



Program Information	<i>[Lesson Title]</i>		TEACHER NAME		PROGRAM NAME		
	Calculating Measures of Central Tendency and Representing Data		Julie Thumann		Cincinnati City Schools		
Program Information	<i>[Unit Title]</i>		NRS EFL(s)		TIME FRAME		
	Data		2 – 4		Two, 75-minutes classes		
Instruction	<u>OBR ABE/ASE Standards – Mathematics</u>						
	Numbers (N)		Algebra (A)		Geometry (G)		Data (D)
	Numbers and Operation	N.4.3	Operations and Algebraic Thinking	A.3.16	Geometric Shapes and Figures		Measurement and Data D.2.4 D.2.5 D.2.6 D.3.1 D.3.2 D.3.14 D.4.10
	The Number System		Expressions and Equations		Congruence		Statistics and Probability
	Ratios and Proportional Relationships		Functions		Similarity, Right Triangles. And Trigonometry		<i>*Benchmarks identified in red are priority benchmarks. Please see the Curriculum Alignments available on the Teacher Resource Center for a complete list of priority benchmarks and related Ohio ABLE lesson plans.</i>
Number and Quantity				Geometric Measurement and Dimensions			



		Modeling with Geometry		
Mathematical Practices (MP)				
✓	Make sense of problems and persevere in solving them. (MP.1)	✓	Use appropriate tools strategically. (MP.5)	
✓	Reason abstractly and quantitatively. (MP.2)	✓	Attend to precision. (MP.6)	
✓	Construct viable arguments and critique the reasoning of others. (MP.3)	✓	Look for and make use of structure. (MP.7)	
✓	Model with mathematics. (MP.4)	✓	Look for and express regularity in repeated reasoning. (MP.8)	
LEARNER OUTCOME(S)		ASSESSMENT TOOLS/METHODS		
<ul style="list-style-type: none"> Define mean, median, mode, and range and complete the Statistical Measures Folded Book Complete the Graph Review Half-Book by generating data for 4 different graphs. Draw a line/dot plot when given data. Solve for mean, median, mode, and range, when given data. 		<ul style="list-style-type: none"> Student responses to warm-up <i>Statistical Measures Folded Book</i> Student answers in <i>Graph Review Half-Book</i> Student dot/line plots Exit Ticket: Prove It, Post It <i>Calculating Measures of Central Tendency and Representing Data Assessment</i> 		
LEARNER PRIOR KNOWLEDGE				
<ul style="list-style-type: none"> Fluency in number operations Ability to solve for single variable equations 				
INSTRUCTIONAL ACTIVITIES			RESOURCES	
<ol style="list-style-type: none"> Pass out Statistical Measures Folded Book handout <ol style="list-style-type: none"> Model how to make the Statistical Measures Folded Book and 			Student copies of Statistical Measures Folded Book handout (attached)	



<p>provide students with supplies.</p> <p>b. Ask students to write the following numbers in the correct space:</p> <ul style="list-style-type: none">i. In the space under mean write “93.”ii. In the space under median write “93.”iii. In the space under mode write “99.”iv. In the space under range write “17.” <p>c. Once students have finished writing the numbers, lead a class discussion in which you ask students to figure out the process for finding mean, median, mode, and range (use phrases from the <i>Math Talk Bookmark</i> to solicit student responses and check student understanding). Complete the inside of the Statistical Measures Folded Book</p> <p>d. On the back of the foldable students will add the example – “Solve for a missing term when the average is given”.</p> <ul style="list-style-type: none">i. Ask students to write the following example using the data set provided: How many points out of a 100 must you score on a 9th test to average 94 for all nine tests? Is an average of 94 possible? Why or Why not?ii. Use the formula for solving for a mean (on the Mathematics Formula Sheet & Explanation)<ul style="list-style-type: none">a. $\text{mean} = \frac{\text{total data sum}}{\text{number of terms}}$iii. Answer: This average is not possible because the missing term is 102. <p>e. On the front of the Statistical Measures Folded Book students can copy the following “nursery” rhyme to help them remember the differences between mean, median, mode, and range:</p> <ul style="list-style-type: none">i. <i>Hey diddle diddle, the _____ is the middle; you add and divide for the _____. The _____ is the one that appears the most and the _____ is the difference between.</i> <p>2. Now that students feel comfortable with the measures of central</p>	<p>Student copies of <i>Math Talk Bookmark</i> (attached) Math Talk Bookmark. (n.d.). Retrieved from https://www.pinterest.com/pin/30751209929886153/</p> <p><i>Mathematics Formula Sheet & Explanation</i>. (2014). Retrieved from http://www.gedtestingservice.com/uploads/files/0756c16704434ff71e43c8117a5fa738.pdf</p> <p>Student copies of Graph Review Half-Book handout (attached)</p> <p>Projector/ability to project</p> <p>Chalkboard or whiteboard</p> <p>Computer with Internet access</p> <p>Create a dot plot. (n.d.). Retrieved from https://learnzillion.com/assignments/AD3GT9B</p> <p>Post-it notes for student use</p> <p>Student copies of <i>Calculating Measures of Central Tendency and Representing Data Assessment</i> (attached)</p> <p>Zike, D. (n.d.). <i>Teaching Mathematics with Foldables</i>. Retrieved from https://blogs.edutech.nodak.edu/badlandsreadingcouncil/files/2012/03/math-foldables.pdf</p>
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tendency and the formula for finding the mean or average, discuss how data is represented in a chart or graph.

