



National Center and State Collaborative

NCSC Math Activities with Scripted Systematic Instruction (MASSI): Middle School Data Analysis

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National Center and State Collaborative

The National Center and State Collaborative (NCSC) is applying the lessons learned from the past decade of research on alternate assessments based on alternate achievement standards (AA-AAS) to develop a multi-state comprehensive assessment system for students with significant cognitive disabilities. The project draws on a strong research base to develop an AA-AAS that is built from the ground up on powerful validity arguments linked to clear learning outcomes and defensible assessment results, to complement the work of the Race to the Top Common State Assessment Program (RTTA) consortia.

Our long-term goal is to ensure that students with significant cognitive disabilities achieve increasingly higher academic outcomes and leave high school ready for post-secondary options. A well-designed summative assessment alone is insufficient to achieve that goal. Thus, NCSC is developing a full system intended to support educators, which includes formative assessment tools and strategies, professional development on appropriate interim uses of data for progress monitoring, and management systems to ease the burdens of administration and documentation. All partners share a commitment to the research-to-practice focus of the project and the development of a comprehensive model of curriculum, instruction, assessment, and supportive professional development. These supports will improve the alignment of the entire system and strengthen the validity of inferences of the system of assessments.



The contents of this lesson were developed as part of the National Center and State Collaborative by Keri Bethune and Diane Browder at University of North Carolina at Charlotte and verified by Amy Lehew, math content expert, under a grant from the Department of Education (PR/Award #: H373X100002, Project Officer, Susan.Weigert@Ed.gov). However, the contents do not necessarily represent the policy of the U.S. Department of Education and no assumption of endorsement by the Federal government should be made.

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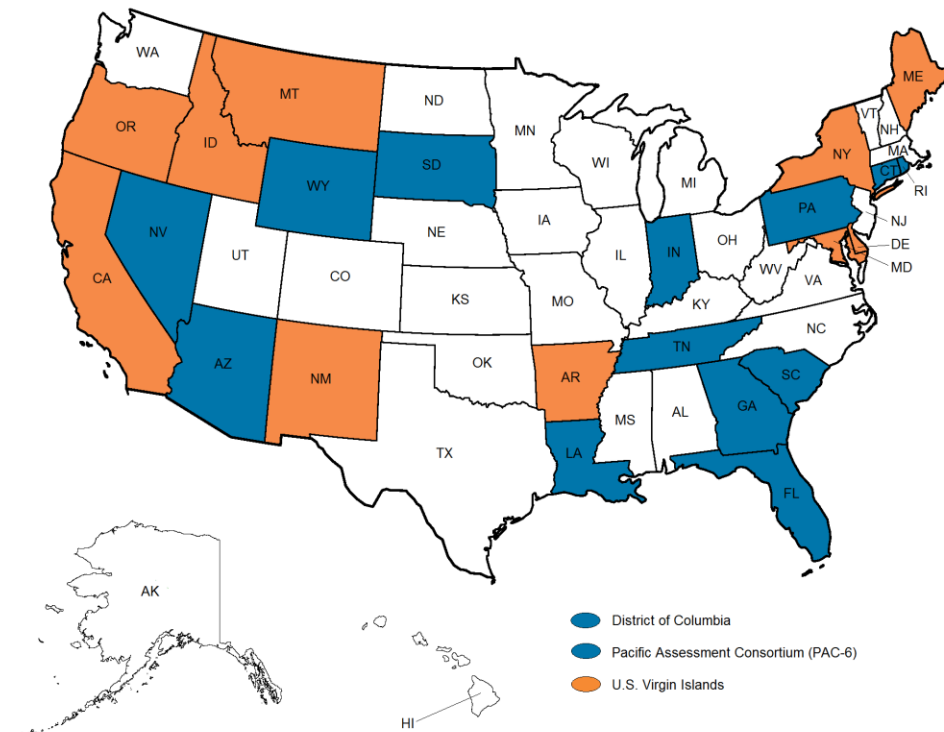


National Center and State Collaborative

NCSC is a collaborative of 15 states and five organizations.

The states include (shown in blue on map): Arizona, Connecticut, District of Columbia, Florida, Georgia, Indiana, Louisiana, Nevada, Pacific Assessment Consortium (PAC-6)¹, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, and Wyoming.

Tier II states are partners in curriculum, instruction, and professional development implementation but are not part of the assessment development work. They are (shown in orange on map): Arkansas, California, Delaware, Idaho, Maine, Maryland, Montana, New Mexico, New York, Oregon, and U.S. Virgin Islands.



*Core partner states are blue in color and Tier II states are orange in color.

¹ The Pacific Assessment Consortium (including the entities of American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Republic of Palau, and Republic of the Marshall Islands) partner with NCSC as one state, led by the University of Guam Center for Excellence in Developmental Disabilities Education, Research, and Service (CEDDERS).



National Center and State Collaborative

The five partner organizations include: The National Center on Educational Outcomes (NCEO) at the University of Minnesota, The National Center for the Improvement of Educational Assessment (Center for Assessment), The University of North Carolina at Charlotte, The University of Kentucky, and edCount, LLC.



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NCSC Math Activities with Scripted Systematic Instruction (MASSI): Middle School Data Analysis

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MASSI: Math Activities with Scripted Systematic Instruction

Activity: Voting for Class President

Grade Band: Grades 6-8

Concept: Data Analysis

Common Core State Standard	Core Content Connectors	MASSI OBJECTIVES
6.SP.5 Summarize numerical data sets in relation to their context.	6th 6.DPS.1d3 Select statement that matches mean, mode, and spread of data for 1 measure of central tendency for a given data set	Given a data set, match statements for range, average (mean), and find mode and median
7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	7th 7.DPS.1k1 Analyze graphs to determine or select appropriate comparative inferences about two samples or populations	Analyze a bar graph to make comparative inferences
8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.	8th 8.DPS.1k2 Analyze displays of bivariate data to develop or select appropriate claims about those data	Analyze a table with bivariate data to select an appropriate claim about the data

Be sure to provide specific practice to students on the skills that correspond to their grade level.

Teaching Materials: Table for 8th grade election results; bar graph for 8th grade election results; greater than, less than, and equal response options; equation for range; equations for mean/average; double bar graph for 8th grade showing how different classes voted; bivariate table showing 8th grade election results and hours spent campaigning; response options for bivariate data

Other Materials: Tables for 7th and 6th grade election results; bar graphs for 7th and 6th grade election results; equation for range; equations for mean/average; double bar graphs for 7th and 6th grade showing how different classes voted, bivariate tables showing 7th and 6th grade election results and hours spent campaigning, response options for bivariate data

Worksheets: There are student worksheets to review each component of the lesson.

Assessments: Progress Monitoring for taking data during the lesson; Skills Test

TEACHING OVERVIEW: The first section of the MASSI provides remedial practice on identifying higher and lowest values in a data set, matching the source of values on x axis with the category of related data on the table, and analyzing a bar graph for greater/less/equal comparisons. 6th graders will learn to match statements for range, average (mean), and to find the mode and median when given a data set. This is a good review for your 7th and 8th graders. The 7th graders will be analyzing a bar graph to make comparative inferences. This is useful for your 6th and 8th graders to gain fluency with these concepts and practice numeracy skills. Then 8th graders work on analyzing a table with bivariate data to select an appropriate claim about the data.

SCRIPT FOR LESSON

BUILDING ESSENTIAL UNDERSTANDING: CONCEPT AND SYMBOLS: Identifying Highest and Lowest Value in a Data Set, Matching Source of Values on x-axis with the Category of Related Data on the Table

(Skip this section for students who understand these relationships and can identify these concepts).

INTRODUCE THE ACTIVITY: Today we are going to learn about elections for class president. An election is when people vote for a person they want to fill a position/job, like class president. The person with the most votes wins the election and becomes the class president. When people vote in an election, it's very important to analyze the results carefully to make sure the right person gets the job. There are a few ways to analyze the results of a vote, today we will work with tables and graphs. Today, we will be working on analyzing the election results for the each grade at Main Street Middle School.

INTRODUCE PROBLEM: One of the first things we need to find when we look at election results data is the highest and lowest values. This shows us who got the most votes and who got the least votes. We can find the highest and lowest value by looking at a table of results or a bar graph.

MODEL THE PROCESS: Show students the bar graph and the table for 8th grade class president. Point to the corresponding locations as you read the following: **Here are the results for 8th grade class president. We can look at the results in a table and a bar graph. First, we need to see which person has the highest value, which means they got the most votes. When I look at the table, I am looking for the highest, or biggest, number. Look 30 is the biggest number on the table, Kamaria got 30 votes. When we look at the bar graph, it shows the data in a different way. Here I'm still looking for the highest, or biggest, bar. t shows the same thing, Kamaria's bar is the highest with 30 votes. Look, everyone else's bar is smaller/lower. Now I need to find the person who got the lowest value, which means they got the least amount of votes. Let's look at the 8th grade table again. It looks like there's a tie; both Francis and Leah got 16 votes, which is the smallest number on the table. When I look at the bar graph, it also shows the same thing. The lowest, or smallest, bars are for Francis and Leah, and everyone else's is higher.**



STUDENT PRACTICE: Give each student the table and bar graph for 7th grade (and 6th grade afterwards). **Now it's your turn. I want you to find the highest and lowest values for the 6th and 7th grade elections for class president.** Use the CONSTANT TIME DELAY script to teach students to identify the highest and lowest value in the data set.

