

LESSON 2

What's Next?

Patterns and Relationships

Objectives . . . Students will be able to:

- ◆ Identify patterns.
- ◆ Recognize patterns.
- ◆ Describe patterns.
- ◆ Extend patterns.
- ◆ Create patterns.

NCTM Standards and NAEP Strand

Concepts learned and applied in Lesson 2 correlate to NCTM Standards 1, 2, 3, 4, and 13; and NAEP Strand 1 (Number Sense, Properties, and Operations).

Materials List

The Class

- *Optional:* 1 copy of *A Remainder of One* by Elinor J. Pinczes, illustrated by Bonnie MacKain
Boston: Houghton Mifflin, 1995
(Used in the video with permission of Houghton Mifflin)
- Overhead transparency of the 100 Chart or poster of the chart.

Each Group

- A copy of BLM 2-C, *A Remainder of One*, and BLM 2-D, *100 Chart*.
- calculator
- unifix cubes (or other loose counting material)

Each Student

- A copy of BLMs 2-A and 2-B for the "You Try It at Home" activities.

To Prepare Your Students

Introduce today's video topic and ask questions designed to ascertain if the students are familiar with the Student Prerequisites and Key Words and Terms. Present some simple examples of the type of problem to be explored—e.g., When you divide 4 by 2, is there anything left over? If you divide 5 by 2, will there be something left over? What is this called? Can anyone tell me what a pattern is? . . .

Student Prerequisites

- ◆ Understanding of division (using divisors of 2, 3, 4, and 5).
- ◆ Knowledge of remainders.

Key Words and Terms

pattern

remainder

divided by

Video Overview

In the opening montage, we see patterns in a variety of contexts—patterns in a carpet, on wallpaper, and sounds.

Video Lesson

In the game “Can You Guess the Pattern?” students first identify patterns and then make a prediction as to what should appear next, thereby extending the given pattern. You should feel free to pause the video tape as the question marks appear at the end of each pattern sequence in order to have your students more actively engage in predicting what comes next and justify their answers.

Classroom Scene

We join Holly Kreiman of Dewey School as she shares the book *A Remainder of One* with her students. In the story, the following number pattern emerges:

