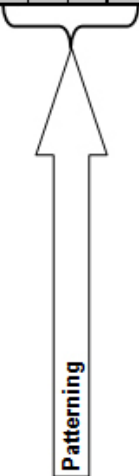


Patterning

Suggested Time: $3 \frac{1}{2}$ Weeks

September	October	November	December	January	February	March	April	May	June
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This is the first explicit focus on Patterning in Grade 3 but, as with other outcomes, it is ongoing throughout the year.

Unit Overview

Focus and Context

In Grade 3, students continue working with increasing patterns. They build on what they have learned in Grade 2 by communicating their understanding of increasing patterns and by representing increasing patterns in a variety of ways: concretely, pictorially and symbolically. Students verbalize and communicate rules to help them understand the predictability of a pattern. A large focus in Grade 3 is the introduction and development of decreasing patterns. Students use their knowledge of increasing patterns to make connections to the concept of decreasing patterns, since similar understandings are developed. These patterning concepts are the basis for further algebraic thinking and will be extended in later grades.

Math Connects

It is important that students see the connection between increasing and decreasing patterns. Many opportunities should be provided for them to connect both types of patterns. Since increasing and decreasing patterns introduce students to a higher level of algebraic thinking, students will also make connections to the patterns embedded in other strands of mathematics.

Historically, much of the mathematics used today was developed to model real-world situations, with the goal of making predictions about those situations. As patterns are identified, they can be expressed numerically, graphically, or symbolically and used to predict how the pattern will continue. It is important that students identify that patterns exist all around us. Viewing and discussing patterns in a real world context creates authentic experiences for patterning concepts to be applied and developed. Identifying patterns in the yearly/monthly calendar, house numbers and money can be used to solve “real life” problems.

Process Standards Key

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Curriculum Outcomes

STRAND	OUTCOME	PROCESS STANDARDS
Patterns and Relations (Patterns)	<p>3PR1 Demonstrate an understanding of increasing patterns by:</p> <ul style="list-style-type: none"> describing extending comparing creating <p>patterns using manipulatives, diagrams, sounds and actions (numbers to 1000).</p>	[C, CN, PS, R, V]
Patterns and Relations (Patterns)	<p>3PR2 Demonstrate an understanding of decreasing patterns by:</p> <ul style="list-style-type: none"> describing extending comparing creating <p>patterns using manipulatives, diagrams, sounds and actions (numbers to 1000).</p>	[C, CN, PS, R, V]

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Demonstrate an understanding of increasing patterns by:

- describing
- extending
- comparing
- creating

patterns using manipulatives, diagrams, sounds and actions and numbers to 1000.

[C, CN, PS, R, V]

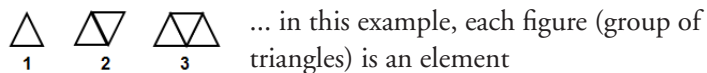
Achievement Indicator:

3PR1.1 Describe a given increasing pattern by stating a pattern rule that includes the starting point and a description of how the pattern continues; e.g., for 42, 44, 46 ... the pattern rule is start at 42 and add 2 each time.

Elaborations—Strategies for Learning and Teaching

In Grade 2, students described, extended, compared and created repeating patterns and increasing patterns. Grade 3 students will review and learn more about increasing shape/number patterns, as well as explore decreasing patterns. They will begin with building patterns and talking about them in a logical step-by-step process. Increasing patterns are sometimes referred to as ‘growing patterns’ – a pattern where the size of the elements increase in a predictable way. An element is any single item or step of a pattern. E.g.

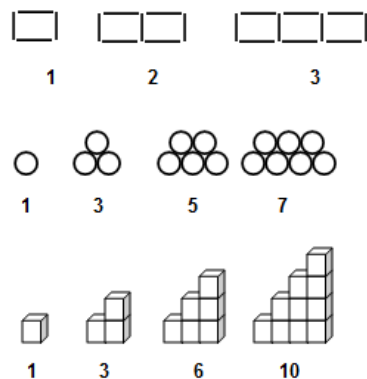
28, 31, 34, 37... the pattern begins at 28 and increases by 3. Each number in the pattern is an element.



It is common for students to confuse a repeating pattern with an increasing or decreasing pattern. Increasing and decreasing patterns do not have a core. Students will be familiar with the mathematical term core from working with repeating patterns in Grade 2. Ask students to look for a ‘core’ first. The core is the shortest part of the pattern that repeats. If they cannot find a core, then the pattern is not a repeating pattern and it must be an increasing or decreasing pattern.

Students need sufficient time to explore increasing patterns through various manipulatives, such as link-its, tiles, flat toothpicks, counters, pattern blocks, base ten blocks, bread tags, stickers, buttons, etc., to realize they increase or decrease in a predictable way. Later, students will connect patterns to numbers, and work with patterns found in the hundreds chart or record patterns in a T-chart.

Give students the first three or four elements of an increasing pattern. Ask them to determine the pattern rule and explain how the pattern continues. A pattern rule tells how to make the pattern and can be used to extend an increasing or decreasing pattern. Both have a starting point and a change that happens each time.



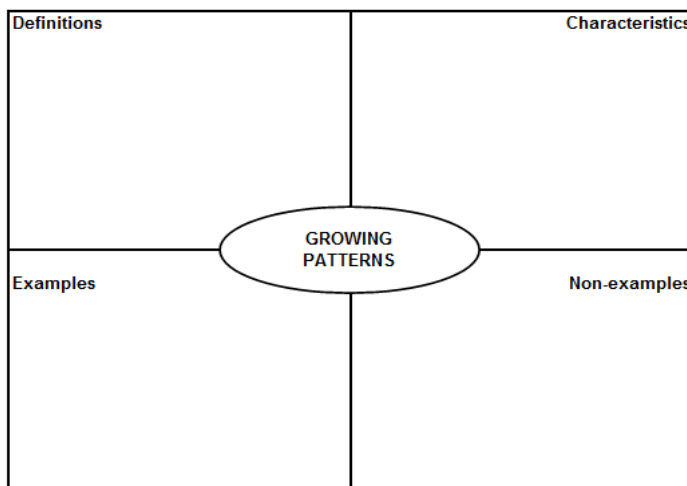
(continued)

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Portfolio

- Ask students to complete a concept map. Use it to inform instruction by determining what students already know about growing patterns. Note any misconceptions to clarify throughout the unit.



Ask students to place the concept map in a portfolio. After further instruction, ask students to complete another allowing them the opportunity to compare it to the first. This allows students to assess their own development. This strategy can also be used to determine their growth and understanding of other concepts. (3PR1)

Performance/Student-Teacher Dialogue

- Calculator Activity – In Grade 3, students can benefit from experiences working with calculators and examining patterns. Ask students press 0 on a calculator. Ask them to select a number from 1 to 9. E.g., 3. Press + followed by 3, then press =. The calculator will add 3 to the previous sum. Record the number displayed. Press = again. Record the new number. Continue pressing = and recording the new number displayed. After several entries, ask the students to predict the next few numbers. Ask: What are some other numbers that are and are not part of the “Add 3” pattern? Is there a rule we can use to predict the numbers? If so, give the rule. Ask students to explore several different numbers from 1 to 9 and see what happens if they start with 0 and then continue to add the chosen number. (Navigating through Algebra in Grades 3-5, 2001, p. 15) (3PR1.1)

Resources/Notes

*Math Makes Sense 3***Launch**

TG pp. 2 – 3

Lesson 1: Exploring Increasing Patterns**3PR1**

TG pp. 4 – 6

Additional Activities:

Missing Figures

TG p. ix and 41

Game: What’s the Pattern Rule?

TG pp.18

This game may be used repeatedly during this unit as extra practice to reinforce 3PR1

Strand: Patterns and Relations (Patterns)

Outcomes

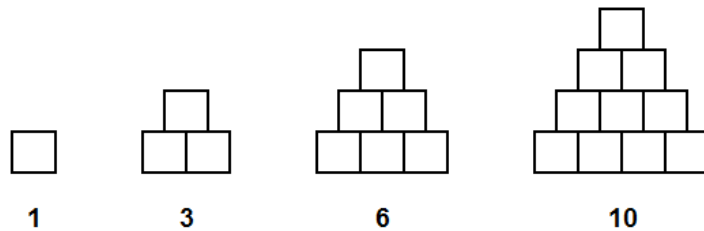
Students will be expected to

3PR1 Continued**Achievement Indicator:**

3PR1.1 Continued

Elaborations—Strategies for Learning and Teaching

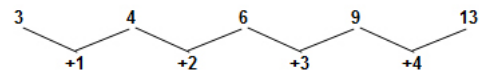
As students describe increasing shape patterns, help them recognize that each element has a numeric value. E.g.



Other numeric patterns include:

2, 4, 8, 16, ... The pattern rule is: Start at 2. Double each time.

3, 4, 6, 9, 13, ... The pattern rule is: Start at 3. Add 1 and increase the number added by 1 more each time.



103, 108, 113, 118, 123, ... The pattern rule is: Start at 103. Add 5 each time.

