Seventh Grade Statistics

Grade: 7

Time Span: 5 days

Tools used in this unit:
• Class set of computers (w/ internet access)
• Colored building cubes
• Newspapers
• Class set of TI 73 calculators
• Overhead TI 73 model calculator
• Yard sticks (Class set)

Prepared By:

Sandra M. Czechowski
Intended Audience

Statistics is a very broad topic, and is introduced at a very young age. This unit is both a review as well as extension of the topic for seventh graders that integrates more technology and hands on learning than previous introductions to the topic. Both the activities as well as necessary grasp of content are conducive to teaching this at the seventh grade level.

Description of the Unit

An interactive unit on Statistics geared towards the seventh grade curriculum. This unit addresses many of the NYS as well as NCTM standards for Seventh Grade utilizing a variety of teaching and learning styles. It encompasses learning through inquiry, using technology, manipulatives, and direct instruction.

The topics addressed in the unit include:

- Discovering Statistics
- Frequency Tables
- Histograms
- Double Bar Graphs
- Stem and Leaf Plots
- Line Plots
- Mean, Median, Mode, and Range
Objectives
Objectives to be met throughout the unit:

The objectives for this unit were written in two categories. The Aim, which is what will be accomplished; and the Behavioral, which is how that will be done.

Aim:

Overall: To introduce students to different applications of Statistics in real life situations as well as give them the knowledge and background to compute and display those applications in various ways.

1.) To introduce the students to the topic of Statistics using a hands on approach.

2.) To introduce and successfully construct frequency tables as well as how the information in a frequency table can be used to create a histogram. The students will use the information presented to analyze related questions.

3.) To introduce the concept of using a bar graph to represent two sets of data.

4.) To introduce steam and leaf plots as well as line plots for use in analyzing sets of data.

5.) The students will review the concepts of mean median, mode and range on paper, and then learn how to manipulate these things on a TI 73 calculator. Data for this lesson will be collected using the Internet. Specifically http://www.weather.com
Behavioral:

Overall: The students will participate in various inquiry based lessons to establish and understanding of Statistics and its applications. The students will do this by creating, displaying, researching or finding the following:

- In their own words: Where do I see Statistics on a daily basis, and how do they pertain to me?
- Finding and bringing in examples of Statistics that they see on a daily basis.
- Using that information to create a Frequency Table, histogram, Stem and Leaf Plot, Line Plot, or Mean, Median, Mode, and Range of a set of data.
- Using the Internet as well as newspaper and classmates to gather data to manipulate in various lessons.
- Use the TI73 calculator to manipulate data and model certain events.

* All of these tasks will be completed to satisfactory (80%) accuracy.

1.) The students will be able to identify a minimum of five different everyday applications of statistics and find pertinent examples of each.

2.) The students will be able to construct label and fill a frequency table from a set of data.

3.) The students will also be able to use the data in that table to create a histogram showing frequency.

4.) The students will be able to successfully create a double bar graph given two sets of related data.

5.) The students will be able to successfully construct a stem and leaf plot given a set of numbers. The students will correctly identify the stem and leaves.

6.) The students will be able to place a given set of data into a line plot and answer questions relating to it.

7.) The students will be able to successfully calculate the mean, median, mode and range of a set of data using the list function of a TI 73 calculator. The students will gather this data using the Internet under the teacher’s supervision.
Standards Addressed
NCTM Standards to be Adressed:

- 1-4
- 1-5
- 1-15
- 7
- 8
- 10
- 13
Resources
Resources Used:


3.) http://www.weather.com, The Weather Channel

4.) The Buffalo News
Materials
Materials Needed:

