

AI1110 Assignment 6

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Outline

- 1 Abstract
- 2 Question
- 3 Theory
- 4 Solution

Abstract

- This document contains the solution to Question of Chapter 13 (Probability) in the NCERT Class 12 Textbook.

Question

Probability ex 13.1 q5.

if $\Pr(A) = \frac{6}{11}$, $\Pr(B) = \frac{5}{11}$ and $\Pr(A + B) = \frac{7}{11}$, find

- ① $\Pr(AB)$
- ② $\Pr(A|B)$
- ③ $\Pr(B|A)$

Theory

Inclusive and exclusive principle

If there are events A and B and the individual probabilities ,probability of occurrence of both events at same time are known,then probability of occurrence of either event A or B is

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \quad (1)$$

Conditional probability

'the probability of A given B'

$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \quad (2)$$

Solution

Let $X, Y \in \{0, 1\}$ are random variables that represents the occurrence of events A and B. In the problem it is given that

$$\Pr(X = 1) = \frac{6}{11}, \Pr(Y = 1) = \frac{5}{11} \text{ and } \Pr(\{X = 1\} + \{Y = 1\}) = \frac{7}{11}$$

Event	Random Variables
A'	$X = 0$
A	$X = 1$
B'	$Y = 0$
B	$Y = 1$

Table 1: Events

- ① Probability of occurrence A and B at same time

$$\Pr(AB) = \Pr(\{X = 1\}, \{Y = 1\}) \quad (3)$$

$$= \Pr(X = 1) + \Pr(Y = 1) - \Pr(\{X = 1\} + \{Y = 1\}) \quad (4)$$

$$= \frac{6}{11} + \frac{5}{11} - \frac{7}{11} \quad (5)$$

$$= \frac{4}{11} \quad (6)$$

- ② Conditional probability of A given B

$$\Pr(A|B) = \frac{\Pr(\{X = 1\}, \{Y = 1\})}{\Pr(Y = 1)} \quad (7)$$

$$= \frac{\frac{4}{11}}{\frac{5}{11}} \quad (8)$$

$$= \frac{4}{5} \quad (9)$$

③ Conditional probability of B given A

$$\Pr(B|A) = \frac{\Pr(\{X = 1\}, \{Y = 1\})}{\Pr(X = 1)} \quad (10)$$

$$= \frac{\frac{4}{11}}{\frac{6}{11}} \quad (11)$$

$$= \frac{2}{3} \quad (12)$$