\therefore \quad \text{Required probability} = \frac{1}{4}$$

So, Assertion (A) is true.

Reason (R): Total possible outcomes = 2

Number of favourable outcomes = 1 (ie., H}

$$\therefore \quad \text{Required probability} = \frac{1}{2}$$

So, Reason (R) is true.

Hence, both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Q 2. Assertion (A): The probability that a leap year has 53 Sundays is $\frac{2}{7}$.

Reason (R): The probability that a non-leap year has 53 Sundays is $\frac{5}{7}$.

Answer : (c) **Assertion (A):** Number of days in a leap year = 366
Number of complete weeks = 52
Number of days left = 2
:- Probability of these days being Sunday
$= \text{Probability of 53 Sundays} = \frac{2}{7}$
So, Assertion (A) is true.
Reason (R): Number of days in a non-leap year = 365
Number of complete weeks = 52
Number of days left = 1
Probability of this day being a Sunday = Probability
of 53 Sundays $= \frac{1}{7}$
So, Reason (R) is false.
Hence, Assertion (A) is true but Reason (R) is false.

Q 3. Assertion (A): Two players Sania and Deepika play a tennis match. If the probability of Sania winning the match is 0.68, then the probability of Deepika winning the match is 0.32.
Reason (R): The sum of the probability of two complementary events is 1.

Answer : (a) **Assertion (A):** Let E be the event 'Sania win the match'.
So, probability of Sania winning the match = P(E)
= 0.68
:- P(E)+P(E)=1
:- Probability of Deepika winning the match
:- P(E)=1-0.68-0.32
So, Assertion (A) is true.
Reason (R): It is true to say that sum of probability of two complementary events is 1.
Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q 4. Assertion (A): Cards numbered 5 to 102 are placed in a box. If a card is selected at random from the box, then the probability that the card selected has

a number which is a perfect square, is $\frac{4}{49}$.

Reason (R): Probability of an event E is a number P(E) such that $0 \leq P(E) \leq 1$.

Answer : (a) **Assertion (A):** Total number of cards = 102-5+1
=98
So, total number of possible outcomes = 98
Let E be the event of selecting a card with square number.
So, favourable outcomes to E are
{9, 16, 25, 36, 49, 64, 81, 100) i.e., 8

$$\therefore \qquad P(E) = \frac{8}{98} = \frac{4}{49}$$

So, Assertion (A) is true.
Reason (R): It is a true statement.
Hence, both Assertion (A) and Reason (R) are
true and Reason (R) is the correct explanation of
Assertion (A).

Q 5. Assertion (A): The probability of getting a prime
Reason (R): On the faces of a die, prime numbers are 2, 3, 5.

Answer : So, Assertion (A) is true.
Reason (R): It is a true statement.
Hence, both Assertion (A) and Reason (R) are
true and Reason (R) is the correct explanation of
Assertion (A).

So, probability of getting a prime number $= \frac{3}{6} = \frac{1}{2}$

:- Assertion (A) is false.
Reason (R): It is a true statement.
Hence, Assertion (A) is false but Reason (R) is true.

Q 6. Assertion (A): Three unbiased coins are tossed together, then the probability of getting exactly

1 head is $\frac{3}{8}$.

Reason (R): Favourable number of outcomes do not lie in the sample space of total number of outcomes.

Answer : (c) **Assertion (A):** Total possible outcomes are
{HHH, HHT, HTH, THH, TTH, THT, HTT, TTT) i.e., 8
Let E be the event of getting exactly 1 head.
;- Outcomes favourable to E are {TTH, THT, HTT}
i.e., 3

$$P(E) = \frac{3}{8}$$

So, Assertion (A) is true.
Reason (R): Favourable outcomes always lies in the sample space of total number of outcomes. So, Reason (R) is false.
Hence, Assertion (A) is true but Reason (R) is false.

Q 7. Assertion (A): In a game, the entry fee is Rs 10. The game consists of tossing of 3 coins. If one or two heads show, Amita won the game and gets entry fee. The probability, of she gets the entry fee is $\frac{3}{4}$.

Reason (R): When three coins are tossed together, all the outcomes are {HHH, HHT, HTH, THH, HTT, THT,TTH and TTT}.

Answer : (a) **Assertion (A):** In case of tossing three coins, total number of possible outcomes = 8
Favourable outcomes one or two heads
{HHT, HTH, THH, HTT, THT, TTH) i.e., 6.

$$\therefore \text{Required probability } = \frac{6}{8} = \frac{3}{4}$$

So, Assertion (A) is true.

Reason (R): It is a true statement Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q.8. Assertion (A) : 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 (R) : $P(\overline{E}) = 1 - P(E)$, where E is any event.

Answer : (d) Assertion is not correct, but reason is correct.

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

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

Q.9. Let A and B be two independent events.

Assertion (A) : If P (A) = 0.3 and $P(A \cup \overline{B}) = 0.8$, then $P(B)$ is $\frac{2}{7}$.

Reason (R) : $P(\overline{E}) = 1 - P(E)$, where E is any event.