CHECK AND SCORE

Step	Teacher Says/Does	Student Response
1.	Give student the bar graph for 7 th grade class president election results and say “Show me who has the highest value; who got the most votes?”	Student identifies Karim (e.g., by stating his name or pointing to his data).
2.	Give student the table for 7 th grade class president election results and say “Show me who has the highest value; who got the most votes?”	Student identifies Karim (e.g., by stating his name or pointing to his data).
3.	Give student the bar graph for 7 th grade class president election results and say “Show me who has the lowest value; who got the least votes?”	Student identifies Maya (e.g., by stating her name or pointing to her data).
4.	Give student the table for 7 th grade class president election results and say “Show me who has the lowest value; who got the least votes?”	Student identifies Maya (e.g., by stating her name or pointing to her data).
5.	Give student the bar graph for 6 th grade class president election results and say “Show me who has the highest value; who got the most votes?”	Student identifies Ruby (e.g., by stating her name or pointing to her data).
6.	Give student the table for 6 th grade class president election results and say “Show me who has the highest value; who got the most votes?”	Student identifies Ruby (e.g., by stating her name or pointing to her data).
7.	Give student the bar graph for 6 th grade class president election results and say “Show me who has the lowest value; who got the least votes?”	Student identifies Clara (e.g., by stating her name or pointing to her data).
8.	Give student the table for 6 th grade class president election results and say “Show me who has the lowest value; who got the least votes?”	Student identifies Clara (e.g., by stating her name or pointing to her data).

INTRODUCE PROBLEM: Now that we've looked at the results in both a table and a bar graph, you know that the table and the bar graph show the same data in different ways. Let's make sure we know that they have the same data.

MODEL THE PROCESS: Show students the table and bar graph for 8th grade. Point to the corresponding sections while you read the following: **Watch me as I match the data on the table with the matching data on the bar graph for the 8th grade election results. I start by looking at the first name on the table, Kamaria. I see that she got 30 votes, now I find the Kamaria's name on the bar graph. I follow the bar graph up and across to the y axis and see that it also shows she got 30 votes. Now let's match up Francis. Here is Francis in the table with 16 votes, and here is Francis on the bar graph, which also shows 16 votes. I do the same thing for Isaac, the table shows he got 25 votes, now I look at the bar graph and find his name. When I look up at the bar, it also shows 25 votes. Next, I look at Ming on the table, 28 votes. I find Ming on the bar graph, and it also shows 28 votes. Last, I find Leah on the table, which shows 16 votes. Now I find Leah on the bar graph, and it matches with 16 votes!**



STUDENT PRACTICE: Give each student the table and bar graph for 7th grade (then 6th grade). **Now it's your turn. I want you to match the sources of data from the table to the x axis on the bar graph.** Use the CONSTANT TIME DELAY script to teach students to match the sources of data to the bar graph.

CHECK AND SCORE

Step	Teacher Says/Does	Student Response
9.	Teacher points to Amy on the 7 th grade results table. “How many votes did Amy get?”	Student states, points to, or otherwise indicates 23.
10.	Teacher points to Amy on the 7 th grade results bar graph. “Now find Amy on the bar graph.”	Student points to Amy on the bar graph.
11.	Teacher points to Ben on the 7 th grade results table. “How many votes did Ben get?”	Student states, points to, or otherwise indicates 29.
12.	Teacher points to Ben on the 7 th grade results bar graph. “Now find Ben on the bar graph.”	Student points to Ben on the bar graph.
13.	Teacher points to Karim on the 7 th grade results table. “How many votes did Karim get?”	Student states, points to, or otherwise indicates 35.
14.	Teacher points to Karim on the 7 th grade results bar graph. “Now find Karim on the bar graph.”	Student points to Karim on the bar graph.
15.	Teacher points to Esperanza on the 7 th grade results table. “How many votes did Esperanza get?”	Student states, points to, or otherwise indicates 29.
16.	Teacher points to Esperanza on the 7 th grade results bar graph. “Now find Esperanza on the bar graph.”	Student points to Esperanza on the bar graph.
17.	Teacher points to Maya on the 7 th grade results table. “How many votes did Maya get?”	Student states, points to, or otherwise indicates 19.
18.	Teacher points to Maya on the 7 th grade results bar graph. “Now find Maya on the bar graph.”	Student points to Maya on the bar graph.
19.	Now remove the 7 th grade materials and present the 6 th grade results table and bar graph. Teacher points to Maya on the table. “Now let’s work on the 6th graders’ election results. How many votes did Anya get?”	Student states, points to, or otherwise indicates 25.
20.	Teacher points to Anya on the 6 th grade results bar graph. “Now find Anya on the bar graph.”	Student points to Anya on the bar graph.
21.	Teacher points to Ali on the 6 th grade results table. “How many votes did Ali get?”	Student states, points to, or otherwise indicates 27.
22.	Teacher points to Ali on the 6 th grade results bar graph. “Now find Ali on the bar graph.”	Student points to Ali on the bar graph.
23.	Teacher points to Clara on the 6 th grade results table. “How many votes did Clara get?”	Student states, points to, or otherwise indicates 21.
24.	Teacher points to Clara on the 6 th grade results bar graph. “Now find Clara on the bar graph.”	Student points to Clara on the bar graph.
25.	Teacher points to Liam on the 6 th grade results table. “How many votes did Liam get?”	Student states, points to, or otherwise indicates 25.

26.	Teacher points to Liam on the 6 th grade results bar graph. “ Now find Liam on the bar graph. ”	Student points to Liam on the bar graph.
27.	Teacher points to Ruby on the 6 th grade results table. “ How many votes did Ruby get? ”	Student states, points to, or otherwise indicates 32.
28.	Teacher points to Ruby on the 6 th grade results bar graph. “ Now find Ruby on the bar graph. ”	Student points to Ruby on the bar graph.

BUILDING ESSENTIAL UNDERSTANDING: SYMBOLS: Analyzing a Bar Graph for Greater/Less/Equal Comparisons *(Skip this section for students who understand these relationships and can identify these concepts).*

INTRODUCE PROBLEM: Now that we know that a bar graph is a different way to look at the data from a table, let’s analyze the bar graphs to make some comparisons. Show students the response cards for greater than, less than, and equal to. **We are going to use some specific words to describe the data: greater than, less than, or equal to. Greater than means bigger or more. Less than means fewer or smaller. Equal means the same amount. Let’s practice.** Do multiple trials with each student, having them compare two numbers and identify the number that is greater, less, or equal if the two numbers are the same. Allow students to respond and correct any errors (not scored). If students are not familiar with the meaning of greater than, less than, and equal to, teach these concepts first (see Instructional Resource Guide for ideas).

MODEL THE PROCESS: Remove the tables, show students the 8th grade bar graph. **I’m going to analyze some of the data from the 8th grade election. Look at the bar graph. First, I’m going to look at Ming’s votes. I want to see whose data is greater than Ming’s. Look, Kamaria’s bar for her data is higher than Ming’s, so I know that Kamaria’s votes are greater than Ming’s. Now let’s look at Isaac’s data. I want to see whose data is less than Isaac’s. There are two students whose data is smaller/lower than Isaac’s. Both Francis and Leah have fewer votes than Isaac. I notice one other interesting thing about Francis and Leah’s data, they are the same size on the bar graph, this means they got the same number of votes and their data are equal.** Note: If students are having trouble seeing the comparisons, give them a ruler, pencil, or piece of paper to hold up to the bar graph to make a straight line across and compare.



STUDENT PRACTICE: Give each student the bar graph for 7th grade (then 6th grade). **Now it’s your turn. Look at the bar graph and answer these questions.** Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

Step	Teacher Says/Does	Student Response
29.	Student has 7 th grade bar graph. “ Whose data is greater than Esperanza? ” Teacher can point to Esperanza on bar graph.	Student states, points to, or otherwise identifies Karim.
30.	Student has 7 th grade bar graph. “ Find one student whose data is less than Ben’s. ” Teacher can point to Ben on bar graph.	Student states, points to, or otherwise identifies Amy or Maya.
31.	Student has 7 th grade bar graph. “ Whose data is equal to Esperanza? ” Teacher can point to Esperanza on bar graph.	Student states, points to, or otherwise identifies Ben.

32.	Student has 6 th grade bar graph. “ Now let’s look at the 6th graders. Whose data is less than Liam’s? ” Teacher can point to Liam on bar graph.	Student states, points to, or otherwise identifies Clara.
33.	Student has 6 th grade bar graph. “ Whose data is greater than Ali’s? ” Teacher can point to Ali on bar graph.	Student states, points to, or otherwise identifies Ruby.
34.	Student has 6 th grade bar graph. “ Whose data is equal to Liam? ” Teacher can point to Liam on bar graph.	Student states, points to, or otherwise identifies Anya.



This may be a good stopping point. Have the student have a classroom student election (they can vote on class president for a day or student of the day). Students can fill out ballots, turn them in, count out the results, and mark them on a table and create a bar graph. There is a generalization worksheet with this level. You can use this for additional guided practice or to send home as homework.

	Teacher Says/Does	Student Response	Error Correction
INDEPENDENT PRACTICE: Data Analysis Skills Test	Give each student the <i>Data Analysis Skills Test 1</i> . Read directions for each problem and have student select response. Record whether response is correct or incorrect.	Only provide praise for completing assessment (if student needs encouragement). Do not provide specific praise for correct answers while student is testing.	Once the student has completed the test, review missed problems with the student.
<i>NOW</i> Stop the lesson here and repeat tomorrow if student is not yet getting at least 20 independent correct responses. Score responses 1-34 on the Data Analysis Progress Monitoring Sheet if you did not do so while teaching.		<i>NEXT</i> Remember the goal is for students to be able to examine the data in further detail using tables and bar graphs, move on to the second half of the lesson to hit the target CCC for this grade level. You can skip this Conceptual Foundation section to move on.	

6th BUILD A GRADE ALIGNED COMPONENT: Given a Data Set, Matching Statements for Range, Average (Mean), and Finding Mode and Median

7th & 8th SYMBOL USE: Matching Statements for Range, Average (Mean), and Finding Mode and Median

INTRODUCE THE ACTIVITY/PROBLEM: Remember before when we looked at the data for the Main Street Middle School class president elections? Now we are going to analyze that data in more detail and learn some new ways to talk about the data, like how to find the range, the average, the mode, and the median. For this portion of the lesson, students will need the tables reporting data from each grade level, but they will NOT use the bar graphs. Note: Teachers may want to have students order the data from least to greatest first. Teachers can use a number line or 100 chart if students need a visual.

