Probability Assignment 1

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Question : Given two independent events A and B such that $\Pr(A) = 0.3$, $\Pr(B) = 0.6$. Find

1) $\Pr(AB)$
2) $\Pr(AB')$
3) $\Pr(A + B)$
4) $\Pr(A'B')$

Solution : Given $\Pr(A) = 0.3$, $\Pr(B) = 0.6$.

1) $\Pr(AB)$: As A and B are independent events.

$$\Pr(AB) = \Pr(A) \times \Pr(B) \tag{1}$$
$$= 0.3 \times 0.6$$
$$= 0.18$$

2) $\Pr(AB')$: We know that,

$$B + B' = 1 \tag{2}$$

Hence,

$$\Pr(B + B') = 1 \tag{3}$$
$$\Pr(B) + \Pr(B') = 1 \tag{4}$$
$$\Pr(B') = 1 - \Pr(B) \tag{5}$$
$$\Pr(B') = 1 - 0.6$$
$$\Pr(B') = 0.4$$

Since A and B are independent,

$$\Pr(AB') = \Pr(A) \times \Pr(B') \tag{6}$$
$$= 0.3 \times 0.4$$
$$= 0.12$$

3) $\Pr(A + B)$: As we know,

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \tag{7}$$
$$\Pr(A + B) = 0.3 + 0.6 - 0.18$$
$$\Pr(A + B) = 0.72$$

4) $\Pr(A'B')$: As we know,

$$A'B' = (A + B)' \tag{8}$$

Therefore,

$$\Pr(A'B') = \Pr((A + B)') \tag{9}$$
$$\Pr(A'B') = 1 - \Pr(A + B) \tag{10}$$
$$= 1 - 0.72$$
$$= 0.28$$