- News paper clippings featuring various descriptive statistics.
- Sample Report Card (Enlarged to poster size)
- Chalkboard
- Thumbtacks or tape
- Lined paper
- Notes page for Statistics Introduction
- Colored Building Cubes
- Graph Paper
- Class set of Computers (with Internet access)
- Class set of TI 73 calculators
- Overhead Model of the TI 73 Calculator
- Class set of Yard sticks
- Height recording sheets
- Class set of Data Detectives recording sheets.
- Class set of Mission #2 worksheets.
- Rulers
- Stem and Leaf Plot notes
- Line Plot notes
- Frequency Tables Homework worksheet
- Double Bar Graph Worksheet
- Stem and Leaf Plot Homework Worksheet
Overview
Overview of Unit Plan:

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Description of Lesson:</th>
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| 1 | **Introduction To Statistics:**  
• Use classroom set up and decor to rouse student’s curiosity about statistics.  
• Make students aware of the “real life” applications of descriptive statistics through research. |
| 2 | **Frequency Tables and Histograms:**  
• To introduce frequency tables as a way of organizing data. This will be done by brainstorming a list of ways to count up and separate pieces of data.  
• Show students that frequency tables are easily converted into histograms, and the similarities of the two types of statistics. |
| 3 | **Double Bar Graphs:**  
• To compare the appearance and uses of histograms to Double Bar Graphs.  
• To construct and analyze a double bar graph given a set of data. |
| 4 | **Line Plots and Stem and Leaf Plots:**  
• Introduce students to a way of condensing large sets of data in a way similar to the histogram, except, you don’t need a frequency table first.  
• Introducing stem and leaf plots as a way of organizing data. Comparing stems to intervals and Leafs to tallies or bars on a histogram. |
| 5 | **Mean, Median, Mode and Range:**  
• Asking students to take the paper and pencil methods that they had learned in the past and transfer them into calculator based computations.  
• Use these new skills to compute the mean, median, mode and range of several different sets of data in an activity called, “Data Detectives.” |
Lesson Plans
Lesson Plan #1:
Specific Topic: Statistics: Introduction

Objectives:

Aim: To introduce the students to the topic of Statistics using a hands on approach.

Behavioral: The students will be able to identify a minimum of five different everyday applications of statistics and find pertinent examples of each.

Materials:
- Chalkboard
- Enlarged examples of Statistics
- Thumtbacks or tape
- Lined paper
- Notes page.

Motivation: The teacher will set up the classroom with various examples of statistics all over the room. Ex: an enlarged faux report card, the sports section of the evening paper, the latest political polling news, etc… When the students arrive to class the teacher will ask them to be seated and begin with the question:

- What do you think all of these things around the room have to do with each other?
- How are these facts similar?

Students will respond that all of the information is a way of showing statistics or describing events.

Follow Through:
- The teacher will explain to students that there are many different ways of keeping track of different events, and statistics help us to organize information.
- The teacher will ask students to brainstorm a list of things that they associate with Statistics. The answers will be recorded on the board in the form of a web.
• After the students will be given a few minutes to look around the room at all of the different displays.
• The students will return to their desks to discuss their findings. They will be asked if there is anything that they would like to add to the web. This will be recorded in a different color.
• After, the students will be given a notes sheet in which they will highlight the important information as the teacher reads through an overview of the different topics in statistics that we will be covering this unit:
  • Frequency Tables:
  • Histograms
  • Double Bar Graphs
  • Stem and leaf plots
  • Line Plots
  • Mean, median, and mode

Summary: After the notes have been read, and discussed, the teacher will ask students to identify the notes as to how they fit in with the web that we made earlier. The teacher will also ask students to relate everything that we have talked about to everyday life. “How do we use these things everyday?”

Extension:
• For Homework, the students will be asked to explain in their own words “Where do I see statistics on a daily basis, and how do they pertain to me?”
• The students will also be asked to bring in one example that they can find at home of statistics. (Ex: Report Card, Trading Cards, Chart/Graph from the Sports Section)
Statistics:

**Definition:** The collecting, organizing, and summarizing of data.

Topics being covered in this unit:

- **Frequency Tables:** A table for organizing a set of data that shows how often each item or number appears.
- **Histograms:** A bar graph showing the frequency of data in set intervals.
- **Double Bar Graphs:** A bar graph comparing the frequency of two related sets of data.
- **Stem and Leaf Plots:** A system used to condense a set of data where the digits in or before the tens place are the stem and the ones place is the leaf.
- **Line Plots:** A vertical graph showing a picture of information on a number line.
- **Mean:** The average of a set of numbers.
- **Median:** The middle number in an odd set of numbers, or the average of the two middle numbers in an even set of data.
- **Mode:** The most often occurring item in a set of data.
- **Range:** The difference between the largest and smallest numbers in a set of data.
Lesson #2

Specific Topic: Statistics: Frequency Tables/ Histograms

Objectives:

**Aim:** To introduce and successfully create frequency tables as well as how to use the information in a frequency table to create a histogram. The students will use the information presented to analyze related questions.

**Behavioral:** The students will be able to construct, label and fill a frequency table from a set of data. (Students heights) The students will also be able to use the data in that table to create a histogram showing frequency. Lastly, The students will be able to summarize and analyze the information shown in the graphs.

**Materials:**
- A Class set of yard sticks
- Chalkboard
- Class set of straight edges or rulers.
- Graph paper
- Transparency of Graph paper.
- Homework activity sheet.

**Motivation:** As the students are entering the room, the teacher will ask them to find a partner, take a yardstick and measure their heights. The students will then be asked to write down their results in list on the board. Once the students have finished. The teacher will tell them, to look at the list of data on the board and ask them to think about how it could be organized. When the students offer a few suggestions, the teacher will tell them that today we are going to start with looking at putting that information in to a frequency table.

**Follow Through:** The teacher will ask the students to:
- Take out their definitions sheet from yesterday and read the definition of a frequency table.
- The teacher will put the definition on the overhead as well as a sample frequency table. The table will have all of the correct inside, however, no labels. The students will be encouraged to figure out what the headings on the columns should be.
- Once they have figured out the intervals, tallies, and frequency column, they will be told that now that they know the parts, they will be making one of their own with the data gathered earlier.
- The teacher will put a completely blank table on the board and the students will copy it into their notes for the day.
- After everything has been labeled, the students will collectively figure out appropriate intervals for the data and add those to their tables. While this is
being done, the teacher will reinforce the importance of equal and appropriate intervals.

- The students will be given two minutes to go through all of the data and add it into their new frequency table. The teacher will suggest that they cross out each number as they use it to eliminate some confusion later.
- When the students have finished, the teacher will ask a few questions about the information such as:
  - Which interval has the most tallies?
  - What does this mean?
  - Is everyone in our class the same height?
  - How can you tell?
  - Is there a big range of heights?
- These questions will stimulate higher thinking in the students.
- After the students have analyzed the table, the teacher will ask, what if I said that this information would fit perfectly into a bar graph? How could I do this? What would it look like?
- The teacher will ask the students who has seen a bar graph before? All will say yes.
- The teacher will say that we are going to create one to represent the data in the frequency table.
- The teacher will pass out sheets of graph paper to the students as well as straight edges or rulers. The teacher will begin with “What do we need to create a graph?
  - Axis (x, y)
  - Label origin
  - Title
  - Label Axis
  - Bars
- When the students have drawn the axis, we will add the labels together. The x-axis will be labeled with the intervals, and the y-axis with the frequency.
- How to draw in the bars will be reviewed with the students and then they will be given five minutes to draw in the rest of the graph.
- The students will be reminded of the importance of labeling the tops of their bars as well.

Closure:
- The teacher will ask the students to identify the steps for creating a frequency table and histogram by popcorning around the room.
- The students will also be asked to think of two really good questions for analyzing a frequency table or histogram and then will be given two minutes to share those questions with the person sitting next to them. Each set of partners will be asked to choose he best question and write down on an index card from the teacher. The questions will be collected for use in a review game later.
**Extension:**

- For homework, the students will be given a worksheet with a data set, blank frequency table and a piece of graph paper. They must create the frequency table, histogram, and answer the question attached. It will be assessed using a 5-point rubric in the homework section of the grade book.
Homework: Complete the frequency table with the given information. Use that information to create a histogram on the given graph paper. Use the table and graph to answer the attached questions. GOOD LUCK!