Note: A pattern rule must have a starting point. E.g., if a student describes the pattern 3, 7, 11, 15, ... as “an add 4 pattern” without indicating that it starts at 3, the pattern rule is incomplete.

Leaping Lizards - Take students to an open area such as a gym or playground to jump like ‘Leaping Lizards’ while skip-counting an increasing pattern. They jump 8 times in a row, stop to feel their hearts beating, then jump 8 more times.

Name the Rule - Tell students the following story: On Earth Day, Mr. Hann and his students planted a vegetable garden in the school yard. He put 2 plants in the first section, 4 in the second section and 6 in the third section. Ask students to:

- create the pattern with blocks
- describe the rule
- predict what comes next
- extend the pattern. E.g., How many plants will they put in the tenth section?

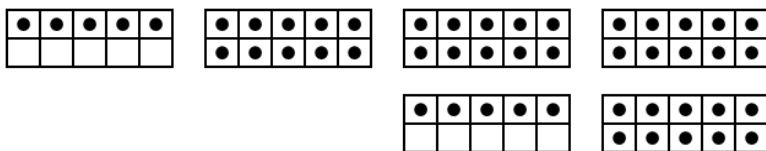
General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- 10-frame Patterns – build an increasing pattern by placing counters on the 10-frame and ask students to identify how the pattern is growing. E.g., Pattern – 5, 10, 15, 20

These 10-frames show that the numbers increase by 5 because another full row of 5 is filled each time.



(3PR1.1)

- Headband – Guess my Pattern - Students play with a partner. One player will wear a headband with a number pattern strip picked from a bag. The player wearing the headband cannot see the number pattern but must ask his/her partner questions to figure out the pattern. They must ask questions to find out the starting number, the pattern rule, and a missing term or three additional terms. (Or the start number can be given.) Examples of questions students might ask their partner:

- Does the pattern start with an even or odd number?
- Is it a multiple of 10?
- Does it have 1 digit, 2 digits, 3 digits?
- Is it greater than 10?
- Is the pattern increasing? Or decreasing?
- Is the rule (add or subtract) by 2, 5, 6, etc.
- Does the pattern increase by 5's?
- Does it increase by more (less) than 5?

(3PR1.1)

Paper and Pencil

- Give students a number pattern and ask them to write the pattern rule. Check that students have included a starting point and how the pattern continues. (3PR1.1)

Resources/Notes

Math Makes Sense 3

Lesson 1 (Cont'd): Exploring Increasing Patterns

3PR1

TG pp. 4 – 6

Additional Reading:

Navigating through Algebra in Grades 3-5 (2001)

Small, Marion (2008) *Making Math Meaningful for Canadian Students K-8*. Chapter 20.

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

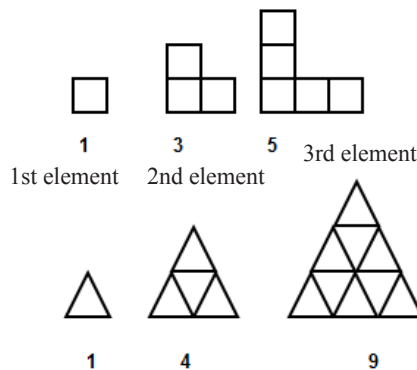
3PR1 Continued

Achievement Indicator:

3PR1.2 Identify the pattern rule of a given increasing pattern, and extend the pattern for the next three elements.

Elaborations—Strategies for Learning and Teaching

Students are given the beginning of a pattern (at least three elements) then asked to extend the pattern by three more elements. They should always look backward to the beginning of the pattern to see that their idea works for the rest of their pattern.



50, 100, 150, 200, ...

6, 13, 20, 27, ...

5, 8, 12, 17, ...

2, 2, 4, 4, 4, 4, 6, 6, 6, 6, 6, 6, ...

Ask students to work on word problems in pairs:

1. Ms. Mercer’s class planted a special seed. On Monday the plant is 2 cm high. On Tuesday the plant has doubled its height and is 4 cm high. Each day the plant doubles its height from the day before. How high will the plant be on Friday? Students can make a table showing each day of the week and how tall the plant is on each day (they can also use manipulatives to make the pattern.)

2. Lily’s new puppy, Pokey, is growing fast. When Lily first got Pokey he weighed only 1 kg. After 1 month Pokey weighed 7 kg. After 2 months, Pokey weighed 12 kg. After 3 months Pokey weighed 16 kg. Lily saw a pattern. Find a pattern to tell how much Pokey weighed after 5 months.

Ask students to complete a table like the one below:

Months	At First	1	2	3	4	5
Pokey’s Weight	1 kg	7kg	12kg	16kg		
Weight Gained		6kg	5kg	4kg		

Pattern: Start at 2 kg. Add 4 kg and then 1 kg less each time.

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Resources/Notes

Journal

- Provide students with a choice of 3 increasing patterns. Students are asked to choose one pattern to extend for the next three elements and explain the rule.

Sample Shape Pattern



Sample Number Pattern

1, 2, 4, 8, __, __, __

Math Makes Sense 3

Lesson 1 (Cont'd): Exploring Increasing Patterns

3PR1

TG pp. 4 – 6

(3PR1.2)

Paper and Pencil

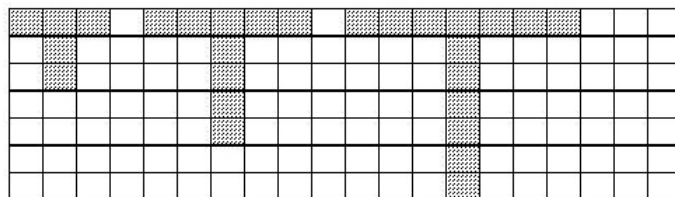
- Extending Patterns – Ask students to complete a chart similar to the one below:

Pattern	1	2	3	4	5	6
Number of X's	X	XX XX	XXX XXX XXX	_____	_____	_____
Number of ♥'s	♥	♥♥ ♥	♥♥♥ ♥♥	_____	_____	_____
Number of ☞'s	☞	☞☞	☞☞☞	_____	_____	_____
Number of *'s	***	*** ***	*** *** ***	_____	_____	_____

Ask them to extend each pattern three times and record each number pattern. (3PR1.2)

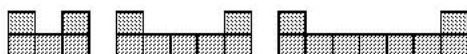
Portfolio

- Provide 1 cm grid paper for the students. Present a pattern such as the one below. Students will use coloured pencils to continue the pattern. Next, ask the students to create their own growing patterns.



(3PR1.2)

- Ask students: How many tiles are needed to make the next 3 figures?



(3PR1.2)

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Continued

Achievement Indicator:

3PR1.3 Identify and explain errors in a given increasing pattern.

Elaborations—Strategies for Learning and Teaching

Students are provided with a variety of increasing patterns which contain errors. Students determine what the pattern is and then explain the error. E.g., 3, 7, 11, 15, 19, 23, 26, 31, 35, 39. The pattern rule is: Start at 3. Add 4 each time.

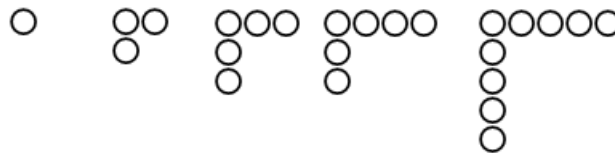
Therefore, 26 is an error since it is only adding on 3 not 4 and 31 is a second error since it is adding 5 and not 4.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

Hint: To help students visualize this pattern they can shade numbers on a hundreds chart and look for the mistake:

Students can see that 26 does not fit the number pattern. It is an error.

In the following example, the shape pattern rule is: Start with 1 counter. Add 1 to each row and column each time.



Therefore the fourth element is a error. There should be 4 counters in the column not 3.

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Provide the start of an increasing pattern. Ask students to continue the pattern for the next 3 elements and to describe the pattern rule. (3PR1.2)

Paper and Pencil

- Give students number patterns such as those below and ask them to find and circle the error.

475, 575, 685, 775

233, 243, 253, 262

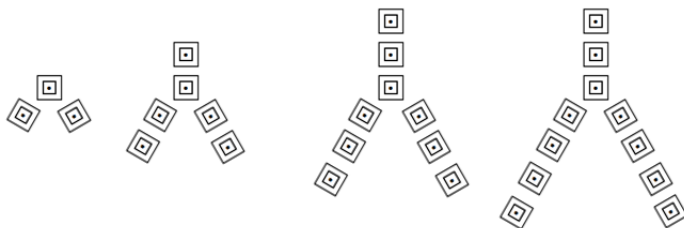
25, 28, 32, 34

7, 12, 15, 19

(3PR1.3)

Journal

- Present students with the following growing pattern. Ask them to find the error and explain how they know.



(3PR1.3)

Resources/Notes

*Math Makes Sense 3***Lesson 1 (Cont'd):** Exploring Increasing Patterns**3PR1**

TG pp. 4 – 6

Strand: Patterns and Relations (Patterns)

Outcomes

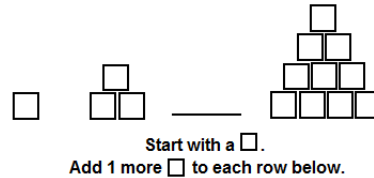
Students will be expected to

3PR1 Continued**Achievement Indicator:**

3PR1.4 Identify and apply a pattern rule to determine missing elements for a given pattern.