MODEL THE PROCESS: You will need the “Equation for Range” template. **First we will work on how to find the range. Range is the difference between the highest and lowest values in a data set. Let’s all say it together. Range is the difference between the highest and lowest**

values in a data set. Students who are unable to respond vocally can use a voice output device to respond. Show students the 8th grade results table. **Here is an equation to show how to calculate range. It says highest value minus lowest value equals range. Now look at the data for the 8th grade class president. Watch me as I fill out the equation and calculate the range. First, I find the highest value, 30, and I write it here. Then I find the lowest value, 16, and I write it here. Now I solve the equation to find the value, 14.**



STUDENT PRACTICE: Give each student the 7th grade election results table (and then the 6th grade) and the “Equation for Range” template. **Now it’s your turn. Look at the table and use it to calculate the range.** Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

**Note: Have the students write the numbers in the formula, but do not score writing ability. If students are unable to write the number, they can use number stamps or direct the teacher to write it for them.

**Note: In the following problem, students are required to subtract. If students are unable to subtract independently, it is ok to provide them with a calculator or other visual, however they must do the work independently. Be consistent with the type of accommodation provided here.

CHECK AND SCORE

STEP	Teacher Says/Does	Student Response
35.	Give each student the 7 th grade election results table and a blank range equation and say “Find the range for the 7th grade set of data.”	Student writes, stamps, or otherwise identifies the highest value (35) in the corresponding place in the equation.
36.	Wait for students to independently initiate this step or say “What’s next?”	Student writes, stamps, or otherwise identifies the lowest value (19) in the corresponding place in the equation.
37.	Wait for students to independently initiate this step or say “Now solve for the range.”	Student subtracts 35-19 to get the correct answer (16) and writes it in the equation.
38.	Give each student the 6 th grade election results table and a blank range equation and say “Good work finding the range for 7th grade, now find the range for the 6th grade set of data.”	Student writes, stamps, or otherwise identifies the highest value (32) in the corresponding place in the equation.
39.	Wait for students to independently initiate this step or say “What’s next?”	Student writes, stamps, or otherwise identifies the lowest value (21) in the corresponding place in the equation.
40.	Wait for students to independently initiate this step or say “Now solve for the range.”	Student subtracts 32-21 to get the correct answer (11) and writes it in the equation.

MODEL THE PROCESS: You will need the “Equation for mean/average” template. **Now we need to learn to calculate the average or mean. The average/mean is one way to describe the middle of a data set. The average is the sum of the data divided by the total number of values. Let’s say that together. The average is the sum of the data divided by the total number of values.** Students who are unable to

respond vocally can use a voice output device to respond. Show students the 8th grade results table. **Now let me show you what that means with the 8th grade data set. We will use our calculator to calculate our answer. First, I add up all of the data to get the sum. So for 8th grade I add $30 + 16 + 25 + 28 + 16 = 115$. Next I need to divide 115 by the total number of values. To find that number I just count the number of students who ran for election, 1, 2, 3, 4, 5. We have 5 total values. Now I divide $115 \div 5 = 23$. The mean or average of the 8th grade data is 23.**



STUDENT PRACTICE: Give each student the 7th grade election results table (and then the 6th grade), the “Equation for mean/average” template, and a calculator. **Now it’s your turn. Look at the table and use it to calculate the average/mean.** Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

****Note:** Have the students write the numbers into the formula, but do not score writing ability. If students are unable to write the number, they can use number stamps or direct the teacher to write it for them.

CHECK AND SCORE

STEP	Teacher Says/Does	Student Response
41.	Give each student the 7 th grade election results table, a blank average equation, and a calculator. Say “ Find the average/mean for the 7th grade set of data. First you need to find the sum of the values. ”	Student adds the values using the calculator to find the sum (135) and writes, stamps, etc. in the corresponding place in the equation.
42.	“ Now you need to count how many values there were in the data set. That means how many students were in the election. ”	Student counts five values and writes, stamps, etc. the number of values (5) in the corresponding place in the equation.
43.	“ Ok, now use your calculator to solve for the average or mean. ”	Student enters 135 into the calculator, presses divide, enters 5, and presses equals to get the average (27) and writes, stamps, etc. the average (27) in the corresponding place in the equation.
44.	Give each student the 6 th grade election results table, a blank average equation, and a calculator. Say “ Now find the average/mean for the 6th grade set of data. First you need to find the sum of the values. ”	Student adds the values using the calculator to find the sum (130) and writes, stamps, etc. in the corresponding place in the equation.
45.	“ Now you need to count how many values there were in the data set. That means how many students were in the election. ”	Student counts five values and writes, stamps, etc. the number of values (5) in the corresponding place in the equation.
46.	“ Ok, now use your calculator to solve for the average or mean. ”	Student enters 130 into the calculator, presses divide, enters 5, and presses equals to get the average (26) and writes, stamps, etc. the average (26) in the corresponding place in the equation.

MODEL THE PROCESS: Next we are going to learn about how to find the mode of the data. The mode is the number that appears the most often in a data set. Say it with me. The mode is the number that appears the most often in a data set. Students who are unable to

respond vocally can use a voice output device to respond. Show students the 8th grade results table. **Let's look at the 8th grade results again. I'm looking to see which number I see the most. I only see 30 one time, I see 16 two times, I see 25 one time, and 28 one time. That means the mode is 16 because it appears the most in the data. We see 16 two times.**



STUDENT PRACTICE: Give each student the 7th grade election results table (and then the 6th grade). **Now it's your turn. Look at the table and use it to find the mode.** Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

STEP	Teacher Says/Does	Student Response
47.	Give each student the 7 th grade election results table and say "Find the mode of this data."	Student vocally states or points to the mode (29).
48.	Give each student the 6 th grade election results table and say "Find the mode of this data."	Student vocally states or points to the mode (25).

MODEL THE PROCESS: This is the last one. Now we are going to learn about how to find the median of the data. The median is the number that is in the middle of a data set after you put the numbers in order. Say it with me. The median is the number that is in the middle of a data set after you put the numbers in order. Students who are unable to respond vocally can use a voice output device to respond. Show students the 8th grade results table. **Let's look at the 8th grade results again. The first thing I'm going to do is write all the numbers in order from least to greatest. Watch me write 16, 16, 25, 28, 30. There are five numbers here, so the middle is the third number. Count three numbers in one, two, three (while pointing to 16, 16, 25). The middle number is 25, so the median is 25.**



STUDENT PRACTICE: Give each student the 7th grade election results table (and then the 6th grade). **Now it's your turn. Look at the table and use it to find the median.** Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

****Note:** Have the students write the numbers, but do not score writing ability. If students are unable to write the number, they can use number stamps or direct the teacher to write it for them.

CHECK AND SCORE

STEP	Teacher Says/Does	Student Response
49.	Give each student the 7 th grade election results table and say "Find the median of this data."	Student puts the numbers in order (either by writing them or using Velcro numbers or number stamps, etc.).
50.	Wait for the student to initiate this step or say "Keep going."	Student identifies the middle number (29).

51.	Give each student the 6 th grade election results table and say “ Find the median of this data. ”	Student puts the numbers in order (either by writing them or using Velcro numbers or number stamps, etc.).
52.	Wait for the student to initiate this step or say “ Keep going. ”	Student identifies the middle number (25).

	Teacher Says/Does	Student Response	Error Correction
INDEPENDENT PRACTICE: Data Analysis Skills Test	Give each student the <i>Data Analysis Skills Test 2</i> . Read directions for each problem and have student select response. Record whether response is correct or incorrect.	Only provide praise for completing assessment (if student needs encouragement). Do not provide specific praise for correct answers while student is testing.	Once the student has completed the test, review missed problems with the student.
<i>NOW</i> Stop the lesson here and repeat tomorrow if student is not yet getting at least 10 independent correct responses. Score responses 35-52 on the Data Analysis Progress Monitoring Sheet if you did not do so while teaching.		<i>NEXT</i> Remember the goal is for students to be able to collect data and graph it as soon as possible, move on to the next portion of the lesson to hit the target CCC for the 7 th grade level.	



This may be a good stopping point. Have a mock classroom student election (they can vote on class president for a day or student of the day). Students can fill out ballots, turn them in, count out the results, and mark them on a table and create a bar graph. They can calculate mean, median, mode, and range. Please note that if there is an even number of students, the median is found by averaging the two middle numbers in the data set (see the Curriculum Resource Guide). There is a generalization worksheet with this level. You can use this for additional guided practice or to send home as homework.

7th BUILD A GRADE ALIGNED COMPONENT: Analyzing a Bar Graph to Make Comparative Inferences

8th SYMBOL USE: Analyzing a Bar Graph to Make Comparative Inferences

INTRODUCE THE ACTIVITY/PROBLEM: Now students are going to analyze bar graphs to make comparative inferences about the data when it is further broken down (e.g., girls vs. boys votes). **Remember before we looked at the bar graphs showing the different number of votes each student got. Now we are going to look at new graphs showing the same data, but breaking it down by how students in different classes voted to make comparative inferences.**

MODEL THE PROCESS: Show students the bar graph for 8th grade election results broken down by classes (double bar graph). **Look at this graph. Mr. Smith’s students’ votes are shown in blue, and Ms. Carter’s students’ votes are shown in red. The different candidates are printed across the horizontal axis and the number of votes is on the vertical axis. Let’s look at Kamaria. 15 of Mr. Smith’s students voted for Kamaria and 15 of Ms. Carter’s students voted for Kamaria. Do you remember the word for this? Give students a chance to respond. Equal. An equal number of students in Mr. Smith’s class and Ms. Carter’s class voted for Kamaria. Now, let’s look at Francis. It looks like 9 of Mr. Smith’s students voted for Francis and 7 of Ms. Carter’s students voted for Francis. This means that the number of Mr. Smith’s students that voted for Francis is greater than the number of Ms. Carter’s students who voted for Francis. Here is another question, “Did more of Mr. Smith’s students or Ms. Carter’s students vote in all?” In order to answer this I look at the graph overall. I see that more of Mr. Smith’s students voted for all candidates except Kamaria, and remember the same number of Mr. Smith’s students and Ms. Carter’s students voted for Kamaria. This means that overall more of Mr. Smith’s students voted.** Note: If students need more support, you can have students add all the votes together for each class.



