Chapter - 15

Probability

(Assertion and Reasoning Questions)

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) 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) : 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.

Q.2. 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.

Q.3. 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) : $\overline{A \cup B} = \overline{A} \cup \overline{B}$.

Q.4. 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 $\frac{1}{2}$.

Q.5. 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.

Q.6. 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 $P(E) + P(\overline{E}) = 1.$

Q.7. 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.

Q.8. 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.

Q.9. 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.

Q.10. Assertion (A) : The probability of winning a game is 0.4, then the probability of losing it, is 0.6

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

Q.11. Assertion (A) : in rolling a dice, the probability of getting number 8 is zero

Reason (R) : Its an impossible event.

Q.12. 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 $0 \leq P(E) \leq 1$

Q.13. 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 $P(A \cap B) = P(A)$.

Q.14. 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.

Q.15. 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 $P(A \cap B) \neq 0$.

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ANSWER KEY

Q.1 : (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.2 : (a) $\frac{2}{7}$

Q.3 : (c)

Q.4 : (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.5 : (b)
Assertion and Reason is correct but Reason is not correct explanation for Assertion.

Q.6 : (a)
Both statements are correct and Reason is the correct for Assertion.

Q.7 : (a)
Both statements are correct. Event given in Assertion is an impossible event.

Q.8 : (c)
When two dice are tossed. Total possible outcomes = 36

$$n(S) = 36$$

$$\text{and total favourable outcomes (doublet)} = \{(1,1),(2,2),(3,3),(4,4),(5,5),(6,6)\}$$

$$n(E) = 6$$

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

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

Q.9 : (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.10 : (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.11 : (a)

Assertion and Reason both are correct. Also Reason is the correct explanation of the Assertion.

Q.12 : (d)

$$\text{Total possible outcomes} = 15$$

$$n(S) = 15$$

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

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

$$n(E) = 7$$

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

Q.13 : (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.14 : (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.15 : (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

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

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