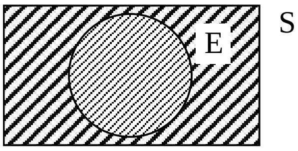
Some questions (Assertion–Reason type) are given below. Each question contains **Statement – 1 (Assertion)** and **Statement – 2 (Reason)**. Each question has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. So select the correct choice :

Choices are :

(A) **Statement – 1** is True, **Statement – 2** is True; **Statement – 2 is** a correct explanation for **Statement – 1**.
(B) **Statement – 1** is True, **Statement – 2** is True; **Statement – 2 is NOT** a correct explanation for **Statement – 1**.
(C) **Statement – 1** is True, **Statement – 2** is False.
(D) Statement – 1 is False, Statement – 2 is True.

PROBABILITY

429. $P(E) = \dfrac{n(E)}{n(S)} = \dfrac{m}{n}$ or $\dfrac{\text{Area of (E)}}{\text{Area of (S)}}$ **[Good]**



Statement-1: Always the probability of an event is a rational number and less than or equal to one
Statement-2: The equation P(E) = |sinθ| is always consistent.

430. Let A and B be two event such that $P(A \cup B) \geq 3/4$ and $1/8 \leq P(A \cap B) \leq 3/8$
Statement–1 : $P(A) + P(B) \geq 7/8$
Statement–2 : $P(A) + P(B) \leq 11/8$

431. **Statement–1 :** The probability of drawing either a ace or a king from a pack of card in a single draw is $\dfrac{2}{13}$.
Statement–2 : For two events E_1 and E_2 which are not mutually exclusive, probability is given by $P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$.

432. Let A and B be two independent events.
Statement–1 : If P(A) = 0.3 and $P(A \cup \bar{B}) = 0.8$ then P(B) is $\dfrac{2}{7}$.
Statement–2 : $P(\bar{E}) = 1 - P(E)$ where E is any event.

433. Let A and B be two independent events of a random experiment.
Statement–1 : $P(A \cap B) = P(A).\ P(B)$
Statement–2 : Probability of occurrence of A is independent of occurrence or non–occurrence of B.

434. A fair die is rolled once.
Statement–1 : The probability of getting a composite number is $\dfrac{1}{3}$
Statement–2 : There are three possibilities for the obtained number (i) the number is a prime number (ii) the number is a composite number (iii) the number is 1, and hence probability of getting a prime number = $\dfrac{1}{3}$

435. Let A and B are two events such that P(A) = $\dfrac{3}{5}$ and P(B) = $\dfrac{2}{3}$, then
Statement–1 : $\dfrac{4}{15} \leq P(A \cap B) \leq \dfrac{3}{5}$.
Statement–2 : $\dfrac{2}{5} \leq P\left(\dfrac{A}{B}\right) \leq \dfrac{9}{10}$.

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436. **Statement–1 :** Three of the six vertices of a regular hexagon are chosen at random. The probability that the triangle with three vertices equilateral equals to $\frac{3}{10}$.

Statement–2 : A die is rolled three times. The probability of getting a large number than the previous number is $\frac{5}{64}$.

437. **Statement-1:** A coin is tossed thrice. The probability that exactly two heads appear, is 3/8
Statement-2: Probability of success r times out of total n trials = P(r) = ^nC_r = $^nC_r\, p^r\, q^{n-r}$ where p be the probability of success and q be the probability of failure.

438. **Statement-1 :** For any two events A and B in a sample space $P(A/B) \geq \frac{P(A)+P(B)}{P(B)}$, $P(B) \neq 0$ is always true

Statement-2 : For any two events A and B $0 < P(A \cup B) \leq 1$.

439. **Statement-1:** The letters of the English alphabet are written in random order. The probability that letters x & y are adjacent is $\frac{1}{13}$.

Statement-2: The probability that four lands deals at random from 94 ordinary deck of 52 cends will contain from an ordinary deck of 52 cends will contain from each suit is 1/4.

440. **Statement-1:** The probability of being at least one white ball selected from two balls drawn simultaneously from the bag containing 7 black & 4 white balls is 34/35.
Statement-2: Sample space = $^{11}C_2$ = 55, Number of fav. Cases = $^4C_1 \times {}^7C_1 + {}^4C_2 \times {}^7C_0$

441. **Statement-1:** If A, B, C be three mutually independent events then A and B∪C are also independent events.
Statement-2: Two events A and B are independent if and only if $P(A\cap B) = P(A)\,P(B)$.

