

Fifth Grade Math

Patterns of Change

January

The attached set of daily lesson plans for *Investigations* and *Every Day Counts* are organized by **instructional days - not the day of the month**. You will need to start the unit on day one and follow it sequentially.

The fourth instructional unit of the year is *Patterns of Change*. It begins in the beginning of January and continues for about a week and a half. There are approximately 8 instructional days in this unit. Due to time constraints, only one investigation was pulled from this unit however, teachers are encouraged to do the second investigation if time permits as this unit provides a lot of mathematical challenges. Please modify the parent letter that is in the unit by only using the first paragraph and the first bullet as that will be the focus for this unit.

The focus of this one investigation that will be done from this unit is for students to study various graphs and tables to interpret the pattern that is being developed. These "tile patterns" include square numbers, triangular numbers, multiples of two, and powers of two. This unit discusses, but does not emphasize, students writing out specific equations using variables. A suggestion would be that whenever possible and appropriate, an equation is written that correlates with the table and graph. Fifth graders need to be able to recognize a variable in an equation. A variable has two definitions: 1. A quantity that changes or that can have different values; 2. A symbol, usually a letter, that can stand for a variable quantity: " in $5n$, the variable is "n". In some activities, such as the "doubling" pattern from Student Sheet 4, the equation (or general rule) goes beyond what is expected for fifth graders. It is up to you as to whether to write this equation out as shown on page 23. It may or may not be appropriate for your group of students. It is certainly a great extension to this particular activity. In the past, many teachers have found this investigation to be helpful in preparing students

for the verification piece of the State Problem Solving. Attached to this unit is some additional homework that is referred to in the plans. The additional homework is from the *Problem Solver 4* and the *Problem Solver 5*.

The January *Every Day Counts* calendar continues to encourage students to

- focus on number theory with the calendar pieces
- identify fractional amounts in the Counting Tape and Daily Decimal
- focus on factors and common factors between numbers through the Factor Figures
- identify mixed fractions and improper fractions and equivalencies through the Daily Measurement (measuring distance in inches and feet, recording as fractions)

Day 01 Calendar / Daily Skills	Day 02 Calendar / Daily Skills	Day 03 Calendar / Daily Skills	Day 04 Calendar / Daily Skills	Day 05 Calendar / Daily Skills
Update All. Discuss Measurement: What fraction of our foot is covered today? Is there another way to record that amount (equivalent fraction)?	Update All. Discuss Factor Figure: Predict how many legs will our factor figure have today? How do you know?	Update All. Discuss: What will today's calendar piece look like? How do you know? When will be the next date we will see the exact same calendar piece? Why?	Update All. Discuss Daily Decimal and Counting Tape: What would we record if we wanted to record how many days are left until we reach day 100?	Update All. Discuss: Daily Measurement: Focus your discussion on mixed number and if possible, the simplification of today's fraction with equivalencies.
Lessons	Lessons	Lesson	Lesson	Lesson
<u>Problem Solver</u> •From the <u>Problem Solver 5</u> , have pairs work on problem #44 following each of the problem solving steps. •Return as a class and discuss the problem and the strategies students used to solve it.	<u>Patterns of Change</u> Inv. 1 Session 1 p.4-6 •Exploring Tile Patterns <i>The step size is sometimes confusing for students. Explain to them that the step size is the amount of new tiles added on to the step number After having discovering the general rule for this pattern in words, attached a mathematical equation to their rule. Introduce the word, variable.</i> •Other Patterns and Their Graphs <i>In the double-step pattern, it will be challenging to find an equation that would help determine the general rule for the total number of tiles. You can determine an equation with a variable for the number of tiles for the step size. Though the teacher note on page 12 explains not to go into an equation, it is important for fifth graders to know what a variable is and how it is used in an equation.</i>	<u>Patterns of Change</u> Inv. 1 Session 2 p. 7-10 • <i>Prior to this lesson, make sure everyone has copied one of the two patterns that you had put up from yesterday's lesson.</i> •From Tables to Groups <i>Students will experience graphing their patterns and be exposed to three different patterns of growth-steady growth, faster growth, and growth that is growing slower and slower. Review the definition of what "steady growth" is as it relates to the pattern.</i> •Teacher Checkpoint: Designing a Growing Tile Pattern <i>encourage students to write down in words a general rule for their pattern. that they designed.</i>	<u>TEST PREP</u> "How to Select a Problem" •See test preparation packet (from previous unit) •Worksheet C from test prep packet •Worksheet D from test prep packet	<u>Patterns of Change</u> Inv. 1 Session 3 p.15 •Making Tables and Graph for Tile Patterns <i>Encourage students to find a general rule about the patterns. If possible, have them write a mathematical equation or write in words what the general rule would be for each pattern.</i>
Ten Minute Math	Ten Minute Math	Ten Minute Math	Ten Minute Math	Ten Minute Math
Guess My Number: Is a factor of 36 and a multiple of 3 and 9. It is even. What is the number?				
Homework	Homework	Homework	Homework	Homework
Problem Solver #69 (see attached homework behind plans)		Student Sheet 2: <i>Growing Tile Patterns</i>	Student Sheet 3: <i>Growing and Graphing Tile Patterns</i>	Problem Solving Worksheet #84 (from Homework packet)
Teacher Support	Teacher Support	Teacher Support	Teacher Support	Teacher Support
Homework support packet	<i>Make sure you have centimeter grid paper available for this lesson</i>	Teacher Notes p. 11 -13		Teacher Note p. 22