- a. Ask students how they have seen data displayed? What information did it provide? If a graph or chart was not used, how would you list the data? Why does displaying the data graphically make more sense?

- a. Pass out the [Graph Review Half-Book](#) handout.

- i. Model how to make the [Graph Review Half-Book](#) and provide students with supplies.

1. This foldable will need to be folded vertically and then accordion-style.

- i. Project the foldable on the board and fill-in the blanks together.
- ii. Then, label the x- and y-axis of the graphs and display the data correctly.

3. Next, students will learn how to interpret and create a “dot/line plot”. (Use both names because this representation of data is on the 2014 GED[®], and it is titled a “line plot.” Other sources though refer to this representation of data as a “dot plot.”)

- a. [Create a dot plot](#) video.

- i. Before the video, let students know they will be drawing a line/dot plot; ask students to have their notebooks and pencils ready to take notes, but only when you pause the video. Otherwise, they should be watching and listening to the video.
- ii. Teacher should watch the video prior to the lesson so they may determine appropriate places to pause the lesson so students can draw their line/dot plot.
- iii. Please refer to the following times as pausing guidelines; however, it will vary from class or individual instruction.

- a. Pause: 1:00 – Discuss what the x’s represent.

- b. Pause 1:15 – Review the vocabulary term



	<p>“frequency”.</p> <p>c. Pause 1:42 – Discuss data.</p> <p>d. Pause 2:15 – Discuss range and then ask students to be ready to draw their own line/dot plots.</p> <p>e. Pause 2:48 – Instruct students to record all data in their notebooks because it will be used to create their line/dot plot.</p> <p>f. Pause 3:05 – Students will draw their number line.</p> <p>g. Pause 3:16 – Students will now record their data with X’s and then finish video to check for correct placement.</p> <p>4. Wrap-up: Prove It, Post It</p> <p>a. Provide students with a set of numbers and ask them to find the mean, median, mode, and range on a Post-it note. When finished, students can stick their Post-its on the door.</p> <p>b. Collect student Post-it notes for evaluation.</p> <p>5. Homework: <i>Calculating Measures of Central Tendency and Representing Data Assessment</i></p> <p>a. Students complete the assessment and then review as a class or turn in to teacher for evaluation.</p>	
	<p>DIFFERENTIATION</p> <ul style="list-style-type: none">• Provide students with partially complete handout, graphic organizer, and/or foldables• Display written vocabulary terms and definitions• Allow students to work individually, in pairs, or in class groups• Provide a script for the video• Provide a variety of number sets for the wrap-up that vary in level of difficulty• Provide a shorter version of the homework assessment	



Adult Basic & Literacy Education

Reflection	TEACHER REFLECTION/LESSON EVALUATION
	ADDITIONAL INFORMATION

- Think: _____.

To find the mean:

1. _____ all values
2. _____ by the number of values.

Example Problem:

Find the Mean of the numbers.

-
- Think: _____.

To find the median:

1. Put numbers in _____ from least to greatest.
2. Mark off high and low values until you reach the _____.
3. If there are 2 middles, add them and _____ by 2.

Example Problem:

Find the Median of the numbers.