442. **Statement-1:** If A and B be two events such that P(A) = 0.3 and $P(A\cup B) = 0.8$ also A and B are independent events P(B) is 0.5.
Statement-2: IF A & B are two independent events then $P(A\cap B) = P(A).P(B)$.

443. **Statement-1:** The probability of occurence of a doublet when two identical dies are thrown is 2/7.
Statement-2: When two identical dies are thrown then the total number of cases are 21 in place of 36 (when two distinct dies are thrown) because the cases like (5, 6). (6, 5) are considered to be same.

444. **Statement-1:** A = {2, 4, 6} , B = {1, 2, 3, } where A & B are the number occuring on a dice, then P(A) + P(B) = 1
Statement-2: If $A_1, A_2, A_3 \ldots A_n$ are all mutually exclusive events, then $P(A_1) + P(A_2) + \ldots + P(A_n) = 1$.

445. **Statement-1:** If $P(A/B) \geq P(A)$ then $P(B/A) \geq P(B)$

Statement-2:: $P(A/B) = \frac{P(A\cap B)}{P(B)}$

446. **Statement-1:** Balls are drawn one by one without replacement from a bag containing a white and b black balls, then probability that white balls will be first to exhaust is a/a+b.
Statement-2: Balls are drawn one by one without replacement from a bag containing a white and b black balls then probability that third drawn ball is white is a/a+b.

447. **Statement-1:** Out of 5 tickets consecutively numbers, three are drawn at random, the chance that the numbers on them are in A.P. is 2/15.
Statement-2: Out of (2n + 1) tickets consectively numbered, three are drawn at random, the chance that the numbers on them are in A.P. is $\frac{3n}{4n^2-1}$.

448. **Statement-1:** If the odds against an event is 2/3 then the probability of occurring of an event is 3/5.
Statement-2: For two events A and B $P(A' \cap B') = -1\, P(A \cup B)$

449. **Statement-1:** A, B, C are events such that P(A) = 0.3, P(B) = 0.4 P(C) = 0.8, $P(A\cap B) = 0.08$, $P(A\cap C) = 0.28$, $P(A\cap B\cap C) = 0.09$ then $P(B\cap C) \in (0.23, 0.48)$.
Statement-2: $0.75 \leq P(A \cup B \cup C) \leq 1$.

450. **Statement-1:** 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.

Statement-2: $(\overline{A \cup B}) = \bar{A} \cup \bar{B}$

451. **Statement-1:** For events A and B of sample space if $P\left(\frac{A}{B}\right) \ge P(A)$ then $P\left(\frac{B}{A}\right) \ge P(B)$.

Statement-2: $P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)} \left(P(B) \ne 0\right)$

ANSWER

429. D	**430. D**	**431. B**	**432. A**	**433. A**	**434. C**	
435. A	**436. D**	**437. A**	**438. D**	**439. C**	**440. A**	**441. A**
442. D	**443. D**	**444. C**	**445. A**	**446. D**	**447. D**	**448. B**
449. A	**450. C**	**451. A**				

Details Solution

430. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
$\therefore 1 \ge P(A) + P(B) - P(A \cap B) \ge 3/4$
$\Rightarrow P(A) + P(B) - 1/8 \ge 1/8 \ge 3/4$ (since min. value of $P(A \cap B) = 1/8$)
$\Rightarrow P(A) + P(B) \le 1/8 + 3/4 = 7/8$
As the max. value of $P(A \cap B) = 3/8$, we get
$1 \ge P(A) + P(B) - 3/8$
$\Rightarrow P(A) = P(B) \le 1 + 3/8 = 11/8.$ Ans. D

431. (b) Clearly both are correct but statement – II is not the correct explanation for statement – I.

432. (A) $P\left(A \cup \bar{B}\right) = 1 - \left(\overline{A \cup \bar{B}}\right) = 1 - \left(\bar{A} \cap B\right) = 1 - P\left(\bar{A}\right)P\left(B\right)$

$0.8 = 1 - 0.7 \times P(B)$ $\Rightarrow P(B) = \frac{2}{7}$.

433. Statement –II is true as this is the definition of the independent events.

Statement – I is also true, as if events are independent, then $P\left(\frac{A}{B}\right) = P(A)$

$\Rightarrow \frac{P(A \cap B)}{P(B)} = P(A) \Rightarrow P(A \cap B) = P(A).\ P(B).$

Obviously statement – II is a correct reasoning of statement – I
Hence (a) is the correct answer.