Grade Level: fifth

Week: 2 of 2

Unit: Patterns of Change

Day 06		Day 07		Day 08	
Calendar / Daily Skills		Calendar / Daily Skills		Calendar / Daily Skills	
Update All. Discuss today's factor figure: Write a number puzzle that we could use to describe today's date.		Update All. Discuss Measurement: If I had 36 inches, what else do I have?		Update All. Discuss Counting Tape: If I said that $\frac{3}{4}$ of our tape is covered, what else could you say that would mean the same?	
Lessons		Lessons		Lesson	
<u>Patterns of Change</u> Inv. 1 Session 3-4 p.15-17 •Continue Day 5's assignment if necessary •Comparing Graph Shapes <i>Encourage students to identify the general rule for each graph.</i>		<u>Patterns of Change</u> Inv. 1 Session 4 p.18 •Investigating a Pattern in Depth <i>You may want to prepare ahead of time assigning patterns of appropriate levels of difficulty for each group of students</i> •Presenting the Poster (if time permits)		Catch Up/End of Unit Assessment	
Ten Minute Math		Ten Minute Math		Ten Minute Math	
		I am a multiple of 2,3,4,6,8,12 and I am between 10-30. What number am I?			
Homework		Homework		Homework	
Problem Solver #84 (from homework packet)		Problem Solver #38 (from homework packet)			
Teacher Support		Teacher Support		Teacher Support	

Patterns of Change – Investigation 1

Alignment to 5th Grade Expectations

ALGEBRAIC THINKING

Grade Level Expectation √= Report Card Language	Activities that Address Expectations	Assessment Activity
<p>*Given the first three arrangements of a predictable geometric pattern is able to draw or describe the 10th or 100th figure based on an understanding of the pattern</p>	<p>*Exploring Tile Patterns p.4 *Other Patterns and Their Graphs p.6 *From Tables to Group p.7 *Making Tables and Graphs for Tile Patterns p.15 *Comparing Graph Shapes p.16 *Investigating a Pattern in Depth p.18</p>	<p>*Making Tables and Graphs for Tile Patterns – Student Sheet 4 *End of Investigation Task 2</p>
<p>*Given a number pattern is able to determine subsequent terms and to describe the rule for generating the pattern</p> <p><i>√describes the rules for generating a pattern</i></p>	<p>*Exploring Tile Patterns p.4 *Other Patterns and Their Graphs p.6 *Making Tables and Graphs for Tile Patterns p.15 *Comparing Graph Shapes p.16 *Investigating a Pattern in Depth p. 18</p>	<p>*Other Patterns and Their Graph – centimeter graph paper activity *Making Tables and Graphs for Tile Patterns – Student Sheet 4 *End of Investigation Task 2</p>
<p>*Use pictures, words, graphs, and symbols to describe relationships between quantities</p> <p><i>√uses pictures, words, graphs, and symbols to describe relationships between two quantities</i></p>	<p>*Making Tables and Graphs for Tile Patterns p.15 *Comparing Graph Shapes p.16 *Investigating a Pattern in Depth p.18</p>	<p>*Teacher Checkpoint: Designing a Growing Pattern p.8 *Making Tables and Graphs for Tile Patterns –Student Sheet 4 *End of Investigation TASK 1</p>

STATISTICS AND
PROBABILITY

<p>*Represent the idea of a variable as an unknown quantity using a letter or symbol</p>	<p>*Exploring Tile Patterns p.4 *Other Patterns and Their Graphs (Double-Step Staircase) p.6</p>	<p>*Teacher Checkpoint: Designing a Growing Tile Pattern p.8 *End of Investigation TASK 2</p>
<p>Identifies or describes a situation which may be modeled by a given graph</p>	<p>*Other Patterns and Their Graphs p.6 *From Tables to Groups p.7 *Making Tables and Graphs for Tile Patterns p.15 *Comparing Graph Shapes p.16</p>	<p>*Teacher Checkpoint: Designing a Growing Tile Pattern *End of Investigation TASK 1 *End of Investigation TASK 2</p>
<p>Interprets and analyzes a wide variety of graphs including bar, line, plots (first quadrant) tables, and circle graphs</p> <p><i>√constructs, interpret and analyzes a wide variety of graohs</i></p>	<p>*From Tables to Groups p.7 *Comparing Graph Stories p.16 *Making Tables and Graphs for Tile Patterns p.15</p>	<p>*Making Tables and Graphs for Tile Patterns p.15- Student Sheet 4</p>

Extensions and Adaptations

Patterns of Change

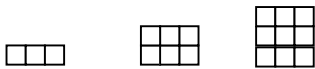
Investigation / Activity	Extension	Adaptation
<p><u>Investigation 1</u></p> <p>Four Growing Tile Patterns p.14</p>	<p>p. 21: Tile Designs to Fit Descriptions</p> <p>Introduce “handshake” problem (i.e., how many handshakes for 9 Supreme Court justices, etc). Illustrate with table and Pascal’s Triangle.</p> <p>P. 50: Find graphs in newspapers to show changes over time (foreign language papers – can information still be understood?)</p> <p>P. 91: Flipbooks with 2 changes</p>	

Teacher Directions TASK 2

End of Investigation Assessment

Grade 5

Patterns of Change



- What do the next three arrangements look like?
- How many tiles will there be in the tenth arrangement?
- Describe the pattern. What is the general rule? Write an equation with a variable to support your general rule.

Teacher Note:

**Does the child have to draw out the entire pattern to come up with the tenth arrangement?*

**Does the child communicate the general rule using a variable or just words?*

Grade Level Expectations that this assessment addresses:

- ◆ Given the first three arrangements of a predictable geometric pattern is able to draw or describe the 10th or 100th figure based on an understanding of the pattern
 - ◆ Describes the rules for generating a pattern
 - ◆ Represent an idea of a variable as an unknown quantity using a letter or a symbol.
- √ Describes the rules for generating patterns

