Unit: Statistics & Probability

Grade: 6th

**Purpose:**

The purpose of this formative/summative assessment is to give teachers and students an idea of how well students can test their understanding of analyzing measures of center, spread, and overall shape of data and graphical representations of data through investigating a real-life statistical problem. Prior to this assessment, students will spend considerable time calculating measures of center, and constructing line plots using data from a table to describe and analyze spread and shape. After this assessment, students will move on to calculating variability of data, more specifically the Mean Absolute Deviation and the Interquartile Range. Students will also create and interpret histograms and box plots. For this assessment, students will complete a five-day project in which they relate graphical representations, measures of center, overall shape, and spread to investigate real-life statistical problem.

**Standards/Benchmarks:**

CCSS.MATH.CONTENT.6.SP.A.2

Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

CCSS.MATH.CONTENT.6.SP.B.4

Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

CCSS. MATH.PRACTICE.MP3

Construct viable arguments and critique the reasoning of others.

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| **Learning Targets** | **Reasoning** |
| I can evaluate the distribution for a set of data using ***mean*** as a measure of center. |  |
| I can evaluate the distribution for a set of data using ***median*** as a measure of center. |  |
| I can evaluate the distribution for a set of data using ***mode*** as a measure of center. |  |
| I can evaluate the distribution for a set of data using ***measures of variation (range)***. |  |
| I can create a ***line plot*** from a data set and analyze the shape of the line plot. |  |
| I can justify my reasoning and critique the reasoning of others. |  |

**Hour: \_\_\_\_\_\_\_\_\_\_\_\_\_ Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_**

**Statistics Mid-Module Assessment**

***“The iPhone Problem”***

*Objective:*

The objective of this week-long formative/summative assessment is to measure your reasoning skills about the topic of statistics, more specifically in using measures of center, spread, and overall shape and line plots to help you analyze and understand a real-life statistical problem. In completing this assessment, you should feel confident in your ability to calculate measures of center and to create line plots to help you describe the overall shape and spread of data. It is important that you understand these concepts before we can move to harder concepts like measures of variability, and constructing and interpreting histograms and box plots.

***Assessment Format / Overall Calendar of Events:***

**Day 1: *Project Introduction***

* Choose a project type
* Computer lab research (record findings)
* Begin designing your presentation

**Day 2: *Line plots***

* Create & analyze a Line Plot using data from a table
* Work on presentation

**Day 3: *Shape, Spread, and the Range***

* Analyzing Shape, Spread, and Range
* Work on presentation

**Day 4: *Measures of Center***

* Calculating measures of center
* Work on presentation

**Day 5: *Small-Group Presentations***

* Small- group presentations (groups of 4)
* Complete critique assignment
* **Turn in the Presentation**

**Directions:**

Over the past few weeks, we have spent some time calculating measures of center, and constructing line plots using data from a table to describe and analyze spread and shape. Now that we know how to make line plots from data in a table and we have practiced calculating the mean, median, mode and range, and have discussed the shape of data looking at the graph, you will complete a five-day project in which you will relate graphical representations, measures of center, overall shape, and spread to investigate real-life statistical problem.

Once you finish this assessment, you are going to go through the questions that you missed and we can talk about it so we can both get an idea of what you may need some help with before we move on to the next unit. This will also show me what I can do to help you to be successful.

This assessment will last five days and will be worth 40 points, or 10 points for the last four days of material. You will have four class periods to compete your projects before you present it on the fifth day. The first day will consist of research, followed by three days of working on completing your project, and on the fifth day you will present your final project. Once you have presented your project to your group, you will submit (1) your completed packet, (2) your critique, and (3) your project. You can leave them on the table next to my desk by the end of class on Friday.

SOME REMINDERS:

* All the worksheets you need are stapled together in this packet. Do your best to keep them all together, because you will have to turn in the packet at the end of the week.
* Make sure you write your name and the date in the top right corner of each worksheet. You can write your answers the space provided under each question.
* If you have questions at any point during the week, you can raise your hand and I will come over to you to answer your question.
* **Make sure to bring this packet with you every day!**

You all know this material, so don’t stress. Relax, take your time, and remember YOU’RE ALL ROCKSTARS!!! ☺

**Day 1: Introduction and Preparation**

**(50 minutes)**

Introduce Assessment: (10 minutes): *“The iPhone Problem”*

Project Selection: (5 minutes)

Lab Research: (15 minutes)

Individual Work on Project: (20 minutes)

Materials:

