

CONSTRUCTING TASK: GRAPHING FRACTIONS

From NCTM Illuminations

Suggested Time for Task: 2 class periods



Students will draw a picture graph of their classmates' favorite pets, a bar graph of their classmates' favorite sports, and a graph of their choice of a bag of colored candies. Students will identify the fractional representation of each bar of data and create questions that could be answered using the data in their graphs.

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.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.*

MCC3.NF.1 Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$.

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

Children need to understand the meaning of fractions based on repeated hands-on activities. They need a general rule for explaining the numerator and denominator of a fraction. Students should be familiar with various types of graphs including bar graphs, and line plots. Students may not realize that data can be described and displayed using fractions.

COMMON MISCONCEPTIONS

Students may read the mark on a scale that is below a designated number on the scale as if it was the next number. For example, a mark that is one mark below 80 grams may be read as 81 grams. Students realize it is one away from 80, but do not think of it as 79 grams.

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Although intervals on a bar graph are not in single units, students count each square as one. To avoid this error, have students include tick marks between each interval. Students should begin each scale with 0. They should think of skip-counting when determining the value of a bar since the scale is not in single units.

ESSENTIAL QUESTIONS

- How can I collect and organize data?
- How can I display fractional parts of data in a graph?

MATERIALS

Small individual bag of candy for each student

GROUPING

Individual/Partner Task

NUMBER TALKS

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students.

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I (SMP 1, 2, 4, 5, 7)

As a class, or in small groups create a picture graph of favorite pets. An example is shown below.

FAVORITE PETS	
Cat	
Dog	
Hamster	

Each  stands for 2 votes.

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Have students determine the fractional representation for pet. For example, in the graph shown above there are:

- 10 children out of 20 prefer cats ($10/20$),
- 4 children out of 20 prefer dogs ($4/20$),
- 6 children out of 20 prefer hamsters ($6/20$)

Discuss the graph. As a class, create problems that could be answered using the data. You may want to display the graph for other classes to analyze.

Part II (SMP 1, 2, 3, 4, 5, 6, 7)

As a class, create a bar graph of students' favorite sports. An example is shown below,

Once again, have students determine the fractional representation for favorite sports. For example, in the graph shown above there are:

- 9 children out of 22 prefer soccer ($9/22$)
- 4 children out of 22 prefer softball ($4/22$)
- 6 children out of 22 prefer basketball ($6/22$)
- 3 children out of 22 prefer other sports ($3/22$)

Discuss the graph, and create questions that can be answered using the data.

Part III (SMP 1, 2, 4, 5, 6, 7)

Working in small groups, students will examine the set model of fractions using colored candies. Give students an individual bag or pack of colored candies. Have students open their bag of candies and sort by color. Have students count the number of each color in their group and record the data in table on notebook paper. Have students record the fraction of each color represented in their group.

Have students log on to the [Create a Graph Tool](#) from the National Center for Education Statistics. Students should choose the type of graph they want to create by using the pull-down menu. Once students have created and printed their graph, they should label the data in fractional parts.

Have students work in groups to create story problems relating to their graphs. Examples of problems students might write:

- Which group had the most candies?
- How many candies did they have in their pack?
- What is the difference between the greatest and least number of candies in a pack?

FORMATIVE ASSESSMENT QUESTIONS

- Which type of graph did you create when you went to the Create a Graph Tool from the National Center for Educational Statistics?
- Why did you select this type of graph?

DIFFERENTIATION

Extension

- Have students create more than one graphical representation of the candy data. Discuss which display is most effective in presenting the data.

Intervention

- Have students graph fewer pieces of candy using sticky notes to represent elements of data in a student-created graph.
Adapted from Elementary and Middle School Mathematics: Teaching Developmentally
By John A. Van de Walle, Karen S. Karp, and Jennifer M. Bay-Williams, p. 443.