STUDENT PRACTICE: Give each student the bar graph for 7th grade showing the votes divided by class (and 6th grade afterwards). **Now it’s your turn. Look at the bar graphs and answer these questions. In this 7th grade graph, the blue bars represent Mrs. Boswell’s students and the red bars represent Ms. Thompson’s students.** Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

STEP	Teacher Says/Does	Student Response
53.	“Did more of Mrs. Boswell’s students or Ms. Thompson’s students vote for Amy?”	Student says, points to, or otherwise identifies Ms. Thompson’s students.
54.	“Did more of Mrs. Boswell’s students or Ms. Thompson’s students vote for Ben?”	Student says, points to, or otherwise identifies Mrs. Boswell’s students.
55.	“Did more of Mrs. Boswell’s students or Ms. Thompson’s students vote for Karim?”	Student says, points to, or otherwise identifies Ms. Thompson’s students.
56.	“Did more of Mrs. Boswell’s students or Ms. Thompson’s students vote for Esparanza?”	Student says, points to, or otherwise identifies Ms. Thompson’s students.
57.	“Did more of Mrs. Boswell’s students or Ms. Thompson’s students vote for Maya?”	Student says, points to, or otherwise identifies Ms. Thompson’s students.
58.	“Did more of Mrs. Boswell’s students or Ms. Thompson’s students vote in all?”	Student says, points to, or otherwise identifies Ms. Thompson’s students.
59.	“Now let’s look at the 6 th grade results. The blue bars represent Mr. Green’s students’ votes and the red bars represent Ms. Joy’s students’ votes. Did more of Mr. Green’s students or Ms. Joy’s students vote for Anya?”	Student says, points to, or otherwise identifies Ms. Joy’s students.
60.	“Listen to this next question carefully. Did fewer of Mr. Green’s students or Ms. Joy’s students vote for Ali?”	Student says, points to, or otherwise identifies Mr. Green’s students.

61.	“Did fewer of Mr. Green’s students or Ms. Joy’s students vote for Clara?”	Student says, points to, or otherwise identifies Mr. Green’s students.
62.	“Did more of Mr. Green’s students or Ms. Joy’s students vote for Liam?”	Student says, points to, or otherwise identifies Ms. Joy’s students.
63.	“Did more of Mr. Green’s students or Ms. Joy’s students vote for Ruby?”	Student says, points to, or otherwise identifies Ms. Joy’s students.
64.	“Did more of Mr. Green’s students or Ms. Joy’s students vote in all?”	Student says, points to, or otherwise identifies Ms. Joy’s students.



This may be a good stopping point. Have a mock classroom student election (they can vote on class president for a day or student of the day). Students can fill out ballots, turn them in, count out the results, record results in a table, and create a bar graph. They can calculate mean, median, mode, and range, as well as answer questions about the data. There is a generalization worksheet with this level. You can use this for additional guided practice or to send home as homework.

	Teacher Says/Does	Student Response	Error Correction
INDEPENDENT PRACTICE: Data Analysis Skills Test	Give each student the <i>Data Analysis Skills Test 3. Read directions for each problem and have student select response. Record whether response is correct or incorrect.</i>	Only provide praise for completing assessment (if student needs encouragement). Do not provide specific praise for correct answers while student is testing.	Once the student has completed the test, review missed problems with the student.
	<i>Stop the lesson here and repeat tomorrow if student is not yet getting at least 7 independent correct responses. Score responses 53-64 on the Data Analysis Progress Monitoring Sheet.</i>	<i>NEXT Remember the goal is for students to be able to examine the data in further detail using tables and bar graphs, move into the second half of the lesson to hit the target CCC for this grade level. You can skip this Conceptual Foundation section to move on.</i>	

8th BUILD A GRADE ALIGNED COMPONENT: Analyzing a Table with Bivariate Data to Select an Appropriate Claim about the Data

INTRODUCE ACTIVITY/PROBLEM: Now we are going to look at the results in one last way. We are going to look at data in a table that shows the candidates, the number of votes they got, and the number of hours they spent campaigning. We are going to look at the number of votes each candidate got and compare with the number of hours they campaigned to see if there is a relationship. When we are looking for a relationship, we need to decide which statement is accurate: (1) if the greater number of hours spent campaigning resulted in more votes for the candidate, (2) the greater number of hours spent campaigning resulted in less votes for the candidate, or (3) if there is no relationship between the number of hours spent campaigning and the votes received for each candidate.

MODEL THE PROCESS: Show students the Bivariate Data table showing 8th grade results for votes and hours spent campaigning. **I am going to look at this table and see if there's a relationship between the number of hours spent campaigning and the number of votes each candidate received. This table shows the candidates here** (point to left column), **the number of votes they received** (point to middle column), **and the hours spent campaigning** (point to right column). **Also, this table shows the candidates in order with the candidate with the least votes at the top** (point) **moving down to the candidate with the most votes on the bottom** (point). **When I look in the hours column, I can see that as the candidate gets more votes, they also campaigned for more hours. Look the number of hours gets bigger as we move down the table. So, to describe this relationship, I would say that the more hours spent campaigning resulted in more votes for the candidate. If the numbers had got smaller as you went down the column, we would say the more hours spent campaigning resulted in fewer votes for the candidate. If the numbers did not get bigger or smaller, or the numbers got both bigger and smaller without a pattern, then we say there is no relationship between the hours spent campaigning and the votes received for each candidate.**

***Note: some students may have difficulty understanding the relationship by simply looking at the table. For these students, it may be helpful to graph the results on a bivariate plot graph so they can see the pattern visually.*



STUDENT PRACTICE: Give each student the table showing 7th grade results for votes and hours spent campaigning (and 6th grade later). Response options are provided in materials if needed. **Now it's your turn. Look at the data in this table, look specifically at the hours spent campaigning and analyze the results.** Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

Step	Teacher Says/Does	Student Response
65.	Student has the 7 th grade results table. “Is there a relationship between the number of hours spent campaigning and the number of votes each candidate received?” Can give response options if needed.	Student states that there is no relationship between the number of hours spent campaigning and the greater number of votes received.
66.	Student has the 6 th grade results table. “Let’s look at the 6th grade data. Is there a relationship between the number of hours spent campaigning and the number of votes each candidate received?” Can give response options if needed.	Student states that the greater number of hours spent campaigning results in greater number of votes received.



This is the end of the lesson. Have a mock classroom student election (they can vote on class president for a day or student of the day). Students can fill out ballots, turn them in, count out the results, record results in a table, and create a bar graph. They can each campaign in the days ahead and track how many minutes they spent campaigning. They can analyze the relationship between minutes spent campaigning and votes received. There is a generalization worksheet with this level. You can use this for additional guided practice or to send home as homework.

INDEPENDENT PRACTICE: Data Analysis Skills Test	Teacher Says/Does	Student Response	Error Correction
	Give each student the <i>Data Analysis Skills Test 4</i> . Read directions for each problem and have student select response. Record whether response is correct or incorrect.	Only provide praise for completing assessment (if student needs encouragement). Do not provide specific praise for correct answers while student is testing.	Once the student has completed the test, review missed problems with the student.

Troubleshooting and Data-Based Decision Making for Data Analysis Skills Test:

If student is unable to complete any items on the data analysis test independently and correctly, go back and teach one problem step-by-step.

MASSI CULMINATING ACTIVITY: Have the student have a classroom or grade level student election (they can vote on class president for a day or student of the day). Students can fill out ballots, turn them in, count out the results, record results in a table, and create a bar graph. They can each campaign in the days ahead and track how many minutes they spent campaigning. They can analyze the relationship between minutes spent campaigning and votes received. They can also analyze the results based on how different classes vote. Students may also go campaign in another class and graph their voting results.

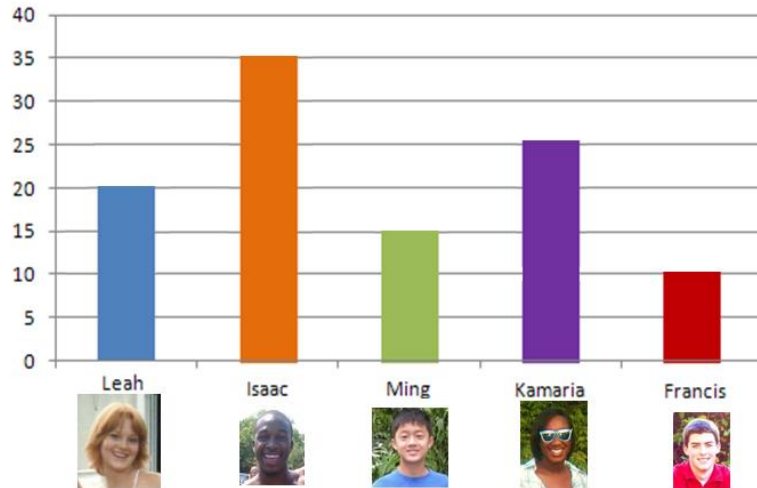
BUILD TOWARDS FULL GRADE LEVEL COMPETENCE

Here are ideas to build competence towards the full grade level competence using this same activity. See the unit plan and talk with the general education teacher for more ideas.






