

Assignment 2

AI1110: Probability and Random Variables

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Question 1(ii) A problem is given to three students whose chances of solving it are $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{3}$ respectively. Find the probability that the problem is solved.

Solution.

Probability of 1st student solving the problem, p_1 : $\frac{1}{4}$

Probability of 2nd student solving the problem, p_2 : $\frac{1}{5}$

Probability of 3rd student solving the problem, p_3 : $\frac{1}{3}$

The probability of event E not occurring, $\neg E$, is given as :

$$\neg E = 1 - E \quad (1)$$

\therefore The probability of the problem being solved, $P(\text{Solved})$ will be given by

$$P(\text{Solved}) = 1 - P(\text{NotSolved}), \quad (2)$$

Where $P(\text{NotSolved})$ is the probability of no student solving the problem.

Let the probability of individual students not solving the problem be $\neg P_1$, $\neg P_2$, $\neg P_3$ respectively. Question is unsolved if all three students simultaneously do not solve it.

$\therefore P(\text{NotSolved})$ can be give as:

$$P(\text{NotSolved}) = \neg P_1 \times \neg P_2 \times \neg P_3 \quad (3)$$

\therefore By equations (1) and (3),

$$P(\text{NotSolved}) = (1 - P_1) \times (1 - P_2) \times (1 - P_3) \quad (4)$$

Substituting with values for P_1, P_2, P_3 ,

$$P(\text{NotSolved}) = (1 - \frac{1}{4}) \times (1 - \frac{1}{5}) \times (1 - \frac{1}{3}) \quad (5)$$

$$= \frac{3}{4} \times \frac{4}{5} \times \frac{2}{3} = \frac{2}{5} = 0.4 \quad (6)$$

\therefore By equation (2),

$$P(\text{Solved}) = 1 - P(\text{NotSolved}) \quad (7)$$

$$P(\text{Solved}) = 1 - 0.4 \quad (8)$$

$$P(\text{Solved}) = 0.6 \quad (9)$$

Thus, the probability of the problem being solved, $P(\text{Solved})$ will be 0.6.

Input and Output	
Input	Value
P1	$\frac{1}{4}$
P2	$\frac{1}{5}$
P3	$\frac{1}{3}$
Output	Value
P(solved)	0.6