STAT 310 HW02 Sol

2.4.14, 2.4.17, 2.4.23, 2.4.26, 2.4.2 Extra 2.4.3

(1) 2.4.14 (a) $P(TB \mid +X\text{-ray}) = 21/97 = 0.278$

(1) (b) $P(+X\text{-ray} \mid \text{No TB}) = \frac{70}{1945}$ (or $\frac{70}{1953}$) $= 0.036$

(1) (c) $P(\text{No TB} \mid -X\text{-ray}) = 1883/1093 = 0.989$

note: $70+1883=1953$ (book is 1945, not add up correctly)

(2) 2.4.17 $P(\text{boy picked up} \mid \text{boy transfered}) +$

will give (1) if identify events & desired conditioning

$P(\quad\quad \mid \text{girl} \quad\quad)$

$= \frac{11}{16} \cdot \frac{13}{25} + \frac{10}{16} \cdot \frac{12}{25}$

$= 0.6575$

(2) 2.4.23 $P(\text{supplier 2} \mid \text{defective})$

will give (1) if identify need to use Bay's rule.

$= \frac{3\% \cdot 40\%}{(3\% \cdot 40\% + 10\% \cdot 60\%)} = 0.17$

(1) 2.4.26 (a) $P(B \text{ and } O)$

$= 0.1 \times 0.45 = 0.045$

(1) (b) $P(B \text{ or } O)$

$= 0.1 + 0.45 = 0.55$

$P(B \text{ or } O \mid B)$

$= \frac{0.1^2 + 0.45 \times 0.1}{0.1} = 0.55$

(2) 2.4.2 $P(B|A) = \frac{P(A|B) \cdot P(B)}{P(A)} > \frac{P(A) \cdot P(B)}{P(A)} = P(B)$

(1) 2.4.3 (a) $P(A|B) + P(A^c|B) = \frac{P(A \cap B) + P(A^c \cap B)}{P(B)}$

$= \frac{P(\Omega \cap B)}{P(B)} = 1$ (can also use fact that conditional prob obeys the 3 axioms of prob function.)

(1) (b) suppose A, B independent

$P(A|B) + P(A|B^c) = 2P(A)$ not equal to 1 for general, (or any counter example)

(1) (c) $P(A|B) + P(A^c|B^c)$

$= P(A|B) + 1 - P(A|B^c)$

If $= 1$, then must $P(A|B) = P(A|B^c)$

(or any counter example)