Answer : (a) $\frac{2}{7}$

Q.10. Assertion (A) : If P(A) = 0.25, P(B) = 0.50 and $P(A \cap B) = 0.14$, then the probability that neither A nor B occurs is 0.39.

Reason (R) : $\overline{A \cup B} = \overline{A} \cup \overline{B}$.

Answer : (c)

Q.11. Assertion (A) : When two coins are tossed simultaneously then the probability of getting no tail is $\frac{1}{4}$.

Reason (R) : The probability of getting a head (i.e., no tail) in one toss of a coin is $\frac{1}{2}$.

Answer : (a) Probability of getting no tail when two coins tossed simultaneously i.e., both are head.

$$\text{Probability of both head} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

Q.12. Assertion (A) : An event is very unlikely to happen. Its probability is 0.0001

Reason (R) : If P (A) denote the probability of an event A, then 0 ≤ P (A) ≤ 1.

Answer : (b) Assertion and Reason is correct but Reason is not correct explanation for Assertion.

Q.13. Assertion (A) : If the probability of an event is P then probability of its complementary event will be 1 - P.

Reason (R) : When E and $\overline{E}$ are complementary events, then

$P(E) + P(\overline{E}) = 1.$

Answer : (a) Both statements are correct and Reason is the correct for Assertion.

Q.14. Assertion (A) : If a die is thrown, the probability of getting a number less than 3 and greater than 2 is zero.

Reason (R) : Probability of an impossible event is zero.

Answer : (a) Both statements are correct. Event given in Assertion is an impossible event.

Q.15. Assertion (A) : In a simultaneously throw of a pair of dice. The probability of getting a double is $\frac{1}{6}$

Reason (R) : Probability of an event may be negative.

Answer : (c) When two dice are tossed. Total possible outcomes = 36

$$n(S) = 36$$

and total favourable outcomes (doublet)

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

$$n(E) = 6$$

Probability $= \frac{6}{36} = \frac{1}{6}$ and,

we know that $0 \leq P(E) \leq 1.$

Q.16. Assertion (A) : If A and B are two independent events and it is given that

$P(A) = \frac{2}{5}$, $P(B) = \frac{3}{5}$, then $P(A \cap B) = \frac{6}{25}$.

Reason (R) : $P(A \cap B) = P(A) \cdot P(B)$, where A and B are two independent events.

Answer : (a) Both assertion and reason are correct. Also, reason is the correct explanation of the assertion.

$$P(A \cap B) = \left(\frac{2}{5}\right)\left(\frac{3}{5}\right) = \frac{6}{25}$$

Q.17. Assertion (A) : The probability of winning a game is 0.4, then the probability of losing it, is 0.6

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

Answer : (a)

We have, $P(E) = 0.4,$

where $E=$ event of winning

$$P(\text{Not } E) = 1 - P(E) = 1 - 0.4 = 0.6$$

Q.18. Assertion (A) : in rolling a dice, the probability of getting number 8 is zero

Reason (R) : Its an impossible event.

Answer : (a) Assertion and Reason both are correct. Also Reason is the correct explanation of the Assertion.

Q.19. Assertion (A) : 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 $\frac{1}{2}$

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

Answer : (d) Total possible outcomes $= 15$

$$n(S) = 15$$

Total favourable numbers are 2, 4, 6, 8, 10, 12, 14.

$$E = \{2, 4, 6, 8, 10, 12, 14\}$$

$$n(E) = 7$$

Probability of drawing an even number $= \frac{7}{15}$

Q.20. Assertion (A) : If E and F are events such that $P(E)=\frac{1}{4}$, $P(F) = \frac{1}{2}$ and P (E and F) $=\frac{1}{8}$, then P (E or F) is $\frac{5}{8}$.

Reason (R) : If A and B are independent, then $P(A \cap B) = P(A)$.

Answer : (c) $P(E \text{ or } F) = P(E \cup F)$

$$= P(E) + P(F) - P(E \cap F)$$

$$= \frac{1}{4} + \frac{1}{2} - \frac{1}{8} = \frac{5}{8}$$

Q.21. Assertion (A) : The probability of getting a prime number. When a die is thrown once is $\frac{2}{3}$

Reason (R) : Prime numbers on a die are 2, 3, 5.

Answer : (d) When a die is thrown once, total possible outcomes = 6 and prime numbers in it are {2,3,5}
Total possible outcomes = 3

Probability of getting a prime $= \frac{3}{6} = \frac{1}{2}$

Q.22. Assertion (A) : The probabilities that A B, ,C can solve a problem independently are $\frac{1}{3}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. The probability that only two of them are able to solve the problem is $\frac{7}{36}$.

Reason (R) : If A and B are mutually exclusive events, then $P(A \cap B) \neq 0$.

Answer : (c)

1. A and B solve the problem and C does not solve the problem
2. B and C solve the problem and A does not solve the problem and
3. C and A solve the problem and B does not solve the problem.

The required probability

$$= \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{3}{4} + \frac{1}{3} \cdot \frac{1}{4} \cdot \frac{2}{3} + \frac{1}{3} \cdot \frac{1}{4} \cdot \frac{2}{3}$$

$$= \frac{3}{36} + \frac{2}{36} + \frac{2}{36} = \frac{7}{36}$$