<table>
<thead>
<tr>
<th>Scores</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>92-100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83-91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74-82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Questions:

a.) Which interval had the least amount of scores?

b.) Did more people score above or below 82%?

c.) Which interval had the most scores, and what does this mean?

2.) Using the information from the frequency table, create a histogram for the data.
(MAKE SURE TO LABEL YOUR HORIZONTAL / VERTICAL AXIS, AND TITLE!)
Lesson #3

Specific Topic: Statistics, Double Bar Graphs

Objectives:

Aim: To introduce the concept of using a bar graph to represent two sets of data.

Behavioral: The students will be able to successfully create a double bar graph given two sets of related data.

Materials:
• Red Blocks, Spheres, and Cones.
• Blue Blocks, Spheres, and Cones.

Motivation:
• The students will be given two sets of data (red blocks, cones, and spheres and blue blocks, cones and spheres.) and told that they need to make a bar graph to represent all of the data at once.
• The teacher will take suggestions as to what they students could do to accommodate this. The students will work in pairs to of how to do this. They will be given about 5 minutes to brainstorm.
• As a class the students will discuss what they came up with. With some coaching, the students will respond that it would be possible to use a double bar graph.

Follow Through:
• The teacher will ask the students to once again take out the definition sheet that they were given at the beginning of the unit. The definition will be discussed and also displayed on the overhead along with a sample double bar graph.
• Because the students have just seen histograms, the teacher will ask the students to make a comparison chart on the overhead of the similarities and differences between the two types of graphs. It will be stressed that even though histograms don’t have spaces between the bars, double bars graphs do!
• As a class the students will make a double bar graph using the same methods from yesterday.
• After it is complete, the teacher will ask a few questions:
  □ Where there more red spheres, or blue spheres?
  □ How can you tell?
  □ Which shape had the most red pieces?
Closure:
• After the students have analyzed the graph they will be asked answer questions about creating and analyzing the class graph in a quick game of “around the world.”

Extension:
• For homework the students will be given a worksheet similar to yesterdays and a few more questions. It will be graded on a 5-point rubric.
Homework: Please complete the following table, graph and questions. Remember to use complete sentences.

3.) The students in Mr. Brown’s class received the following scores on their last technology project.

Girls: 95 87 68 76 93 85 78 71 84 81
Boys: 99 74 66 69 97 85 91 97 67 88

Complete the frequency tables below.

<table>
<thead>
<tr>
<th>Girl’s Scores</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>92-100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83-91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74-82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Boy’s Scores</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>92-100</td>
<td></td>
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<tr>
<td>83-91</td>
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<tr>
<td>74-82</td>
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<tr>
<td>65-73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a.) Which group received more A’s on the project?

b.) What can you say about the boys score on the project?

c.) What can you say about the girl’s scores?

Create a Double Bar Graph for the data above:
(MAKE SURE TO LABEL THE HORIZONTAL / VERTICAL AXIS, AND TITLE THE GRAPH)
Lesson #4:

Specific Topic: Stem and leaf plots, line plots

Objectives:

**Aim:** To introduce steam and leaf plots as well as line plots for use in analyzing sets of data.

**Behavioral:** After being introduced to stem and leaf plots and line plots, the students will be able to create two of each with a rate of 80% accuracy.

**Materials:**
- Notes page
- Overhead projector
- Homework

**Motivation:**
The teacher will have a picture of a tree on the board when the students enter the room. The teacher will ask the student if they have ever heard of a graph that looks like a tree before? The students will respond a Stem and leaf. The teacher will ask for a volunteer to explain what a stem and leaf is, and how it looks.

