Overview

Students will investigate how the quotients and remainders from integer division relate to the quotients from rational number division in both fraction and decimal form.

Grade Levels: 3–5

Concepts

- Division
- Fractions
- Whole numbers
- Decimals

Materials

- TI-15 Explorer™ calculator
- Student activity sheet
- Objects for counters
- Pencils

Assessment

Throughout the activity, questions are included for formative assessment. Student work should be used as a check for understanding. Have the students use the TI-15 Explorer calculator to complete the activity.

Modified from Patterns in Division, from Uncovering Math with Manipulatives, the TI-10, and the TI-15 Explorer™

Introduction

1. Pose a simple problem like this one: If you had 10 cookies to divide evenly among 3 people, how any cookies would each person get? Have students act out the division with counters. (Or, use the cookie pictures provided at the end of the activity.)

   Ask: *What would you do with the leftover cookie?* Discuss the two choices. Leave the cookie alone and let it be left over, or cut it into three equal pieces to give to the three people.

2. Discuss how you might record the first choice with a whole number quotient and a whole number remainder and how you might record the second choice with a fraction in the quotient.

3. Demonstrate using the integer divide key [Int÷] on the calculator to record the situation in which you leave the extra cookie alone: **10** [Int÷] **3** [=] to display **3 r 1**.

4. Have students compare this method of division to dividing in fraction notation, displaying the quotient in mixed number form. Enter **10** [n] **3** to represent 10 divided by 3 as a fraction. Then press [Enter] to display $3\frac{1}{3}$, the mixed number quotient for 10 divided by 3.

5. Finally, have students change the fraction to decimal form using [F↔D].

6. Have students compare this result to the decimal quotient found by entering **10** [÷] **3** [=].

7. Have students record their data on their activity sheets.

8. Ask students: *What data do you think you would have collected if you had started with a different number of cookies? What if there had been 20 cookies instead of 10? 30 cookies? 35 cookies?*

9. Have students work in small groups to investigate what happens when they use 4 as a divisor. Have them record the data on their activity sheets, try other divisors, and look for patterns in the data.

Using the Calculator

- *How would changing the* Fraction Display Mode *affect your result?* [Frac] ➔ [Enter] [CLEAR]
- *Use the scroll feature, , to compare results.*

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Collecting and Organizing Data

While students generate data for the different divisors, ask questions such as:

Questions for Students:

- *What divisor are you using? What kinds of remainders do you expect to find? (Refer to the* Recurring Remainders *activity.)*
- *What does the quotient represent? What does the remainder represent?*
- *What does the fraction form of the quotient represent?*
- *What patterns do you notice in the fraction form of the quotients? How do the fractions relate to the remainders? To the divisors? Why do you think this happens?*
- *What happens when you change the divisor? How do your remainders and fractions change? How do their relationships change?*
- *What relationships do you see between the fractions and the decimals?*
- *What kind of conjectures can you make about relationships between the remainders and the fractions? The relationships between the fractions and the decimals?*

Using the Calculator

- *How are the different ways to perform division on the calculator alike? How are they different? Do they differ from calculator to calculator?*

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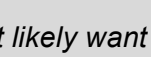
Analyzing Data and Drawing Conclusions

After students have made and compared several tables and looked for relationships, have them discuss their results as a whole group. Ask questions such as:

Questions for Students:

- *What kinds of remainders occur with a divisor of _____? Why?*
- *What kinds of fractions occur in the quotients with a divisor of ____? Why?*
- *What kinds of decimals occur in the quotients with a divisor of ____? Why do you think those decimals look the way they do?*
- *Do the related fraction quotients and decimal quotients represent the same amount? Why do you think this is true or not true?*
- *Now what kinds of questions do you have about division, remainders, fractions, and decimals? How might we investigate these questions?*

Using the Calculator

- *When would you most likely want to use*  *?*
- *When would you want to use the*  *on the calculator?*
- *When might you want to represent division as a fraction with*  *on the calculator?*

Continuing the Investigation

Have students collect data about other divisors to see whether their conjectures continue to be true or whether the patterns in their data lead them to new conjectures.

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SOLUTIONS

Name _____

Date _____

Focus: Relate fraction quotients and decimal quotients.

