GEORGIA MIDDLE SCHOOL Instructional Resources

CAREER, TECHNICAL, & AGRICULTURAL EDUCATION

BUSINESS & COMPUTER SCIENCE

COURSE: Business & Computer Science

UNIT 4: Mean, Median and Mode

INTRODUCTION

Annotation:

This unit includes lessons to help students demonstrate understanding of data analysis by posing questions, collecting data, analyzing the data using measures of central tendency and variation, and using the data to answer the questions posed. Students will also understand the role of probability in sampling.

Grade(s):

	6th
X	7th
	8th

Time:

4+ hours

Author:

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Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided appropriately. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation. Many students (both with and without disabilities) who struggle with reading may benefit from the use of text reading software or other technological aids to provide access to printed materials. Many of these are available at little or no cost on the internet.

FOCUS STANDARDS

GPS Focus Standards:

MSBCS-BCSII-9- Student will develop and apply basic spreadsheet skills.

a) Identify and explain basic spreadsheet terminology (cell, column, row, formula, label, function, etc..)
b) Label the parts of a spreadsheet.
c) Create and save a basic spreadsheet.
d) Change column width and row height.
e) Retrieve, edit, manipulate, and print a spreadsheet.
f) Format the contents of a cell – change fonts and font sizes, align text, format numbers, and apply borders.
g) Use the autosum feature.
h) Create and print a basic chart/graph using spreadsheet data.

GPS Academic Standards:

M7D1- Students will pose questions, collect data, represent and analyze the data, and interpret results.

a) Formulate questions and collect data from a census of at least 30 objects and from samples of varying sizes.
b) Construct frequency distributions.
c) Analyze data using measures of central tendency (mean, median, and mode), including recognition of outliers.
f) Analyze data using appropriate graphs, including pictographs, histograms, bar graphs, line graphs, circle graphs, and line plots introduced earlier, and using box and – whisker plots and scatter plots.

M7P1- Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.
b. Solve problems that arise in mathematics and in other contexts.
c. Apply and adapt a variety of appropriate strategies to solve problems.
d. Monitor and reflect on the process of mathematical problem solving.

MRC- Students will enhance reading in all curriculum areas by:

c) Building vocabulary knowledge

- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

UNDERSTANDING & GOALS

Enduring Understandings:

- The **mean** of a set of data is probably what most people refer to as **average**. The **mean** is found by adding up all the numbers in the data set and then dividing by the number of data points that were added up.
- **Median** is another number often used to describe a set of data. The **median** refers to the number in the middle of a data set. When finding the **median** of a data set, make sure that the numbers are put in order first. If there is an odd number of data in the list, there is only one number that is exactly in the middle of the data. If there is an even number of data points, then there are two numbers in the middle. In this case, add the two middle numbers together and divide by two to find the **median.**

- The **mode** of a data set refers to the number that occurs most often. If there is not a number that occurs more than any other, **there is no mode** for the data. It is possible to have more than one **mode** for a data set.

Essential Questions:

- Identify and explain the measures of central tendency.
- How are mnemonic phrases used to help distinguish the terms: mean, median, and mode?
- Explain and demonstrate how to find the mean, median, and mode.
- Explain how and why using the appropriate type graph is essential for displaying data.
- Identify and explain the location and purpose of the X-axis, Y-axis, and scale on a graph.
- Explain the purpose of conducting a survey and how the collected data can be used.
- Review and demonstrate utilizing basic parts of an Excel spreadsheet.
- What is a spreadsheet/worksheet and describe some of its uses in business? in school? at home?
- Explain the differences between a cell, row, and column.
- Demonstrate and explain formatting one or multiple cells in a spreadsheet/worksheet.
- Demonstrate how to enter spreadsheet/worksheet data.
- Demonstrate inserting/applying a formula in an Excel spreadsheet.
- Demonstrate how to use spreadsheet/worksheet data to create a chart/graph.
- What are keyboard shortcuts and how are they used? Demonstrate.
- Demonstrate how you can construct line graphs to show trends or changes in data.
- Explain and demonstrate how to find a missing piece of data if you know (or you are given), the average and all other data?

Knowledge from this Unit:

- Understand the measures of central tendency.
- Understand mnemonic phrases.
- Understanding of how to find the mean, median, and mode.
- Describe with understanding, how to identify the appropriate graph for displaying data.
- Understand how to design and conduct a survey.
- Understand how to collect and analyzing data.
- Understand the purpose of formulas in Excel and how they are applied.
- Understand the difference between existing data and new data in Excel and how each are used to create a chart/graph.
- Understand the purpose of keyboard shortcuts and the difference between ‘general’ shortcuts and ‘application/program-specific’ shortcuts.
- Understand how to find missing data from the given data.