Component	Activity	What Student Does	Generalization/ Fluency
Summarize numerical data sets in relation to their context.	Present students with a data set. Have students calculate range, mean, median, and mode without using equation templates. Practice finding median of a data set with an even number of items, so students have to average middle numbers and find median.	Students calculate range, mean, median, and mode without using equation templates.	Present data in a variety of formats. Use data sets that vary in size.
Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	Present students with data sets and double bar graphs that have at least two populations and have them calculate measure of center (mean, median, and mode) and measures of variability (range). They can then make informal comparative inferences between two populations.	Students calculate mean, median, mode, and range, and then make informal comparative inferences between two populations.	Present data in a variety of formats (table and double bar graph). Use data sets that vary in size.
Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.	Have students look at bivariate data, put it in order based on one of the values, and then enter the data in a table. Then, have students make associations between the data and support these associations using frequency data as support.	Students look at bivariate data, put it in order based on one of the values, and then enter the data in a table. Then, have students make claims between the data and support these claims using frequency data as support (see bivariate response options for example).	Present data in a variety of formats. Use data sets that vary in size.

Worksheet 1: Generalization (Concepts and Symbols)

Circle who has the highest value; who got the most votes?








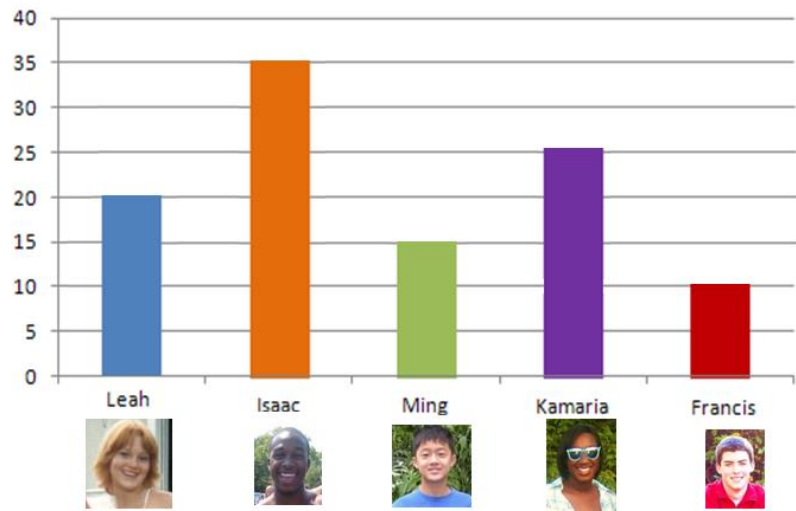
Circle who has the highest value; who got the most votes?

Student	Votes Received
 Leah	20
 Isaac	35
 Ming	15
 Kamaria	25
 Francis	10






Circle who has the lowest value; who got the fewest votes?

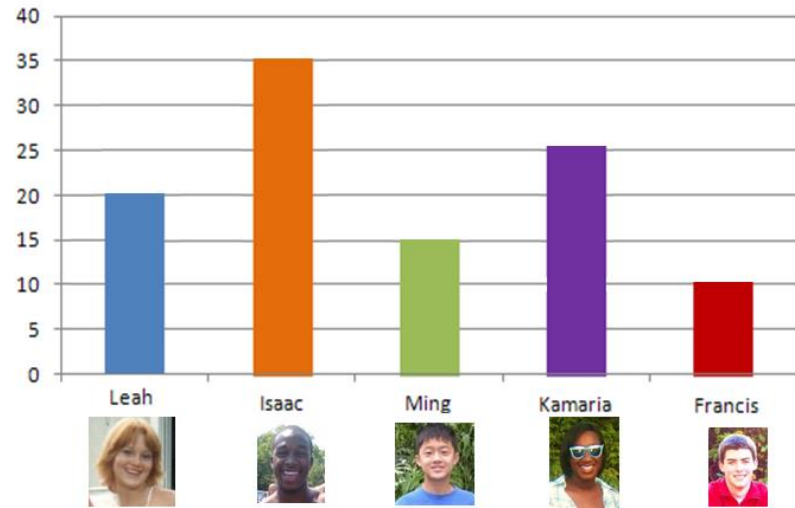
Circle who has the lowest value; who got the fewest votes?

Student	Votes Received
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 Isaac	35
 Ming	15
 Kamaria	25
 Francis	10








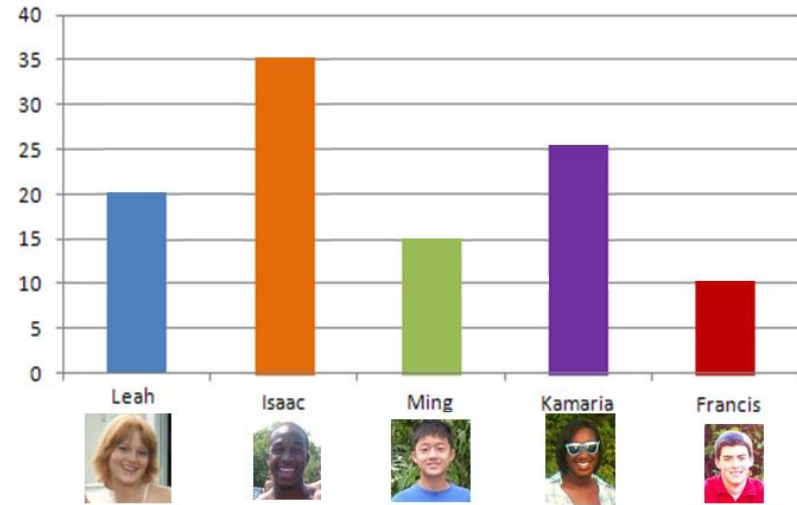
Ming's data is circled on the table, circle his data on the graph:

Student	Votes Received
 Leah	20
 Isaac	35
 Ming	15
 Kamaria	25
 Francis	10



Francis's data is circled on the table, circle his data on the graph:

Student	Votes Received
 Leah	20
 Isaac	35
 Ming	15
 Kamaria	25
 Francis	10

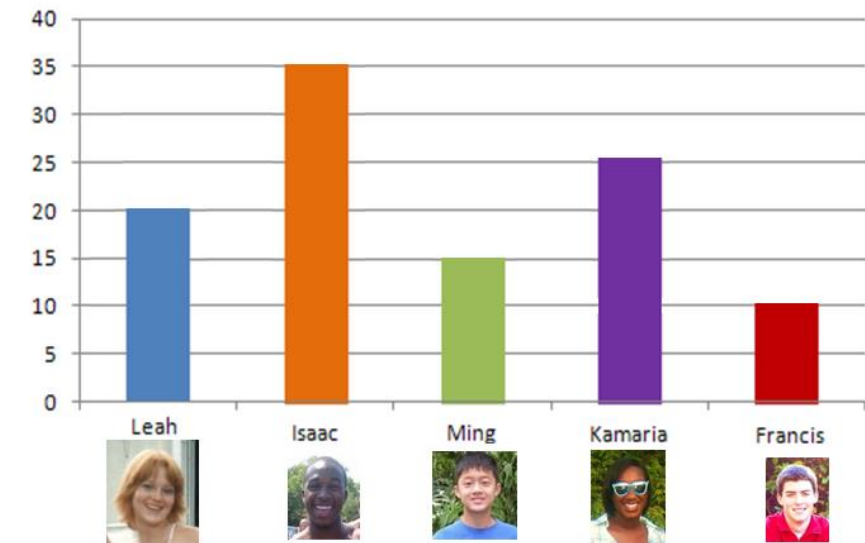


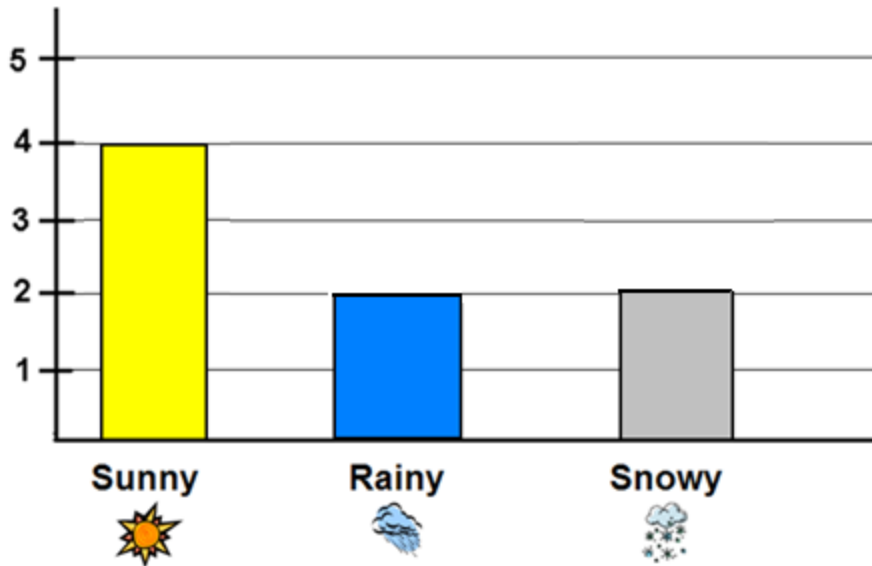
Look at the graph and answer the following questions:

Whose data are greater than Kamaria?



Whose data are less than Leah's?





Look at the graph and answer the following questions:

Which type of weather occurred in greater amounts than rainy days?

Sunny



Rainy



Snowy



Which type of weather occurred an equal amount as snowy days?

