Classroom Activity 1 | Math 113 | Name : ____________________
10 pts | Intro to Applied Stats

Materials Needed:

Stopwatch, straps.

Instructions:

Divide into teams of three people.

We will be determining the time it takes to complete a four-legged race of a pre-determined distance. Each team of three should stand side by side and strap their legs together at the ankles. This is similar to a three-legged race except the middle person will have both legs strapped to another person.

Once the legs are strapped together, walk the length of the course and record the time it takes to finish. Then rearrange the order of the group and repeat the process so that each person has a chance to be in the middle once.

1. Record the first names of the persons in each position and the time in seconds that it takes to complete the course.

Heat	Left	Middle	Right	Time
1				
2				
3				

2. Give your results to the instructor, who will combine the data. Use the combined class data to answer the remaining questions.

3. Describe the who, what, where, when, why, and how of the activity.

4. Summarize the time variable. Do this for each heat as well as the total.

Heat	**1**	**2**	**3**	**Total**
Sample Size				
Mean				
Median				
Standard Deviation				

5. Answer the following questions based on common sense and the summarized data.

   a. Do the times seem to be getting shorter or longer in the later heats?

   b. What statistic are you looking at to determine this?

   c. As the teams have more practice (ie, 2nd and 3rd heats), do the times of the teams become more consistent, less consistent, or stay the same?

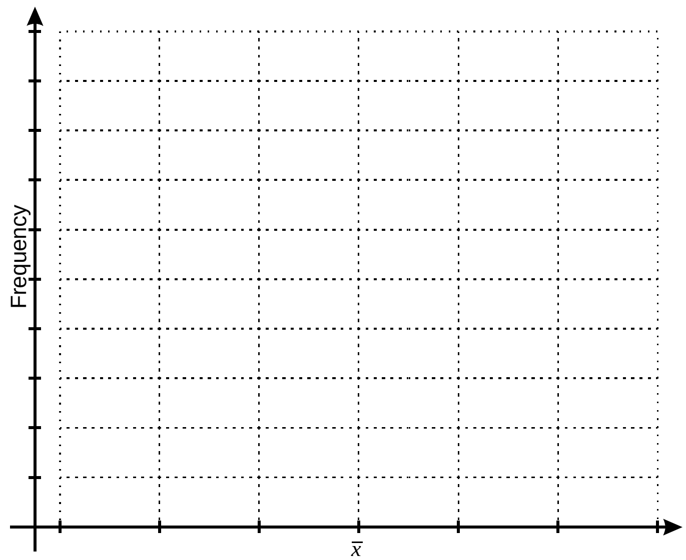
   d. What statistic are you looking at to determine this?

   e. Each group should generate and print a box plot of the time vs the heat number; each person should answer the questions below based on the box plot.

      i. Do the times seem to be getting shorter? How can you tell?

      ii. Do the times seem to be getting more consistent? How can you tell?

6. Generate a histogram that displays the region from $\bar{x} - 3s$ to $\bar{x} + 3s$ in six equal intervals of one standard deviation each. Each team should print out one graph, each person should copy the graph below. Label the boundary values for the histogram along the x-axis.



a. Find the percent of the total values that lie within 1, 2, and 3 standard deviations of the mean and record them in the table. Compare them with the theoretical values for the empirical rule and Chebyshev's theorem. This empirical rule is only for unimodal, bell-shaped data while Chebyshev's theorem is supposed to apply to any distribution.

% of values	**w/in 1 std. dev.**	**w/in 2 std. devs.**	**w/in 3 std. devs.**
Our sample data			
Empirical Rule	≈ 68%	≈ 95%	≈ 99.7%
Chebyshev	Not Applicable	≥ 75%	≥ 88.9%

b. Do either of the rules hold for our data? If so, which one(s)?

7. Read the section in chapter 6 on "Are you normal? How can you tell?"

   a. How can you tell from a normal probability plot whether or not the data is roughly normal?

   b. Generate a normal probability plot and interpret whether or not the data looks normally distributed. Each team should print one graph, each person should interpret the results.

8. If you have decided that the data is normally distributed, then perform a One-Way ANOVA to see if the mean time for each of the heats is the same. If the data is not normally distributed then perform the non-parametric Kruskal-Wallis test to see if the median time for each of the heats is the same. In either case, you will get a probability value identified by “P = ”. This represents the probability of getting the results we did if the means [medians] really are the same. If the chance of getting our results is small (less than 5% or 0.05), then we reject the assumption that the means [medians] are equal.

   a. Which test did you run? (ANOVA / Kruskal-Wallis)

   b. What is the probability value?

   c. Should we reject the assumption that the means [medians] are equal?

   d. The means [medians] (do / do not) appear to be equal.