Skills from this Unit:

- Identify the measures of central tendency.
- Explain and demonstrate mnemonic phrases.
- Demonstrate with understanding, finding the mean, median, and mode.
- Identify and demonstrate appropriate graph for displaying data.
- Demonstrate how to design and conduct a survey.
- Demonstrate collecting and analyzing data.
- Identify, explain and demonstrate creating an Excel spreadsheet with basic formulas.
- Identify, explain and demonstrate creating a chart/graph with existing Excel spreadsheet data.
- Identify and demonstrate utilization of keyboard shortcuts.
- Demonstrate how to find missing data from the given data.

ASSESSMENTS

Assessment Method Type:

____ Pre-test
X Objective assessment - multiple-choice, true- false, etc.
  X Quizzes/Tests
  __ Unit test
____ Group project
X Individual project
____ Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
  X Self-check rubrics
  __ Self-check during writing/planning process
  __ Journal reflections on concepts, personal experiences and impact on one's life
  __ Reflect on evaluations of work from teachers, business partners, and competition judges
  __ Academic prompts
  X Practice quizzes/tests
____ Subjective assessment/Informal observations
  __ Essay tests
  X **Observe students working** (with partners **or** without partners)
  __ Observe students role playing
____ Peer-assessment
  __ Peer editing & commentary of products/projects/presentations using rubrics
  __ Peer editing and/or critiquing
____ Dialogue and Discussion
  __ Student/teacher conferences
  __ Partner and small group discussions
  X Whole group discussions
  __ Interaction with/feedback from community members/speakers and business partners
____ Constructed Responses
  __ Chart good reading/writing/listening/speaking habits
  X Application of skills to real-life situations/scenarios
____ Post-test

Assessment(s) Title:

- Objective Assessment #1: Mean, Median, and Mode
- Objective Assessment #2: Excel Spreadsheets
- Project Assessment #1: Create An Excel Spreadsheet
- Project Assessment #2: Create An Excel Chart

Assessment(s) Description/Directions:

- Objective Assessment #1 consists of various methods for assessing the students ability to find the mean, median, and mode for sets of data. Methods include rounding decimals, finding the missing pieces, and solving problems.
- Objective Assessment #2 consists of assessment methods where students will identify parts of a spreadsheet; proper terminology; and location of various formatting features.
- Project Assessment #1 consist of students being assessed on his/her ability to use basic spreadsheet formatting features, to create a spreadsheet from collected survey data.
- Project Assessment #2 consist of students being assessed on his/her ability to use existing spreadsheet data to identify and create an appropriate spreadsheet chart for displaying the selected data.

Attachments for Assessment(s):

- Objective Assessment #1 (with answer key)
- Objective Assessment #2 (with answer key)
- Project Assessment #1 (with **adaptable** answer key)
- Project Assessment #2 (with **adaptable** answer key)

LESSON PLANS

- **INTRODUCTION**

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

MSBCS-BCSII-9.	Student will develop and apply basic spreadsheet skills
M7D1.	Students will pose questions, collect data, represent and analyze the data, and interpret results.
M7P1.	Students will solve problems (using appropriate technology).
MRC.	Students will enhance reading in all curriculum areas by.

2. Review Essential Questions

- Identify and explain the measures of central tendency.
- How are mnemonic phrases used to help distinguish the terms: mean, median, and mode?
- Explain and demonstrate how to find the mean, median, and mode.
- Explain how and why using the appropriate type graph is essential for displaying data.
- Identify and explain the location and purpose of the X-axis, Y-axis, and scale on a graph.
- Explain the purpose of conducting a survey and how the collected data can be used.
- Review and demonstrate utilizing basic parts of an Excel spreadsheet.
- What is a spreadsheet/worksheet and describe some of its uses in business? in school? at home?
- Explain the differences between a cell, row, and column.
- Demonstrate and explain formatting one or multiple cells in a spreadsheet/worksheet.
- Demonstrate how to enter spreadsheet/worksheet data.
- Demonstrate inserting/applying a formula in an Excel spreadsheet.
- Demonstrate how to use spreadsheet/worksheet data to create a chart/graph.
- What are keyboard shortcuts and how are they used? Demonstrate.
- Demonstrate how you can construct line graphs to show trends or changes in data.
- Explain and demonstrate how to find a missing piece of data if you know (or you are given), the average and all other data?

