MTH 105: Final Review Part 2

1. Each team in a new basketball league will play three games against each of the other teams. There are seven teams: the Antelopes, the Bears, the Cubs, the Dusters, the Eagles, the Foxes, and the Goats. How many games will be played in all?

   Note that the game "Antelopes vs. Bears" is the same as the game "Bears vs. Antelopes" so don't over count. There are a total of 21 games if each team plays every other team one time, so if they each play every other team three times there will be 3 $\times$ 21 = 62 games.

2. The average (mean) of ten test scores is 79.2. The average of the lowest three scores is 62. What is the average of the other seven scores?

   Recall that to compute the mean we add up all of the scores and divide by the total number of scores. Working backwards, if the mean of ten scores is 79.2, then the sum of those ten scores is 79.2 $\times$ 10 = 792. If the mean of the lowest three is 62, then the sum of the lowest three is 3 $\times$ 62 = 186. So we can figure out the sum of the other seven scores by subtracting: 792-186 = 606. To find the mean, we just divide by seven: 606 $\div$ 7 = 86.57.

3. Construct a data set where 80% of the values are below the average. What is the median of your data set?

   There are many possible answers, but in all cases 80% of the numbers will be low compared to the top 20%. One example is : 0,0,0,0,0,0,0,0,10,10.

4. Graphs and means.

   (a) Make a sketch of graphs with the following shapes: normal, skewed left, bimodal, uniform.

   See your book: normal (p. 701), skewed left (p. 672), bimodal (p. 682), uniform (p. 694)

   (b) For which of the graph(s) in (a) would you expect the mean of the data to be equal to the median?

   normal and uniform

5. You conducted a survey and found that 45% of people prefer coke over pepsi with a margin of error of $\pm$3% at the 95% confidence level. Based on these results, can you predict which cola most people prefer? Explain.

The confidence interval for this is 45% ± 3% which is between 42% and 48%. All of those values are less than 50% so this says most people prefer pepsi.

6. You are the owner of a restaurant and are considering adding ice cream to your dessert menu. You want to survey people to see if they would order this tasty treat. How many people should you ask to get a 95% confidence interval with an error of no more than 3%?

   The error in a 95% confidence interval for proportions is given by $\frac{1}{\sqrt{n}}$ where n is the sample size. So we want to find an n such that $\frac{1}{\sqrt{n}} = 0.03$ You can solve for n using algebra or find n by trial and error. You get $n = 1111.\overline{1}$. Since we want an error of <u>at most</u> 3%, then we must always round UP to error on the side of caution. Hence we need to ask 1112 people.

7. You play a game where two dice are rolled. If you roll doubles you win $10; if you get an odd sum you pay $2; in all other cases you win $0. Is this a fair game? Explain.

   The expected value is $10 \times \frac{6}{36} - 2 \times \frac{18}{36} + 0 \times \frac{12}{36} = \frac{24}{36} = \$0.67$. Since the expected value is not zero, this is NOT a fair game.

8. You want to buy a 5 year CD. You go in expecting to put $2000 down for an annual interest rate of 3%. The bank tells you that if you put $4000 down, they will increase the interest rate to 3.5%. How much more money would you make if you took the higher interest rate offer?

   If we put $2000 down we earn $\$2000(1.03)^5 = \$2,318.55$, which is a profit of $318.55. If we put $4000 down we earn $\$4000(1.035)^5 = \$4750.75$, which gives a profit of $750.75. Hence if we put down the larger amount we will make $\$750.75 - \$318.55 = \$432.20$ more.

9. You want to purchase a $\$450,000$ home. You have $\$40,000$ saved up to put down on the house.

   (a) If you get a 15 year mortgage with an annual interest rate of 3.5%, how much will your monthly mortgage payments be? In the end, how much money will you spend on the purchase of your home?

   Your monthly payment will be $2931.02 for a total of $\$40,000 + (\$2931.02 \times 12 \times 15) = \$567,583.60$.

   (b) If you get a 30 year mortgage with an annual interest rate of 4.3%, how much will your monthly mortgage payments be? In the end, how much money will you spend on your home?

   Your montly payment will be $1517.63 for a total of $\$40,000 + (\$1517.63 \times 12 \times 30) = \$586,346.80$