Q2 a. $P(flu) = 5/8 = 0.625$ $P(no\ flu) = 0.375$ (3/8)

$P(chills/flu) = 3/5 = 0.6$ $P(chills/no\ flu) = 0.33$

$P(no\ chills/flu) = 2/5 = 0.4$ $P(no\ chills/no\ flu) = 0.66$

$P(runny\ nose/flu) = 0.8$ $P(runny\ nose/no\ flu) = 0.33$

$P(no\ runny\ nose/flu) = 0.2$ $P(no\ runny\ nose/no\ flu) = 0.66$

$P(strong\ head/flu) = 0.4$ $P(strong\ head/no\ flu) = 0.33$

$P(mild\ head/flu) = 0.6$ $P(mild\ head/no\ flu) = 0.33$

$P(no\ headache/flu) = 0$ $P(no\ head/no\ flu) = 0.33$

$P(fever/flu) = 0.8$ $P(fever/no\ flu) = 0.33$

$P(no\ fever/flu) = 0.2$ $P(no\ fever/no\ flu) = 0.66$

Here, $C \Rightarrow P(chills = Y, runny\ nose = N, headache = N, fever = Y)$

Without laplacian correction :-

$P(flu/C) \Rightarrow P(flu) \times P(chills/flu) \times P(no\ runny/flu) \times P(no\ headache/flu) \cdot P(fever/flu)$.

$= 0.625 \times 0.6 \times 0.2 \times 0 \times 0.8 = 0$

$P(no\ flu/C) = P(no\ flu) \times P(chills/no\ flu) \times P(no\ runny/no\ flu) \times P(no\ head/no\ flu) \times P(no\ fever/no\ flu)$

$= 0.375 \times 0.33 \times 0.66 \times 0.33 \times 0.33$

$= 0.0088 \approx 0.009$

$\therefore P(flu/C) < P(no\ flu/C) \Rightarrow$ The ans is no flu. [NO FLU]

b) With Laplace correction –

$P(strong\ head/flu) = \frac{2+1}{5+3} = 0.375$ $P(strong\ head/no\ flu) = 2/6 = 0.33$

$P(mild\ head/flu) = 4/8 = 0.5$ $P(mild\ head/no\ flu) = 2/6 = 0.33$

$P(no\ head/flu) = 1/8 = 0.125$ $P(no\ head/no\ flu) = 2/6 = 0.33$

$P(\text{no flu} \mid E) = 0.375 \times 0.33 \times 0.66 \times 0.33 \times 0.33$

$= 0.009$

$P(\text{flu} \mid C) = 0.625 \times 0.6 \times 0.2 \times 0.125 \times 0.8$

$= 0.0075$

Since, after laplace correction P(flu|C) ⇒ we get
[NO FLU]