Assignment 2

AI1110: Probability and Random Variables

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28 April 2022

ICSE 2017 Grade 12

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 1^{st} student solving the problem, P1: $\frac{1}{4}$

Probability of 2^{nd} student solving the problem, P2: $\frac{1}{5}$

Probability of 3^{rd} student solving the problem, P3: $\frac{1}{3}$

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

$$\neg E = 1 - E \tag{1}$$

$\therefore$ The probabilty of the problem being solved, P(Solved) will be given by

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

Where P(NotSolved) is the probability of no student solving the problem.

Let the probability of individual students not solving the problem be $\neg P1$, $\neg P2$, $\neg P3$ respectively. Question is unsolved if all three students simultaneously do not solve it.

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

$$P(NotSolved) = \neg P1 \times \neg P2 \times \neg P3 \tag{3}$$

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

$$P(NotSolved) = (1 - P1) \times (1 - P2) \times (1 - P3) \tag{4}$$

Substituting with values for P1,P2,P3,

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

$$= \tfrac{3}{4} \times \tfrac{4}{5} \times \tfrac{2}{3} = \tfrac{2}{5} = 0.4 \tag{6}$$

$\therefore$ By equation (2),

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

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

$$P(Solved) = 0.6 \tag{9}$$

Thus, the probabilty of the problem being solved, P(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