3. Identify and review the unit vocabulary

data	interpret	formulate
frequency distributions	line graph	circle/pie graph
line plot	analyze	mean
median	mode	measure of central tendency
spreadsheet	cell	range
row	chart	autosum
gridlines	column	formula
name box	label	value
number format	function	conditional formatting
cell address	active cell	formula bar

x-axis	y-axis	cell pointer

4. Introduction and Demonstration to mean, median, and mode

Explain to students that there are three (3) ways to describe data. All three ways can be thought of as the **measure of central tendency** or as **average** as most people would say. Point out to the students that the word **average** and **measure of central tendency** are basically the same, but **in statistics, the mean, median, and mode are the 'measures of central tendency.'**

Have students to write a brief definition of **mean, median, and mode**.

• LESSON 1: MEAN, MEDIAN, and MODE

Discussion

1. Ask students to explain in their own words, how to find the **mean, median, and mode** of data.
2. Have the table from the 'Warm-Up' activity already drawn on the board.
3. Ask the question: **What is Genna's mean daily mileage?** Have students to get out a sheet of paper and show work for calculating the mean.
4. Check for understanding and comprehension. If there are students who did not get the correct answer, find out if they now understand what they did wrong and have them to explain in their own words, what they should have done to get the correct answer.
5. Now ask the students to show-work and calculate the **median** of Genna's mileage. Students are to use the same paper for this calculation. Give the students the **hint:** put the numbers in order from least to greatest.
6. Check for understanding and review.
7. Have students to identify the **mode** of Genna's mileage.
8. Check for understanding and review.

Table for 'Warm-Up' Activity #1

DAILY	MILEAGE
Day 1	**3.1**
Day 2	**7.5**
Day 3	**11.4**
Day 4	**6.8**
Day 5	**7.0**
Day 6	**6.8**
Day 7	**7.2**
Day 8	**6.8**
Day 9	**9.1**

8. Have students to demonstrate understanding by completing 'Warm-Up' Activity #2. Write problem on the board:

• Genna needs to average 8 miles per day to complete a hiking trip in 7 days. On the first 6 days she hiked 9.1, 10.7, 8.3, 5.4, 6.2, and 7.9 miles. **How far must she hike on the seventh (7^{th}) day?**

9. You may give the students hints:
   Hint #1: Find the total miles of the trip.
   Hint #2: Find how far she must hike on the seventh (7^{th}) day.

10. Have students to complete 'Activity #1: Mean, Median, and Mode' in class or as homework.

11. Have students to work in groups of 2 or 3 to complete 'Activity #2: Mean, Median, and Mode." Check and review.

12. Have students to complete 'Assessment #1: Mean, Median, and Mode.'

• LESSON 2: INTERPRETING and MAKING BAR/COLUMN GRAPHS

Discussion

1. Introduce and/or review steps involved for drawing/creating a graph.
   *Step 1: What type of graph would best display the data?
   *Step 2: How will you label each axis? What scale will you use?
   *Step 3: How does your graph compare the data for each event, activity, and/or category?

2. Either make copies for students or create a transparency displaying the table and graph: **12-BCS-7-2**

3. Have students to use the table and graph: **12-BCS-7-2** to answer the following questions:
   - On the graph, why doesn't the percent scale run from 0% to 100%?
   - What is the purpose of the key/legend?
   - Why is the sum of percents representing boys greater than 100%?

4. Check for understanding by having students to complete **'Warm-Up Activity: Graphs.'**
   - Give students 10 to 15 minutes and review (have students discuss, answer and demonstrate).

• LESSON 3: SURVEYS

Discussion and Demonstrate

1. Introduce and/or review steps involved for creating and conducting a survey.
   *Step 1: Choose a survey topic.
   *Step 2: Take your survey by collecting data from each group member.
   *Step 3: Organize the data and find the mean, median, and mode.
   *Step 4: Arrange the results as a display – in a graph/chart.

2. Write on board and have students to answer on his/her paper:

   How much time do I spend watching tv every day? ***(write the approximate # of hours for each day)***

Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**

3. Have students to answer the following questions AFTER he/she has completed the # of hours:
   *What is the mean for my daily tv watching?
   *What is the median for my daily tv watching?
   *What is the mode for my daily tv watching?

4. Check for understanding - allow students to discuss and compare results.

5. Have students to conduct a pizza survey on themselves and classmates. Students will calculate the mean, median, and mode for each pizza type.