Sunny



Rainy



Snowy



Worksheet 2: Generalization (6th Grade Aligned Component)

Find the range of this data set:






$$\frac{\text{highest value}}{\quad} - \frac{\text{lowest value}}{\quad} = \frac{\text{range}}{\quad}$$

Find the average (mean) of the data set:

List values and add here:

+

$$\frac{\text{sum}}{\quad} / \frac{\quad}{\text{number of values}} = \frac{\text{average}}{\quad}$$

Student	Votes Received
 Leah	20
 Isaac	35
 Ming	10
 Kamaria	25
 Francis	10

What is the mode of the data set:

Mode

What is the median of the data set:

Median

Worksheet 3: Generalization (7th Grade Aligned Component)

Did more of Mr. Smith's students or Ms. Carter's students vote for Leah?

■ Mr. Smith ■ Ms. Carter = Equal Amount

Did more of Mr. Smith's students or Ms. Carter's students vote for Isaac?

■ Mr. Smith ■ Ms. Carter = Equal Amount

Did fewer of Mr. Smith's students or Ms. Carter's students vote for Ming?

■ Mr. Smith ■ Ms. Carter = Equal Amount

Did fewer of Mr. Smith's students or Ms. Carter's students vote for Kamaria?

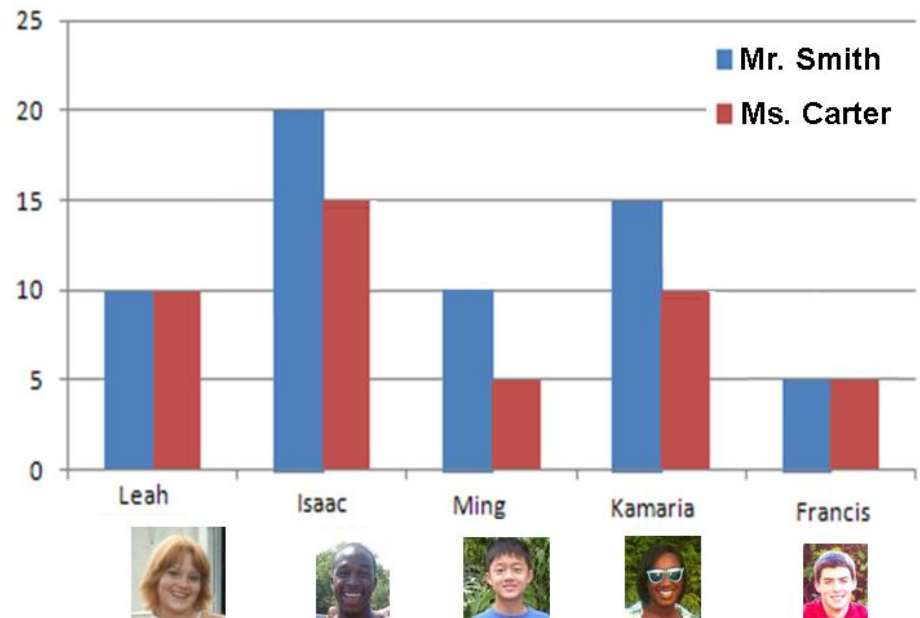
■ Mr. Smith ■ Ms. Carter = Equal Amount

Did more of Mr. Smith's students or Ms. Carter's students vote for Francis?

■ Mr. Smith ■ Ms. Carter = Equal Amount






Did more of Mr. Smith's students or Ms. Carter's students vote overall?

■ Mr. Smith ■ Ms. Carter = Equal Amount



Worksheet 4: Generalization (8th Grade Aligned Component)

Is there a relationship between the number of votes received and the number of hours spent campaigning?



Student	Hours Campaigned	Votes Received
 Leah	1	20
 Isaac	2	35
 Ming	3	10
 Kamaria	4	25
 Francis	4	10

The more hours spent campaigning resulted in more votes for the candidate.

The more hours spent campaigning resulted in fewer votes for the candidate.





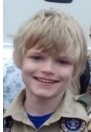










There is no relationship between the hours spent campaigning and the votes received.

Is there a relationship between the number of dogs walked and the number of money earned?

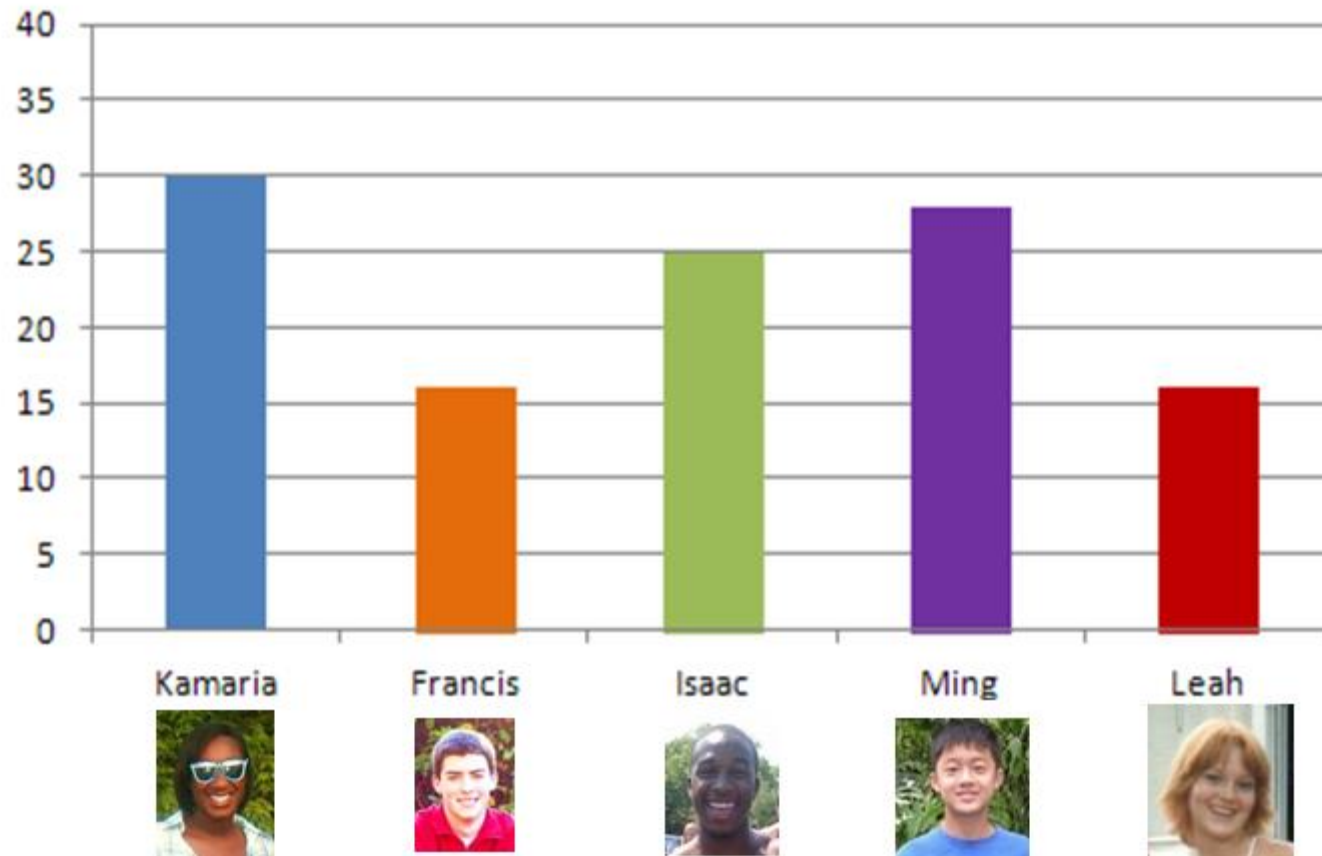
 Dogs Walked	 Money Earned
5	\$25
7	\$35
9	\$45
12	\$60
15	\$75

The more dogs walked resulted in more money.	The more dogs walked resulted in less money.	There is no relationship between the number of dogs walked and the amount of money.
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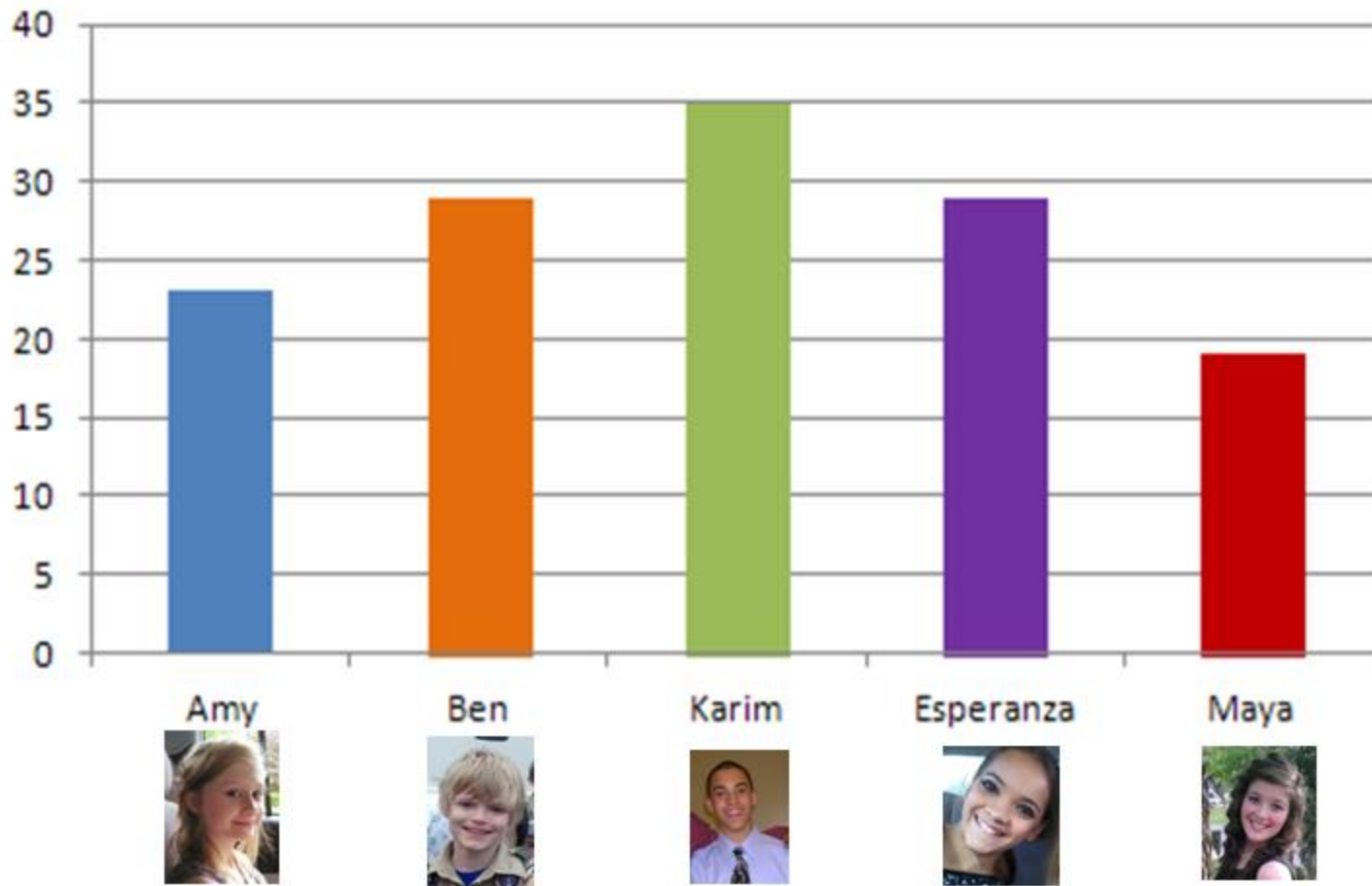
Materials:

