Overview

Students will reduce a school cafeteria recipe for cookies to a household-sized recipe. Problem solving will use compatible numbers to choose smaller measurements that are easier to use.

Grade Levels: 4–6

Concepts

- Proportional reasoning
- Computation
- Problem solving

Materials

- TI-15 Explorer™ calculators
- Grocery store ads that show the cost of flour, sugar, and butter
- Recipe for Bonnie's Favorite Sugar Cookies
- Chart paper
- Markers
- Student activity sheet
- Using the TI-15 (included)

Assessment

Throughout the activities, questions are included for formative assessment. Student work samples should be used as a check for understanding. Have the students use the TI-15 to show their calculations.

Modified from Making Cookies, from Developing Problem Solving-Skills with the TI-15

Introduction

- Present the following situation to the students:

  You received a box of chocolates for Valentine's Day. There are 35 chocolates in the box. You want them to last for two weeks, eating about the same number each day. How many chocolates can you eat each day?

- Discuss possible ways to solve the problem. Allow students to work on solutions. Since 35 is not evenly divisible by 14, they to decide what to do with the remainder. Students can choose how to divide. One method is 35 [÷] 14 [Enter]. Another is 35 [Int÷] 14 [Enter]. A discussion about the two different answers may be helpful.

- Review with students the number of days in two weeks. Ask them to determine the fraction that represents one day. Ask the students what would happen if 35 is multiplied by $\frac{1}{14}$. Have them enter 35 [×] 1 [n] 14 [d] [Enter] into the TI-15. Have them compare the answer they got by dividing with a whole number and the answer they got by multiplying with a fraction. Explain that dividing by 14 tells one part of 14 parts and multiplying by $\frac{1}{14}$ tells $\frac{1}{14}$th of the whole. Discuss why either method can tell them how many chocolates could be eaten each day.

First Things First

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

Presenting the Problem

Present the *Making Cookies* activity page to the students. Discuss the problem and the final products they are to create.

Discuss with the students the similarities between the Introduction and the *Making Cookies* activity page. Remind students that when dividing a recipe to make a smaller amount, the proportions of each ingredient must remain the same.

Discuss the type of measuring tools typically used in the kitchen: 1 cup, $\frac{3}{4}$ cup, $\frac{2}{3}$ cup, $\frac{1}{2}$ cup, $\frac{1}{3}$ cup, and $\frac{1}{4}$ cup. If their calculations indicate that $\frac{3}{5}$ cup would be the best, they will need to modify the amounts to use standard kitchen measuring tools. Ask the students, "Since $\frac{3}{5}$ cup is not a standard measuring tool for recipes, which measuring cup or combination of cups would give you the closest amount?" Depending on their mathematics experience, students can use a common denominator as a comparison, convert to decimal equivalents or fraction manipulatives to compare the various fractions.

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Evaluating the Results

Have students present their completed results to the class.

After the presentations, have students discuss the various approaches used. Discuss the similarities and difference between the group solutions. Have students confirm that the calculations were done correctly.

Have students compare the various prices for cookies. Ask them to select one or more groups that would make the class the most money at the bake sale. Have them justify the selection with information from the posters.

Have groups evaluate how the TI-15 was used to help solve this problem.

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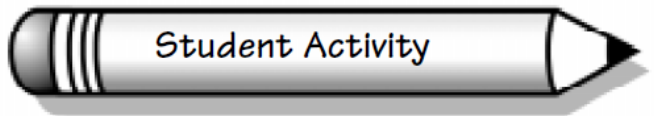
SOLUTIONS



Name _____

Date _____

Making Cookies: First Things First

Focus: Using proportions to solve problems.

The Problem

Cooks often change recipes to make more or less than the amount specified n the original recipe. If a cook wants to make half as many cookies as the recipe, he can multiply each ingredient amount by $\frac{1}{2}$ and know how much half of each ingredient is. So if a recipe calls for 2 cups of flour, 2 multiplied by $\frac{1}{2}$ is 1. Half of the recipe requires 1 cup of flour.

Working the Problem

1. Suppose a recipe makes 5 dozen cookies and you want to make 1 dozen. What fractional part of 5 dozen is 1 dozen? How do you know?

