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Probability Assignment-II

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I. Problem

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

1) mutually exclusive
2) independent

II. Solution

1) mutually exclusive
Given A and B are mutually exclusive events, then,

$$\Pr(A+B) = \Pr(A) + \Pr(B) \tag{1}$$
$$\frac{3}{5} = \frac{1}{2} + p \tag{2}$$
$$\therefore p = \frac{1}{10} \tag{3}$$

2) independent
Given A and B are independent events, then,

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