## The MEAN Class <br> The Measures of Central Tendency

## Subject Area:

Math : Data Analysis, Probability, and Discrete Math
Science: Science as Inquiry and Transformation of Energy
Grade Level:
5-8
Activity Time:
45 Minutes
Device:
TI-73 Explorer ${ }^{\text {TM }}$
Apps:
none (can be adapted to the TI Navigator)
Software:
TI Connect ${ }^{\text {TM }}$
Accessories:
none
Other:
Meter sticks or tape measures

## Overview

The students will gather the heights of all everyone in class to better learn about the measures of central tendencies. The purpose of this lesson will be a creation of a box and whiskers plot of student gathered data.

## Math Objectives:

Interpret and analyze graphs of height as a function of time, Use the change in the $y$ coordinates of an ordered pair to determine the height of an object
GLEs:
Measurement, Data Analysis, Probability, and Discrete Math
Grade 6
\#21 Demonstrate an intuitive sense of relative sizes of common units for length and area of familiar objects in real-life problems ( $M-2-M$ ) ( $G-1-M$ )
\#31 Demonstrate an understanding of precision, accuracy, and error in measurement (D-2M) ( $M-2-M$ )
\#32 Calculate and discuss mean, median, mode, and range of a set of discrete data to solve real-life problems (D-2-M)
Grade 7
\#32 Describe data in terms of patterns, clustered data, gaps, and outliers (D-2-M)
\#37 Determine probability from experiments and from data displayed in tables and graphs (D-5-M)
Grade 8
\#34 Determine what kind of data display is appropriate for a given situation (D-1-M)
\#37 Collect and organize data using box-and-whisker plots and use the plots to interpret quartiles and range (D-1-M) (D-2-M)

## Set Up and Discussion

Unless you have a very small class, this activity works best with students divided into groups of three to five.

Name a time and an example where using the mean value of data would be the best choice. -

Name a time and an example where using the median value of data would be the best choice.

Name a time and an example where using the mode value of data would be the best choice.

## Data Collection

Measure the height of each member of the group using the meter sticks - measure in centimeters.

1. Record the height of each student:
2. $\qquad$
3. $\qquad$ cm
4. $\qquad$ cm
5. $\qquad$
6. $\qquad$ cm
7. Place data of all students in a list.

To create a list go to LIST and enter each height of each student within L1.
(A named list can also be created)

## Analyzing the data

Calculate the mean, median, mode, min value, max value, and range and enter the values of each student.
(To find the median on paper)
Order the data from least to greatest in the table to find the median.

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| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Median $\qquad$
Look at the lower half of the data and find the median of that data. This is called the lower quartile: Q1
Q1 $\qquad$

Look at the upper half of the data and find the median of that data. This is called the upper quartile: Q3
Q3 $\qquad$

To calculate the mean:
Go the home screen


Press $2^{\text {nd }}$ key then LIST
Using the red arrow key - arrow over to MATH
Scroll down to number 3 (or just press 3)
To calculate the mode, min and max values:
Follow the same procedure as calculating mean with the exception of the following options

- for mode choose number 5
- for min value choose number 1
- for max value choose number 2
- for range this must be calculated in the home screen after finding the min and max values

Mean $\qquad$
Mode $\qquad$

Min value $\qquad$
Max Value $\qquad$

Range $\qquad$

## Constructing a box and whiskers plot:

Construct $a$ box and whiskers plot of the class data in the graph below. Make sure to label and scale the $x$ axis.


To create a box-and-whiskers plot on the calculator:

1. Press $2^{\text {nd }}$ then PLOT
2. Press enter on the first plot (or go to the next available plot)
3. Press enter on ON then arrow down to Type
4. Press enter on the box-and-whiskers plot then arrow down to Xlist
5. Press $2^{\text {nd }}$ LIST to retrieve the data stored in L1
6. Press enter on L1
7. Press the GRAPH soft key
8. If the graph is not visible then change the window settings or ZOOM 7
9. Using the TRACE soft key arrow right and left to find the following data
10. Write each of the following pieces of data in the spaces provided:

Mean $\qquad$ Min value $\qquad$ Max Value $\qquad$ Q1 $\qquad$ Q3 $\qquad$

Were the values of each piece of data the same as when you constructed your own box-andwhiskers above? Why or Why not?

## Answer the following questions:

Is the median higher or lower than the mean?

What would cause the mean to be higher than the median? Explain.

What would cause the mean to be lower than the median? Explain.
$\qquad$
$\qquad$

Does the data show any outliers? Explain.

How would the data change in two years for the same group of students?

If a sample the entire school was taken, would the mean change? Why or Why not?

If a sample the entire school was taken, would the median change? Why or Why not?

