Prob & Stats Names: _____

Variation in Measurement Date: Period:

Work in Pairs. Turn in one answer per pair. Use this cover sheet.
All measurements in **millimeters**
Do not drop any outliers.

	Tennis Ball		Head Circumference		Thickness of Page	
Your measurements:						
Fill this table with your calculations						
Mean (Mark this on your graphs)						
Median						
Standard Deviation (sample)						
IQR						
Mark on the graph the outlier boundaries and list here any measurements that are outliers **(Do not Drop Outliers)**						
Range						
Mark on the graph the 2 SD boundaries and list here any measurements more than 2 SDs away from mean						

After graphing: **- answer these questions for each of the three measurements**

1. Make a dot-plot with box plot of each.
2. Describe each distribution, including any interesting "features" of each.
3. Do the mean and median differ? Explain why, using the data explicitly.
4. a) Identify (color or list) any measurements that are more than two standard deviations away from the mean. Compare these values to any outliers.
   b) Choose which you think is a better measure for outliers: 1.5IQR or ±2SD. Why?
5. Make hypotheses on why these outliers exist or don't exist. Think: causes of variation.
6. Is mean or median the best measure for center for these data? Is standard deviation or IQR the best measure of variability for these data? Explain why.
7. Suggest the sources of variation for these measurements, and identify whether the primary source of variation for each element is due to the measurement system itself or due to the variation among the elements or both equally. Discuss how you know this.
8. Suggest ways to reduce measurement caused variability.

9. As a class we will redo one of the measurement activities, making use of one variation-reduction suggestion from step 7 above. Answer the questions given below.

Re-Measurement

1. Re-do the dot plot and box plot. Don't forget to indicate the mean and ± 2 SD boundaries.
2. Describe in writing what you see in the new distribution compared to the original. Think center, spread, shape.
3. Did the different technique(s) make a difference? Describe how you know.

Variation in Measurement - Rubric

1a. Graphs & Graphing conventions	/4	/4	/4	/12
1b. Correct Calculations	/2	/2	/2	/6
2. Describing Data (center, spread, shape)	/8	/8	/8	/24
3. Are Mean & median different? Explain...	/2	/2	/2	/6
4a. 2-sd from mean...	/2	/2	/2	/6
4b which is better? Why?	/2	/2	/2	/6
5. Why Outliers... causes of variation...	/2	/2	/2	/6
6. Which is better … Why?	/2	/2	/2	/6
7. Sources of variation...	/2	/2	/2	/6
8. Suggestions for reducing variation	/2	/2	/2	/6
9.1. New graph				/5
9.2. Comparison/description center/spread/shape				/8
9.3. Did it make a difference? How do you know?				/9
			Total:	/106