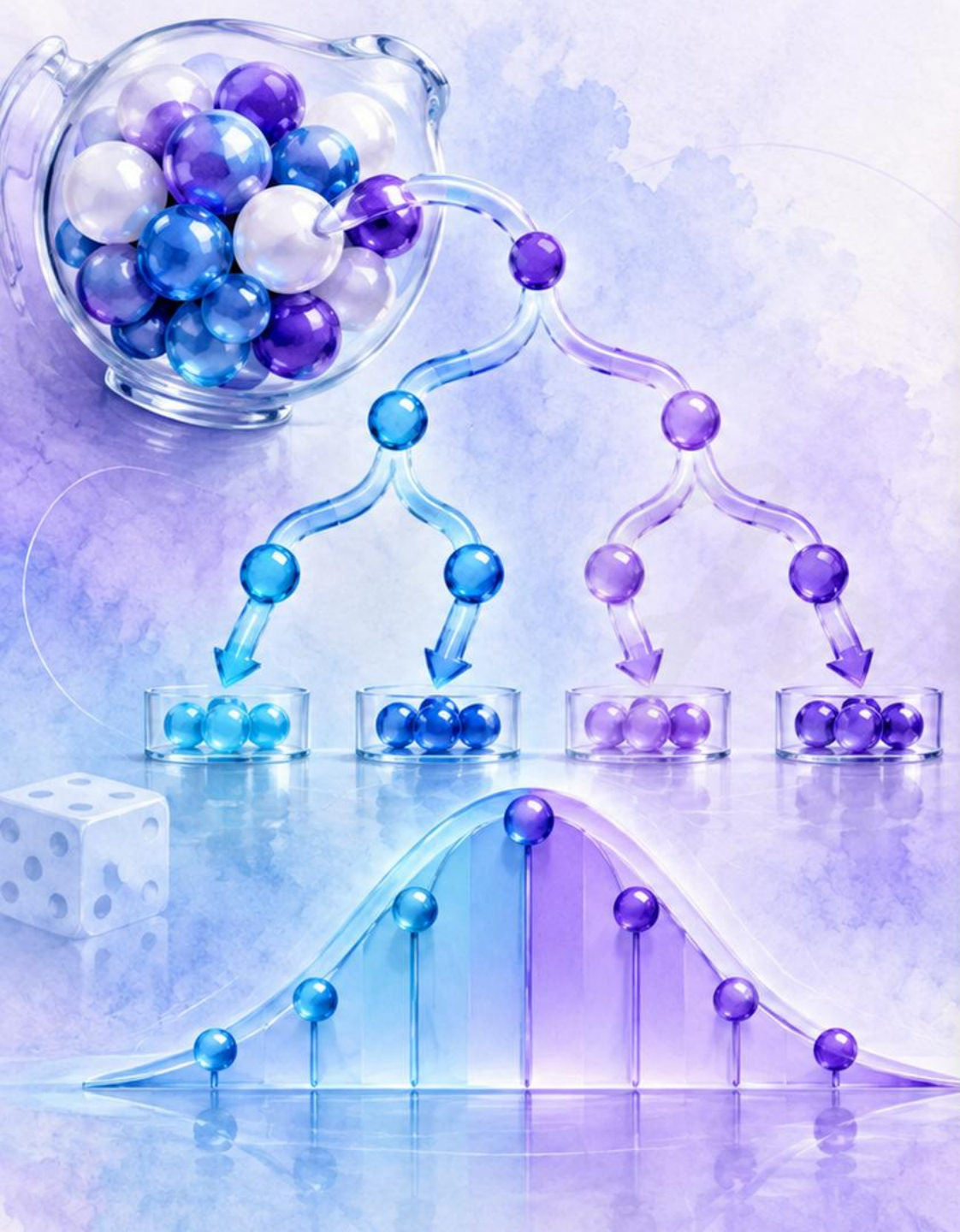




MATHEMATICS • CLASS 12

13

CHAPTER

Probability

NCERT SOLUTIONS

PROBABILITY — EXERCISE 13.1 Q1

Q. Given that E and F are events such that $P(E) = 0.6$, $P(F) = 0.3$ and $P(E \cap F) = 0.2$, find $P(E|F)$ and $P(F|E)$.

