Gizmos

Name: _____ Date: _____

Student Exploration: Reaction Time 2

Vocabulary: mean, median, mode, outlier, range

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)
Bob and Jane went bowling. Bob's scored 120, 85, and 110. Jane scored 131, 90, and 95.

1. Bob and Jane decide that the fairest way to compare their scores would be to add up their total scores. What were their totals? Bob: _____ Jane: _____

2. Sue scored 74, 85, 114, and 82. She says that she did better than Bob and Jane because her total score was 355. Do you agree with Sue? _____ Explain. _____

   _____

3. What would be a fair way to compare the three sets of scores? _____

   _____

Gizmo Warm-up
First, let's review three statistics that describe data – range, mode, and median. You will use the experiments in the *Reaction Time 2* Gizmo to generate some data.

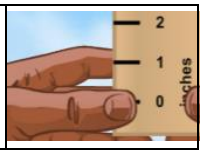
Choose **Click the target (stationary)** from the dropdown list. Click **Begin experiment**. When the target appears, click it as many times as you can. Repeat 10 times. Select **End experiment**.

Next to **Display**, choose the **List** view. Next to **Show results**, select **from smallest to largest**.

Results: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

- The **range** is the greatest value minus the least value. What is the range of this data? _____
- The **mode** is the most common value or values in the data set. What is the mode? _____
- The **median** is the middle value of the data set. (In this case, it's the number halfway between the two middle values.) What is the median of this data? _____

Use the Gizmo to check your answers by turning on **Show statistic** and selecting each statistic.

Activity A: **Finding the mean**	Get the Gizmo ready: • Click **Reset**. • Select **Catch the ruler (no sound)**.	

1. Click **Begin experiment**. Catch the ruler 5 times. Click **End experiment**. (Click any key on the keyboard to catch the ruler.) Write the results in inches: ____ ____ ____ ____ ____

2. Select the **Catch the ruler (with sound)** experiment. Check that your speakers are on.

   How do you think sound will affect your results? _____

3. Click **Begin experiment**. Catch 5 times. Write the results: ____ ____ ____ ____ ____

4. Add up the total score for each experiment. No sound: _____ With sound: _____

   A. Based on these totals, do you have better reactions to sight alone, or to sight and sound? _____

   B. Do you think that adding up the scores is a fair way to compare the data? _____

      Explain. _____

5. Click **Reset**, then **Begin experiment** for the **Catch the ruler (with sound)** experiment. Close your eyes, and catch the ruler *6* times. Write the results and add up the total score:

   Results (in inches): ____ ____ ____ ____ ____ ____ Total score: _____

6. Compare the total score for the eyes-closed experiment to the other total scores in #4.

   A. Which experiment had the best (lowest) total score? _____

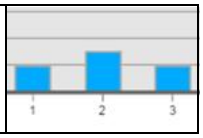
   B. When comparing data sets of different sizes, is it fair to compare total scores? _____

      Explain. _____

7. One way to compare data sets of different sizes is to find the **mean** of each data set. To find the mean, divide the total score by the number of scores. (So if there were 5 scores, divide the total by 5.) Calculate the mean of each data set.

   No sound: _____ Sound, eyes open: _____ Sound, eyes closed: _____

   Based on the means, in which experiment were your reactions fastest? _____

Activity B: **Outliers**	Get the Gizmo ready: • Click **Reset**. • Select **Enter your own data**.	

In many large data sets, the mean, median, and mode are very similar. One thing that can change this is an **outlier**. An outlier is a data value that is very different from the others.

1. Click the digit buttons to enter the following data set: 2, 3, 3, 4. Calculate the range, mode, median, and mean of this data. Turn on **Show statistic** to check your answers.

   Range: _____ Mode: _____ Median: _____ Mean: _____

2. Now add an outlier to the data set by clicking the "9" button once. The number 9 is an outlier because it is very different from the other values. Calculate the four statistics again.

   Range: _____ Mode: _____ Median: _____ Mean: _____

3. Compare the two sets of statistics. Describe how the outlier affected each statistic.

   Range: _____

   Mode: _____

   Median: _____

   Mean: _____

4. Click **Reset**, and choose the **List** view. Next to **Show results**, select **in the order they occurred**. Enter the data set: 7, 8, 7, 9, 1, 9, 8, 6, 8, 8.

   A. On the list, is it easy to see which value is the outlier? _____

   B. Now switch to the **Bar graph** view. How can you identify the outlier now? _____

   _____

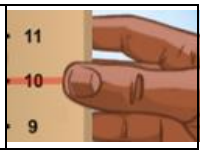
   C. Do you think the mean will be greater than or less than the median? _____

   D. Check your answer using the Gizmo. Were you correct? _____

5. In Olympic gymnastics, each routine is scored by a panel of judges. Before the total score is added up, the highest and lowest scores are thrown out. Why do you think this is done?

   _____

   _____

Activity C: **Reaction-time contest**	Get the Gizmo ready: • Click **Reset**.	

You can do many contests with the Gizmo. Design your own contest, or use one of these ideas.

- Catch the ruler or click the target, boys vs. girls
- Catch the ruler or click the target, kids vs. grown-ups
- Catch the ruler or click the target, 5th graders vs. 3rd graders (or something similar)

1. Which contest did you decide on? _____

2. Your contest needs two contestants. Who will they be? Name and describe each contestant.

   Contestant 1: _____

   Contestant 2: _____

3. Run 10 trials for each person. To make the contest fair, make sure that everything stays the same for each contestant. (If you are comparing computers or left vs. right hand, then use the same person for each trial.)

   Record the results below. (What unit is used for your data? _____)

   Contestant 1: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

   Contestant 2: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

4. Calculate the four statistics for each contestant.

   Contestant 1 Range: _____ Mode: _____ Median: _____ Mean: _____

   Contestant 2 Range: _____ Mode: _____ Median: _____ Mean: _____

5. Based on all of these statistics, who won the contest? _____

   Explain. _____

   _____

6. Which statistic did you find most useful for comparing data sets? _____

   Explain. _____

   _____