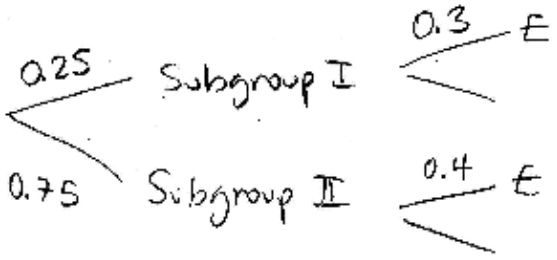
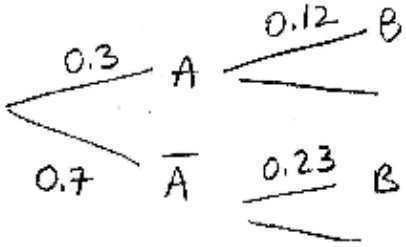
Solutions

① 

$$P(E) = P(I \cap E) + P(II \cap E)$$
$$= 0.25(0.3) + 0.75(0.4)$$
$$= 0.375$$

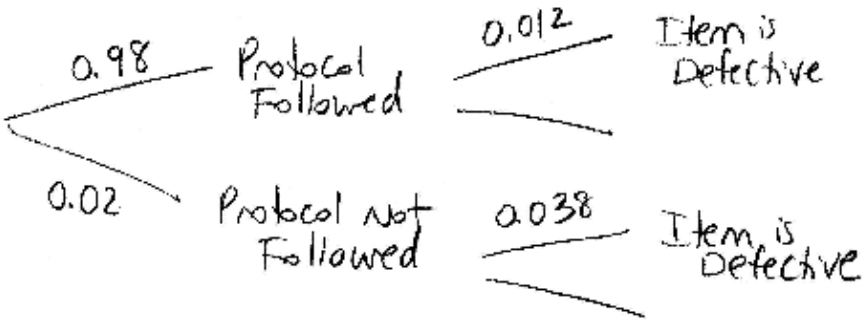
② a) 

b) $P(A \cap B) = 0.3(0.12) = 0.036$

c) $P(B) = P(A \cap B) + P(\overline{A} \cap B)$
$= 0.3(0.12) + 0.7(0.23)$
$= 0.197$

d) $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$
$= \dfrac{0.036}{0.197}$
$\simeq 0.183$

(3)



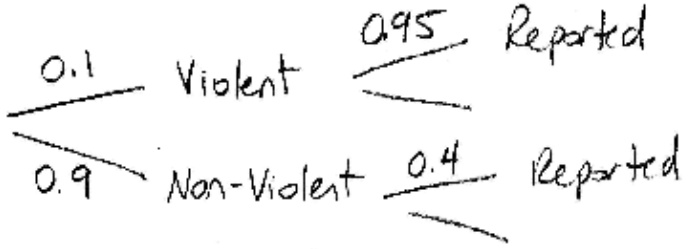
$$P(\text{Protocol Followed} \mid \text{Item is Defective})$$

$$= \frac{P(\text{Protocol Followed} \cap \text{Item is Defective})}{P(\text{Item is Defective})}$$

$$= \frac{0.98(0.012)}{[0.98(0.012) + 0.02(0.038)]}$$

$$\approx 0.939$$

(4)

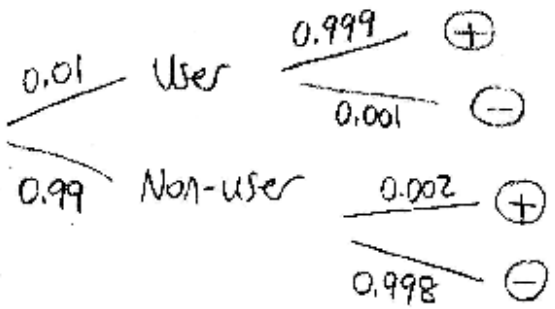


$$P(\text{Violent} \mid \text{Reported})$$

$$= \frac{P(\text{Violent} \cap \text{Reported})}{P(\text{Reported})}$$

$$= \frac{0.1(0.95)}{[0.1(0.95) + 0.9(0.4)]} \approx 0.209$$

(5)



