

Activity 12

Proportional
Flag

Concepts/Skills

- ◆ Computation
- ◆ Ratios
- ◆ Problem solving

Materials

- ◆ TI-15
- ◆ Student activity pages (pp. 82 - 85)
- ◆ Toy truck or car with scale indicated
- ◆ Color tiles
- ◆ Paper and pencils
- ◆ Chart paper and markers
- ◆ Using the TI-15 (p. 86)

Overview

Students will create a scale drawing of the United States flag that is large enough to cover most of a football field.

Focus

- ◆ Show a toy car or truck that has the scale listed. (It is helpful to have a toy car like one in the parking lot. If a real car like the toy car is not available, the measurements of the real car will be needed.) Have a student read the numbers of the scale. Ask students what they think the numbers mean.
- ◆ Measure the length of the toy car. If possible, measure the length of the matching real car. Compare the length of the two cars with the scale size given on the toy car.
- ◆ The scale is a ratio showing the relationship between the toy car and the real car. When written as a fraction, the numerator refers to the toy car and the denominator to the real car. Have students enter the actual length of the toy car as the numerator and the length of the real car as the denominator. When this fraction is in simplest terms, it should be the same as or similar to the scale.
- ◆ Discuss with students the ratio 1:5. Since this ratio shows a relationship, if you know the unit of measure for the first number, then you can calculate the second. For example, if the length of the windshield is 1 foot on the model, the length is 5 feet on the real car.

First Things First

For students not ready for the open-ended problem, start with the *First Things First* activity page.

Presenting the Problem

Have students read the *Proportional Flag* activity page. Make sure they understand the final product and the required presentation.

Evaluating the Results

After the presentations have been made, have students discuss the solutions presented. Have them determine if all of the calculations are reasonable and answer the question in the problem.

Have students look at the diagrams presented and note any similarities and differences. Determine if each presentation met the criteria stated in the problem.

Have students evaluate how the TI-15 helped them solve this problem.

How do you know? Check to see if it is in simplest terms.

When rectangles are similar, they have the same proportions or ratios between the long edge and the short edge. One way to check this is to write the ratios as fractions. If the fractions are equivalent, the rectangles are similar. If the dimensions of two rectangles stated as a fraction simplify to the same fraction, then the fractions are equivalent, the ratios are the same, and the two rectangles are similar. Similar figures have proportional dimensions.

4. Measure the top of your desk. Enter the numbers as a fraction using the shortest side as the numerator. For example, if the desk is 18 inches by 24 inches, enter 18 as the numerator and 24 as the denominator.

Enter 18 24

If the fraction is not in simplest terms, then simplify it. Record the fraction in simplest terms.

How can you build a rectangle with color tiles that is smaller and similar to your desktop? A rectangle built with 12 tiles, 3 on the short side and 4 on the long side, is smaller and similar to the desktop measuring 18 inches by 24 inches.



Name _____

Date _____

Activity 12

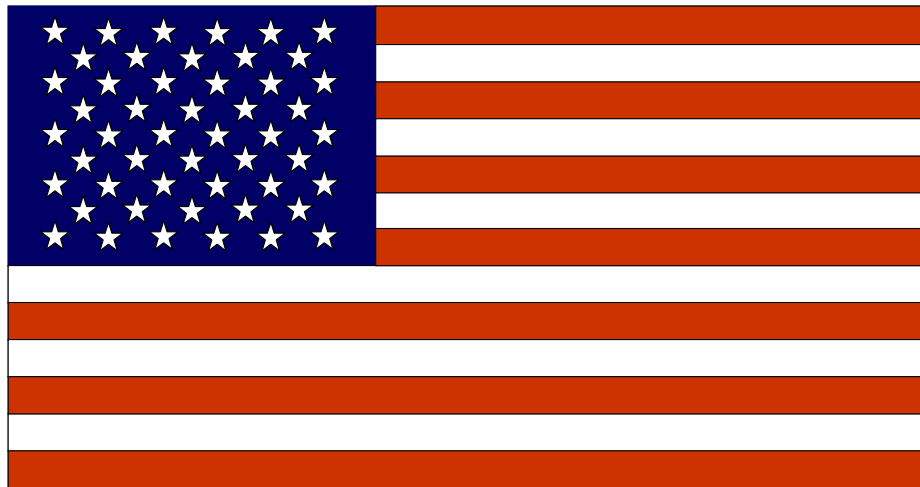
Proportional Flag

The Problem: How big does the United States flag need to be to cover a football field?

Mr. Sousa, the band director at the high school, needs your help. He wants to create a large U.S. flag to use in his half-time show. He would like for the flag to be as large as the football field. Knowing the rules for proper flag handling, he promises that the flag will be treated with respect and will not touch the ground. He plans on having the band members stand under the flag as it is stretched out over the football field. He needs to know the outside dimensions of the flag as well as the dimensions of each flag part: the stripes, the blue field, and the stars.

The Facts

- ◆ The United States Flag has specific ratios for its size. No unit of measure is given. Any unit of measure can be used so long as the same unit is used for each dimension of the flag.



- ◆ The hoist (width) of the flag is 1. The fly (length) of the flag is 1.9. The width of each stripe is $\frac{1}{13}$ of the hoist. The hoist of the Union (the blue section) is $\frac{7}{13}$ of the hoist of the flag. The fly of the Union is .76. The diameter of each star is 0.0616.
- ◆ The width of a football field is 50 yards. The length of a football field is 100 yards.

- ◆ The ratio of the length and width of the flag (1.9:1) is not the same as the ratio of the length and width of the football field (2:1). Mr. Sousa will be satisfied if most of the football field is covered with the flag.

The Task

1. Your team will:
 - Draw a scale model of the football field flag
 - Label the width and length of the flag
 - Label the width and length of the blue field
 - Label the width and length of each stripe
 - Label the diameter of one star
 - Calculate the approximate amount in square yards of red, white, and blue fabric that will be needed to create this flag
2. Each person on the team will write an explanation of the solution. This explanation will answer the following questions:
 - How did your team calculate each dimension of the flag? What unit of measure did you use?
 - How did your team calculate the number of square yards of fabric needed to make the flag?
 - Do you think your team's answers make sense? Was there another way you could have calculated these numbers? Why do you think so?
3. Your team will present your flag poster to the class. Be prepared to explain how you calculated the size of each part of the flag and the amount of fabric needed to create the flag.



Using the TI-15

Activity 12

Proportional Flag

2 $\frac{n}{d}$ 4 $\frac{d}{n}$ $\frac{\text{Enter}}{\text{=}}$

$\frac{\text{Simp}}{\text{=}}$ $\frac{\text{Enter}}{\text{=}}$

The display shows the fraction $\frac{2}{4}$ followed by an equals sign. To the right, a small diagram shows the fraction $\frac{N}{D}$ with an arrow pointing to $\frac{n}{d}$, and below it, the fraction $\frac{2}{4}$ is shown.

The display shows the fraction $\frac{2}{4}$ followed by a flag symbol (S) and an equals sign. To the right, the fraction $\frac{2}{4}$ is shown with a vertical line through the denominator, indicating a simplified fraction.