8 th Grade		7 th Grade		6 th Grade	
 Kamaria	30	 Amy	23	 Anya	25
 Francis	16	 Ben	29	 Ali	27
 Isaac	25	 Karim	35	 Clara	21
 Ming	28	 Esperanza	29	 Liam	25
 Leah	16	 Maya	19	 Ruby	32

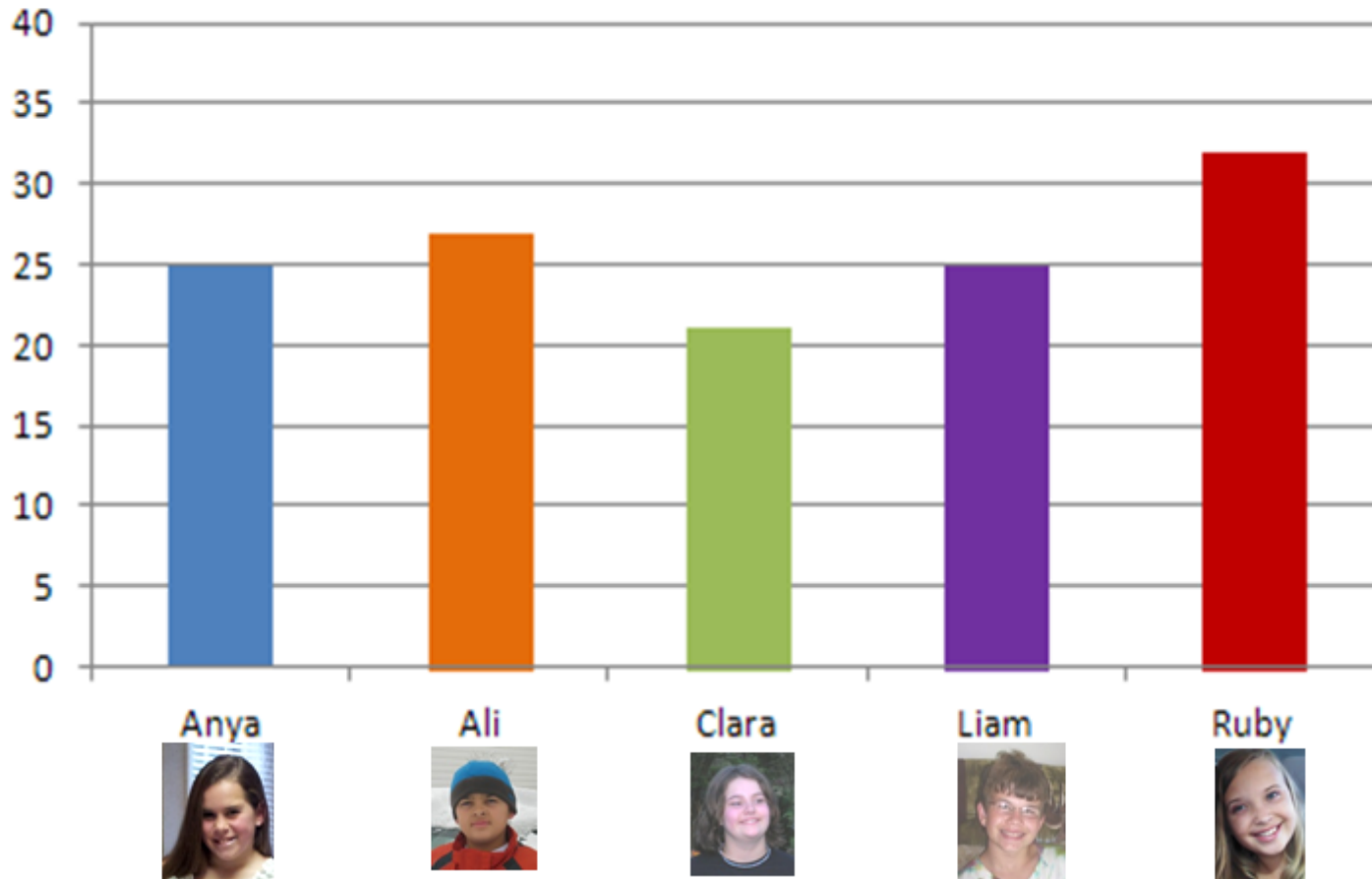
8th Grade



7th Grade



6th Grade



Response options

>

greater than

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less than

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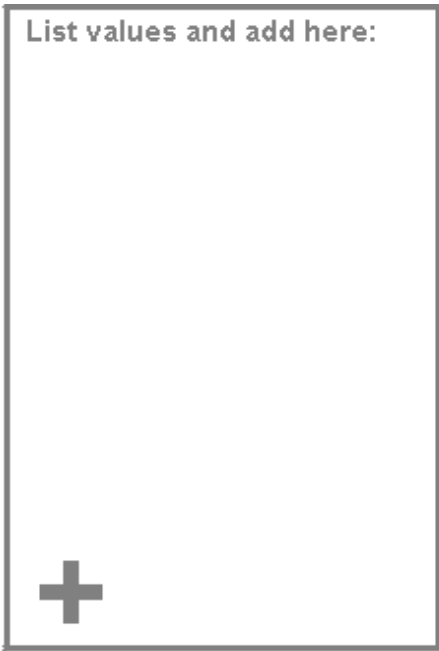
equal to

Equation for Range:

$$\text{highest value} - \text{lowest value} = \text{range}$$

Equation for mean/average:

List values and add here:

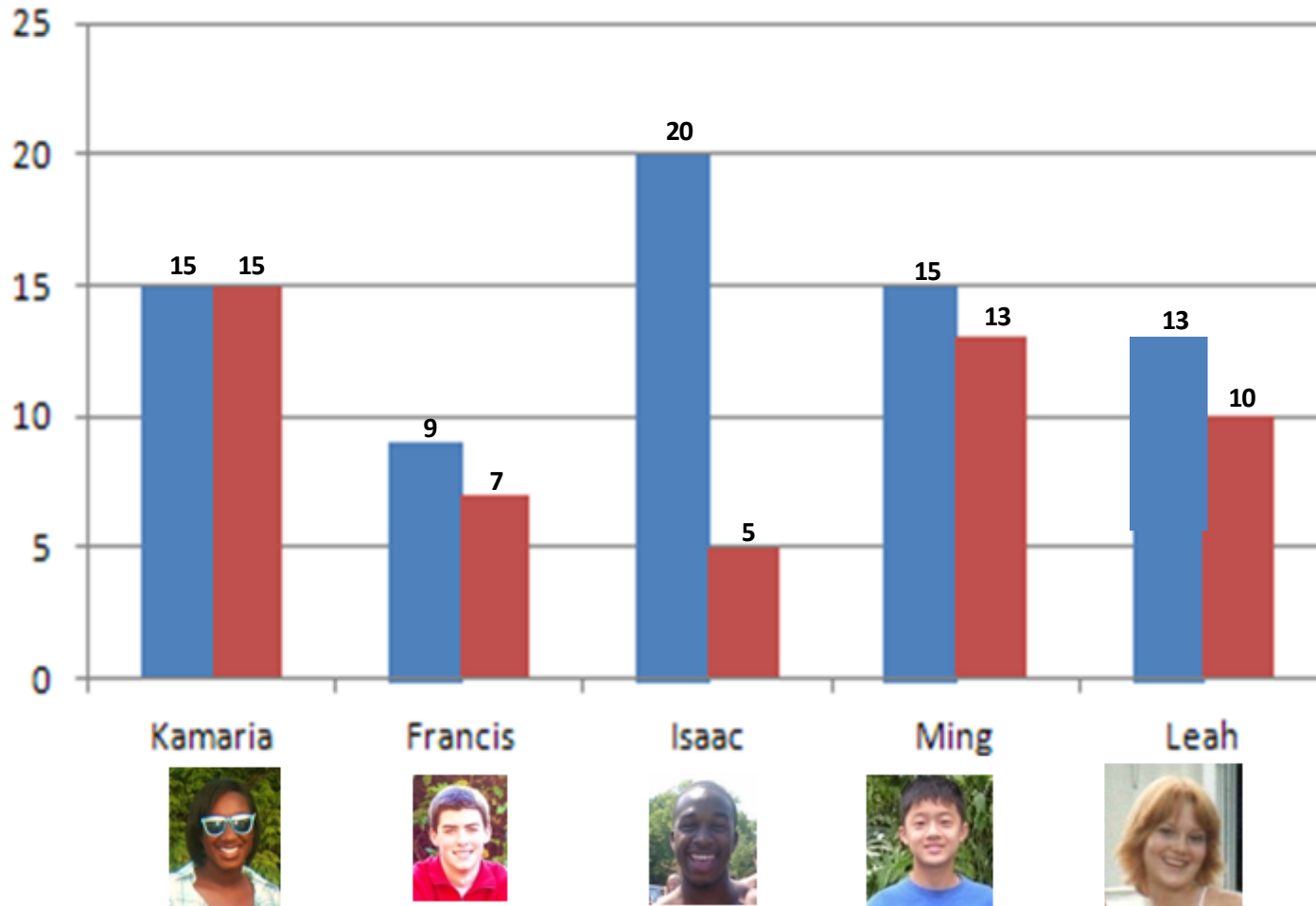


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$$\frac{\text{sum}}{\text{number of values}} = \text{average}$$