a) $P(\oplus \mid \text{non-user}) = 0.002$

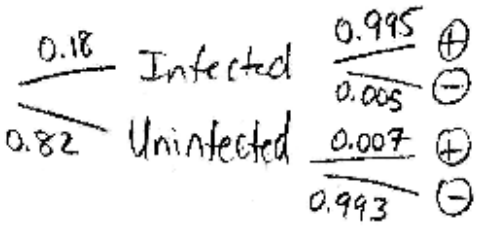
b) $P(\text{non-user} \mid \oplus) = \dfrac{P(\text{non-user} \wedge \oplus)}{P(\oplus)}$

$= \dfrac{0.99(0.002)}{[0.01(0.999) + 0.99(0.002)]}$

$\simeq 0.165$

This probability is relatively high because users are rare in the population.

(6)

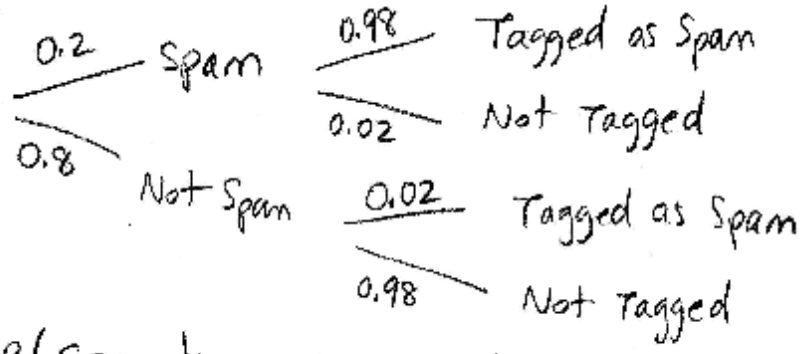


a) $P(\oplus \mid \text{Uninfected}) = 0.007$

b) $P(\text{Uninfected} \mid \oplus) = \dfrac{P(\text{Uninfected} \wedge \oplus)}{P(\oplus)}$

$= \dfrac{0.82(0.007)}{[0.18(0.995) + 0.82(0.007)]} \simeq 0.031$

(7)



$$P(\text{Spam} \mid \text{Tagged as Spam}) = \frac{P(\text{Spam} \cap \text{Tagged})}{P(\text{Tagged})}$$

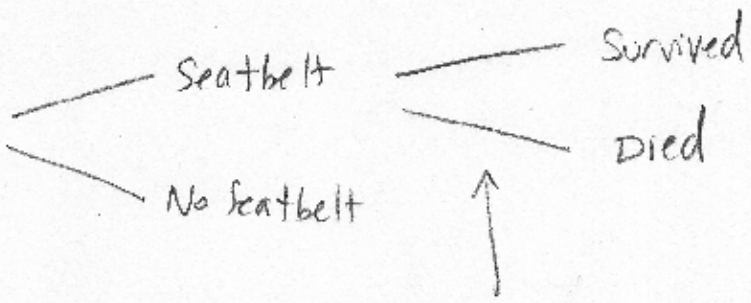
$$= \frac{0.2(0.98)}{[0.2(0.98) + 0.8(0.02)]}$$

$$\approx 0.925$$

(8) Of the accident victims wearing seatbelts, 5% died.
[other possibilities as well].

(9) Of the accident victims who died, 25% were wearing seatbelts.

(10)



$P(\text{Survived} \mid \text{Seatbelt}) + P(\text{Died} \mid \text{Seatbelt}) = 1$

$P(\text{Survived} \mid \text{Seatbelt}) + 0.05 = 1$

$P(\text{Survived} \mid \text{Seatbelt}) = 0.95$