CONSTRUCTING TASK: SUBJECT TO INTERPRETATION!

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

How Should We Teach Data Analysis? (Van de Walle, 2007)

• Don't rely on textbook questions- students are not interested in questions that have no relevance to their own lives. Allow opportunities for students to generate questions, decide on the appropriate data needed to answer the question, and how to analyze the data.

• In the primary grades, students like to learn about themselves and their class. Questions around favorites, numbers, and measures are useful for the primary grades. Each student can contribute one piece of data (favorite color, number of siblings, foot length).

• In the upper elementary grades, students can answer questions outside of the classroom. At these grade levels, data collection and analysis can be used in science and social studies (collecting leaf samples, U.S. Census).

• Students must learn how to categorize or classify things in order to organize the data.

• Classification is done by finding objects' attributes that allow them to be sorted (color, height, gender, etc.).

• Once data is organized, it can be recorded in a graphical representation such as a pie chart, a **picture graph, a bar graph**, a line plot, or a histogram.

• Students should construct their own graphs so that they are connected to the data and they learn how a graph conveys information about the data.

• These graphs provide a visual representation that allows students to look at information about the data as the "big picture" and see how the data is spread out, instead of just a collection of numbers.

• It is possible for one set of data to be used to answer multiple questions about the population depending on the depth of the data collection.

• Understanding of data is impacted by choice of graphical representation.

• The shape of the data allows the student to see how the data is spread out or grouped, what characteristics of the data is seen with the graph, and what it says about the data's population.

ESSENTIAL QUESTION

- What is the relationship between a pictograph and problem solving?
- What's the relationship between the picture's value and patterns found in multiplication?

MATERIALS

- Math journals/learning logs
- clipboards
- Chart paper
- markers
- http://illuminations.nctm.org/ActivityDetail.aspx?ID=204

GROUPING

Partner

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSIONS

In this task, students will pose a question, collect and organize data, and analyze and interpret data.

Students should have opportunities reading and solving problems using scaled graphs before being asked to draw one. While exploring data concepts, students should **P**ose a question, **C**ollect data, **A**nalyze data, and **I**nterpret data (PCAI).

The teacher can begin the lesson by asking the students the following questions: What if I needed to order math team t-shirts for 40 students? What are some possible strategies I could use to collect the information and report about which of four t-shirt styles they preferred?

Pictographs: Scaled pictographs include symbols that represent multiple units. The teacher will explain the purpose of posing, collecting, and organizing the data first. Using chart paper, the teacher should model the creation of a pictograph for the t-shirts. The teacher should emphasize the importance of graphs having **a title, categories, category label, key, and data.**

T-Shirt Colors	
Striped T-shirts	
Blue T-shirts	
Yellow T-shirts	
White T-shirts	
 = 5 T-Shirts	

The teacher could then model analyzing and interpreting the data through questions:

- Which t-shirt did they like most?
- Which did they like least?
- How many more people liked white than yellow?
- Which t-shirt was liked more than striped but less than blue?
- What interval was used for each t-shirt?
- What are the benefits of using a pictograph?
- Is there a relationship to multiplication? If so, what is it?
- Can the picture values vary or change?
- How does this relate to multiplication and patterns?
- How does the pictograph help solve problems?

Note to teacher: Use the following pictograph to develop student understanding of scaled graphs. Students need opportunities reading and solving problems using scaled graphs before being asked to draw one.


Girl Scout Cookie Pictograph
Four Girl Scouts sold cookies for one month. The list below shows how many boxes were sold by each Girl Scout.

Jamiya - 60 boxes
Lauren - 40 boxes
Zoey - 25 boxes
Macy - 15 boxes

Use the information from the list to complete the pictograph below and answer the questions.

NAME	Cookie Sales
Macy	
Lauren	
Jamiya	
Zoey	
 = 5 boxes	

1. How many boxes of cookies did the girls sell in all? _____

2. How many more boxes of cookies did Jamiya sell than Macy?_____

3. Which two girls sold a total of 65 boxes of cookies?

4. Half of the cookies sold by Lauren were Thin Mints. How many boxes of Thin Mints did Grace sell?_____

5. How many more cookies did Zoey and Macy need to sell in order to equal Jamiya?_____

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

The teacher will instruct the students to generate a question to use as a survey question. Using a clipboard and the attached sheet, they will ask the question, record/collect the data, and create a pictograph so they can analyze and interpret the data. The teacher should tell them that each picture symbol was worth 2 this time and explain the need of cutting the picture in half if it is an odd number.

The students will create a pictograph along with questions, switch with another group and allow them to answer the questions and vice-versa, and conclude by exchanging back and grading each other's work being sure to discuss mistakes and what should have been included or excluded.

FORMATIVE ASSESSMENT QUESTIONS

- What is the relationship between a pictograph and problem solving?
- What's the relationship between the picture's value and patterns found in multiplication?

DIFFERENTIATION

Extension

- The teacher could increase the value of the scale intervals to numbers beyond 10 to challenge students who are fluent with their multiplication facts. OR, she can have the students import their data into an online pictograph generator using the following website: http://illuminations.nctm.org/ActivityDetail.aspx?ID=204
- The same concept used to teach pictographs can be applied to teach **simple bar graphs**.

Intervention

- Having the students work in small groups will provide support for students who struggle with this concept and will enable them to develop the ability to describe their thinking.

Pictograph Data Collection Sheet

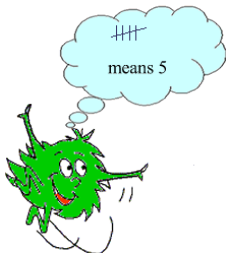
TOTAL NUMBER OF PEOPLE SURVEYED:_____

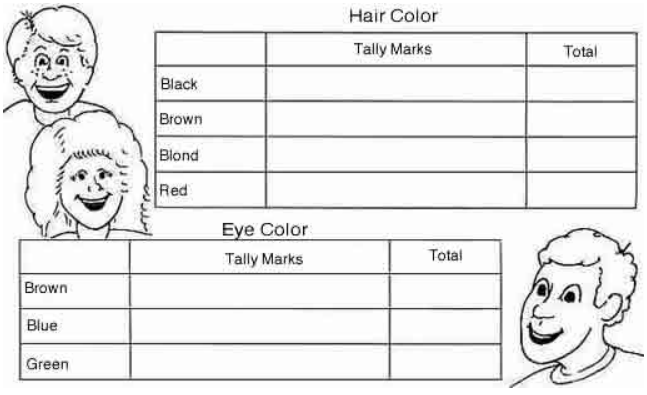
SURVEY QUESTION:_____

DIRECTIONS: Interview the total number of people in your class and use a tally mark to represent their response. Use the attached box as needed to record the data and create the bar graph.

Title of Bar Graph

Survey Responses	***Tally Marks***	***Total***





Hair Color

	Tally Marks	Total
Black		
Brown		
Blond		
Red		

Eye Color

	Tally Marks	Total
Brown		
Blue		
Green		