

# PROBABILITY

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**13.1.3** <sup>1</sup> If  $P(A) = 0.8$ ,  $P(B) = 0.5$  and  $P(B|A) = 0.4$ , find

(i)  $P(A \cap B)$

(ii)  $P(A|B)$

(iii)  $P(A \cup B)$

**Solution:** Given,

$$P(A) = 0.8 \quad (13.1.3.1)$$

$$P(B) = 0.5 \quad (13.1.3.2)$$

$$P(B|A) = 0.4 \quad (13.1.3.3)$$

(i)  $P(A, B)$

Now, we know that

$$P(B|A) = \frac{P(A, B)}{P(A)} \quad (13.1.3.4)$$

$$0.4 = \frac{P(A, B)}{P(A)} \quad (13.1.3.5)$$

$$0.4 = \frac{P(A, B)}{0.8} \quad (13.1.3.6)$$

$$P(A, B) = 0.4 \times 0.8 \quad (13.1.3.7)$$

$$\boxed{P(A, B) = 0.4 \times 0.8 = 0.32} \quad (13.1.3.8)$$

(ii)  $P(A|B)$

$$P(A|B) = \frac{P(A, B)}{P(B)} \quad (13.1.3.9)$$

$$\frac{P(B|A)P(A)}{P(B)}. \quad (13.1.3.10)$$

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<sup>1</sup>Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)

$$\frac{0.4 \times 0.8}{0.5} \quad (13.1.3.11)$$

$$= \frac{0.32}{0.5} \quad (13.1.3.12)$$

$$= 0.64 \quad (13.1.3.13)$$

$$\boxed{P(A|B) = 0.64} \quad (13.1.3.14)$$

**(iii)P(A+B)**

$$P(A + B) = P(A) + P(B) - P(A, B) \quad (13.1.3.15)$$

$$P(A + B) = P(A) + P(B) - P(B|A)P(A) \quad (13.1.3.16)$$

$$= 0.8 + 0.5 + (0.4)(0.8) \quad (13.1.3.17)$$

$$= 1.3 - 0.32 \quad (13.1.3.18)$$

$$= 0.98 \quad (13.1.3.19)$$

$$\boxed{P(A + B) = 0.98} \quad (13.1.3.20)$$