Robert has a box which contains three good and two defective products. In an experiment he will select two products out of his box without replacement. He will record the number of good products as a random variable $X$. Before his experiment, he is supposed to answer the following questions first. Could you help him?

1. What are the possible outcomes for the random variable $X$?

2. What are the probabilities of the following events? Show your procedure to obtain the probabilities.  
   (a) No good products  
   (b) Exactly one good product  
   (c) At least two good products

3. If the probability distribution function of $X$ is given by the following table, what are the mean ($\mu$) and standard deviation ($\sigma$) of $X$?

   $\begin{array}{ccc|c}
   X & P(X = x) & 0 & 1 & 2 & \text{Total} \\
   \hline
   & 0.1 & 0.6 & 0.3 & 1.0 \\
   \end{array}$

**Answer:**

1. $X = 0, 1, 2$

2. Let $G$: Good, and $D$: Defective.

   (a) $P(X = 0) = P(DD) = (2/5)(1/4) = 2/20 = .1$
   (b) $P(X = 1) = P(DG) + P(GD) = (2/5)(3/4) + (3/5)(2/4) = 12/20 = .6$
   (c) $P(X = 2) = P(GG) = (3/5)(2/4) = 6/20 = .3$

3.

   $\begin{array}{cccc}
   x & f(x) & xf(x) & x^2 f(x) \\
   \hline
   0 & 0.1 & 0.0 & 0.0 \\
   1 & 0.6 & 0.6 & 0.6 \\
   2 & 0.3 & 0.6 & 1.2 \\
   \hline
   \text{Total} & 1.0 & 1.2 & 1.8 \\
   \end{array}$

   (a) mean: $\mu = \sum x f(x) = 1.2$
   (b) $\sigma^2 = \sum x^2 f(x) - \mu^2 = 1.8 - (1.2)^2 = .36$
   
   standard deviation: $\sigma = \sqrt{.36} = .6$