

## MEASURES OF CENTRAL TENDENCY ACTIVITY

Planned by Julie Keener at Central Oregon Community College

Material:      Graphs for students to post on (one per group - on one inch grid paper)  
                  One inch dots (each student needs one for each graph)  
                  1/4 inch grid paper - one per student  
                  Signal dots - (each student will need one for each person in class)  
                  Masking tape  
                  Chart markers  
                  Rulers  
                  Meter sticks  
                  Dice  
                  Two color counters  
                  Snap cubes (1000 Hex-a-link cubes for \$80 from Math Learning Center  
                                  1-800-575-8130)

Questions for graphs:

How many letters in your first and last name combined?  
What is the sum of the four digits in the year you were born?  
How many buttons are you wearing today?  
How long is your stride (toe to toe) to the nearest inch?  
What is the sum of the last four digits in your phone number?  
Toss 10 two color counters. How many land red side up?  
What is the length of your hand span to the nearest centimeter (little finger tip to thumb tip with your hand stretched).  
Roll 5 dice. What is the sum?  
How many cubes did you grab in a handful?

As students come into class, have them collect the information for the class graphs.  
Post the questions on the board - warn students to do the sampling activities only once each.  
(Have rulers, Meter Sticks, Dice and Two color Counters at the tables.)

As students collect the data, circulate with the snap cubes, having each student grab a handful.

Give each student 9 one-inch sticker dots.

## HANDFULS

- Count your own cubes
- What do you think the range will be (lowest, highest)?  
Discuss in groups - share.
- Group by the number of cubes you have.  
Which group is largest? MODE
- Post the first sticker dot, then line up in order from smallest to largest number of cubes.  
Who is in the middle? MEDIAN
- Input data into Excel spreadsheet.
- How can you find the MODE and MEDIAN from the graph?
- Record the MODE and MEDIAN on the graph.
- Find Q1 and Q3. Record these on the graph.
- Build a Box and Whisker Graph above the Sticker dots.

Box and whisker plots require:

- lowest score
- the median
- the highest score
- the lower and upper quartiles

To find the lower and upper quartile, arrange the scores in increasing order. With an even number of scores, say  $2n$ , the lower quartile is the median of the  $n$  smallest scores. The upper quartile is the median of the  $n$  largest scores. With an odd number of scores, say  $2n + 1$ , the lower quartile is the median of the  $n$  smallest scores, and the upper quartile is the median of the  $n$  largest scores.

The difference between the upper and lower quartiles is called the **interquartile range (IQR)**. This statistic is useful for identifying extremely small or large values of the data, called outliers.

An **outlier** is commonly defined as any value of the data that lies more than 1.5 IQR units below the lower quartile or more than 1.5 IQR units above the upper quartile.

The Box and Whisker gives a visual picture of the distribution of the data.

- Compare the box and whisker graph to the bar graph and the class standing in the semi-circle.
- Sit back down. Most often in school the measure of central tendency we have students find is the MEAN.
- Discuss in your groups and determine the mean for the cubes.
- Class discussion of methods. What does it mean to find the MEAN? Discuss.
- Even up cubes. MEAN
- How many cubes are there altogether? How can you find out?
- Compare the MEAN, MEDIAN AND MODE with spreadsheet results.
- Use Excel to compute Standard Deviation.
- Uses for mean, median, mode.
- Compute Mean  $\pm 1$ , 2, and 3 Standard Deviations.
- Record these below the bar graph. Determine the percent of data mean  $\pm 1$  SD, mean  $\pm 2$  SD and mean  $\pm 3$  SD.

Number off students by 8's. After everyone has put there 8 sticker dots on the 8 graphs, each group will get one of the big graphs, to do the same thing we just did with the handfals graph. Each person will also get a sheet of quarter inch grid paper with 1/4 inch dots to make a mini-replica of the big poster for their records.

Verify that each group has someone who is at least a little comfortable with Excel.

As groups finish the big poster, they should post them back up on the wall.

Compare and contrast results.

Compare to Normal Distribution.

A normal distribution exists when the MODE = MEDIAN = MEAN

The interval within one standard deviation of the mean contains about 68% of the data, the interval within two standard deviations of the mean contain 95% of the data, and the interval within three stand deviaitions of the mean contain 99.7% of the data.

Microsoft Excel - Book1

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A	B	C	D	E	F	G
1	5	Mean	=AVERAGE(A1:A17)	Type the formulas as shown, adjusting the A17 to correspond to the cell containing your last piece of data. (When you hit return after putting the formula in each cell you should no longer see the formula, instead, the value should be displayed.)		
2	8	Median	=MEDIAN(A1:A17)			
3	9	Mode	=MODE(A1:A17)			
4	11	Standard Deviation	=STDEV(A1:A17)			
5	11					
6	12					
7	12					
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9	13	Column A should				
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Draw AutoShapes

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