   Answer: $\frac{1}{5}$; I divided the group of cookies by 5 in order to get the 1 dozen. There are 5 equal parts, each part is 1 dozen, therefore, each part is $\frac{1}{5}$.

2. The recipe calls for 1 pound of flour. You know that there are about 4 cups of flour in one pound. How much flour do you need? The amount of cookies you want to make is $\frac{1}{5}$ of the batch. To find out how much flour, multiply 4 cups by $\frac{1}{5}$.

   Enter 4 × 1 ▯ 5 ▯ Enter. What do you get?

   Answer: $\frac{4}{5}$

   Explain your result.

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Answer: The result shows the sum of 4 parts or 4 $\frac{1}{5}$'s.

Unfortunately, measuring cups do not include fifths. Is the answer closer to $\frac{3}{4}$ or $\frac{2}{3}$?

Answer: $\frac{3}{4}$

Here is a way to compare these measures: there are 16 tablespoons in 1 cup. How many tablespoons are there in $\frac{4}{5}$ cup?

Answer: $12\frac{4}{5}$

3. Enter 16 × 4 $\frac{n}{d}$ 5 $\frac{n}{d}$ Enter. What do you get?

Enter the answer in the table on the next page. Use the whole number part of the answer for the next calculation.

Since there are 16 tablespoons in a cup and the whole number part of the last answer was 12, you can use that fraction to help decide whether $\frac{4}{5}$ cup is closer to $\frac{2}{3}$ cup or $\frac{3}{4}$ cup.

What fractional part of a cup is $\frac{12}{16}$?

Answer: $\frac{3}{4}$

4. Enter 12 $\frac{n}{d}$ 16 $\frac{n}{d}$ Enter. Then simplify the fraction by entering Simp Enter.

If you can simplify it again, enter Simp Enter.

What do you get? Enter the answer in the table below.

Is this fraction close to $\frac{4}{5}$ cup? How do you know?

Answer: yes; explanations will vary.

Would you need to add or remove tablespoons of flour to make it closer to $\frac{4}{5}$ cup?

Answer: We would need to add

How much would you add or remove? Answer: add $\frac{1}{5}$ cup

	Answers
$\frac{1}{5}$ of the flour	Answer: $\frac{4}{5}$ cup
$\frac{4}{5}$ cup flour in tablespoons	Answer: $12\frac{4}{5}$ tbs
$\frac{12}{16}$ cup simplified	Answer: $\frac{3}{4}$ cup

Sometimes, changing a recipe is not that easy. Since the original recipe needed 4 cups of flour, what fractions would have been easier to calculate than $\frac{1}{5}$? Why do you think so?

Answers will vary.

Making Cookies

The Problem: How much money can we make at a bake sale if we sell Bonnie's Favorite Sugar Cookies?

In the second part of the activity, students will make a chart that shows the cost of the ingredients, three dozen cookies, the cost per cookie, and the profit for one batch of cookies. Team members will then provide explanations of the processes used to solve the problem. Answers will vary with individual groups.

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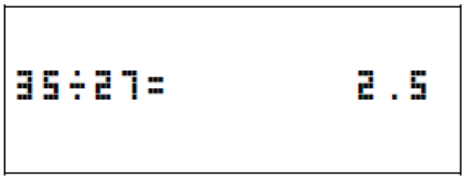
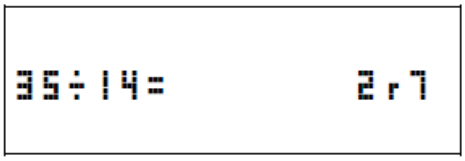
Using the TI-15

Making Cookies

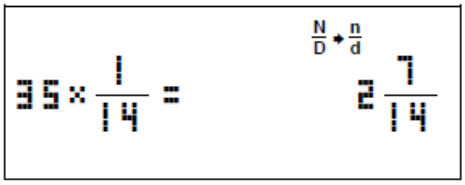
35 ÷ 14 Enter



35 Int÷ 14



35 × 1 n 14 d Enter



Simp Enter