(9) Given, $P(E_1) = p_1$ and $P(E_2) = p_2$.

(i) $p_1 \cdot p_2 = P(E_1) \cdot P(E_2) = P(E_1 \cap E_2)$.

E_1 and E_2 occuring simultaneously.

(ii) $(1-p_1)\,p_2 = (1 - P(E_1))(P(E_2))$

$= P(\bar{E_1})\,P(E_2)$

$= P(\bar{E_1} \cap E_2)$.

E_1 does not occur and E_2 occurs.

(iii) $1 - (1-p_1)(1-p_2)$

$= 1 - P(\bar{E_1})(P(\bar{E_2}))$

$= 1 - P(\bar{E_1} \cap \bar{E_2})$

$= 1 - [1 - P(E_1 \cup E_2)]$

$= P(E_1 \cup E_2)$

Either E_1 or E_2 occurs or both E_1 and E_2 occurs.

(iv) $p_1 + p_2 - 2p_1p_2$.

$= P(E_1) + P(E_2) - 2P(E_1)P(E_2)$,

$= P(E_1) + P(E_2) - 2P(E_1 \cap E_2)$.

$= [P(E_1) + P(E_2) - P(E_1 \cap E_2)] - P(E_1 \cap E_2)$

$= P(E_1 \cup E_2) - P(E_1 \cap E_2)$

Either E_1 or E_2 occurs. but <u>not</u> both