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) $\Pr(AB')$:

$$= 0.3 \times (1 - 0.6)$$
$$= 0.12$$

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

$$= AB' + A'B + AB \tag{2}$$
$$= A(B + B') + A'B \tag{3}$$
$$= A + A'B \tag{4}$$
$$= A + B \tag{5}$$

Since A and B are independent,

$$\Pr(A + B) = \Pr(AB') + \Pr(A'B) + \Pr(AB) \tag{6}$$
$$\Pr(A + B) = (0.3) \times (1 - 0.6) + (1 - 0.3)(0.6) + (0.3)(0.6)$$
$$\Pr(A + B) = 0.72$$

4) $\Pr(A'B')$:

$$As, A'B' = (A + B)' \tag{7}$$
$$= \Pr(A') \times \Pr(B') \tag{8}$$
$$= (1 - 0.3) \times (1 - 0.6)$$
$$= 0.28$$