Examples

Ex(1) A card is drawn from a well shuffled pack of playing cards. Find the probability that it is either a diamond or a king.

Solution: Let A denote the event of drawing a diamond.
B denote the event of drawing a king.

$P(A) = \frac{13}{52} = \frac{1}{4}$ $\quad$ $P(B) = \frac{4}{52} = \frac{1}{13}$

Probability of drawing either king or diamond

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= \frac{1}{4} + \frac{1}{13} - P(A \cap B)$$

There is only one case favourable to the event $A \cap B$ (king of diamond). Hence, $P(A \cap B) = \frac{1}{52}$

$$\Rightarrow P(A \cup B) = \frac{1}{4} + \frac{1}{13} - \frac{1}{52}$$
$$= \frac{13+4-1}{52}$$
$$= \frac{16}{52}$$
$$= \frac{4}{13}$$

Ex(2) A pair of dice is rolled. If the sum on the two dice is 9, Find the probability that one of the dice is showed 3.

Solution:

Let A = The sum on two dice is 9
B = One dice shows 3

In a random toss of two dice.
$S = \{1, 2, \ldots 6\} \times \{1, 2, \ldots 6\}$
$n(S) = 6 \times 6 = 36.$

Event	Favourable cases	Probability
A	(3,6)(6,3) (4,5)(5,4)	$P(A) = \frac{4}{36} = \frac{1}{9}$
$A \cap B$	(3,6)(6,3)	$P(A \cap B) = \frac{2}{36} = \frac{1}{18}$

$$P(B/A) = \frac{P(A \cap B)}{P(A)} = \frac{1/18}{1/9} = \frac{1}{2} = 0.5 \text{ (Ans)}$$

Ex(3) Chose the correct alternative For two equally likely, exhaustive and independent events A and B, P(AB) is:
(i) 0, (ii) 0.25 (iii) 0.50 (iv) 1.

Solution

As A and B are equally likely

$$P(A) = P(B)$$

As A and B are exhaustive

$$P(A) + P(B) = 1$$

$$P(A) = P(B) = \frac{1}{2}$$

As A and B are independent also

$$P(A \cap B) = P(A)\,P(B)$$

$$= \frac{1}{2} \cdot \frac{1}{2}$$

$$= \frac{1}{4} = 0.25 \text{ (Ans)}$$

Ex(4) A box contains 3 red and 7 white balls. One ball is drawn at random and in its place a ball of the other colour is put in the box. Now one ball is drawn at random from the box. Find the probability that it is red.

Solution

Let

A = Drawing a white ball in the first draw.

B = Drawing a Red ball in the first draw.

C = Drawing a Red ball in the Second draw.

$P(A) = \frac{7}{10}$ $P(B) = \frac{3}{10}$

. The required event of getting a red ball in the 2nd draw can materialise in the following mutually exclusive ways:

(1) First draw gives a white ball and then red ball is drawn in the 2nd draw $(A \cap C)$

(2) First draw gives a red ball and then red ball is drawn in the 2nd draw $(B \cap C)$

According to Addition theorem of probability

$$P(1) + P(2) = P(A \cap C) + P(B \cap C)$$

$$= P(A)\,P(C/A) + P(B) \cdot (P(C/B))$$

$$= \frac{7}{10} P(C/A) + \frac{3}{10} P(C/B)$$

$P(C/A)$ = P(Drawing red ball in 2nd draw when the first ball drawn is white)

=) if first ball is drawn white, then it is replaced by the red ball (the other colour ball), then the box for 2nd draw becomes 4 red and 6 white balls.

$$P(C/A) = \frac{4}{10}.$$

Similarly $P(C/B) = \frac{2}{10}$.

Required Probability.

$$= \frac{7}{10} \times \frac{4}{10} + \frac{3}{10} \times \frac{2}{10}$$

$$= \frac{28+6}{100}$$

$$= \frac{34}{100} = 0.34 \text{ (Ans)}$$

Reference: Fundamentals of Statistics by S. C. Gupta.