

Assignment 1

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Download all python codes from

[https://github.com/Dishank422/AI1103-Probability
-and-random-variables/blob/main/
Assignment_1/codes/simulation.py](https://github.com/Dishank422/AI1103-Probability-and-random-variables/blob/main/Assignment_1/codes/simulation.py)

and latex-tikz codes from

[https://github.com/Dishank422/AI1103-Probability
-and-random-variables/blob/main/
Assignment_1/main.tex](https://github.com/Dishank422/AI1103-Probability-and-random-variables/blob/main/Assignment_1/main.tex)

On substituting the values of $P(A)$, $P(B)$ and $P(A \cup B)$ in (2.0.7), we get

$$\frac{3}{5} = \frac{1}{2} + p - \frac{1}{2}p \quad (2.0.8)$$

$$\Rightarrow p = \frac{1}{5} \quad (2.0.9)$$

1 PROBLEM

Given that the events A and B are such that $P(A) = \frac{1}{2}$, $P(A \cup B) = \frac{3}{5}$ and $P(B) = p$. Find p if they are

- i) mutually exclusive
- ii) independent

2 SOLUTION

i)

Since the events are mutually exclusive, by definition

$$P(A \cap B) = 0 \quad (2.0.1)$$

$$\Rightarrow P(A \cup B) = P(A) + P(B) \quad (2.0.2)$$

On substituting the values of $P(A)$, $P(B)$ and $P(A \cup B)$ in (2.0.2), we get

$$\frac{3}{5} = \frac{1}{2} + p \quad (2.0.3)$$

$$\Rightarrow p = \frac{1}{10} \quad (2.0.4)$$

ii)

Since the events are independent

$$P(A \cap B) = P(A)P(B) \quad (2.0.5)$$

We know

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \quad (2.0.6)$$

$$\Rightarrow P(A \cup B) = P(A) + P(B) - P(A)P(B) \quad (2.0.7)$$