Measures Exploration Questions

Scientists study how things react to certain conditions in their environment. Scientists conduct experiments in which they control the environmental conditions to determine the effect on the subject. Scientists must decide what characteristic of their subject they wish to measure. For example, biologists conduct series of experiments using plants. They control the environment and measure the plants' height, development, the total weight of grains or fruits on each plant, and so on. Because plants are different from each other, if scientists measured just one or two plants, they would get random results, which might be inaccurate. So scientists measure several plants and take all these measurements into consideration. The more plants they study the more accurate the results will be. But when measuring multiple plants the scientists need a way to represent the change that occurred to all the plants. The scientists use several methods to measure the "center" of the data collected. Mean and median are two ways to measure the "center" of the data. This applet allows you to collect or make up your own data on any subject you wish to study and measure any characteristic you wish.

Mean

1. Set the number of subjects you are studying to be two, and set the measurement of both subjects to the same number. What is the value of the mean?

2. Increase the measurement of one subject by 10. What happens to the mean? Keep increasing the measure of this subject. What happens to the mean?

3. Set the measurement of both subjects to the same number. Note the mean. Now decrease the measurement of one subject by 10. What is the mean now? What should you do to the measurement of the second subject to change the mean back? Do you already know what the mean is?

4. Set the number of subjects to be 5 and set all their measurements to the same value. Increase the measurement of one subject by 10. What happens to the mean? What happens if you increase the measurement of one subject by 20? Decrease by 30? What happens to the mean if you increase the measurements of two subjects by 10 each? Three plants by 10 each?

5. Set the number of subjects to 10 and repeat the experiments from 4. What is different now? Why?

Median

1. Set the number of subjects to be 3, and their measurements to three different numbers. What is the median? Repeat with another three measurements. What is the median now?

2. Set the number of subjects to be 2, and the measurements to two different numbers. What is the median? Repeat with different measurements.

3. Reset the number of subjects. Change their measurements and observe the median. What happens? Why?

Mean and Median

1. Set the number of subjects to be two. Using different measurements, compare mean and median. What happens? Why?

2. Set the number of subjects to be three. Find several different settings of measurements for which mean and median are different. Now find several different settings when mean and median are the same. What is the pattern?

3. Find a setting for which median is much larger than mean.

4. Set the number of subjects to be 10. Set 9 of the measurements to be the same, and the last one different by many points (e.g., set nine measurements to 3 and the tenth to 50). What is the mean and the median? Which one represents the data better?