

ASSIGNMENT-1

Probability & Random Variables

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Question

A team of medical students doing their internship have to assist during surgeries at a city hospital. The probabilities of surgeries rated as very-complex, complex, routine, simple or very-simple are respectively, 0.15, 0.20, 0.31, 0.26, .08. Find the probabilities that a particular surgery will be rated

- 1) complex or very-complex
- 2) neither very-complex nor very simple
- 3) routine or complex
- 4) routine or simple

Solution

Let E_1, E_2, E_3, E_4, E_5 be the events that the surgeries are rated as very-complex, complex, routine, simple and very-simple respectively.

Then according to the given information.

$$P(E_1) = 0.15 \quad P(E_2) = 0.20$$

$$P(E_3) = 0.31 \quad P(E_4) = 0.26$$

$$P(E_5) = 0.08$$

Here if you notice one thing, the events are **Disjoint** because we are talking about surgeries then it can be very-complex or complex but it cannot be very-complex and complex at the same time.

\Rightarrow These events are **Disjoint** to each other and intersection of these events is 0

- 1) To find the probabilities that a particular surgery will be rated complex or very-complex:

$$\begin{aligned} P(E_1 \cup E_2) &= P(E_1) + P(E_2) - P(E_1 \cap E_2) \\ &= 0.15 + 0.20 - 0 \\ &= 0.35 \end{aligned}$$

$$\therefore P(E_1 \cup E_2) = 0.35$$

- 2) To find the probabilities that a particular surgery will be rated neither very complex nor-very simple:

$$\begin{aligned} P(E'_1 \cap E'_5) &= P(E_1 \cup E_5)' \\ &= 1 - P(E_1 \cup E_5) \\ &= 1 - [P(E_1) + P(E_5) - P(E_1 \cap E_5)] \\ &= 1 - [0.15 + 0.08 - 0] \\ &= 1 - 0.23 \\ &= 0.77 \end{aligned}$$

$$\therefore P(E'_1 \cap E'_5) = 0.77$$

- 3) To find the probabilities that a particular surgery will be rated Routine or complex:

$$\begin{aligned} P(E_3 \cup E_2) &= P(E_3) + P(E_2) - P(E_3 \cap E_2) \\ &= 0.31 + 0.20 - 0 \\ &= 0.51 \end{aligned}$$

$$\therefore P(E_3 \cup E_2) = 0.51$$

- 4) To find the probabilities that a particular surgery will be rated routine or simple:

$$\begin{aligned} P(E_3 \cup E_4) &= P(E_3) + P(E_4) - P(E_3 \cap E_4) \\ &= 0.31 + 0.26 - 0 \\ &= 0.57 \end{aligned}$$

$$\therefore P(E_3 \cup E_4) = 0.57$$