434. Statement – I is true as there are six equally likely possibilities of which only two are favourable (4 and 6). Hence P(obtained number is composite) = $\frac{2}{6} = \frac{1}{3}$.
Statement – II is not true, as the three possibilities are not equally likely.
Hence (c) is the correct answer.

435. $\because P\left(A \cap B\right) = P\left(A\right) + P\left(B\right) - P\left(A \cup B\right) \ge P(A) + P(B) - 1$

$\therefore P(A \cap B) \ge \frac{3}{5} + \frac{2}{3} - 1 \Rightarrow P(A \cap B) \ge \frac{4}{15}$ . . . (i)

$\because P(A \cap B) \le P(A) \Rightarrow P(A \cap B) \le \frac{3}{5}$ . . . (ii)

from (i) and (ii), $\frac{4}{15} \le P\left(A \cap B\right) \le \frac{3}{5}$ . . .(iii)

from (iii), $\frac{4}{15P(B)} \le \frac{P(A \cap B)}{P(B)} \le \frac{3}{5P(B)} \Rightarrow \frac{2}{5} \le P\left(\frac{A}{B}\right) \le \frac{9}{10}$

Hence (a) is the correct answer.

436. For statement I, $n(S) = {}^6c_3 = 20$
only two triangle formed are equilateral, they are $\Delta A_1A_3A_5$ and $\Delta A_2A_4A_6$. $\therefore n(E) = 2$

$\Rightarrow P(E) = \dfrac{n(E)}{n(S)} = \dfrac{2}{20} = \dfrac{1}{10}$.

For statement – II n(S) = 216

No. of favorable ways = $\sum_{i=1}^{6}(i-1)(6-i) = 20$

$\therefore$ Required probability = $\dfrac{20}{216} = \dfrac{5}{64}$.

Hence (d) is the correct answer.

440. $\therefore$ Reqd. probability = 35/55.
Option (A) is correct.

441. $P\{A\cap(B\cap C)\} = P(A\cap B\cap C) = P(A)\,P(B)\,P(C)$
$\therefore P[A\cup(B\cup C)] = P[(A\cap B)\cup(A\cap C)]$
$= P[(A\cap B) + (A\cap C) - P[(A\cap B)\cap(A\cap C)]$
$= p(A\cap B) + P(A\cap C) - P(A\cap B\cap C)$
$= P(A)\,P(B) + P(A)\,P(C) - P(A)\,P(B)\,P(C)$
$= P(A)\,[P(B) + P(C) - P(B)\,P(C)]$
$= P(A).P(B\cup C)$
$\therefore$ A & $B\cup C$ are independent events Ans. (A)

442. $P(A\cup B) = P(A) + P(B) - P(A\cap B)$
$P(A\cup B) = P(A) + P(B) - P(A) \times P(B)$
$0.8 = 0.3 + P(B) - 0.3 \times P(B)$
$P(B) = 5/7$ 'd' is correct.

445. (A) The statement-1 A is true and follows from statement-2
indeed $P(A/B) = \dfrac{P(A\cap B)}{P(B)} \le P(A)$
$\Rightarrow \dfrac{P(A\cap B)}{P(A)} \le P(B)$
$\Rightarrow P(B/A) \le P(B)$

446. Statement-1 is false. Since if the colour white is first to exhaust then last ball must be black.
$\Rightarrow$ favourable sample points
$((a + b - 1)!)b$
req. probability = $\dfrac{b(a+b-1)!}{a+b!} = \dfrac{b}{a+b}$

447. (D) $2n+1 = 5, n = 2$
$P(E) = \dfrac{3n}{4n^2-1} = \dfrac{6}{15} = \dfrac{2}{5}$
For a, b, c are in A. P. $a + c = 2b \Rightarrow a + c$ is even
$\therefore$ a and c are both even or both odd.
So, number of ways of choosing a and c is ${}^{n}C_2 + {}^{n+1}C_2 = n^2$ ways.
$P(E) = \dfrac{n^2}{{}^{2n+1}C_3} = \dfrac{3n}{4n^2-1}$

448. (B) Both A and R are correct but R is not the correct explanation of A.

449. (A) $\because P(A\cup B\cup C) = P(A) + P(B) + P(C) - P(A\cap B) - P(B\cap C) - P(A\cap C) + P(A\cap B\cap C)$
using all the given values we get that $P(B\cap C) \in (0.23, 0.48)$.

450. (C) Required probability is $P(\bar{A}\cap\bar{B})$
$= 1 - P(A\cup B) = 1 - [P(A) + P(B) - P(A\cap B)]$
$= 0.39$