NCERT-11.16.3.17.2

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Problem:

Given that:

- $P(A) = 0.42$
- $P(B) = 0.48$
- $P(A \cap B) = 0.16$

Find $P(B')$.

Theoretical Solution:

For two Boolean variables A and B, we use the axiom:

$$B + B' = 1 \tag{1}$$

$$P(1) = 1 \tag{2}$$

$$P(B) + P(B') = 1 \tag{3}$$

$$P(B') = 1 - P(B) \tag{4}$$

Given:

$$P(A) = 0.42, \quad P(B) = 0.48, \quad P(A \cap B) = 0.16$$

Using the formula:

$$P(B') = 1 - 0.48 = 0.52 \tag{5}$$

Thus, $P(B') = 0.52$.

Computational Solution:

Define indicator random variable:

- X for event B'

Let X be an indicator random variable for B':

$$X = \begin{cases} 1, & B' \\ 0, & B \end{cases} \tag{6}$$

The probability mass function (PMF) for X (representing the event B'):

$$p_X(n) = \begin{cases} 1 - p, & n = 1 \\ p, & n = 0 \end{cases} \tag{7}$$

where $p = P(B) = 0.48$.
the PMF is:

$$p_X(n) = \begin{cases} 0.52, & n = 1 \\ 0.48, & n = 0 \end{cases} \tag{8}$$

Thus, $P(B') = 0.52$.