

Remainder Rules

<p>Math Concepts</p> <ul style="list-style-type: none"> • whole numbers • multiplication • division • subtraction • addition <p>Materials</p> <ul style="list-style-type: none"> • TI-10, TI-15 Explorer™ • Remainder Rules recording sheets • cubes, sticks, etc. • pencils 	<p>Overview</p> <p>Students will use calculators, whole-number division, multiplication, addition, and subtraction to generate mathematical expressions that describe the relationships between dividends, divisors, quotients, and remainders.</p>
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Introduction

The **Random Remainders** (page 7) and **Recurring Remainders** (page 11) activities should be completed before beginning this activity.

1. Have students revisit their conclusions from the **Random Remainders** and **Recurring Remainders** activities.
2. Ask students to imagine the following: Suppose you own a flower stand. Each day you order carnations from the dealer and separate them into equal-sized bunches to sell at your stand. You like to take some carnations home each day, so you always place your order and make your bunches so that there are five carnations left for you.
3. Ask students: How many carnations can you order and what size bunches do you make to take five carnations home?
4. Have students work in groups using calculators, cubes, and sticks to explore solutions to this problem. They may also use the sheet of flowers provided on page 19. Have them record their solutions on the recording sheet.
5. Have students use the data that they collect to describe the relationship between the dividends and divisors that result in the remainder 5. On the recording sheet, have them write mathematical expressions using number and operation symbols that represent their descriptions.
6. Have students repeat the activity using the other charts on the recording sheet. Have them look for similarities in their descriptions.

Remainder Rules *(continued)*

Collecting and Organizing Data

While students are generating and recording their data, ask questions such as:

- What operation represents the action of making bunches of equal size?
- What do the five carnations left over represent?
- What size bunches might you make so that you would have five carnations left?
- How would the size of the bunches you make be used in your description of the action of grouping the flowers in bunches?
- Suppose you made bunches of eight carnations. How many could you order to have zero left?

Example:

$1 \times 8, 2 \times 8, 3 \times 8$, etc.

- How would the number of flowers that you order and the size bunches that you make be related to each other if you had none left? How can you express this relationship in words?

Note: The total number of carnations would have to be a multiple of the number in each bunch.

- How could you express this with symbols?


Example:


If t = total number of carnations and c = carnations in each bunch, for none to be left over, t = some whole number of bunches $\times c$.


- How would the dividend and divisor be related if you wanted to have 1 left?
- How could you express this relationship in symbols?

Example:

$t = [\text{some whole number} \times c] + 1$.

 How are you using the calculator to help you investigate solutions to this problem?

 Which operations are you using on the calculator? Why did you choose those?

 How do you record what you are doing with the calculator?

Remainder Rules *(continued)*

Analyzing Data and Drawing Conclusions


After students have generated several solutions to the problem and looked for a general pattern, have them analyze their data. Ask questions such as:


- What solutions did you find?
- How are your solutions the same or different from those of other groups?
- What strategies did you use in looking for solutions?
- What patterns did you find in your solutions?
- How did you use words, numbers, and operation symbols to describe those patterns?
- How are your descriptions alike or different from those written by others?
- What general statements can you make about a division equation that has a remainder of five?




Continuing the Investigation

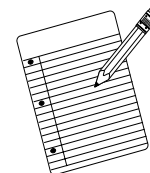
Have students:

- Repeat the activity with this change: Suppose you want to keep eight carnations each day. How are your solutions different from having five left? How are they the same?
- Make a generalization about the relationship between dividends and divisors and any size remainder.

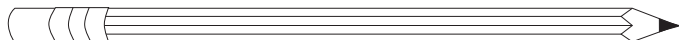
 How did you use the calculator to help you in this activity?

 Using the patterns you observed in your data, make a conjecture about another possible solution. Use the calculator to test your conjecture.

 Using the scroll feature,  , look for general patterns and analyze the data.



Name:



Remainder Rules Recording Sheet

Collecting and Organizing Data

Note: t = total number of carnations, and c = number of carnations in each bunch.

To have 5 left

t	c

To have 6 left

t	c

To have 10 left

t	c

To have n left

t	c

Analyzing Data and Drawing Conclusions

From the data we gathered, we think that the relationship between the dividend (t), the divisor (c), and the remainder is:

Remainder Rules

Flowers

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