

# Fraction Forms

Grades 4 - 6

## Overview

Students will compare the results of using division to create fractions under the different mode settings for fraction display and make generalizations from the patterns they observe.

## Math Concepts

- division
- multiplication
- common factors
- equivalent fractions

## Materials

- TI-15
- pencil
- student activity (page 9)

## Introduction


1. Present students with a problem such as:


*In a small cafe, there are 6 cups of sugar left in the pantry to put into 4 sugar bowls. If you want them all to contain the same amount of sugar, how much sugar goes into each sugar bowl?*

2. Have students present their solutions to the problem. Encourage them to find as many ways to represent the solution as possible.

### Examples:

- By thinking of using a  $\frac{1}{4}$  cup scoop to fill the bowls, each bowl would receive 6 scoops, or  $\frac{6}{4}$  cups of sugar.
  - By thinking of separating each cup into half cups, there would be 12 half cups, and each bowl would receive 3 half cups, or  $\frac{3}{2}$  cups of sugar.
  - If a 1-cup measuring cup was used first, each bowl would receive 1 cup of sugar, then the last two cups could be divided into eight fourths to give  $1\frac{2}{4}$  cups per bowl.
  - The last two cups could be divided into 4 halves to give  $1\frac{1}{2}$  cups per bowl.
3. Have students identify the operation and record the equation that they could use with the calculator to represent the action in the situation ( $6 \text{ cups} \div 4 \text{ bowls} = \text{number of cups per bowl}$ ).

 Refer to page 45 for detailed information about mode settings on the TI-15.

 Division can be represented by  $6 \div 4$  or  $\frac{6}{4}$  (entered on the calculator as  $6 \boxed{\div} 4 \boxed{=}$ ). In this activity, the fraction representation is used.

# Fraction Forms (Continued)

4. Have students enter the division to show the quotients in fraction form, and record the resulting displays.
5. Have students explore the quotient with the different combinations of settings and discuss the different displays that occur. If necessary, have them use manipulatives to connect the meanings of the four different fraction forms.
6. Have students, working in groups of four, choose a denominator and record the different fraction forms on the activity sheet provided.
7. Have students share their results, look for patterns, and make generalizations.

## Collecting and Organizing Data

To guide students in creating data that will exhibit patterns in the fraction quotients, ask questions such as:

- *What denominator did you choose to explore with? Why?*
- *What denominators do you get with the settings  $\frac{n}{d}$  man? With the settings  $U \frac{n}{d}$  man?*
- *What denominators do you get with the settings  $\frac{n}{d}$  auto? With the settings  $U \frac{n}{d}$  auto?*
- *What denominator are you going to choose to explore with next?*


### Example:

After exploring with denominators of 2 and 3, you might suggest exploring with a denominator of 6 and comparing results.

- *How can you organize your results to look for patterns?*

### Example:

Continuing to increase the numerators by 1 each time.

 For example, for  $6 \div 4$  as a fraction, enter  $6 \square 4 \square \square$ . The displays in the different modes will look like the following:

$$\frac{n}{d} \text{ man} \qquad \frac{6}{4}$$

$$\frac{n}{d} \text{ auto} \qquad \frac{3}{2}$$

$$U \frac{n}{d} \text{ man} \qquad 1 \frac{2}{4}$$

$$U \frac{n}{d} \text{ auto} \qquad 1 \frac{1}{2}$$

# Fraction Forms (Continued)

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## Analyzing Data and Drawing Conclusions

To focus students' attention on the patterns in their fractions and the relationship of these patterns to the denominators, ask questions such as:

- *What patterns do you see in your results?*

**Example:**

When a denominator of 4 is used in the  $\frac{n}{d}$  **auto** column, every fourth number is a whole number.

- *How do the results of using a denominator of 2 compare with the results of using a denominator of 4?*
- *How does a denominator of 5 compare to a denominator of 10?*
- *Which other denominators seem to be related?*

**Example:**

The pattern using a divisor of 6 is related to the patterns for 2 and 3.)

- *What pattern do you see in the related denominators?*

**Example:**

They are related as factors and multiples.

## Continuing the Investigation

Have students brainstorm situations in which they would prefer to use each of the combinations of settings of fraction forms.

**Example:**

- When working with probabilities that may need to be added, using the  $\frac{n}{d}$  **man** settings would keep the denominators of the probabilities all the same and make mental addition easier.
- In a situation where estimated results are close enough, using the **U**  $\frac{n}{d}$  **auto** settings would make it easier to see quickly the whole number component of the result and whether the additional fraction part was more or less than  $\frac{1}{2}$ .

# Fraction Forms

Name \_\_\_\_\_

Date \_\_\_\_\_



## Collecting and Organizing Data

1. Have each person in your group set his/her calculator to one of the following combinations of modes for fraction display. (Each person should choose a different setting.)
  - improper/manual simp
  - improper/auto simp
  - mixed number/manual simp
  - mixed number/auto simp
2. Select a denominator: \_\_\_\_\_
3. Use this denominator with several numerators and record each person's results in the table below.

Numerator	Denominator	$\frac{n}{d}$ Man	$\frac{n}{d}$ Auto	$U \frac{n}{d}$ Man	$U \frac{n}{d}$ Auto
0					
1					
2					
3					
4					

# Fraction Forms (Continued)

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## Analyzing Data and Drawing Conclusions

1. What patterns do you see?

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2. What generalizations can you make?

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3. Try the activity again with a different denominator and compare your results with the two denominators.

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