* “Project Guide” Handout
* “Lab Research” Worksheet

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| **Day #1 Checklist** | |
| *Completion:*  \_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_ | *Description:*  I completed the “Lab Research” worksheet and recorded my data findings in a table.  I chose which type of project I am going to create and recorded it on the “Project Guide” Handout |

**Hour: \_\_\_\_\_\_\_\_\_\_\_\_\_ Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_**

Project Guide

**Assessment Prompt:**

Your entire assessment will be based on your investigation of the following statistical problem:

***“The iPhone Problem”***

*Your friend Matt needs your help. He wants to buy a new iPhone 6s, but he wants to save some money by getting the best price. Matt asks if you can help him visit 15 different stores and record the price of a new iPhone at each store so that he can compare the prices for a new iPhone 6s.*

**Choose a Project:** At the end of the week, you will be expected to present your findings to your small-groups before turning in your completed assessment. You will have a week to work on a project to help you present your topic. Choose ***one*** of the projects below to create, and record your choice with an “X” in the left column:

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|  | Create a poster |
|  | Make a Power Point Presentation |
|  | Write and Perform a skit |
|  | Write journal/ diary entries |
|  | Create a scrapbook |
|  | Make an instructional video |
|  | Make a pamphlet or brochure |
|  | Have a panel discussion of “experts” |
|  | Create a children’s story about the topic |
|  | Write a text message dialogue relevant to the topic |
|  | Write a series of tweets relevant to the topic |
|  | Start a blog |
|  | Create a foldable/flip book |
|  | Create a mini-book with one fact/idea per page |
|  | Create a handout/ graphic |

**Project Checklist**

* I selected a project type
* I included a data table
* I included a line plot
* I included a calculation & analysis of the mean
* I included a calculation & analysis of the median
* I included a calculation & analysis of the mode
* I included a calculation & analysis of the range
* I included an analysis of the shape & spread of data

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| Graphing  (10 points) | I did not create a graph. | I did not create the right type of graph. | I created the right type of graph (a line plot). |
| I did not label my graph. | My graph is missing some labels. | I correctly labeled my graph, and I am not missing any labels. |
| My graph is missing several data points. | My graph is missing only some data points. | My graph includes all data points. |
| Shape, Spread, and Range  (10 points) | I did not calculate the range.  I did not analyze the shape and spread of the graph. | I tried to calculate the range, but I made a small mistake.  I tried to analyze the shape and spread of the graph, but I did not use mathematical language in my analysis. | I calculated the range without making any mistakes.  I analyzed the shape and spread of the graph using appropriate mathematical language. |
| Measures of Center  (10 points) | I did not calculate the mode.  I did not calculate the mean.  I did not calculate the median.  I did not compare the mean, median, and mode and argue which is a better measure of center. | I tried to calculate the mean, but I made a small mistake.  I tried to calculate the mode, but I made a small mistake.  I tried to calculate the median, but I made a small mistake.  I tried to compare the mean, median, and mode and argue which is a better measure of center, but I made the wrong choice. | I calculated the mode and did not make any mistakes.  I calculated the mean and did not make any mistakes.  I calculated the median and I did not make any mistakes.  I compared the mean, median, and mode and argued which is a better measure of center and made the right choice. |
| Small-group Presentation  (10 points) | I did not use the data to justify my findings.  I was not able to critique my classmates’ work and I did not use data justify my conclusions. | I justified my findings using only some data.  I was able to critique my classmates’ work, but I used only some data to justify my  conclusions. | I used plenty of data to justify my findings.  I was able to critique my classmates’ work and I used plenty of data to justify my conclusions. |

**Project Rubric**

**Hour: \_\_\_\_\_\_\_\_\_\_\_\_\_ Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_**

Lab Research Record

***“The iPhone Problem”***

*Your friend Matt needs your help. He wants to buy a new iPhone 6s, but he wants to save some money by getting the best price. Matt asks if you can help him visit 15 different stores and record the price of a new iPhone at each store so that he can compare the prices for a new iPhone 6s.*

**Directions:** Instead of driving around and visiting 15 different stores, you will help Matt research iPhone prices online. You will have the remainder of the hour to research prices online and record the data table below. You can research prices by going to *Google.com* and typing in the keywords *“iPhone 6s 64gb”.* Make sure you are finding the price of a *new* iPhone, not a used or refurbished one. Once you are finished with your research, you may begin designing your project.

