AI1110 Assignment-7

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***Abstract*—This document contains the solution of CBSE Class 12 Probability Exercise 13.2 Question 7.**

EXERCISE 13.2.7 : Given that the events A and B are such that $\Pr(A) = \frac{1}{2}$, $\Pr(A \cup B) = \frac{3}{5}$ and $\Pr(B) = p$. Find p if they are

(i) mutually exclusive
(ii) independent.

Solution:

We have,

$$\Pr(A) = \frac{1}{2} \tag{1}$$
$$\Pr(A + B) = \frac{3}{5} \tag{2}$$
$$\Pr(B) = p \tag{3}$$

let, $\Pr(AB) = x$
W.K.T,

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \tag{4}$$
$$\frac{3}{5} = \frac{1}{2} + p - x \tag{5}$$
$$\implies p - x = \frac{3}{5} - \frac{1}{2} \tag{6}$$
$$\implies p - x = \frac{1}{10} \tag{7}$$

(i) When events A and B are mutually exclusive, $x = 0$
So from equation (7) we get,

$$p - 0 = \frac{1}{10} \tag{8}$$
$$p = \frac{1}{10} \tag{9}$$

(ii) When events A and B are independent,

$$\Pr(AB) = \Pr(A) \times \Pr(B) \tag{10}$$
$$x = \frac{1}{2} \times p \tag{11}$$
$$x = \frac{p}{2} \tag{12}$$

On substituting (12) in equation (7),

$$p - \frac{p}{2} = \frac{1}{10} \tag{13}$$
$$\frac{p}{2} = \frac{1}{10} \tag{14}$$
$$p = \frac{1}{5} \tag{15}$$