Elaborations—Strategies for Learning and Teaching

Since patterns increase in a predictable way, to determine a missing step students will look at the pattern that comes before and after. They must identify the pattern rule.



15, 26, 37, 48, ____, 70, 81 Start at 15. Add 11 each time.

5, 6, 8, 11, ____, 20, 26, 33, 41 Start at 5. Add 1, and then increase the number added by 1 more each time.

13, 26, ____, 52, 65, 78, 91 Start at 13. Add 13 each time.

Ask students to practice finding missing elements by making patterns, covering a step and asking a partner “What’s missing?”

Literature Connection - Read the following *Skip Count Cheerleaders* chants from *Riddle-iculous MATH* by Joan Holub. Ask students to fill in the missing element as they chant:

2, 4, 6, 8,

Who do we appreciate?

8, 10, 12, _?_

Our soccer coach, Ms. Mordeen.

5, 10, 15, 20,

Who do we all like, and plenty?

20, 25, 30, _?_

Our lunch lady, Mrs. Dive.

20, 30, 40, 50,

Who do we all think is nifty?

50, 60, 70, _?_

Our principal, Mr. Grady.

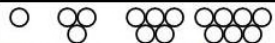
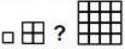
General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Pattern BANG! – Have a variety of cards in a paper bag, such as the examples below:

Sample Cards

 What is the pattern rule?	3, 6, 9, __, 15, 18 What is the missing term?
25, 50, 75, __, __, __ Extend the pattern	4, 8, 11, 16, 20 What is the error in this pattern?
18, 21, 24, 27, __ Which number comes next?	 What is the missing element?
Bang!	Bang!

Include 1 BANG card for every 4 or 5 question cards.

Give each small group a bag. Students take turns drawing a card out and answering the question. If the student answers correctly, she/he gets to keep the card, (group members can help each other with the answer). They then pass the bag to the next player. If a student pulls out a BANG card, she/he must put all of her/his cards back into the bag (leaving the BANG card out). They continue playing until there are no cards left in the bag and whoever has the most cards wins.

(3PR1.1, 3PR1.2, 3PR1.3, 3PR1.4)

- Ask each student to make a growing pattern using manipulatives. Next she/he covers one element of the pattern to reveal it to a classmate. The classmate will then recreate the pattern putting in the missing element. The initial pattern is uncovered and the two patterns compared.

(3PR1.8, 3PR1.4)

Paper and Pencil

- In pairs, ask students to make up their own chants and riddles which include including a missing element, to put into a class *Riddle-iculous MATH* book.

(3PR1.4)

Resources/Notes

Math Makes Sense 3

Lesson 1 (Cont'd): Exploring Increasing Patterns

3PR1

TG pp. 4 – 6

Children's Literature (not provided):

Holub, Joan. *Riddle-iculous Math*
 ISBN: 9780807549964

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Continued

Achievement Indicator:

3PR1.5 Describe the strategy used to determine missing elements in a given increasing pattern.

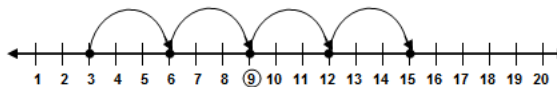
Elaborations—Strategies for Learning and Teaching

Students identify the pattern rule and then describe how they discovered that rule. E.g., 3, 6, ____, 12, 15

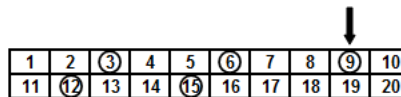
The rule is: Start at 3. Add 3 each time.

Possible strategies to determine missing elements include use of:

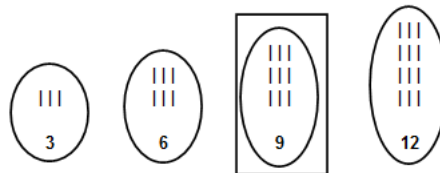
- Number lines



- Hundreds chart



- Pictures



- Manipulatives

- Skip counting

It is important to accept other possible strategies that students use and to discuss them.

 General Outcome: Use Patterns to Describe the World and to Solve Problems

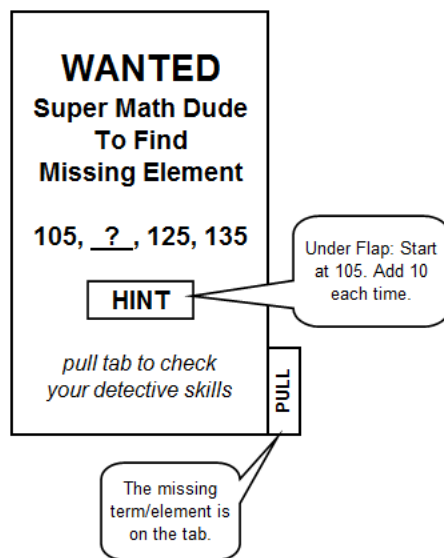
Suggested Assessment Strategies

Paper and Pencil/Portfolio

- Wanted Poster – students will make wanted posters, asking readers to find the missing element of an increasing pattern. See sample below:

Students create a number or shape pattern, leaving one element out. They will include a hint flap, which tells the pattern rule for those who need to use it. Also, they will create a pull tab, which will give the missing element so that the “detectives” can check to see if they are correct.

Note: To make pull tab, tape half of an envelope to the back of the poster for sliding the tab card in and out (be sure the tab is longer than the envelope).



(3PR1.5, 3PR1.4)

Student-Teacher Dialogue

- Where is the Birthday Party today? (Can be included in Morning Routine). Present students with a pattern of numbers on a display of houses. Add six extra houses with no number. Ask students to tell what the pattern is. Tell students that the party will be at a certain house (pick an extended number from the pattern). Ask students to pick out the location of the house and describe the strategy (pattern rule) they used. Examples of streets could be:
 - Street # 170, 180, 190, House 4, House 5, House 6 Rule: Start at 170. Go up by 10 each time. The party is at house number 200.
 - Street # 31, 36, 41, House 4, House 5, House 6 . Rule: Start at 31. Increase by 5 each time. We are looking for the house which would have the street number 61.
 - Street # 101, 104, 107, House 4, House 5, House 6. Rule: Start at 101. Increase by 3 each time. The party is at house number 116.

(3PR1.1, 3PR1.5, 3PR1.9)

Resources/Notes

Math Makes Sense 3

Lesson 1 (Cont'd): Exploring Increasing Patterns

3PR1

TG pp. 4 – 6

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Continued**Achievement Indicator:**

3PR1.6 Create a concrete, pictorial or symbolic representation of an increasing pattern for a given pattern rule.

Elaborations—Strategies for Learning and Teaching

Give students various pattern rules to create their own model, picture or number representation.

To represent concretely they can choose from a variety of manipulatives (such as pattern blocks, coins or buttons) or they may choose to draw a picture or use numbers. E.g.,

Start at 2 and double each time.

2, 4, 8, 16, ...

Examples of other increasing number patterns include:

1, 2, 2, 3, 3, 3, ... each digit repeats according to its value

2, 4, 6, 8, 10, ... even numbers – skip counting by 2

1, 2, 4, 8, 16, ... double the previous number

2, 5, 11, 23, ... double the previous number and add 1

1, 2, 4, 7, 11, 16, ... successively add 1, then 2, then 3, and so on

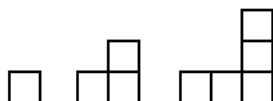
2, 2, 4, 6, 10, 16, ... add the preceding two numbers

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Staircase – Give students the first 3 frames of a staircase pattern (see below). Ask them to use square tiles pattern blocks, base-ten units, or multi-link cubes to build the next three frames of the staircase pattern. Students then predict what each frame will look like before they build it.



Frame 1 Frame 2 Frame 3

A growing pattern can be recorded in a table. This allows students to see the relationship between a concrete/pictorial pattern and the corresponding number pattern. Ask students make a table and record the number of frames, the number of squares added each time and the number of squares in each frame.

Frame	Squares Added	Squares in a Frame

(3PR1.6, 3PR1.7)

Resources/Notes

*Math Makes Sense 3***Lesson 2:** Exploring Increasing Patterns**3PR1**

TG pp. 7 – 9

Children's Literature (not provided):Hutchins, Pat. *The Doorbell Rang*
ISBN: 0688092349Anno, Mitsumasa. *Anno's Magic Seeds*

ISBN: 9780698116184

Crews, Donald. *Ten Black Dots*
ISBN: 978-0688135744Hong, Lily Toy. *Two of Everything*
ISBN: 978-0807581575

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

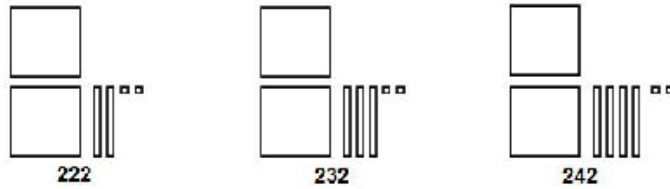
3PR1 Continued

Achievement Indicator:

3PR1.7 Create a concrete, pictorial or symbolic increasing pattern; and describe the relationship, using a pattern rule.

