Let $P$ stand for positive test result, $N$ for negative, $D$ for a drug user, and $C$ for a clean person. (a) $P(D \mid P) = \frac{P(P \mid D)P(D)}{P(P \mid D)P(D) + P(P \mid C)P(C)} = \frac{0.97 \cdot 0.04}{0.97 \cdot 0.04 + 0.96 \cdot 0.06} \approx 57.4\%$ (b) $P(C \mid N) = \frac{P(N \mid C)P(C) + P(N \mid D)P(D)}{P(N \mid C)P(C) + P(N \mid D)P(D)} = \frac{0.99 \cdot 0.96}{0.99 \cdot 0.96 + 0.02 \cdot 0.04} \approx 99.9\%$

20. For independence we want $P(A \cap B) = P(A) \cdot P(B)$. We know since $A \cap B = \emptyset$, so $P(A \cap B) = 0$. Therefore, one of $P(A)$ and $P(B)$ must be 0.

23. (a) He has a $1/3$ chance of answering the first question correctly and a $1/5$ for the 2nd so in total $(1/3) \cdot (1/5) = 1/15$. (b) He can get the first question right and the 2nd question wrong, $(1/3) \cdot (4/5)$ or he can get the first one wrong and the 2nd one right, $(2/3) \cdot (1/5)$ which in total is $4/15 + 2/15 = 2/5$. (c) This is simply $1 - (the \ answers \ in \ (a) + (b))$. We get $8/15$. 

CSE 21: HW8 Solutions

September 3, 2007
29. (a) $P(\text{none}) = (.97)^{10}$. (b) $P(\text{at least 1}) = 1 - P(\text{none}) = 1 - (.97)^{10}$. (c)

$P(\text{exactly 4}) = \binom{10}{4}(.03)^{4}(.97)^{6}$ (d) $P(\text{at most 2}) = P(\text{none}) + P(\text{exactly 1}) + P(\text{exactly 2}) = (.97)^{10} + \binom{10}{1}(.03)^{1}(.97)^{9} + \binom{10}{2}(.03)^{2}(.97)^{8}$