

Assignment-2

(ICSE 12, 2019)

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Problem 1(x):

If events A and B are independent such that $P(A) = \frac{3}{5}$, $P(B) = \frac{2}{3}$, find $P(A \cup B)$.

Using the above two formulas, (1) and (2), we can use the modified probability addition rule for independent sets as,

$$P(A \cup B) = P(A) + P(B) - P(A) \cdot P(B) \quad (3)$$

Solution:

The given input probabilities and desired values are given in the Table 1,

Event	Probability	Value
A	$P(A)$	$\frac{3}{5}$
B	$P(B)$	$\frac{2}{3}$
$A \cup B$	$P(A \cup B)$?

Table 1:

By substituting the respective values in (3), we get,

$$\begin{aligned} P(A \cup B) &= \frac{3}{5} + \frac{2}{3} - \frac{3}{5} \cdot \frac{2}{3} \\ &= \frac{3}{5} + \frac{2}{3} - \frac{2}{5} \\ &= \frac{13}{15} \end{aligned}$$

So, the desired probability $P(A \cup B)$ is found to be,

$$P(A \cup B) = \frac{13}{15}$$

It is also given that events A and B are independent which means,

$$P(A \cap B) = P(A) \cdot P(B) \quad (1)$$

And from the general probability addition rule for the union of two events, we get,

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \quad (2)$$