Elaborations—Strategies for Learning and Teaching

Students may use base ten blocks to concretely create an increasing pattern with larger numbers. For example,



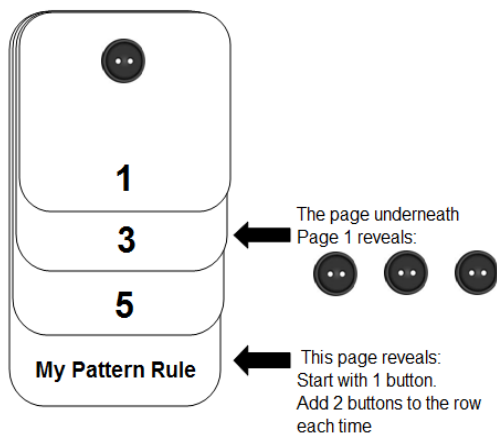
Pattern Rule: Start at 222. Add 10 each time.

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance/Paper and Pencil

- Students will build a concrete pattern of their choice using objects such as pattern blocks, square tiles, base ten blocks, buttons, coins, etc. Next, ask students to create a flip book with each page slightly bigger than the next (stapling the smallest page on the top and largest page on the bottom). Students draw the increasing pattern on the top of each page and label the bottom of each page with the correct numeric value. When the book is closed the number pattern will be visible and as they open each page the picture will be revealed. The last page of the book reveals the pattern rule. Extend the above activity by having students exchange their flip book with a partner. Each student will then use manipulatives to concretely create the number pattern represented on the outside flaps. Then ask students to describe to their partner the pattern rule before checking the last page. Observe students' concrete representations and ability to describe the pattern rule to each other.



(3PR1.7, 3PR1.8)

Resources/Notes

Math Makes Sense 3

Lesson 2 (Cont'd): Exploring Increasing Patterns

3PR1

TG pp. 7 – 9

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Continued

Achievement Indicator:

3PR1.8 Solve a given problem, using increasing patterns.

Elaborations—Strategies for Learning and Teaching

Students should have frequent experiences with solving real-world problems that interest and challenge them. Ask students to solve the following problems:

- Carrie buys Yummy cat food for her cat, Cleo. One can of Yummy costs 15¢. How many cans can she buy for 90¢?

Complete a table

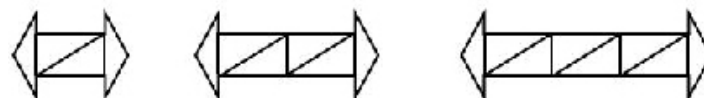
Cans of Yummy	1	2	3			
Cost	15¢	30¢	45¢			

- Robert decided to count the pennies in his piggy bank. After he counted them, he made a pattern. His pattern looked like this:



How many pennies will he need for the 5th element in his pattern?
(Problem-Solving Experiences in Math Grade 3, Charles and Lester, 1985, p.52)

- Sarah wants to make an increasing pattern out of 25 stickers. How many different ways can Sarah make an increasing pattern? She does not have to use all of her stickers.
- Give students the task of discovering how many triangles can make a five-day-old caterpillar. Ask them to use pattern block triangles to construct the following:



They will need to continue the pattern to determine how many blocks a five-day-old caterpillar will have. They can use a T-chart to show the relationship between the age of the caterpillar, in days, and the number of triangles in its body.

Caterpillar Age (days)	Number of Triangles
1	4
2	6
3	8
4	10
5	?

(continued)

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Paper and Pencil

- The Ups and Downs of Patterns – Distribute ‘Ricardo’s Growth Chart’. Ask students to describe the patterns they see.

Pose the following questions:

At what ages do the growth patterns change?

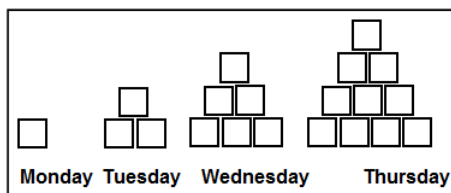
At what ages was Ricardo growing fastest? Slowest?

(3PR1.8, 3PR1.9)

Ricardo's Growth Chart

Age (years)	Height (centimetres)	Growth (centimetres)
5	92	
6	99	7
7	106	
8	113	
9	120	
10	127	
11	138	
12	149	
13	160	
14	171	
15	175	

- Tell students that tickets for the school concert cost \$3 for every couple. If 10 people go to the concert, ask them how much will they pay for tickets? (3PR1.8, 3PR1.9)
- The Pirates – Present students with the following problem: Mice have been taking chunks of cheese from the captain’s kitchen. They keep stacking the chunks in their den. Each day their stack gets bigger.



If the mice keep using the same pattern, what will the stack look like on Sunday? Students may use cubes to figure out the pattern.

(Source: Get Your Hands on Problem Solving Grade 3, 1998, p.2)

(3PR1.2, 3PR1.9)

Resources/Notes

Math Makes Sense 3

Lesson 2 (Cont’d): Exploring Increasing Patterns

3PR1

TG pp. 7 – 9

Additional Reading:

Get Your Hands on Problem Solving Grade 3, 1998, p.2

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Continued

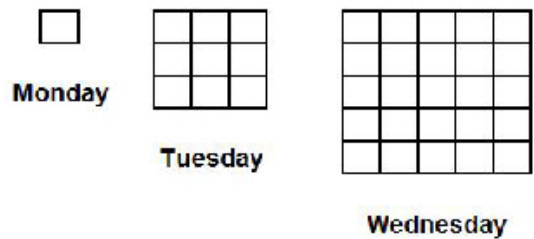
Achievement Indicator:

3PR1.8 Continued

Elaborations—Strategies for Learning and Teaching

Literature Connections -The *Quiltmaker's Gift* by Jeff Brumbeau, provides opportunities to engage students in exploring geometric patterns and principles in a real-world context of quilting. After reading the book students can work on the following jean quilt problem:

Sarah is making a jean quilt with blocks. She adds a border each day as seen below (you may use a T-chart to help you).



Draw the pattern she will make on Thursday. How many blocks will she have to add on Friday? On what day will she have added 48 blocks?

Another literature connection is, *Minnie's Diner* by Dayle Dodds. After reading and discussing the book, ask: If each special cost \$4.00, how much money did it cost each brother? How much did it cost for the whole McFay family? Complete a T-chart to find your answers.

Number of Specials	Cost
Will - 1 Special	\$4.00
Bill - 2 Specials	\$8.00

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Paper and Pencil/Portfolio

- Students create their own menu with five items. Students can choose what pattern they would like to use in increasing the number of specials. They indicate the cost per each increase. Once a menu is created students glue their worksheet onto construction paper and continue with their menu design. The menus can be colourful, decorative, the five items should be original and follow an increasing pattern rule.

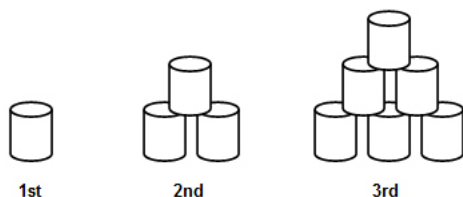
When each menu is completed it can be posted on a bulletin board. Students will view the posters of classmates and attempt to state the increasing pattern rule in each menu.

(3PR1.9)

Journal/Student-Teacher Dialogue

- Food Items – Ask students to pretend they are grocery store workers and they have to restack the soup cans before going home. In the first minute they stack 1 can, the second minute, stack 3 cans, and in the third minute they stack 6 cans. Continuing the shape pattern below, how many cans will be stacked in the sixth minute?

Students can model this problem concretely and then explain their findings in their journals using pictures, numbers and words.



(3PR1.8)

Resources/Notes

Math Makes Sense 3

Lesson 2 (Cont'd): Exploring Increasing Patterns

3PR1

TG pp. 7 – 9

Children's Literature (provided):
Brumbeau, Jeff, *The Quiltmaker's Gift*

Dodds, Dayle, *Minnie's Diner*

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Continued**Achievement Indicator:**

3PR1.9 Identify and describe increasing patterns in the environment.

Elaborations—Strategies for Learning and Teaching

Patterns are found in everyday life. Students need opportunities to recognize patterns in their world. Use the outdoors to extend students' learning about patterns. Organize a 'Math Trail' which consists of a sequence of designated sites along a planned route where students stop to explore patterns in the environment and record what they find. E.g.,

- Hometown: house numbers, post office boxes, fences, flower gardens, etc.
- School: calendar, books, lockers, number lines, classroom doors, stairs, etc.
- Nature : gardens, pine cones, ferns, etc.

Following the exploration, students discuss the patterns they observed.

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Ferns – A fern has just begun to grow. On day one it had 1 leaf, on day two it had 3 leaves, on day four it had 7 leaves. How many leaves will the fern have on day eight?



