Solutions for quiz 3

1. The random variable X can take values 0,1,2. The probability masses at those points are

$$P(X=0) = \frac{\binom{9}{2}}{\binom{12}{2}} = \frac{36}{66}$$

$$P(X=1) = \frac{\binom{3}{1}\binom{9}{1}}{\binom{12}{2}} = \frac{27}{66}$$

$$P(X=2) = \frac{\binom{3}{2}}{\binom{12}{2}} = \frac{3}{66}$$

2. (a) Define these events:
   A: Company A makes a profit
   B: Company B makes a profit
   $P(A) = .9, P(B) = .8, P(\overline{A \cup B}) = P(\overline{A} \cap \overline{B}) = .05$
   $P(A \cup B) = 1 - .05 = .95$
   $P(A \cap B) = P(A) + P(B) - P(A \cup B) = .9 + .8 - .95 = .75$

   (b) Compare the two conditional probabilities $P(B|A)$ and $P(B|\overline{A})$:
   $P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{.75}{.9} \simeq .83$
   $P(B|\overline{A}) = \frac{P(\overline{A} \cap B)}{P(\overline{A})} = \frac{P(B) - P(A \cap B)}{1 - P(A)} = \frac{.8 - .75}{1 - .9} = \frac{.05}{.1} = .5$
   $P(B|A) > P(B|\overline{A})$
   Company B is more likely to make a profit if company A makes a profit.