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.
(a) complex or very complex;
(b) neither very complex nor very simple;
(c) routine or complex
(d) routine or simple

Solution: Let

E_1 = event that surgeries are rated as very complex

E_2 = event that surgeries are rated as complex

E_3 = event that surgeries are rated as routine

E_4 = event that surgeries are rated as simple

E_5 = event that surgeries are rated as very simple

Given: P (E_1) = 0.15, P (E_2) = 0.20, P (E_3) = 0.31, P (E_4) = 0.26, P (E_5) = 0.08

(a) P (complex or very complex) = P (E_1 or E_2) = P ($E_1 \cup E_2$)

By General Addition Rule:

P ($A \cup B$) = P(A) + P(B) − P ($A \cap B$)

$\Rightarrow$ P ($E_1 \cup E_2$) = P (E_1) + P (E_2) − P ($E_1 \cap E_2$)

= 0.15 + 0.20 − 0 [given] [∵ All events are independent]

= 0.35

(b) P (neither very complex nor very simple) = P (E_1' $\cap$ E_5')

= P ($E_1 \cup E_5$)'

= 1 − P ($E_1 \cup E_5$)

[∵By Complement Rule]

= 1 − [P (E_1) + P (E_5) − P ($E_1 \cap E_5$)] [∵ By General Addition Rule]

= 1 – [0.15 + 0.08 – 0]

= 1 – 0.23

= 0.77

(c) P (routine or complex) = P (E$_3$∪ E$_2$)

= P (E$_3$) + P (E$_2$) – P (E$_3$∩ E$_2$)

[∵ By General Addition Rule]

= 0.31 + 0.20 – 0 [given]

= 0.51

(d) P (routine or simple) = P (E$_3$∪ E$_4$)

= P (E$_3$) + P (E$_4$) – P (E$_3$∩ E$_4$)

[∵ By General Addition Rule]

= 0.31 + 0.26 – 0 [given]

= 0.57