- Dog Years – One year in a human's life is equivalent to seven years of a dog's life. If you were three years old when you got your puppy and now you are eight, how old is your dog now, in dog years? Use a table to organize your data. (3PR1.8, 3PR1.9)

Resources/Notes

Math Makes Sense 3

Lesson 2 (Cont'd): Exploring Increasing Patterns

3PR1

TG pp. 7 – 9

Additional Reading:

National Council of Teachers of Mathematics, *Trail Blazers: Teaching Children Mathematics*, March 2010

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Continued

Achievement Indicator:

3PR1.10 Compare numeric patterns of counting by 2s, 5s, 10s, 25s and 100s.

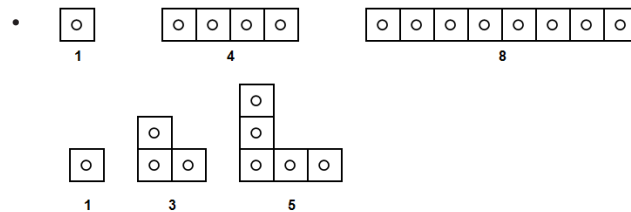
Elaborations—Strategies for Learning and Teaching

Many everyday situations provide opportunities for students to compare number patterns. When comparing increasing patterns, compare the starting point and the change that occurs each time.

Ask students to clap 2 more times than the student before them. Afterwards change the pattern rule from: Start with 2 claps. Add 2 claps each time, then change the pattern rule to: Start with 2 claps. Add 3 claps each time. Discuss and compare the two pattern rules.

Compare the patterns in each set:

- Start at 2. Add 5 each time. 2, 7, 12, ...
Start at 2. Double each time. 2, 4, 8, ...



- Start with 3 blocks. Add 2 each time. 3, 5, 7, ...
Start with 4 blocks. Add 2 each time. 4, 6, 8, ...

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Pattern Strips – Have a variety of cards with a number or shape on it, to be the start point of an increasing pattern. Ask students to choose a card and then to create 4 different increasing patterns from this starting point. They may put each pattern on a piece of paper folded into 4 strips or use a sheet similar to the one below.

Pattern Strips

Name _____	Date _____
1. <input style="width: 90%;" type="text"/>	
2. <input style="width: 90%;" type="text"/>	
3. <input style="width: 90%;" type="text"/>	
4. <input style="width: 90%;" type="text"/>	

E.g., if a student chooses a card with 5 on it, some possible patterns they could create are:

5, 7, 9, 11,...

Pattern Rule: Start at 5. Add 2 each time.

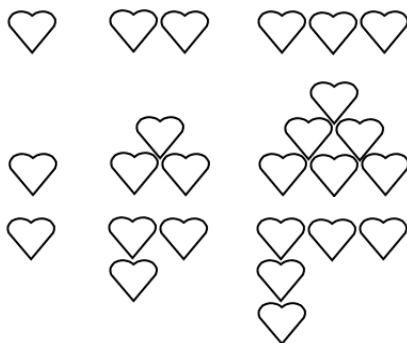
5, 10, 20, 40,...

Pattern Rule: Start at 5. Double each time.

5, 6, 8, 11, 14,...

Pattern Rule: Start at 5. Add 1, and then increase the number added by 1 each time.

E.g., if a student chooses a card with a heart on it some possible patterns they could create are:



(3PR1.10, 3PR1.11, 3PR1.6)

Resources/Notes

Math Makes Sense 3

Lesson 2 (Cont'd): Exploring Increasing Patterns

3PR1

TG pp. 7 – 9

Math Makes Sense 3

Lesson 3: Comparing Increasing Patterns

3PR1

TG pp. 10 – 12

Additional Activity:

Patterning Mix-Up

TG p. ix and 43

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Continued**Achievement Indicator:**

3PR1.11 Locate and describe various increasing patterns found on a hundred chart, such as horizontal, vertical and diagonal patterns.

Elaborations—Strategies for Learning and Teaching

Using a large hundred chart, show a pattern rule such as skip counting by 3. Note: When skip counting by 3, use only starting points that are multiples of 3 (3, 6, 9, 12...).

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Duplicate small copies of hundred charts. Ask students to shade in their own patterns that show multiples of two and multiples of four (starting only at numbers that are multiples of two when counting by two and only numbers that are multiples of four when counting by four). Students can write a description of their pattern. E.g., if they chose 5, the pattern is two vertical columns, with numbers ending in the digits 5 or 0. Discuss the pattern rules created by going horizontally, vertically or diagonally.

Give students a pattern rule such as, start at 4. Add 5 each time. They shade this pattern on their individual hundred charts and discuss.

Secret Pattern - Ask students to think of a number pattern for a hundred chart. They must keep it secret and colour the first ten numbers in their pattern on a hundred chart. Next they trade patterns with a partner and describe the patterns in their partner's chart. They write the numbers in the pattern and extend the pattern.

(continued)

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Student-Teacher Dialogue

- Show students a hundred chart with the first few numbers of a pattern coloured. Ask them to tell you what pattern is represented and what would come next in the pattern.
(3PR1.10, 3PR1.1, 3PR1.2)

Paper and Pencil

- Comparing Hundred Chart Patterns – Give students a 5-wide hundred chart with some numbers missing. Ask them to complete the chart. Ask students to count by 2s and shade these numbers with one colour. Then count by 5s and shade these numbers with a different colour. Also, start at 8 and count on by 10s. Shade these numbers with a third colour. Next use a 10-wide hundred chart and repeat the number patterns from the previous chart. Ask students: How are the patterns in the two charts the same? How are the patterns different?

5-wide Hundred Chart

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50
51	52	53	54	55
56	57	58	59	60
61	62	63	64	65
66	67	68	69	70
71	72	73	74	75
76	77	78	79	80
81	82	83	84	85
86	87	88	89	90
91	92	93	94	95
96	97	98	99	100

10-wide Hundred Chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

(3PR1.10, 3PR1.5, 3PR1.11, 3PR1.6)

Resources/Notes

Math Makes Sense 3

Lesson 4: Increasing Number Patterns

3PR1

TG pp. 13 – 15

Additional Activities:

Roll and Go!

TG pp. ix and 42

Missing Numbers

TG p. ix and 44

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR1 Continued**Achievement Indicators:**

3PR1.11 Continued

Elaborations—Strategies for Learning and Teaching

Pick a Hundred Chart Pattern - Students choose one of the following to shade in on a hundred chart and then describe:

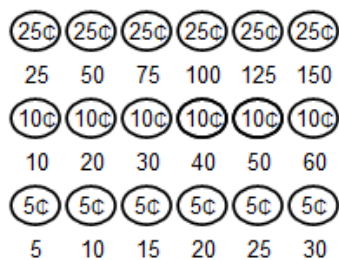
1. Numbers with a 2 in the tens place.
2. Numbers with a 4 in the ones place.
3. Numbers that are a multiples of 3.
4. Numbers with a 7 in the tens place.
5. Numbers that are multiples of 5.
6. Numbers with a 0 in them.
7. Numbers with a 5 in the tens place.
8. Numbers having both digits the same.
9. Numbers that are multiples of both 2 and 3.
10. Numbers whose digits add to 9. (For example, in 63, the digits 6 and 3 add to 9). Ask students to look at the shaded area and describe a pattern rule for the shaded sections.

3PR1.10 Continued

Students need opportunities to compare numeric patterns, discussing how they are the same and how they are different.

Give students a page with four small hundred charts. Ask them to skip count and shade one chart by 2s, one chart by 5s, one chart by 10s and one chart by 25s. Then discuss the pattern rule, in each chart including similarities and differences among the charts.

Coin Comparison - Make an array of coins with 6 quarters in the first row, 6 dimes in the second row and 6 nickels in the third row. In the first row write the money amount under each quarter adding the money as you go. Do the same for the row of dimes and nickels.



Discuss and compare the pattern rule for each row.

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Skip Counting on the Hundreds Chart – As the class counts aloud by twos, place a counter over each number on the hundreds chart transparency. Discuss the pattern. Ask students to look away while one (or several) counters are removed. Are students able to tell you which numbers need to be covered to complete the pattern. Repeat for multiples of 3, 4 and 5. Then distribute copies of the hundreds chart and counters and ask students to repeat the activity working in small groups.

(*Hands-on Math* grades 2-3, Glenda Nugent, 1995, p. 32)

(3PR1.10, 3PR1.6, 3PR1.4)

Journal

- Ask students to look for numeric patterns in books and using manipulatives, model the patterns. Next, they can represent the patterns in their journal pictorially, with a stated pattern rule.