Answer:

For any two events A and B with $P(B) > 0$, the conditional probability is given by

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

To find $P(E|F)$:

Here $P(F) = 0.3 > 0$, so we can use the formula

$$P(E | F) = \frac{P(E \cap F)}{P(F)}.$$

Substituting the given values,

$$P(E | F) = \frac{0.2}{0.3} = \frac{2}{3}.$$

To find $P(F|E)$:

Here $P(E) = 0.6 > 0$, so we can use the formula

$$P(F | E) = \frac{P(E \cap F)}{P(E)}.$$

Substituting the given values,

$$P(F | E) = \frac{0.2}{0.6} = \frac{1}{3}.$$

Hence, $P(E | F) = \frac{2}{3}$ and $P(F | E) = \frac{1}{3}$.

PROBABILITY – EXERCISE 13.1 Q2

Q. Compute $P(A|B)$, given $P(B) = 0.5$ and $P(A \cap B) = 0.32$.

Answer:

Conditional probability of an event A given an event B (with $P(B) > 0$) is defined by

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

This formula applies here because $P(B) = 0.5 > 0$, so the conditional probability is well defined.

Substitute the given values:

$$P(A|B) = \frac{0.32}{0.5}.$$

Simplify the value:

$$\begin{aligned} P(A|B) &= \frac{0.32}{0.5} \\ &= \frac{32}{100} \div \frac{1}{2} \\ &= \frac{32}{100} \times \frac{2}{1} \\ &= \frac{64}{100} \\ &= \frac{16}{25} \\ &= 0.64. \end{aligned}$$

Hence, $P(A|B) = \frac{0.32}{0.5} = 0.64 = \frac{16}{25}.$

PROBABILITY – EXERCISE 13.1 Q3

Q. If $P(A) = 0.8$, $P(B) = 0.5$ and $P(B | A) = 0.4$, find

(i) $P(A \cap B)$

(ii) $P(A | B)$

(iii) $P(A \cup B)$

Answer:

(i) $P(A \cap B)$

Using the definition of conditional probability, for $P(A) > 0$,

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

Hence,

$$P(A \cap B) = P(B | A) \times P(A).$$

Substituting the given values,

$$\begin{aligned} P(A \cap B) &= 0.4 \times 0.8 \\ &= 0.32. \end{aligned}$$

Hence, $P(A \cap B) = 0.32$.

(ii) $P(A | B)$

Using the definition of conditional probability, for $P(B) > 0$,

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

From part (i), $P(A \cap B) = 0.32$ and given $P(B) = 0.5$. Therefore,

$$\begin{aligned} P(A | B) &= \frac{0.32}{0.5} \\ &= 0.64. \end{aligned}$$

Hence, $P(A | B) = 0.64$.

(iii) $P(A \cup B)$

Using the addition rule for two events,

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

Substituting the given values

$P(A) = 0.8$, $P(B) = 0.5$ and from part (i) $P(A \cap B) = 0.32$,

$$\begin{aligned} P(A \cup B) &= 0.8 + 0.5 - 0.32 \\ &= 1.3 - 0.32 \\ &= 0.98. \end{aligned}$$

Hence, $P(A \cup B) = 0.98$.

PROBABILITY – EXERCISE 13.1 Q4

Q. Evaluate $P(A \cup B)$, if $2P(A) = P(B) = \frac{5}{13}$ and $P(A|B) = \frac{2}{5}$.

Answer:

We are given $2P(A) = P(B) = \frac{5}{13}$. Hence,

$$P(B) = \frac{5}{13} \text{ and } 2P(A) = \frac{5}{13} \Rightarrow P(A) = \frac{5}{26}.$$

Also, we are given $P(A|B) = \frac{2}{5}$. By the definition of conditional probability (with $P(B) > 0$),

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \Rightarrow P(A \cap B) = P(A|B) P(B) = \frac{2}{5} \times \frac{5}{13} = \frac{2}{13}.$$

Now, using the addition formula for two events,

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

Substituting the known values,

$$P(A \cup B) = \frac{5}{26} + \frac{5}{13} - \frac{2}{13} = \frac{5}{26} + \frac{10}{26} - \frac{4}{26} = \frac{11}{26}.$$

Hence, $P(A \cup B) = \frac{11}{26}.$

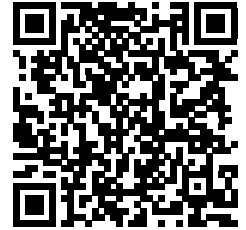


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