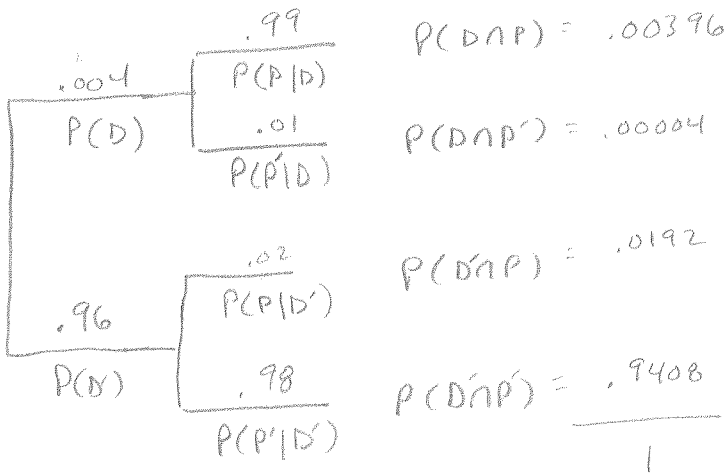
Bayes Theorem Supplemental Problems

64.

D = has disease
D′ = does not have disease
P = + test
P′ = − test



$P(D \cap P) = .00396$

$P(D \cap P') = .00004$

$P(D' \cap P) = .0192$

$P(D' \cap P') = .9408$

1

a. $P(P) = .00396 + .0192 = \underline{.02316}$ prob. of positive test result

$P(D|P) = \dfrac{P(D \cap P)}{P(P)} = \dfrac{.00396}{.02316} = \underline{.1710}$ prob. of having disease given positive test result

$P(D'|P') = \dfrac{P(D' \cap P')}{P(P')}$

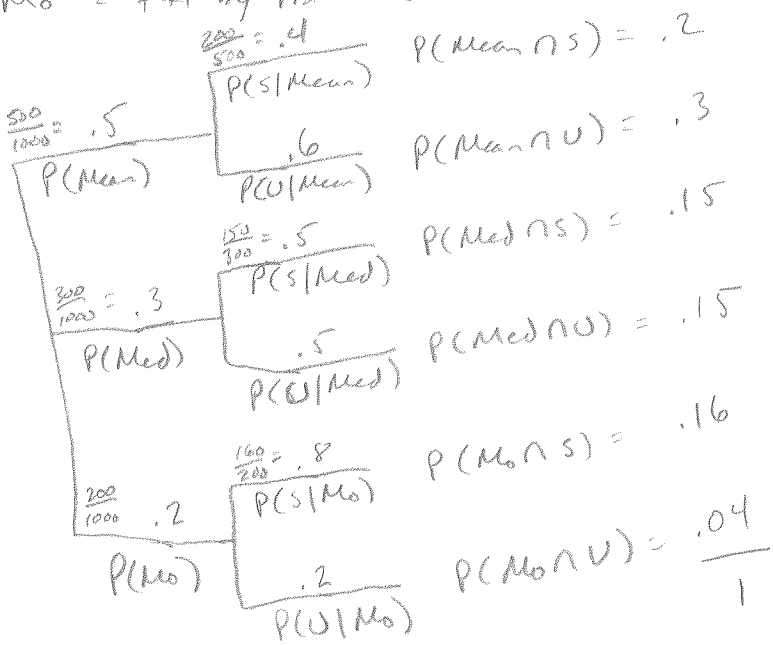
$1 - P(P) = .97684 = P(P')$

$\dfrac{.9408}{.97684} = \underline{.9631}$

65.

Mean = text by Prof. Mean
Med = text by Prof. Median
Mo = text by Prof Mode

S = satisfied with book
U = unsatisfied with book



$P(Mean \cap S) = .2$

$P(Mean \cap U) = .3$

$P(Med \cap S) = .15$

$P(Med \cap U) = .15$

$P(Mo \cap S) = .16$

$P(Mo \cap U) = .04$

1

65. (cont.)

$$P(\text{Mean} \mid S) = \frac{P(\text{Mean} \cap S)}{P(S)} = \frac{.2}{.51} = .3922$$ ← Greatest probability author

$$P(\text{Med} \mid S) = \frac{P(\text{Med} \cap S)}{P(S)} = \frac{.15}{.51} = .2941$$ ← least probability author

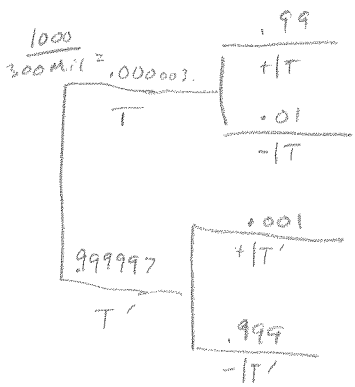
$$P(\text{Mo} \mid S) = \frac{P(\text{Mo} \cap S)}{P(S)} = \frac{.16}{.51} = .3137$$

$$P(S) = .2 + .15 + .16 = .51$$

67.

T = terrorist + = IDs as terrorist

T′ = not terrorist − = IDs not terrorist



$P(T \cap +) = .0000033$

$P(T \cap -) = .00000003$

$P(T' \cap +) = .000999997$

$P(T' \cap -) = .99899667$

$$P(T \mid +) = \frac{P(T \cap +)}{P(+)} = \frac{.0000033}{.001003} = .003289$$

$$P(+) = .000003 + .001 = .001003$$

.03% of time person will become a terrorist given they get a positive test result.

that means out of 100 positive results 3 will actually become terrorists. Not very confident about that system.