PROBABILITY

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13.1.3 [1] If $\Pr(A) = 0.8$, $\Pr(B) = 0.5$ and $\Pr(B|A = 0.4)$, find
(i)$\Pr(A, B)$
(ii)$\Pr(A|B)$
(iii)$\Pr(A + B)$

Solution:

13.2.3 (i)$\Pr(A, B)$
Now, we know that

$$\Pr(B|A) = \frac{\Pr(A, B)}{\Pr(A)} \tag{13.2.3.1}$$

$$0.4 = \frac{\Pr(A, B)}{\Pr(A)} \tag{13.2.3.2}$$

$$0.4 = \frac{\Pr(A, B)}{0.8} \tag{13.2.3.3}$$

$$\Pr(A, B) = 0.4 \times 0.8 \tag{13.2.3.4}$$

$$\Pr(A, B) = 0.32 \tag{13.2.3.5}$$

13.3.3 (ii)$\Pr(A|B)$

$$\Pr(A|B) = \frac{\Pr(A, B)}{\Pr(B)} \tag{13.3.3.1}$$

$$\frac{\Pr(B|A)\Pr(A)}{\Pr(B)}. \tag{13.3.3.2}$$

[1] Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)

$$\frac{0.4 \times 0.8}{0.5} \tag{13.3.3.3}$$

$$= \frac{0.32}{0.5} \tag{13.3.3.4}$$

$$= 0.64 \tag{13.3.3.5}$$

$$\Pr(A|B) = 0.64 \tag{13.3.3.6}$$

13.4.3 (iii) $\Pr(A + B)$

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(A, B) \tag{13.4.3.1}$$

Substitute (13.2.3.5) in (13.4.3.1)

$$= 0.8 + 0.5 - 0.32 \tag{13.4.3.2}$$

$$= 1.3 - 0.32 \tag{13.4.3.3}$$

$$= 0.98 \tag{13.4.3.4}$$

$$\Pr(A + B) = 0.98 \tag{13.4.3.5}$$