$$25 \div 2 = 12 \text{ Remainder } 1$$

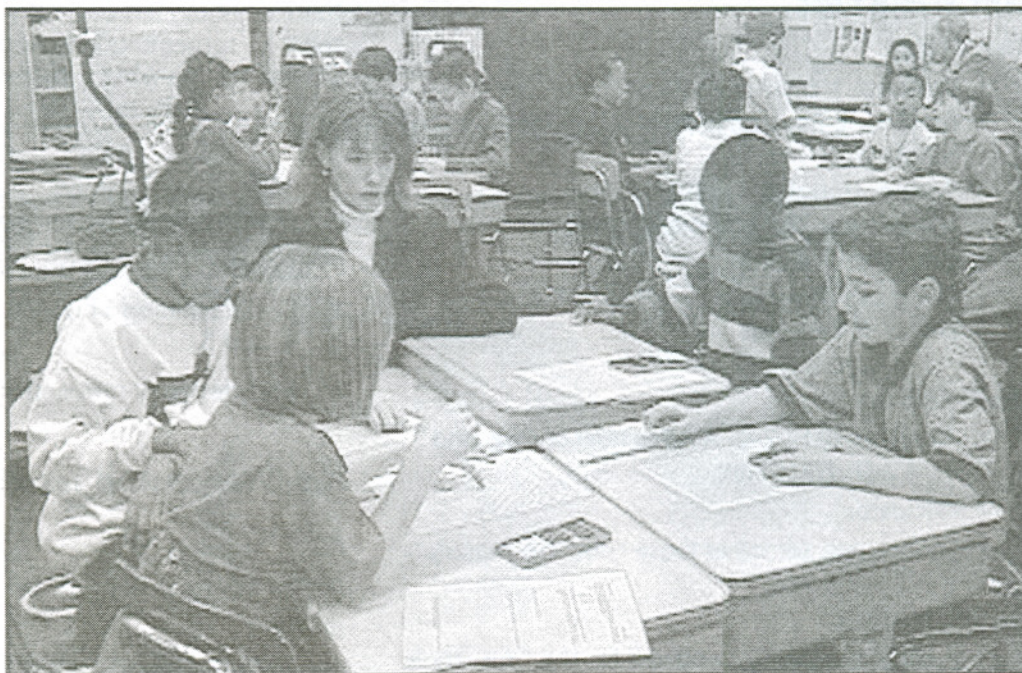
$$25 \div 3 = 8 \text{ Remainder } 1$$

$$25 \div 4 = 6 \text{ Remainder } 1$$

$$25 \div 5 = 5 \text{ Remainder } 0$$

After talking with her students about this number pattern, Holly poses the following problem for each group to solve:

“Think about the numbers from 1 to 100 and the pattern that was in the story. Are there other numbers from 1 to 100 that the author could have used that follow the same pattern?”





YOUR CLASS MAY WANT TO TRY THIS NOW

Form the class into groups and give each group a copy of BLM 2-C and 2-D.

Here are some suggestions to assist students in solving the problem:

1. Ensure that each group can identify and describe the pattern of the divisors and the remainders in the story. Students should be able to tell you some other numbers from 1 to 100 that fit the pattern and result in a remainder of 1 when divided by 2, 3, and 4, and are evenly divisible (remainder of 0) by 5.
2. You may want to discuss the questions on BLM 2-C and remind your students that if they get stuck in their thinking, they should use the questions to guide them.
3. Remind students that they can also use counters, e.g., unifix cubes and calculators, if they think these tools would help solve the problem.
4. Remind students that they will need to share with the rest of the class both their group's *solution* and the *strategies* they used to solve the problem.

After they have worked out the problem, but before they present their solutions, play the video showing how other kids solved the problem.

Play

Watch the ways the children on the video solve the problem. The video then asks:

WERE THESE SOLUTIONS LIKE YOURS?

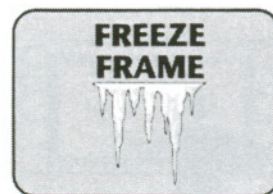
Note: Question is on-screen but there is no stop sign. Teachers should pause at this point and ask each group to present its solution. Encourage your class to think about all of the solutions and remind them that there are many possible solutions.

Play

Next, a girl uses the pattern that occurs in the address numbers on houses to find her new friend's house. Children in your class should look for similar numbering patterns in the way rooms in your school are identified, or buildings in your school's neighborhood, or houses and buildings in their own neighborhoods. The video suggests . . .

You Try It!

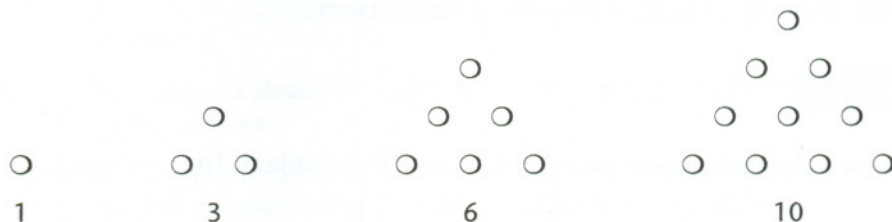
2 5 8 3



EXTENDED ACTIVITIES

These activities are designed to extend the mathematics learning introduced in this lesson.

1. Using an overhead transparency of the 100 Chart, or poster of the chart, and transparent colored chips, show a pattern on the chart, e.g., multiples of 2. Have students describe the pattern numerically ("It's like counting by twos." "It goes up by twos.") and visually ("Number, Skip, Number, Skip." "It's every other row."). Have the students close their eyes as you move three or four chips to other locations, e.g., 13, 41, 79; then have them open their eyes and tell which counters have been moved and where those counters need to be moved to again show the pattern.
2. Using square tiles (transparent colored ones if using the overhead), lay out a series of squares—first one tile, then a square of four, then of nine, etc. (1X1, 2X2, 3X3, etc.). Have students identify and describe the pattern. Ask your students to extend the pattern. How many tiles will you need for the fifth square in the pattern? the 10th? the 15th?
3. Use circular counters, e.g., pennies, chips, etc., to investigate triangular numbers. Have students create pages for a class pattern book about triangular numbers.