(3PR1.6, 3PR1.10, 3PR1.7, 3PR1.1)

Resources/Notes

Math Makes Sense 3

Lesson 4 (Cont'd): Increasing Number Patterns

3PR1

TG pp. 13 – 15

Children's Literature (not provided):

Friedman, Aileen, *The King's Commissioners*

ISBN: 978-0590489898

Strand: Patterns and Relations (Patterns)

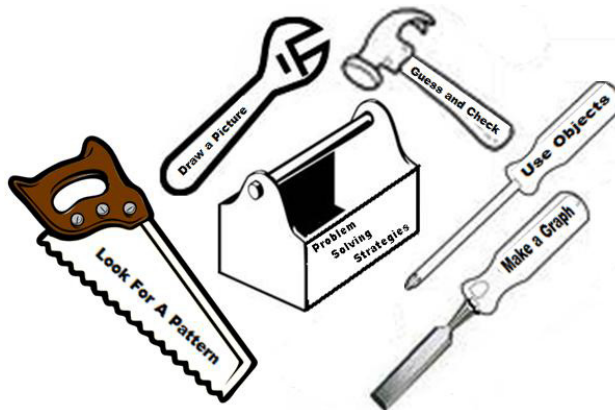
Outcomes

3PR1 Continued

Problem Solving Strategy:
Use a Pattern

Elaborations—Strategies for Learning and Teaching

Problem solving strategies introduced in previous grades should be reviewed and extended. It is important to explicitly discuss problem solving strategies with students, preferably as they come up naturally in classroom activities and discussions. There is value in naming the strategies so that students can discuss and recall them readily. (Consider posting these different strategies in your classroom as they are taught).



Each unit will focus on a specific problem solving strategy with suggested ideas to practice. Although certain strategies are highlighted in specific units, students are essentially ‘filling their toolboxes’ with problem solving tools that can be used at any time.

Strategy	Units of Focus
Use a Chart	Multiplication and Division
Use a Model	Fractions
Draw a Picture	Measurement
Solve a Simpler Problem	Data Analysis
Work Backward	Addition and Subtraction
Guess and Check	Geometry
Make an Organized List	Numbers to 1 000
Use a Pattern	Patterning

Strategy Focus: Use a Pattern - To solve problems, students will look for a pattern and act out the problem using manipulatives. Acting out problems using objects such as cubes, money, square tiles, etc., is a part of ‘acting’.

“Because mathematics is so full of patterns, students soon learn that using patterns is an effective way to solve problems. This strategy continues to be useful to students as they move up the grades.” Small (2008), p. 44-45.

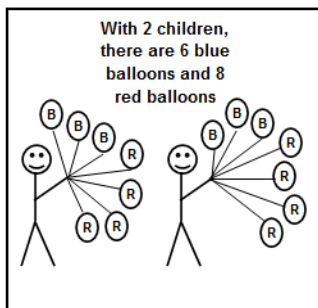
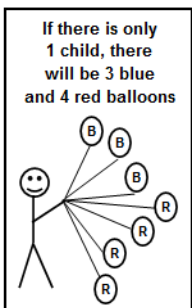
Patterns are found in nature, art, music, movement and numbers. Problems involving growing patterns can be taken from real-world contexts, such as patterns on a calendar, house numbers, locker numbers, money, etc.

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Ask students to solve the following problems:
 - Chelsea’s Pizza – Kids were lining up to buy Chelsea’s cheese pizza. Chelsea and her friend Kris sold 1 slice in the first minute, and 6 slices in the second minute. They sold 11 slices in the third minute, and 16 slices in fourth minute. If the pattern continued, how many slices did they sell in the fifth minute? Extension – If Chelsea started out with 80 slices of pizza, when did she sell her last slice?
(*Get Your Hands on Problem Solving* Grade 3,1998, p. 5)
 - Pet Food Plaza – It is Bargain Bonanza Day at Pet Food Plaza. Sari pays for 8 bags of Healthy Hamster food and gets 16 bags. Vanessa buys 5 boxes of Canary Crunch and gets 10 boxes. Bryan buys 7 Dog Toys and gets 14 toys. If Alex buys 9 bags of Nibble Kibble, how many bags will he get?
Extension (Journal Activity) – Write your own story problem about Bargain Bonanza Day at Pet Food Plaza. Let a friend solve your problem. (*Get Your Hands on Problem Solving* Grade 3,1998, p. 6)
 - You are having a birthday party and have invited 6 people. You will be giving each child 3 blue balloons and 4 red balloons. How many blue balloons will you need? How many red balloons will you need? How many balloons will there be in total? When solving this problem, students can use manipulatives such as different colour snap cubes for balloons. They will record their findings by drawing pictures and recording the numbers in a T-chart to see the pattern.



Children	Blue Balloons	Red Balloons
1	3	4
2	6	8
3	9	12
4		
5		
6		

Resources/Notes

Math Makes Sense 3

Lesson 5: Strategies Tool Kit

TG pp. 16 – 17

Additional Reading: (Provided)

Small, Marion (2008) *Making Math Meaningful to Canadian Students, K–8*, p. 37-59

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR2 Demonstrate an understanding of decreasing patterns by:

- **describing**
- **extending**
- **comparing**
- **creating**

patterns using manipulatives, diagrams, sounds and actions and numbers to 1000.

[C, CN, PS, R, V]

Elaborations—Strategies for Learning and Teaching

Decreasing patterns is a new concept for Grade 3 students. A decreasing pattern is a ‘shrinking’ pattern.

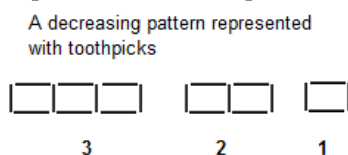
Show students a decreasing pattern, by starting with a large number or shape pattern, then taking away a number or shapes repeatedly. Students will begin with building decreasing patterns and talking about how to extend them in a logical step by step process. Building decreasing patterns with concrete materials such as tiles, cubes, counters, etc. gives students opportunity to try the next step and change it if necessary. Sometimes students are more comfortable during the exploration stage if they can experiment first, using manipulatives, and then commit answers to paper. Several of the same tasks that were suggested with work on increasing patterns can be used with modifications to represent decreasing patterns.

As students begin to investigate patterns, they sometimes confuse repeating patterns with decreasing patterns. Remind them to look for a core first. If they cannot find a core, then the pattern is not a repeating pattern.

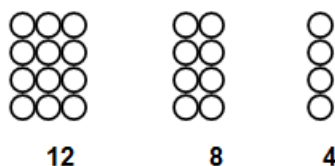
Achievement Indicator:

3PR2.1 Describe a given decreasing pattern by stating a pattern rule that includes the starting point and a description of how the pattern continues.

Give the students the first three or four elements of a decreasing pattern, ask them to determine the pattern rule and explain how the pattern continues. E.g.



Earlier, students became familiar with assigning a numeric value to each element in an increasing pattern. This also applies to decreasing patterns. E.g.



(continued)

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Resources/Notes

Performance/Student-Teacher Dialogue

- Calculator Activity – Ask students to press 100 on their calculator. Ask students to select a number from 1 to 9, e.g., 3. Press the subtract button followed by 3, then press =. The calculator will subtract 3 from the previous number. Record the number displayed. Press = again. Record the new number. Continue pressing = and recording the new number displayed. After several entries, ask the students to predict the next few numbers. Ask: What are some other numbers that are and are not part of the “Decrease by 3” pattern? Is there a rule we can use to predict the numbers? If so, give the rule. Ask students to explore several different numbers from 1 to 9 and see what happens if they start with 100 and then continue to subtract the chosen number. Ask:

What happens when you start with 100 and subtract the chosen number? Will you reach 0?

What numbers could you start with in order to reach 0 using your chosen number? (Adapted from *Navigating through Algebra in Grades 3-5*, (2001).p. 15)

(3PR2.1)

Paper and Pencil

- Ask students to individually create a decreasing pattern pictorially or by using manipulatives. Ask students to switch chairs, write the name of the student who created the pattern and the pattern rule to describe it. Choose students to present their decreasing pattern and say the pattern rule so students can check their answers. Encourage discussion. (Remind students to include a starting point and a description of how the pattern continues).

(3PR2.1)

*Math Makes Sense 3***Lesson 6:** Exploring Decreasing Patterns

3PR2

TG pp. 19 - 22

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR2 Continued

Achievement Indicators:

3PR2.1 Continued

3PR2.2 Identify the pattern rule of a given decreasing pattern, and extend the pattern for the next three terms.

Elaborations—Strategies for Learning and Teaching

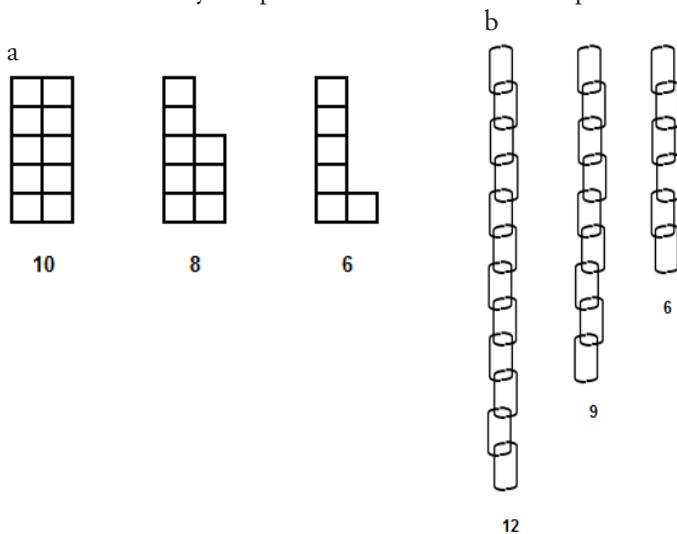
Other numeric patterns include:

- 42, 37, 32, 27, ... The pattern rule is: Start at 42. Count back by 5 each time.
- 160, 150, 140, 130,... The pattern rule is: Start at 160. Subtract 10 each time.
- 108, 105, 102, 99 ... The pattern rule is: Start at 108. Decrease by 3 each time.

