Solution for quiz 2

1. Define these events:

   E: student has econ major;   S: student has taken STA 103

   We know that $P(E) = .15, P(S|E) = .6, P(S|\bar{E}) = .1, P(\bar{E}) = 1 - P(E) = .85$

   Using Bayes's rule,

   $$P(E|S) = \frac{P(S|E)P(E)}{P(S|E)P(E) + P(S|\bar{E})P(\bar{E})} = \frac{(.6)(.15)}{(.6)(.15) + (.1)(.85)} = \frac{.09}{.175} \simeq .51$$

2. (a) The total number of ways of selecting 4 from 11 people is $\binom{11}{4} = \frac{11!}{4!(11-4)!} = 330$.

   The total number of ways of selecting two women and two men is

   $\binom{6}{2}\binom{5}{2} = \frac{6!}{2!(6-2)!}\frac{5!}{2!(5-2)!} = 15 * 10 = 150$

   Therefore, the probability that the subcommittee will have exactly two women is $150/330 \simeq .45$.

   (b) Define these events:

   A: the subcommittee has two women

   B: the subcommittee has at least one woman

   The total number of the combinations where the subcommittee has no women and four men is $\binom{5}{4} = 5$, therefore,

   the total number of the combinations where the subcommittee has at least one woman is 330-5=325.

   And since $A \subset B, P(A \cap B) = P(A)$.Therefore,

   $$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A)}{P(B)} = \frac{150/330}{325/330} = 150/325 \simeq .46$$