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| Store # | Store Name | iPhone 6s 64gb  Price (in $) |
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**Day 2: *Line plots***

**(50 minutes)**

*Graphing Worksheet*: (20 minutes)

Individual Work on Project: (30 minutes)

Materials:

* “Project Guide” Handout
* “Lab Research Record” Worksheet
* “My Line Plot Design” Worksheet

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| **Day #2 Checklist** | |
| *Completion:*  \_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_ | *Description:*  I completed the “My Line Plot Design” worksheet and showed proficiency in creating a line plot from a set of data.  I used the “My Line Plot Design” worksheet to help me complete the graphing portion of my project. |

**Hour: \_\_\_\_\_\_\_\_\_\_\_\_\_ Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_**

My Line Plot Design

**Directions:** Before you can begin analyzing the data you researched, you will first graph the data you recorded in the table on the “Lab Research Report” worksheet. Record the data as a line plot below:



**Day 3: *Shape, Spread, and Range***

**(50 minutes)**

“Analyzing Shape & Spread” Worksheet: (25 minutes)

Individual Work on Project: (25 minutes)

Materials:

* “Project Guide” Handout
* “My Line Plot Design” Worksheet

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| **Day #3 Checklist** | |
| *Completion:*  \_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_ | *Description:*  I completed the “Analyzing Shape & Spread” worksheet.  I used the “Analyzing Shape & Spread” worksheet to help me complete the Shape, Spread, and Range portion of my assessment. |

**Hour: \_\_\_\_\_\_\_\_\_\_\_\_\_ Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_**

Analyzing Shape & Spread

**Directions:** You will use your completed “My Line Plot Design” Worksheet to help you answer the following questions:

1. What do you notice about the data points? Is there anything that jumps out?
2. Does the data seem to be clumped together in a certain spot? Meaning, is there a high concentration of data points in one particular spot?
3. Are there any spots on the graph where there are not any data points? What is happening at these spots?
4. Do any points seem like they don’t belong? Which ones?
5. Calculate the range of the data. What does the range mean in the context of the iPhone problem?

**Day 4: Measures of Center**

**(50 minutes)**

*“The Three M’s (Mean, Median, and Mode)” worksheet*: (25 minutes)

Individual Work on Project: (25 minutes)

Materials:

* “Project Guide” Handout
* “Lab Research Report” Worksheet
* “My Line Plot Design” Worksheet

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| **Day #4 Checklist** | |
| *Completion:*  \_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_ | *Description:*  I completed “The Three M’s (Mean, Median, and Mode)” worksheet  I used the ““The Three M’s (Mean, Median, and Mode)” worksheet to help me complete the Measures of Center portion of my assessment. |

**Hour: \_\_\_\_\_\_\_\_\_\_\_\_\_ Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_**

The Three M’s (Mean, Median, Mode)

**Directions**: Use the line plot of your data and the data table you created to answer the questions below:

1. a. What is the median of the data? Record the median on your line plot.
2. What does the median tell you about the iPhone prices?
3. a. What is the mean of the data? Record the mean on your line plot.
4. What does the mean tell you about the price of an iPhone?
5. a. What is the mode of the data? Record the mode on your line plot.

b. What does the mode tell you about the iPhone prices?

1. Which is the best measure of center of the data: Mean, Median, or Mode? How do you know? Justify your reasoning.

**Day 5: *Small-* *Group Presentations***

**(50 minutes)**

Small Group Presentations: (35 minutes)

Critique Worksheet: (15 minutes)

Materials:

* “Project Guide” Handout
* “Critique” Worksheet

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| **Day #5 Checklist** | |
| *Completion:*  \_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_ | *Description:*  I presented my final project to my small group.  Lab Research  I completed the “Critique” worksheet  I completed my Assessment packet. |

**Hour: \_\_\_\_\_\_\_\_\_\_\_\_\_ Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_**

Critique

**Directions:** Part of being a mathematician is being able to justify your own reasoning and critique the reasoning of others. During the group presentations, you will each critique eachothers’ work. You will each select a different person in your group to critique and complete the critique by answering the following questions:

1. Do you agree with your group members’ calculation of the mean? Show your work and justify why or why not.
2. Do you agree with your group members’ calculation of the median? Show your work and justify why or why not.
3. Do you agree with your group members’ calculation of the mode? Show your work and justify why or why not.
4. Do you agree with your group members’ justification of which measure of center most accurately represents the data? Justify why or why not.
5. Do you agree with your group members’ calculation of the range? Show your work and justify why or why not.
6. Do you agree with your group members’ analysis of shape and spread? Show your work and justify why or why not.