-
- Think: _____.

To find the mode:

1. Put numbers in _____ from least to greatest.
2. Find the number that appears the _____.
3. There may be more than one mode, or there may be _____.

Example Problem:

Find the Mode of the numbers.

-
- Think: _____.

To find the range:

1. Put numbers in _____ from least to greatest.
2. _____ the lowest number from the highest number.

Example Problem:

Find the Range of the numbers.

Statistical Measures

Mean

Median

For all examples:

Find the Mean, Median, Mode and Range of the following numbers.

Your Math Test Grades:

94, 86, 92, 100, 99, 91, 99, 83

Mode

Range

- Think: Average.

To find the mean:

1. Add all values
2. Divide by the number of values.

Example Problem:

Find the Mean of the numbers.

(Answer is 93)

-
- Think: Middle.

To find the median:

1. Put numbers in order from least to greatest.
2. Mark off high and low values until you reach the middle.
3. If there are 2 middles, add them and divide by 2.

Example Problem:

Find the Median of the numbers.

(Answer is 93)

-
- Think: Most Often.

To find the mode:

1. Put numbers in order from least to greatest.
2. Find the number that appears the most.
3. There may be more than one mode, or there may be no mode.

Example Problem:

Find the Mode of the numbers.

(Answer is 99)

-
- Think: High - Low.

To find the range:

1. Put numbers in order from least to greatest.
2. Subtract the lowest number from the highest number.

Example Problem:

Find the Range of the numbers.

(Answer is 17)

Statistical Measures

Mean

Median

For all examples:

Find the Mean, Median, Mode
and Range of the following
numbers.

Your Math Test Grades:

94, 86, 92, 100, 99, 91, 99, 83

Mode

Range

★ Math Talk ★

- I agree/disagree with you because...
- What I heard you say was...
- What key words helped you solve this?
- Can you explain this to me?
- What were you thinking here?
- How did you solve it?
- What did you start with?
- Why did you choose that operation?
- What strategy did you use?
- Why did you choose that strategy?
- How did you know your answer was right?
- Prove your answer is right.
- How else can you solve it?
- How did this help you understand?
- How is this like other problems you've solved?

+ = ÷ + - × = ÷ +

★ Math Talk ★

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Mathematics Formula Sheet & Explanation

The 2014 GED® Mathematical Reasoning test contains a formula sheet, which displays formulas relating to geometric measurement and certain algebra concepts. Formulas are provided to test-takers so that they may focus on *application*, rather than the *memorization*, of formulas.

Area of a:

square	$A = s^2$
rectangle	$A = lw$
parallelogram	$A = bh$
triangle	$A = \frac{1}{2}bh$
trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$
circle	$A = \pi r^2$

Perimeter of a:

square	$P = 4s$
rectangle	$P = 2l + 2w$
triangle	$P = s_1 + s_2 + s_3$
Circumference of a circle	$C = 2\pi r$ OR $C = \pi d$; $\pi \approx 3.14$

Surface area and volume of a:

rectangular prism	$SA = 2lw + 2lh + 2wh$	$V = lwh$
right prism	$SA = ph + 2B$	$V = Bh$
cylinder	$SA = 2\pi rh + 2\pi r^2$	$V = \pi r^2 h$
pyramid	$SA = \frac{1}{2}ps + B$	$V = \frac{1}{3}Bh$
cone	$SA = \pi rs + \pi r^2$	$V = \frac{1}{3}\pi r^2 h$
sphere	$SA = 4\pi r^2$	$V = \frac{4}{3}\pi r^3$

(p = perimeter of base with area B ; $\pi \approx 3.14$)

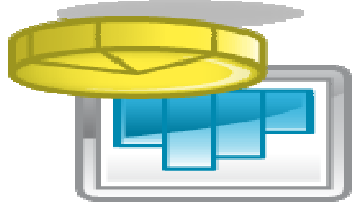
Data

mean	mean is equal to the total of the values of a data set, divided by the number of elements in the data set
median	median is the middle value in an odd number of ordered values of a data set, or the mean of the two middle values in an even number of ordered values in a data set