Cross-curricular Activities

1. Talk with music educators in your school. Ask them about helping your students identify, describe, and extend patterns in music.
2. Art is often full of patterns. Have an artist come and show some of his/her work and talk with your students about the ways in which patterns are important in art.

Writing Activity

On the blackboard, show the beginnings of a number pattern. Ask the students what the next 5 numbers in the pattern would be and how they would describe the pattern. For example, use multiples of 6—6, 12, 18, 24, etc.—and ask them to color those numbers in on a 100 Chart. On the back, they should write out the numbers they found and describe how they know these numbers fit the pattern.

You Try It At Home

Two handout masters, numbered 2-A and 2-B, are provided in a booklet accompanying the Teacher's Guide; reproduce as many of these as you need. Reduced examples are also provided at the end of this lesson. These activities are designed to extend and reinforce concepts taught in the lesson, and to enable parents or other caregivers to become more involved with students' mathematics learning.

Assessment and Criteria for Scoring

The following five proficiency categories may be used to evaluate student performance in response to Lesson 2. You may use these evaluation categories to assess student classroom performance and extended activity performance.

The problem: Students are given a 100 Chart and asked to find numbers other than 25 which have a remainder of 1 when divided by 1, 2, 3, and 4, but a remainder of 0 when divided by 5.

Advanced Response: The response shows evidence of finding the correct pattern mathematically, with more than one supporting example. The strategies used and the reasons for the choice are clearly explained.

Proficient Response: The response shows evidence of finding the correct pattern mathematically, with at least one supporting example. There is adequate communication of the strategy used.

Partially Proficient Response: The response may show evidence of finding the correct pattern, but there is not adequate mathematical support and/or the communication of the strategy used is somewhat unclear or incomplete.

Minimal Response: The response shows evidence of searching for a pattern and using a mathematical strategy to do that, but the mathematics is flawed and the pattern is incorrect. The communication of the strategy is missing or incomplete.

Attempted Response: The response is an attempt to find a pattern, but there is almost no mathematics used or the mathematics is seriously flawed. The explanation is missing or can't be understood.

References and Resources

National Council of Teachers of Mathematics (1989) Curriculum and Evaluation Standards for School Mathematics. Reston, VA: The Council.

Standard 1 : Mathematics as Problem Solving.

Standard 2 : Mathematics as Communication.

Standard 3 : Mathematics as Reasoning.

Standard 4 : Mathematical Connections.

Standard 13 : Patterns and Relationships.

NAEP Strand 1 (Number Sense, Properties, and Operations).



Suggested Children's Literature

Carol Cornelius, *Polka Dots, Checks, and Stripes*

Howard Fehr, *Number Patterns Make Sense*

Robert Froman, *A Game of Functions*

Henry Pluckrose, *Pattern*

Charlotte Zolotow, *Some Things Go Together*

You Try It At Home 1 and 2

Number Patterns

Calculators can show many fun number patterns. With a parent or other care-giver, try the following exercise with a calculator. You will need to test your calculator first to see if it can perform what is called the *arithmetic constant feature*. Enter in the following sequences:

$$2 + \text{=====} \text{ OR}$$

$$0 + 2 \text{=====} \text{ OR}$$

$$2 + + + + + + +$$

If one of these sequences results in a successive display of 2, 4, 6, 8, 10, then your calculator has an arithmetic constant and can be used for the following activities.

1. Make your calculator display 11, 22, 33, 44, 55, etc. How did you do it? Keep a record of the sequence of keys you pushed.



What will the 6th term be in this sequence? _____

The 12th term? _____

Will 222 appear on the calculator display? _____

2. Enter on your calculator $14 + 5 \text{=====}$.

What digits are displayed in the 1's place? _____

A friend says that her calculator showed 85 while using this sequence. Do you think she entered the correct pattern? Why or why not? Explain below.

Patterns All Around You

Patterns appear in many different forms. Look around your home. What patterns can you find? What shapes are parts of these patterns? What colors are parts of these patterns? Make a record of the patterns you find and write about them.

OR

With an adult, go to a store that sells wallpaper and/or home decorating materials. Look through the products in the store. What patterns can you find? Talk with an interior decorator or store employee about the ways patterns are used in decorating homes and other indoor spaces.