$$s^2 = \frac{\sum\limits_{i=1}^{n} (y_i - \bar{y})^2}{(n-1)}$$

$$P\{E_1 \cup E_2\} = P\{E_1\} + P(E_2) - P\{E_1 \cap E_2\}$$

$$P\{E_1 \cap E_2\} = P\{E_1\}P\{E_2 \mid E_1\}$$

$$\mu_Y = \sum y_i \, P\{Y = y_i\}$$

$$\sigma_Y^2 = \sum (y_i - \mu_Y)^2 \, P\{Y = y_i\}$$
$$= E(Y^2) - (E(Y))^2$$

$$P\{Y = j\} = {}_nC_j \, p^j \, (1 - p)^{n-j}$$
$$\mu_Y = np$$
$$\sigma_Y^2 = np(1 - p)$$

$$Z = \frac{(Y - \mu)}{\sigma}$$

Part I: Answer six of the following seven questions. If you complete more than six, I will grade only the first six. Five points each.

1) $P(A) = 0.2$ $P(B) = 0.40$ A and B are independent. **What is $P(A \cap B)$?**

$(0.2)(0.4) = 0.08$

2) $P(A) = 0.2$ $P(B) = 0.40$ A and B are mutually exclusive. **What is $P(A \cup B)$?**

$0.2 + 0.4 = 0.6$

3) $P\{A\} = 0.8$ $P\{A \cap B\} = 0.2$ **What is the probability of B given A?**
$$\frac{0.2}{0.8} = 0.25$$

4) Circle the correct answer. In a breeding experiment, white chickens with small combs were mated and produced 190 offspring. Researchers observed the offspring to determine whether the offspring had

White feathers, small comb
White feathers, large comb
Dark feathers, small comb
Dark feathers, large comb

The variable in this study is discrete / continuous / nominal / ordinal.

5) The following data set is weight gain (lbs.) in lambs fed a certain diet over a specified amount of time:
9, 16, 21, 11, 18

Calculate the mean of this data.
$$\bar{x} = \frac{9+16+11+21+18}{5} = 15 \text{ pounds}$$
Calculate the median of this data.

$M = Q_2 = 16$ pounds

6) An experiment, which fit the criteria for the Bins setting, was conducted using a sample size of 80 with the probability of a success equal to 0.6.
What is the mean of this distribution?
$\mu = np = (80)(0.6) = 48$ ...there are no units reported here
What is the standard deviation?
$\sigma^2 = np(1\text{-}p) = (80)(0.6)(0.4) = 19.2 \Rightarrow \sigma = \sqrt{19.2} = 4.382$ ...there are no units reported here

7) A graphical display shows that a particular data set is fairly symmetric and bell-shaped. **Approximately what percent of the data lie within 3 standard deviations of the mean?**
Using the empirical rule, approximately 99.7% of the data lie within 3 standard deviations of the mean.

8) Circle the correct answer. A data entry clerk is entering some data from an experiment involving the number of seizures during an eight week period for each of 20 epilepsy patients. The data entry clerk mistypes one of the datum by either adding or deleting a 0 off the end. **The <u>mean</u> / <u>median</u> is most likely to be affected.**

9) Let Y denote the number of times a person can get chicken pox in his or her lifetime. A researcher reports the following probability distribution for Y:

Y	0	1	2
P{Y}	.01	.86	.13

Find μ_Y

$$\mu = \sum yP(y) = 0(0.01) + 1(0.86) + 2(0.13) = 1.12 \text{ times}$$

Find σ_Y

$$\sigma^2 = \sum (y\text{-}\mu)^2 P(y) = (0\text{-}1.12)^2(0.01) + (1\text{-}1.12)^2(0.86) + (2\text{-}1.12)^2(0.13) = 0.1256$$
$$\Rightarrow \sigma = \sqrt{\sigma^2} = \sqrt{0.1256} = 0.354 \text{ times}$$

Using the TI-83/84 Enter y's in List 1, P(y)'s in List 2, STAT -> scroll to CALC -> ENTER (for 1-Var Stats) -> L₁, L₂ after the 1-Var Stats prompt appears
$\mu_x = 1.12$ times   ($\bar{x}$ is the same calculation)
$\sigma_x = 0.354$ times (S_x is a different calculation and would be marked incorrect)

Part II: Answer every part of the next two problems. Read each question carefully, and show your work for full credit.

1) In the United States, 11% of adolescent girls have iron deficiency. Suppose six adolescent girls are chosen at random.

   a) (15 pts.) Find the probability that at most one of these six girls will be iron deficient.

   Using the TI-83/84
   P(Y ≤ 1) = binomcdf(6, 0.11, 1) = 0.8655

   b) (15 pts.) Find the probability that 2 or more of these girls will be iron deficient.
   P(Y ≥ 2) = 1 − P(Y ≤ 1) = 1 − binomcdf(6, 0.11, 1) = 0.1345

2) The brain weights of a certain population of adult Swedish males follow a normal distribution with mean $\mu = 1400$g and standard deviation $\sigma = 100$g.

  a) (15 pts.) What percentage of the brain weights for this population are between 1200 and 1600 grams?

normalcdf(1200, 1600, 1400, 100) = 0.9545 $\Rightarrow$ 95.45%

  b) (15 pts.) What is the 80th percentile for this distribution?

invNorm(0.8, 1400, 100) = 1484.162 grams

3) (12 pts.) A researcher measured the weights(g) of 19 woodchucks. The researcher is hoping to use a statistical test which requires the assumption of the data coming from a normal population. Using the QQplot below, discuss whether this assumption appears to be met or violated and why. One or two sentences should suffice…
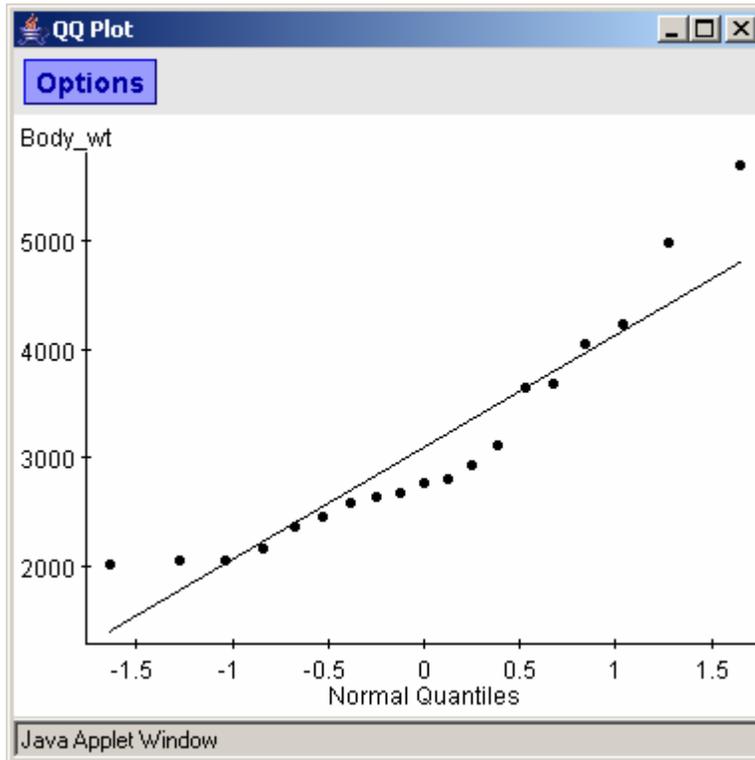
The points are making a systematic departure from the line, the shape of which, is indicating they are from a skewed right distribution. There is a probable violation of the normality assumption here.