Remind students that a pattern rule must have a starting point or the pattern rule is incomplete. E.g., if a student describes the pattern 16, 12, 8, 4, ... as “a decrease by 4 pattern” without indicating that it starts at 16, the pattern rule is incomplete.

Roll and Go - Students flip a coin. If it lands on heads students will create an increasing pattern. If it lands on tails, it means they create a decreasing pattern. Depending on the result, students choose an appropriate starting number. Each player then rolls the number cube. This is the number added or subtracted each time. Ask them to write the next 5 numbers in the pattern. Once it is created, students trade patterns with a partner and find their partner’s pattern rule.

Display a decreasing pattern such as the one shown in the example: Ask students to identify the pattern rule and extend the pattern.

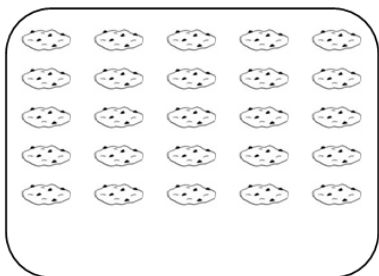


General Outcome: Use Patterns to Describe the World and to Solve Problems

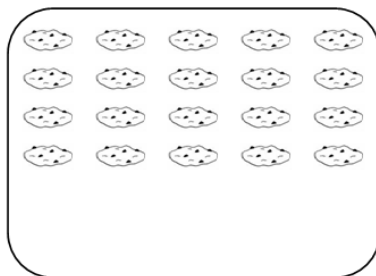
Suggested Assessment Strategies

Performance

- Grandma's Cookies – Present students with the following problem: Grandma baked 25 chocolate chip cookies. She lays them on a tray to cool. Her dog smells the cookies and eats 5 of them. He goes back a second time and eats 5 more. If he continues this pattern, how many times will he be able to return and eat cookies until there are none left? (Students may use counters).



1st time



2nd time

(3PR2.2, 3PR2.3)

Resources/Notes

Math Makes Sense 3

Lesson 6 (Cont'd): Exploring Decreasing Patterns

3PR2

TG pp. 19 - 22

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR2 Continued

Achievement Indicator:

3PR2.3 Solve a given problem, using decreasing patterns.

Elaborations—Strategies for Learning and Teaching

Provide students with the following problem: A monarch caterpillar discovers a milkweed plant that has 24 leaves. It eats 2 leaves each day. If it begins eating on Monday, on what day will all the leaves be eaten?

Ask students to use pattern block triangles to first model the subtraction of milkweed leaves and then use a T-chart to record the number of leaves that are left at the end of each day.

Days	Number of Leaves Left At the End of the Day
1	22
2	20
3	18
↓	↓
12	0

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Paper and Pencil

- The Car Trip – The O’Riley family went on a trip to visit relatives. They recorded the kilometres they drove and the amount of gas they had left at that time:

Distance Driven (km)	Gas Left (litres)
0	14
50	12
100	10
?	?

What patterns do you see?

What rule could you use to describe the number of litres of gas left as the kilometres traveled increase?

Complete the chart to find out how many kilometres they will travel before running out of gas.

(Adapted from *Navigating through Algebra in Grades 3-5*, 2001, p. 28)

(3PR2.3, 3PR2.1, 3PR2.2, 3PR2.11)

Portfolio/Performance

- Decreasing Pattern Story - After exploring the decreasing patterns in *Five Little Monkeys Jumping on the Bed* and *There were Ten in the Bed*, ask students to create their own decreasing pattern stories with a partner. Encourage them to be creative with their stories, possible ideas include using: six headed monsters, butterflies with spots, insects, flower petals, etc.

Afterwards, students will role play their stories and discuss their various pattern rules. (3PR2.3, 3PR2.7, 3PR2.1)

Resources/Notes

*Math Makes Sense 3***Lesson 6 (Cont’d):** Exploring Decreasing Patterns

3PR2

TG pp. 19 - 22

Children’s Literature (not provided):

Christelow, Eileen. *Five Little Monkeys Jumping on the Bed*

Adam, Pam. *There Were Ten in the Bed*

Students may be familiar with these selections as they are in the Grade 1 -2 Mathematics program.

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR2 Continued**Achievement Indicators:**

3PR2.4 Identify and describe decreasing patterns in the environment.

3PR2.5 Compare decreasing numeric patterns of counting backwards by 2s, 5s, 10s, 25s, and 100s.

Elaborations—Strategies for Learning and Teaching

Over a period of 4 days, ask students to be a ‘Pattern Detective’.

Prepare recording sheets containing a large magnifying glass in which students draw or glue a photo of patterns they have seen outside.

Brainstorm, with students, some places that patterns might occur. E.g., Tile borders in a bathroom, tiles on a kitchen floor, in quilts, jewellery, etc. Post students’ work on a bulletin board or create a class book.

When comparing decreasing patterns, compare the starting point and the change that occurs each time.

Ask a class, do one set of 12 jumping jacks (or squats, lunges, twists or any simple exercises). Then do 2 less repetitions for each successive set. Repeat the activity using different exercises and decreasing the number of exercises differently each time.

Other examples:

Pattern A: Start at 20. Subtract 5 each time. 20, 15, 10, ...

Pattern B: Start at 20. Subtract 2 each time. 20, 18, 16...

(continued)

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Journal/Student-Teacher Dialogue

- Give students the following problems, involving decreasing patterns in the environment, and ask them to solve:
 - Locker Numbers – Jane is running for class president. Beginning at locker number 212, she puts a poster on every third locker going down the hall. What are the next 5 locker numbers she put posters on?
 - Money – Harrison is given \$15.00 for his weekly allowance. He spends \$3.00 each day on recess. Use a t-chart to determine how much money he has left at the end of the week?
 - Calendar – Date (Morning Routine)
 - Ask questions such as:
 - What is the date today?
 - What was the date last Friday?
 - What was the date two Fridays ago?
 - Do you see a pattern? Is it increasing or decreasing?
- (3PR2.4, 3PR2.1, 3PR2.3, 3PR2.11)

Paper and Pencil

- Solve the following problem: Adam and Tammy each bring 30 stickers to school on Monday. Everyday Adam gives away 5 stickers and Tammy gives away 3. How many stickers will Adam and Tammy each have on Friday?

Day	Mon	Tues	Wed	Thurs	Fri
Adam	30	25			
Tammy	30	27			

Ask students to complete a table to find the answer.

(3PR2.5)

Resources/Notes

*Math Makes Sense 3***Lesson 6 (Cont'd):** Exploring Decreasing Patterns

TG pp. 19 - 22

*Math Makes Sense 3***Lesson 7:** Creating and Comparing Decreasing Patterns

3PR2

TG pp. 23-25

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR2 Continued

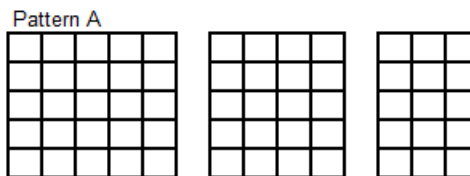
Achievement Indicators:

3PR2.5 Continued

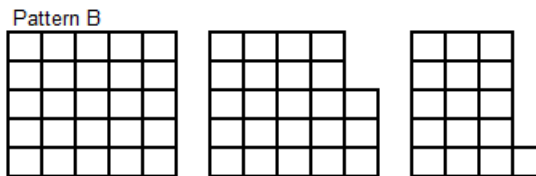
3PR2.6 Create a concrete, pictorial or symbolic decreasing pattern for a given pattern rule.

Elaborations—Strategies for Learning and Teaching

Discuss why Pattern B has 1 block left over and Pattern A has none left.



**Pattern Rule: Start with 25 square tiles.
Remove 1 column of 5 each time**



**Pattern Rule: Start with 25 square tiles.
Decrease by 2 square tiles each time.**

Pattern C: Start with 12 blocks. Decrease by 3 each time. 12, 9, 6, ...

Pattern D: Start with 10 blocks. Decrease by 3 each time. 10, 7, 4, ...

Give students various pattern rules to create their own model, picture or number representation.

To represent concretely they can choose from a variety of manipulatives (such as pattern blocks, coins or buttons) or they may choose to draw a picture or use numbers.

E.g., Start at 32. Decrease by 4 each time.

32, 28, 24, 20, ...

Examples of other decreasing number patterns include:

5, 5, 5, 5, 5, 4, 4, 4, 4, 3, 3, 3, ... each digit repeats according to its value

14, 12, 10, 8, ... even numbers – skip counting by 2

16, 8, 4, 2, ... half the previous number

2, 5, 11, 23, ... half the previous number and add 1

1, 2, 4, 7, 11, 16, ... successively add 1, then 2, then 3, and so on

2, 2, 4, 6, 10, 16, ... add the preceding two numbers

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Pattern Strips – This task was previously used for increasing patterns on page 57. Have a variety of cards with a number or shape on it, to be the start point of a decreasing pattern. Ask students to choose a card and then to create 4 different decreasing patterns from this starting point. E.g., if a student chooses a card with 40, some possible patterns they could create are:

40, 35, 30, 25, ...