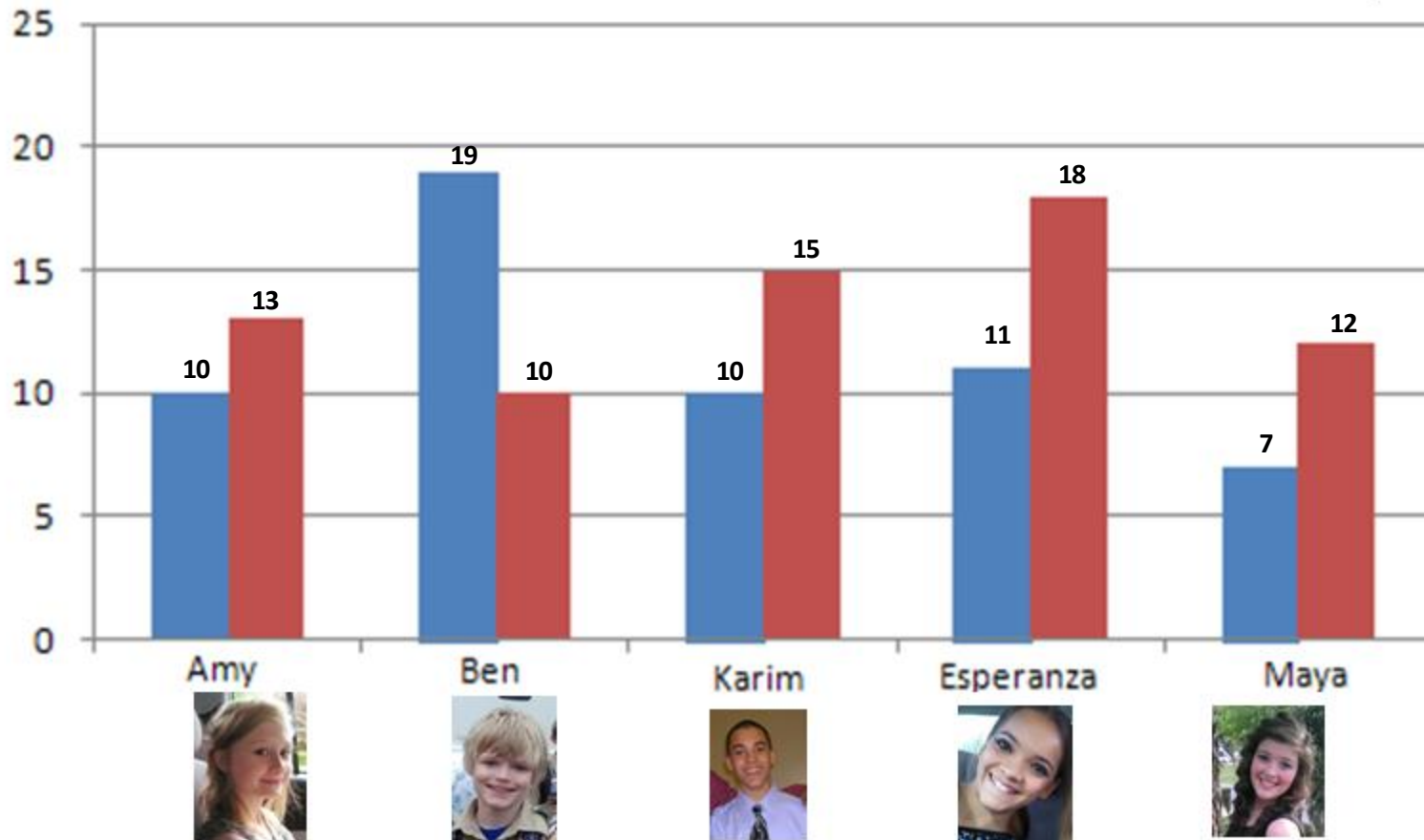
8th Grade

Mr. Smith's students
Ms. Carter's students

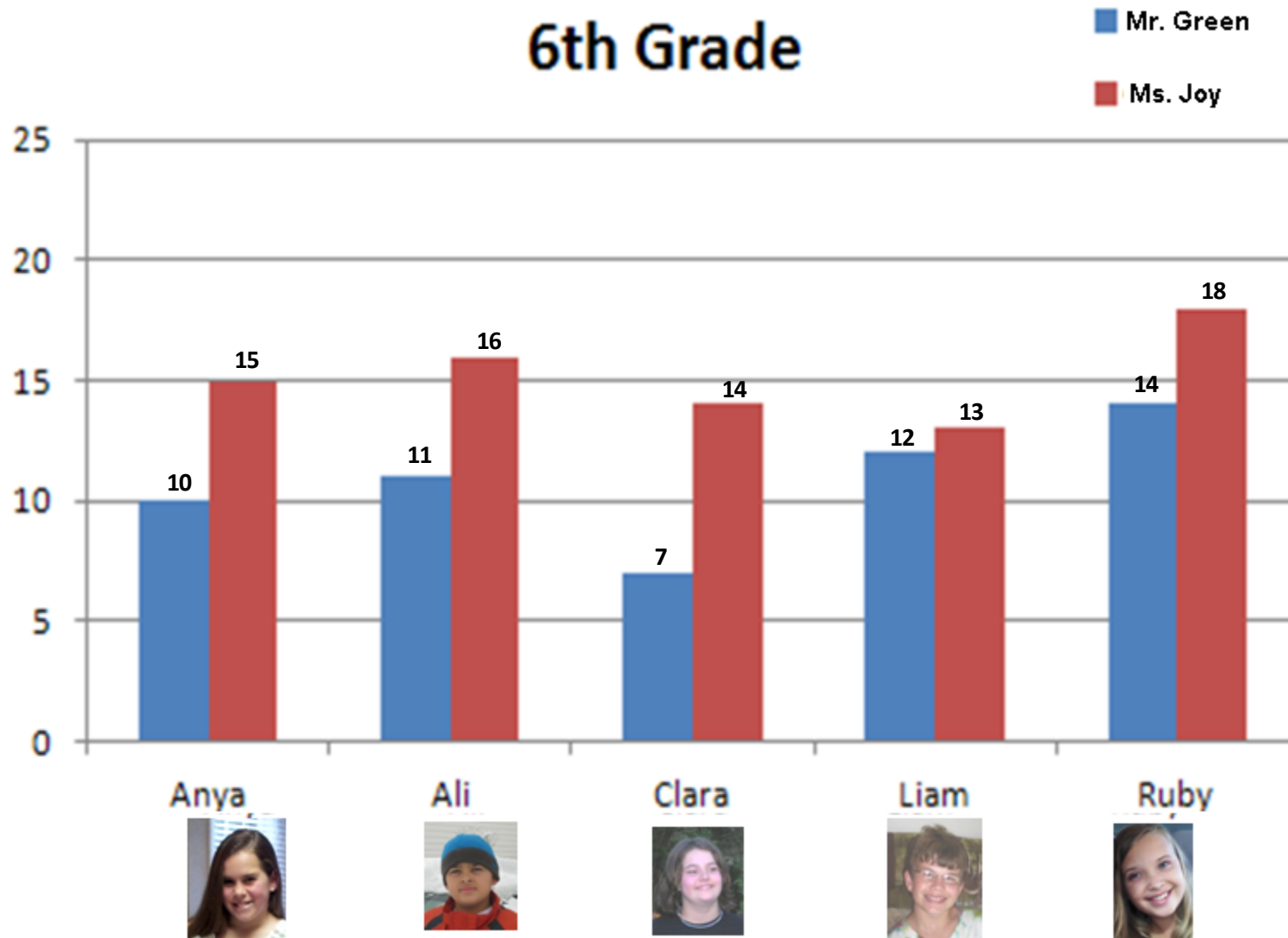


7th Grade





■ Mrs. Boswell
■ Ms. Thompson













6th Grade



Bivariate Data Tables:

8 th Grade		
Candidate	Votes	Hours
 Leah	16	10
 Francis	16	11
 Isaac	25	16
 Ming	28	18
 Kamaria	30	25

7 th Grade		
Candidate	Votes	Hours
 Amy	19	6
 Ben	23	10
 Karim	29	15
 Esperanza	29	8
 Maya	35	5

6 th Grade		
Candidate	Votes	Hours
 Anya	21	10
 Ali	25	15
 Clara	25	16
 Liam	27	20
 Ruby	32	30

Response Options for Bivariate Data:

<p>The more hours spent campaigning resulted in more votes for the candidate.</p>	<p>The more hours spent campaigning resulted in fewer votes for the candidate.</p>	<p>There is no relationship between the hours spent campaigning and the votes received.</p>
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