

Assignment 1

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Download all python codes from

<https://github.com/Digjoy12/probability/blob/main/Assignment%201/main.tex>

and latex codes from

<https://github.com/Digjoy12/probability/blob/main/Assignment%201/codes/code.py.py>

PROBLEM(6.7)

An electronic assembly consists of two subsystems, say, A and B. From previous testing procedures, the following probabilities are assumed to be known:

$$P(A \text{ fails}) = 0.2$$

$$P(B \text{ fails alone}) = 0.15$$

$$P(A \text{ and } B \text{ fail}) = 0.15$$

Evaluate the following probabilities

(i) $P(A \text{ fails alone})$

(ii) $P(A \text{ fails—} B \text{ has failed})$

SOLUTION(6.7)

Given,

$$P(A \text{ fails})=P(A)=0.2$$

$$P(B \text{ fails alone})=P(B-A)=0.15$$

$$P(A \text{ and } B \text{ fails})=P(AB)=0.15$$

Now, we need to find $P(A \text{ fails alone})=P(A-B)$

1)

$$P(A) = P(A - B) + P(AB) \quad (6.7.1)$$

$$\Rightarrow P(A - B) = P(A) - P(AB) \quad (6.7.2)$$

$$\Rightarrow P(A - B) = 0.20 - 0.15 \quad (6.7.3)$$

$$\Rightarrow P(A - B) = 0.05 \quad (6.7.4)$$

Therefore, $P(A \text{ fails alone})=P(A-B)=0.05$

2) Now, finding the probability of B

$$P(B - A) = P(B) - P(AB) \quad (6.7.5)$$

$$\Rightarrow P(B) = P(B - A) + P(AB) \quad (6.7.6)$$

$$\Rightarrow P(B) = 0.15 + 0.15 \quad (6.7.7)$$

$$\Rightarrow P(B) = 0.30 \quad (6.7.8)$$

Now, we need to find $P(A \text{ fails} | B \text{ has failed})=P(A|B)$

$$P(A|B) = \frac{P(AB)}{P(B)} \quad (6.7.9)$$

$$\Rightarrow P(A|B) = \frac{0.15}{0.30} \quad (6.7.10)$$

$$\Rightarrow P(A|B) = 0.5 \quad (6.7.11)$$

Therefore, $P(A \text{ fails} | B \text{ has failed})=P(A|B)=0.5$