**Math 121** **Test #2 Solutions** **Fall 2006**

$(26, 56, 73, 83, 92)$, $\overline{x} = 67.7$.

1. (13 pts) $(0, 10, 10, 10.75, 13)$, $\overline{x} = 9.6$.

   Enter the numbers into a list and store it as $\texttt{L}_1$. Then use $\texttt{1-Var Stats L}_1$ to get the following statistics.

   (a) $\overline{x} = 98.73$.

   (b) $s = 14.20$.

   (c) The variance is the square of the standard deviation, so $s^2 = 14.20^2 = 201.6$.

2. (16 pts) $(11, 12.25, 14, 16, 16)$, $\overline{x} = 14.0$.

   For parts (a) and (b), use the same method as in problem 1, and scroll down further through the statistics.

   (a) median = 99.

   (b) Q1 = 93 and Q3 = 106. If you use the formula $r = 1 + \frac{p}{100}(n-1)$, then you should get Q1 = 94 and Q3 = 103.5.

   (c) Use $r = 1 + \frac{p}{100}(n-1)$ with $p = 60$ and $n = 11$. You get $r = 7$. The $7^{\text{th}}$ number in the list is 99.

   (d) The number you were to start with should have been 84, not 88. I changed the value in the list and forgot to update part (d). Had the number been 84, then you would use $r = 2$ because it is the $2^{\text{nd}}$ number in the list. Then solve for $p$ and get $p = 10$. So 84 is the $10^{\text{th}}$ percentile.

3. (8 pts) $(4, 6, 7, 7, 8)$, $\overline{x} = 6.7$.

   (a) Use the quartiles from problem 2. If your quartiles were 93 and 106, then the IQR is $106 - 93 = 13$. Then find $1.5 \times 13 = 19.5$. Add this to Q3 and subtract it from Q1 to get the fences of 73.5 and 125.5. Since 72 and 126 are outside of this range, they should be plotted as outliers and the whiskers should end at 84 and 114.

   If your quartiles were 94 and 103.5, then follow the same procedure and get fences of 79.75 and 117.75. Again, 72 and 126 are outliers, so plot them as such.

   (b) The boxplot appears to be very symmetric, but not uniform. You might speculate that the distribution is unimodal, but that is not very certain.

4. (20 pts) $(0, 8.5, 13, 20, 20)$, $\overline{x} = 12.5$.

   (a) The interval is infinite to the left, so use `normalcdf(-E99,90,77,13)` and get 0.8413.

(b) Use `normalcdf(60,100,77,13)` and get 0.8661.

(c) Use `invNorm(.60,77,13)` and get 80.29.

(d) The cutoff for the top 10% of the scores is the same as the $90^{\text{th}}$ percentile of the scores. So use `invNorm(.90,77,13)` and get 93.66.

5. (18 pts) $(2, 5, 13, 13.75, 15)$, $\overline{x} = 10.0$.

(a) The variable $X$ is the amount of money won, not the number of heads. So the pdf is

| $x$ | $P(X = x)$ |
|---|---|
| 5 | $\frac{1}{8}$ |
| 10 | $\frac{3}{8}$ |
| 15 | $\frac{3}{8}$ |
| $-50$ | $\frac{1}{8}$ |

You could use the decimal values 0.125 and 0.375 instead of the fractions $\frac{1}{8}$ and $\frac{3}{8}$.

(b) Enter the values of $X$, namely {`5,10,15,-15`}, into list $\mathtt{L}_1$ and enter the probabilities {`0.125,0.375,0.375,0.125`} into list $\mathtt{L}_2$. Then use `1-Var Stats` $\mathtt{L}_1$, $\mathtt{L}_2$ and get $\overline{x} = 3.75$. If you incorrectly used the number of heads {`0,1,2,3`}, then you got an average of 1.5.

(c) Continuing from part (b), read the value of $\sigma$ as 20.58. If you incorrectly used the number of heads {`0,1,2,3`}, then you got a standard deviation of 0.8660.

(d) If the player won *at least* \$5.00, then he won \$5.00, \$10.00, or \$15.00, which has probability $\frac{7}{8}$. If he won *more than* \$5.00, then he won either \$10.00 or \$15.00, which has probability $\frac{6}{8}$. So the probability is $\left(\frac{6}{8}\right) / \left(\frac{7}{8}\right) = \frac{6}{7}$.

6. (25 pts) $(0, 6.5, 15, 21.75, 25)$, $\overline{x} = 14.5$.

(a) In each case, $X$ is uniform, so the graph is a horizontal straight line. For the first graph, the line extends from 5 to 10, with a height of $\frac{1}{5}$. In the second graph, it extends from 5 to 20, with a height of $\frac{1}{15}$.

(b) Using the first graph, the area from 8 to 10 is $A = (10-8) \times \frac{1}{5} = 0.4$, so the probability is 0.4. These are continuous distributions, so it is important to use area to find probabilities.

(c) The direction of extreme is to the right. Therefore, you should shade the area to the right of 9 (from 9 to 10) in the first graph. The area is $\alpha = (10 - 9) \times \frac{1}{5} = 0.2$.

(d) Shade the area to the left of 9 (from 5 to 9) in the second graph. The area is $\beta = (9 - 5) \times \frac{1}{15} = \frac{4}{15} = 0.2667$.

(e) The $p$-value is measured in the same graph and in the same direction as $\alpha$. So the $p$-value is $(10 - 7.5) \times \frac{1}{5} = \frac{2.5}{5} = 0.5$.