

Assignment 6

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Abstract—This document contains 6th problem from exercise 2 of CBSE Class 12 (Probability)

Problem 1. Exercise 2 Problem 3 Let E and F be events with $P(E) = \frac{3}{5}$, $P(F) = \frac{3}{10}$ and $P(EF) = \frac{1}{5}$. Are E and F independent?

Solution: Let's denote the outcome of the experiment by a random variable $X \in \{0, 1\}$, where $X = 0$ denotes occurrence of event E and $X = 1$ denotes occurrence of event F .

$$\Rightarrow P(X = 0) = \frac{3}{5}, \quad (1)$$

$$P(X = 1) = \frac{3}{10} \text{ and} \quad (2)$$

$$P(X = 0, X = 1) = \frac{1}{5} \quad (3)$$

We know that two events A, B (say) are said to be independent if $P(A|B) = P(A)$

$$\Rightarrow P(A|B) = \frac{P(AB)}{P(B)} = P(A) \quad (4)$$

$$\Rightarrow P(A) \times P(B) = P(AB) \quad (5)$$

Let's check whether the above events are independent or not.

From (1),(2)

$$P(X = 0) \times P(X = 1) = \frac{3}{5} \times \frac{3}{10} \quad (6)$$

$$\Rightarrow P(X = 0) \times P(X = 1) = \frac{9}{50} \quad (7)$$

From (3) and (7) it's clear that

$$P(X = 0, X = 1) \neq P(X = 0) \times P(X = 1) \quad (8)$$

Which says that the events E and F are not independent.