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Solution T-2.1:

We have to compute

$$P(F|E^c) = \frac{P(F, E^c)}{P(E^c)}$$

Here,

$$E^c = \{v_1, v_2\}^c$$
$$= \{v_1, v_2, v_3\} - \{v_1, v_2\}$$
$$= \{v_3\}$$

$$P(F, E^c) = P(\{v_1, v_3\} \cap \{v_3\})$$
$$= P(\{v_3\})$$

So,

$$P(F|E^c) = \frac{P(\{v_3\})}{P(E^c)}$$
$$= \frac{P(\{v_3\})}{P(\{v_3\})}$$
$$= 1$$

Solution T-2.2 :

Let define two events

$A = \{x \in X \mid \text{man lives at least 70 years}\}$

$B = \{x \in X \mid \text{man who lives at least 80 years}\}$

We need to compute

$$p(B|A) = \frac{P(A, B)}{P(A)}$$

Here, $p(A) = 4/5$, $p(B) = \frac{50}{100} = \frac{1}{2}$

and $B \subseteq A$ as who lives 80 years also lives 70 years.

Hence, $A \cap B = B$.

$$\therefore p(B|A) = \frac{p(A, B)}{p(A)}$$

$$= \frac{p(A \cap B)}{p(A)}$$

$$= \frac{p(B)}{p(A)} = \frac{1/2}{4/5}$$

$$= \frac{5}{8}$$

Solution T-2.3

Let Y_i be the event of the i-th drawing which is flawless.

So, we have to find

$$P(Y_1, Y_2, Y_3, Y_4, Y_5)$$

and we know that $P(A, B) = P(A|B) \cdot P(B) = P(B|A) \cdot P(A)$

$$P(Y_5, Y_4, Y_3, Y_2, Y_1) = P(Y_5 | Y_4, Y_3, Y_2, Y_1) \cdot P(Y_4, Y_3, Y_2, Y_1)$$

$$= P(Y_5 | Y_4, Y_3, Y_2, Y_1) \, P(Y_4 | Y_3, Y_2, Y_1) \cdot P(Y_3, Y_2, Y_1)$$

$$= \dots\dots$$

$$= P(Y_5 | Y_4, Y_3, Y_2, 1) \, P(Y_4 | Y_3, Y_2, Y_1) \, P(Y_3 | Y_2, Y_1) \cdot P(Y_2 | Y_1) \cdot P(Y_1)$$

Here, $P(Y_1) = \frac{40}{50}$, $P(Y_2 | Y_1) = \frac{39}{49}$

$$\therefore P(Y_5, Y_4, Y_3, Y_2, Y_1) = 40/50 \cdot 39/49, 38/48, 37/47 \cdot 36/46$$

$$= 0.31$$