Exemplar - 12.13.3.73

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Question: Two events E and F are independent. If $\Pr(E) = 0.3$, $\Pr(E+F) = 0.5$, then $\Pr(E|F) - \Pr(F|E)$ equals

(a) $\frac{2}{7}$
(b) $\frac{3}{35}$
(c) $\frac{1}{70}$
(d) $\frac{1}{7}$

Solution: As E and F are independent:

$$\Pr(EF) = \Pr(E)\Pr(F) \tag{1}$$

$$\text{But } \Pr(E+F) = \Pr(E) + \Pr(F) - \Pr(EF) \tag{2}$$

$$\therefore \Pr(E+F) = \Pr(E) + \Pr(F) - \Pr(E)\Pr(F) \tag{3}$$

$$0.5 = 0.3 + \Pr(F) - 0.3\Pr(F) \tag{4}$$

$$\Pr(F) = \frac{2}{7} \tag{5}$$

As E and F are independent:

$$\Pr(E|F) = \Pr(E) \tag{6}$$

$$\Pr(F|E) = \Pr(F) \tag{7}$$

$$\therefore \Pr(E|F) - \Pr(F|E) = \Pr(E) - \Pr(F) \tag{8}$$

$$= \frac{3}{10} - \frac{2}{7} \tag{9}$$

$$= \frac{1}{70} \tag{10}$$