• LESSON 4: SPREADSHEETS

Discussion and Demonstrate

1. Introduce and/or review the basic parts of an Excel spreadsheet.

2. Have students to follow the direction sheet and use data collected with pizza survey to create a spreadsheet. Students will insert/apply a basic addition formula and a basic division formula to have the mean and median calculated in Excel.

3. Student will apply basic Excel formatting for cells and clip art.

• LESSON 5: SPREADSHEET CHART

Discussion and Demonstrate

1. Introduce and/or review the basic parts of an Excel chart.

2. Have students to follow the direction sheet and use existing spreadsheet data to identify and create the appropriate (column) chart for displaying selected data.

3. Student will apply basic Excel formatting for selected chart area.

• ATTACHMENTS FOR LESSON PLANS

- Standards
- Essential Questions
- Key Terms
- Introduction & Demonstration 'Warm-Up' Activities
- Activity #1: Mean, Median, and Mode
- Activity #2: Mean, Median, and Mode
- Assessment #1: Mean, Median, and Mode
- Interpreting and Making Bar/Column Graphs Handout
- Graphs 'Warm-Up' Activity
- Surveys Handout
- Surveys: Practice Activity
- Project PIZZA #1 (Survey)
- Excel Key Terms Handout
- Excel Basic Parts of a Spreadsheet Handout
- Excel Basic Keyboard Shortcuts Handout
- Basic Excel Formulas Handout
- Project PIZZA #2 (Create A Spreadsheet)
- Project PIZZA #3 (Create A Chart)
- Assessment #2: Excel Spreadsheets
- Checklist for Project PIZZA #2 and Project PIZZA #3

- **NOTES & REFLECTION:**

One of the most important steps in this unit is that the student be able to display their collected survey data in the form of a spreadsheet and chart. Students can further discuss how the collected data could be used in various avenues (i.e. local businesses).

Suggestion: Students may go to various 'fast-food' establishments in their community and get permission to conduct a survey for that 'specific' restaurant to find out :

*most popular restaurant by number of visits per (morning, lunch, evening, day of the week, etc.)
*most popular food item on menu
*average (mean) age of customers
*frequently visited by male/female

CULMINATING PERFORMANCE TASK

Culminating Unit Performance Task Title:

Students complete the Project PIZZA spreadsheet and chart checklist at the end of each direction sheet.

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

Students will complete and save a completed spreadsheet and chart with data collected from a survey of classmates.

Attachments for Culminating Performance Task:

- Checklist items for spreadsheet:
  - *Merged, formatted, and typed title in cells A1 – F1
  - *Formatted and typed column headings in cells A2 – F2
  - *Formatted and typed data in cells A3 - F3 down to A17 - F17
  - *Formatted and typed data in cells A14 - A17
  - *Inserted/Applied 'addition' formula to cell B14 to get the **total** for each column
  - *Filled - Right the 'addition' formula to cells C14 - F14
  - *Inserted/Applied 'division' formula in cell B15 to get the **mean** for each column
  - *Filled - Right the 'division' formula to cells C15 - F15
  - *Formatted numbers in cells C15 - F15 to be 'rounded'
  - *Sorted data in cells B3 - B13 -- C3 - C13 -- D3 - D13 -- E3 - E13 -- F3 - F13
  - *Identified and typed the **median** for each column (row 16)
  - *Identified and typed the **mode** for each column (row 17)
  - *Inserted/Formatted/Copied/Rotated clip art
  - *Proofed & spell-check
  - *Saved

- Checklist items for chart:
  - *Opened existing Excel spreadsheet
  - *Used **Ctrl key** to highlight cells B2 - F2 **and** B14 - F14
  - *Went to Insert -- Chart and selected the appropriate chart for displaying data ***(select 'Clustered Column' for this assignment)***
  - *Typed in titles for:
    - *Chart Title *Category X Axis *Value Y Axis
  - *Inserted/Applied gridlines
  - *Selected legend placement
  - *Selected 'value' data labels
  - *Formatted chart
  - *Adjusted size and positioned (under spreadsheet) *Save

UNIT RESOURCES

Materials & Equipment:

- Computer
- Microsoft Office software
- Handouts
- Overhead & transparency, or 'smart-board'

21st Century Technology Used:

	Slide Show Software	X	Graphing Software		Audio File(s)
X	Interactive Whiteboard	X	Calculator		Graphic Organizer
	Student Response System		Desktop Publishing	X	Image File(s)
	Web Design Software		Blog		Video
	Animation Software		Wiki		Electronic Game or Puzzle Maker
	Email		Website		
X	Microsoft Excel				