Patterns in Division

Collecting and Organizing Data

# of Cookies (Dividend)	# of People (Divisor)	Integer Quotient and Remainder	Fraction Quotient	Decimal Quotient
Sample answers:				
15	4	3 r3	$3\frac{3}{4}$	3.750
15	6	2 r3	$2\frac{3}{6}$	2.50
15	8	1 r7	$1\frac{7}{8}$	1.875

Analyzing Data and Drawing Conclusions

After you have collected the data in the chart above, discuss this exercise as a group and record your findings. Enter any questions you come up with in the space below, and be prepared to discuss them.

Questions we thought of while we were doing this activity: Sample answer:

What are the patterns? Will the patterns still be the same with odd numbered divisor/even numbered dividends?

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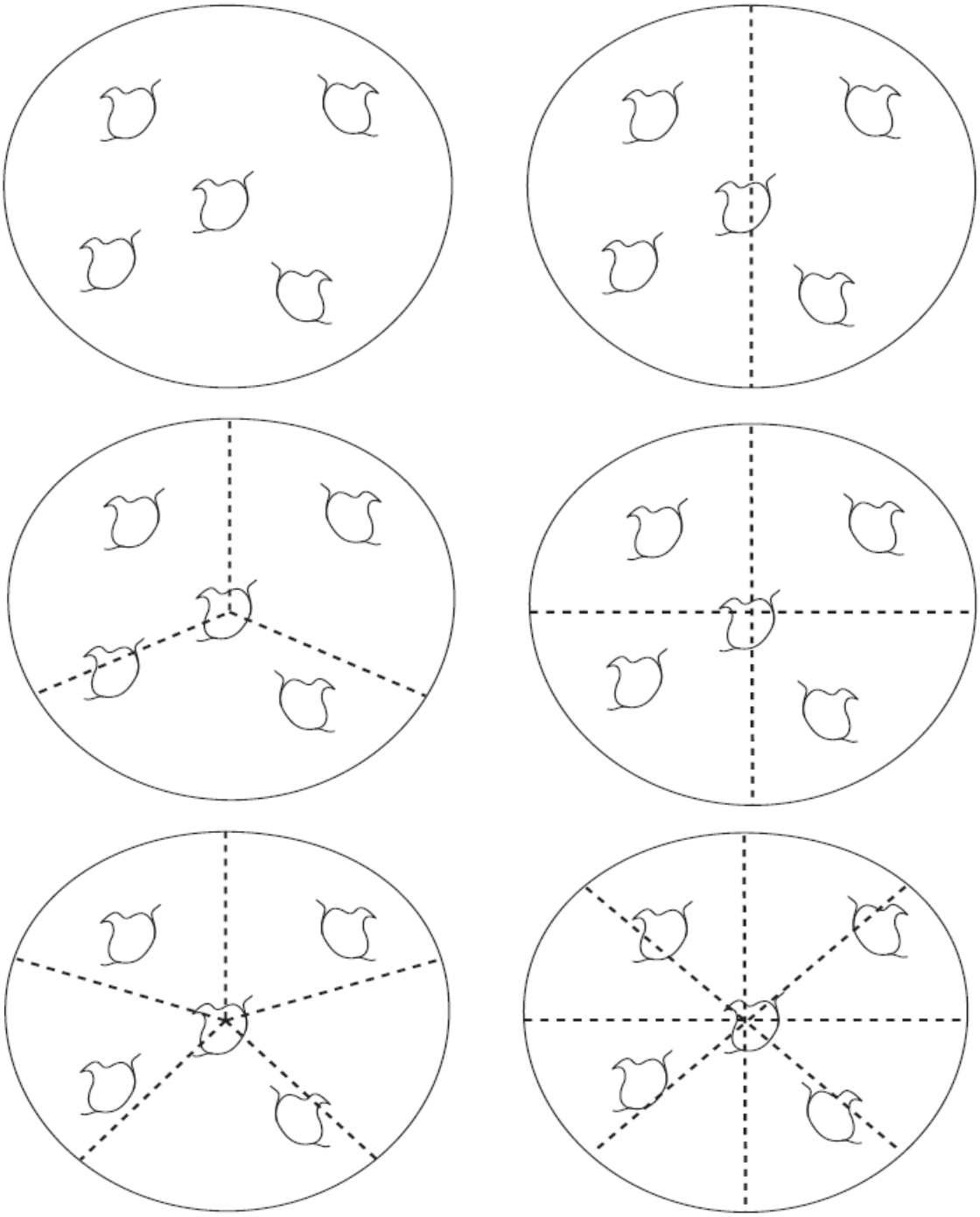
Patterns in Division

Cookies



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