Probability Assignment

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Question : If A and B are mutually exclusive events, $\Pr(A) = 0.35$ and $\Pr(B) = 0.45$ then find
  1) $\Pr(A')$
  2) $\Pr(B')$
  3) $\Pr(A + B)$
  4) $\Pr(AB)$
  5) $\Pr(AB')$
  6) $\Pr(A'B')$

Solution: Given that A and B are mutually exclusive events.

$$AB = 0 \tag{1}$$

1)

$$\Pr(A') = 1 - \Pr(A) \tag{2}$$
$$= 1 - 0.35 \tag{3}$$
$$= 0.65 \tag{4}$$

2)

$$\Pr(B') = 1 - \Pr(B) \tag{5}$$
$$= 1 - 0.45 \tag{6}$$
$$= 0.55 \tag{7}$$

3) From (1).

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \tag{8}$$
$$= 0.35 + 0.45 - 0 \tag{9}$$
$$= 0.80 \tag{10}$$

4) From (1)

$$\Pr(AB) = 0 \tag{11}$$

5)

$$\Pr(A) = \Pr(A.S) \tag{12}$$
$$= \Pr(A.(B + B')) \tag{13}$$
$$= \Pr(AB + AB') \tag{14}$$
$$= \Pr(AB) + \Pr(AB') - \Pr(AB.AB') \tag{15}$$
$$= \Pr(AB) + \Pr(AB') - \Pr(AA.(BB')) \tag{16}$$
$$= \Pr(AB) + \Pr(AB') \tag{17}$$

$BB' = 0$.So, $\Pr(A(BB')) = 0$

$$\Pr(AB') = \Pr(A) - \Pr(AB) \tag{18}$$
$$= 0.35 - 0 \tag{19}$$
$$= 0.35 \tag{20}$$

6) Using Demorgan's laws that is $(A + B)' = A'B'$.

$$\Pr(A'B') = \Pr((A + B)') \tag{21}$$
$$= 1 - \Pr(A + B) \tag{22}$$
$$= 1 - 0.80 \tag{23}$$
$$= 0.20 \tag{24}$$