**Follow Through:**
- The teacher will tell the students that today they will in fact be making a graph much like the tree on the chalkboard.
- The teacher will explain that first we must have a definition of stem and leaf plots. (Notes on the overhead.) The students will be called on to define a stem and leaf plot from what is in their notes.
- Students will read through the steps for creating a stem and leaf together.
- After they have defined one, the teacher will tell them that we are going to make one in class to see if they really do in fact look like a tree.
- Data will be collected by asking the students share the number of their birth date. The teacher will go around the room and ask the students to share their numbers while someone records them on the chalkboard.
- On the overhead, the teacher will have a transparency of a tree with the “branches” of a stem and leaf on it. This diagram will also be copied into the students’ notes sheet. Together we will create a stem and leaf by following all of the steps.
• After that is complete, the teacher will ask the students to flip over their paper and look at the other type of graphs we are going to discuss today.

• A volunteer will read the definition of line plots.

• A sample will be put on the overhead. The teacher will explain that it is just another way of showing data that is very similar to the pictographs that they saw yesterday, except with x’s instead of pictures.

• The students will now be asked to share the number of their birth month, and this will also be recorded on the board.

• After the students have recorded this new data set, they will be asked to record it into their notes in the form of a line plot.

• The students will answer a few questions based on the results.

Summary:
• The students will re-iterate the steps for creating a line plot from memory.

• The teacher will ask the students to look at the graph and tell me three things that a graph like this would be good for.

• The same will be done for stem and leaf plots.

Homework: The students will be given a worksheet on stem and leaf plots.
**STEM AND LEAF PLOTS**

**Def:** A system used to condense a set of data where the greatest place value of the data forms the stem and the next greatest place value forms the leaves.

**Steps for creating a Stem and leaf plot:**

- Put the numbers in numerical order.
- Find the least number and greatest number in a set of data.
- Draw a vertical line and write the digits in the tens place or greater in order from least to greatest down the left side of the line. These are the stems.
- The unit or ones digits are written in order from least to greatest on the right side of the line.

<table>
<thead>
<tr>
<th>Ex:</th>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2 4 5 7</td>
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<tr>
<td></td>
<td>2</td>
<td>1 5 9</td>
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<td>3</td>
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<td></td>
<td>4</td>
<td>7 8 9</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0 1 3 7 9</td>
</tr>
</tbody>
</table>
Line Plots

Line Plots- A vertical graph of the tally marks made when creating a tally chart.

A line plot shows the amount of data of a certain value by placing an X over that value on a number line.

Example: x= A day from last winter.

$$
\begin{array}{cccc}
& 11^\circ F & 12^\circ F & 13^\circ F & 14^\circ F & 15^\circ F \\
\hline
x & \times & x & x & x & x \\
\end{array}
$$

Temperatures Last Winter

Steps for Creating a LINE PLOT!

1.) Draw a number line, labeled to accommodate all of your data.

2.) Draw X’s over the number line to represent all of your data.

3.) Title your graph and label the parts.
What do you use a line plot for?

• To find the mode or most frequently occurring number.
• To find an outlier, or number that is far away from all of the other data.
• To find a cluster or group of number bunched close together.

EXAMPLE:

X  X
X  X
X  X  X
X  X  X
X  X  X  X

1  2  3  4  5  6  7

The number of telephones in the average household.

• Identify the mode.
• Identify the outlier.
• Identify a cluster.
Name ___________________________  Per______

Mark McGuire’s Homerun’s Per Game After 16 Games.

<p>| | | | |</p>
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<tr>
<td>4</td>
<td>2</td>
<td>1</td>
<td>4</td>
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<tr>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
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<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

1.) Create a line plot for the homerun’s per game by Mark McGuire.

2.) Michael Jordan scored the following points per game in the last twelve games:

<p>| | | | |</p>
<table>
<thead>
<tr>
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<tr>
<td>35</td>
<td>42</td>
<td>21</td>
<td>33</td>
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<tr>
<td>27</td>
<td>34</td>
<td>16</td>
<td>22</td>
</tr>
<tr>
<td>35</td>
<td>13</td>
<td>54</td>
<td>41</td>
</tr>
</tbody>
</table>

2.) Make a Stem and Leaf Plot of the points that Michael Jordan scored in the last twelve games.
Lesson #5

Specific Topic: Statistics: Mean Median and Mode

Objectives:

Aim: The students will review the concepts of mean median, mode and range on paper, and then learn how to manipulate these things on a TI 73 calculator.