Algebra

slope of a line	$m = \frac{y_2 - y_1}{x_2 - x_1}$
slope-intercept form of the equation of a line	$y = mx + b$
point-slope form of the equation of a line	$y - y_1 = m(x - x_1)$
standard form of a quadratic equation	$y = ax^2 + bx + c$
quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Pythagorean theorem	$a^2 + b^2 = c^2$
simple interest	$I = Prt$ (I = interest, P = principal, r = rate, t = time)
distance formula	$d = rt$
total cost	total cost = (number of units) \times (price per unit)

Graphs Review Book



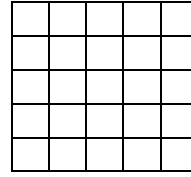
This Book Belongs to: _____

Histograms

- ⇒ A bar graph that displays _____.
- One bar per interval
- No _____ between _____

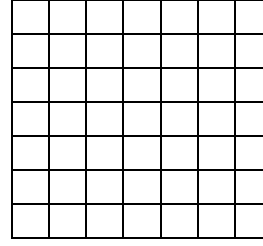
How to make a histogram:

Test Scores	Frequency
71—80	4
81—90	5
91—100	3



Graph the following data:

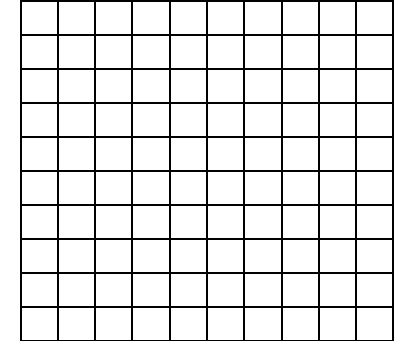
Day	Number of Minutes spent reading
Monday	45
Tuesday	30
Wednesday	60
Thursday	45



Graph the following data:

Grade Level of Chorus Students

Grade	Boys	Girls
6	40	64
7	32	58
8	26	46



- ⇒ Used to show change over _____.
- How to make a line graph: _____.
- Choose a _____.
- Horizontal axis represents _____.
- Data is plotted as a _____.
- DO NOT connect to the _____ of the _____ graph.
- _____ in vertical axis is allowed.

Double Bar Graphs

- ⇒ Used to compare data for two different _____.

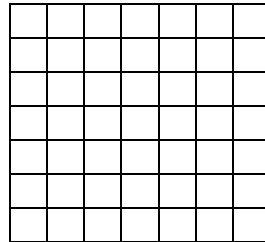
How to make a double bar graph:

- Choose a _____.
- 2 group bars are side by side (no spaces)
- Leave _____ between the groups.
- _____ of bars represents data.
- All bars have the same _____.
- Requires a _____.

Graph the following data:

Books Sold by Grade at the Book Fair

Grade	Number of Books
6	30
7	20
8	25



Bar Graphs

- ⇒ Used to _____ data.

How to make a bar graph:

- Choose a scale (what to _____).
- Leave _____ between the bars.
- _____ of bars represents data.
- All bars have the same _____.

Calculating Measures of Central Tendency and Representing Data Assessment

1. The data represents the number of miles six employees drive to work.
9, 7, 9, 5, 7, 9
Create a line plot using x's to display the data.
2. Several people were surveyed about the amount of emails they received today. The data represents the number of emails 21 recipients received.
6, 4, 5, 4, 5, 3, 4, 3, 2, 2, 3, 1, 1, 0, 1, 0, 2, 2, 3, 2, 2
Create a labeled line plot using x's to display the data and answers the questions 1-4.

1. How many people received fewer than 3 pieces of mail?
 - A. 4
 - B. 11
 - C. 13
 - D. 15
2. What is the median of the data?
 - A. 2
 - B. 3
 - C. 4
 - D. 11
3. Write *less than*, *greater than*, or *equal to* in each blank.
 - a. The range of the data is _____ 4.
 - b. The number of people surveyed is _____ 22.
 - c. The mean of the data is _____ the median.
 - d. The number of people who received at least 4 emails is _____ the number of people who received 2 emails.
4. GED Challenge Question – In a bowling league match, Keyerra has bowled scores of 180 and 210 so far. He will bowl one more game. If he wants his average for the three games to be at least 205, what is the minimum score he needs for the third game?
**Hint: The formula for solving for a mean or average is: $\text{mean} = \frac{\text{sum}}{\text{number of terms}}$*
Plug-in the given numbers and solve for the missing score.
 - A. 185
 - B. 205
 - C. 215
 - D. 225
 - E. 245