Behavioral: The students will be able to successfully calculate the mean, median, mode and range of a set of data using the list function of a TI 73 calculator.

Materials:
• A class set of TI 73 calculators
• An overhead model of TI 73 calculators.
• Computer lab
• Worksheets

Motivation:
The students will be told that they will be researching mean, median, mode, and range. They will be given a worksheet that has blanks for all of the definitions. Because the students have seen these before, they will be looking up a proper definition of these terms on the computer in Microsoft Encarta. As the students find proper definitions for these words, they are to copy them down. The students will compare answers with a partner when they are finished.

Follow through:

• The students will also be asked that while they are at the computer they should log on to www.weather.com and find the extended forecast for Buffalo. After that, each student should look up the forecast for the city of his or her choice and record this information on the Data Detectives worksheet that was passed out at the beginning of class.
• The students will reconvene as a class and compare the definitions that they found.
• The teacher will ask that the temperatures that were found be put into their calculators and manipulated. The students will practice loading in a list of numbers and then finding the mean median and mode.
• The students will be responsible for finding the range. They must set this up by hand, however they may use a calculator to help with the math.
• The teacher will go through each of the individual steps with the students including keystrokes. (See Note at end of lesson.)
Summary:
The students will ask the students for a few volunteers to share the data about his or her city or town. Since all of the information is different depending on the student, it will be interesting to share, and also impossible to share answers with a friend.

Extension:
The teacher will assign the last worksheet as homework for the evening. It is entitled Mission #2. The students will be given 5 minutes at the end of class to gather the data, and the rest of the assignment is homework for the night. It will also be graded using a 5-point rubric.
Data Detectives

Congratulations! You have accepted the mission. Your job is to find and manipulate all of the requested data. You will be rewarded with a grade for your work on this special assignment!

Mission #1:

**Track the 7-day weather forecast for Buffalo as well as your favorite city.** Some ideas might be San Francisco CA, Atlanta GA, Orlando FLA, or Tucson AZ. To accomplish this task, you may use the Buffalo Newspaper, Weather Channel, or the online forecast.

<table>
<thead>
<tr>
<th>Buffalo:</th>
<th>Other City: ________________</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day #1</strong></td>
<td>__________</td>
</tr>
<tr>
<td><strong>Day #2</strong></td>
<td>__________</td>
</tr>
<tr>
<td><strong>Day #3</strong></td>
<td>__________</td>
</tr>
<tr>
<td><strong>Day #4</strong></td>
<td>__________</td>
</tr>
<tr>
<td><strong>Day #5</strong></td>
<td>__________</td>
</tr>
<tr>
<td><strong>Day #6</strong></td>
<td>__________</td>
</tr>
<tr>
<td><strong>Day #7</strong></td>
<td>__________</td>
</tr>
</tbody>
</table>
Use this data to:

Find the mean of each city's temperature:

Buffalo: __________ Other City: ____________

Find the median temperature of each city:

Buffalo: __________ Other City: ____________

Which is a better representation of the temperature for the week, the mean or the median?

Why?

What is the range of temperatures?

Buffalo: __________ Other City: ____________

Which city had the larger range?

Buffalo: __________ Other City: ____________

Is there a mode temperature? If so, what is it?

Buffalo: __________ Other City: ____________
Mission #2

Congratulations! You have completed your first mission. Your next task awaits you. For this you must find out from 10 of your classmates how many people live in their house. Record this information below:

Person:  

_________________________   _________
_________________________   _________
_________________________   _________
_________________________   _________
_________________________   _________
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Make a line plot of this data:
Is there an outlier in this data? What is it?

What is the mean?

What is the median?

Which is a better representation of the data, the mean or the median? Why?

What is the mode?

What is the range of your data? Show your work.