Pattern Rule: Start at 40. Decrease by 5 each time.

40, 37, 34, 31, 28, ...

Pattern Rule: Start at 40. Subtract 3 each time.

40, 20, 10, 5

Pattern Rule: Start at 40. Decrease by half the number each time.

40, 39, 37, 34, 30, ...

Pattern Rule: Start at 40. Subtract 1, and then decrease the number subtracted by 1 each time.

(3PR2.5, 3PR2.8)

- Make a Worm – Using base-ten blocks, ask students to make a worm family with 5 members. Each worm in the family is “two” smaller than the one before. Make the whole family and record how much the worm family shrinks each time. (3PR2.6)
- What’s My Pattern? – Ask students to work in pairs using pattern blocks or other manipulatives. Create a visual barrier between the students’ work areas. One student will create a pattern and then verbally give the pattern rule to the other student, who will try and recreate the pattern. Then the students will remove the barrier and compare their patterns. (3PR2.6)

Resources/Notes

Math Makes Sense 3

Lesson 7: Creating and Comparing Decreasing Patterns

3PR2

TG pp. 23-25

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

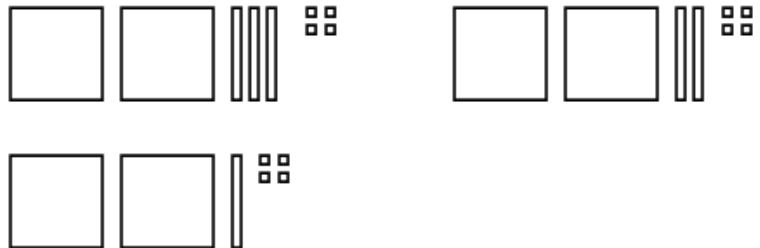
3PR2 Continued

Achievement Indicator:

3PR2.7 Create a concrete, pictorial or symbolic decreasing pattern; and describe the relationship, using a pattern rule.

Elaborations—Strategies for Learning and Teaching

Students are given many opportunities to create decreasing patterns using manipulatives, pictures and numbers and then explaining their pattern rule. For example, they may use base ten blocks to create the following pattern:



The pattern rule is: Start at 234. Subtract 10 each time.

Provide each group with a number belonging to a pattern, e.g., 8, 4, 6, 2, 10. A member from each group will display their number (in the correct order) to form the pattern. The class will come up with the pattern and provide two or three additional numbers in extending the pattern. As well, a question mark can replace one element or term so students can guess the missing step.

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Same Pattern, Different Stuff – In pairs, have one student make a decreasing pattern with one set of manipulatives. Have the other student make the same pattern using a different manipulative. (3PR2.7)
- Cleaning Up – Tell students that the students in the class next door are having a class party. They want to help the teacher keep the classroom clean. As each student finishes their meal, he/she removes their plate and cutlery (fork and knife). There are 16 students and one cleans up at a time. Create a table to show the pattern of plates and cutlery left.

Cleaning Up

Plates	16	15	14	13	14							
Cutlery (fork & knife)	32	30	28	26	24							

Describe the pattern of the number of plates and cutlery students leave.

Note: Students can use counters and toothpicks to represent plates and cutlery. (3PR2.7, 3PR2.6, 3PR2.5)

Resources/Notes

Math Makes Sense 3

Lesson 7 (Cont'd): Creating and Comparing Decreasing Patterns

3PR2

TG pp. 23-25

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR2 Continued**Achievement Indicator:**

3PR2.8 Identify and describe various decreasing patterns found on a hundred chart, such as horizontal, vertical and diagonal patterns.

Elaborations—Strategies for Learning and Teaching

Many of the tasks mentioned earlier are repeated with modifications for decreasing patterns.

Model, on a large hundreds chart a decreasing pattern rule such as: Start at 99. Subtract multiples of 3.

Provide copies of hundred charts. Ask students to pick a number from 2 to 10. They will begin with 100 and skip count using that number, shading in the number for each count all the way to 1. Then they write a description of a pattern. For example, if they chose 5, the pattern is two vertical columns, with numbers ending in the digits 5 or 0.

Give students a pattern rule such as, start with 100 and subtract 5 each time. They shade this pattern on their individual hundred charts and discuss.

Secret Pattern - Ask students to decide on a decreasing number pattern for a hundreds chart. They must keep it secret and colour the first ten numbers in their pattern on a hundred chart. Next they trade patterns with a partner and describe the patterns in their partner's chart. They write the numbers in the pattern and extend the pattern.

Give students a page with four small hundred charts. Ask them to skip count backwards (starting at 100) and shade each chart by 2s on one chart, 5s on another chart, 10s on another chart and 25s on another chart. Then discuss the pattern rule, including similarities and differences among the charts.

Counting Coins - Students take a handful of the same coin and count the amount they have by skip counting. Use either nickels, dimes, quarters or toonies to represent 2 dollars or loonies to represent 100 cents. Next they remove one coin at a time, counting backwards. This gives them the opportunity to count backwards by 2, 5, 10, 25 and 100.

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Student-Teacher Dialogue

- Show students a hundred chart with the first few numbers of a decreasing pattern coloured. Ask them to tell you what pattern is represented and what would come next in the pattern. (3PR2.8)

Performance

- Skip Counting on the Hundreds Chart – Using an overhead projector and a transparency, ask students to count backwards (aloud) by twos, place a counter over each number on the hundreds chart transparency. Discuss the pattern. Remove one (or several) counters. See if the students can tell you which numbers need to be covered to complete the pattern. Repeat for multiples of 3, 4 and 5. Then distribute copies of the hundreds chart and counters and ask students to repeat the activity working in small groups. (Hands-on Math grades 2-3, Glenda Nugent, 1995, p. 32) (3PR2.8)

Journal / Paper and Pencil

- Ask students to create their own decreasing number and/or shape pattern and explain the pattern rule. (3PR2.8)

Portfolio

- Ask students to create a decreasing patterns poster. Students can use numbers and/or shapes or other manipulatives to represent decreasing patterns to create a poster or collage. (3PR2.8)

Resources/Notes

*Math Makes Sense 3***Lesson 8:** Decreasing Number Patterns

3PR2

TG pp. 26 - 29

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR2 Continued

Achievement Indicators:

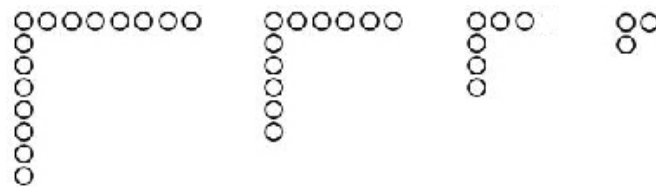
3PR2.9 Identify and explain errors in a given decreasing pattern.

Elaborations—Strategies for Learning and Teaching

Students are provided with a variety of decreasing patterns which contain errors. Refer to examples previously presented for increasing and modify to represent decreasing patterns. Students first need to determine what the pattern is and then explain the error. For example, 89, 86, 83, 80, 77, 75, 71. The pattern rule is: Start at 89. Subtract 3 each time. Therefore, 75 is an error since it is only subtracting 2, not 3.

Hint: To help students visualize this pattern they can shade numbers on a hundreds chart and look for the mistake. This will allow them to see that there are fewer than three numbers between 77 and 75 and more than three between 75 and 71.

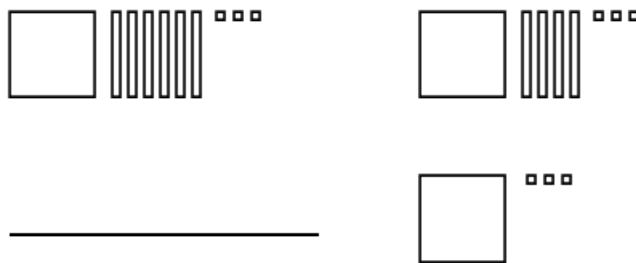
Use counters to make the following pattern. Ask students to identify and explain the error.



This shape pattern rule is: Start with 15 counters. Subtract 2 from each row and column each time. In this example, the third element is a mistake. There should be 4 counters in the row, not 3.

3PR2.10 Identify and apply a pattern rule to determine missing elements for a given pattern.

Since patterns decrease in a predictable way, to determine a missing step students will look at the pattern that comes before and after. They must identify the pattern rule.



150, 125, 100, 75, ____, 25 Start at 150. Subtract 25 each time.

(continued)

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Paper and Pencil

- Give students number patterns such as those below and ask them to find and circle the error.

955, 855, 745, 655

675, 650, 625, 605

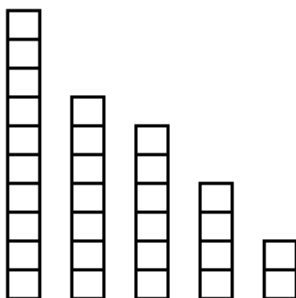
89, 86, 83, 81, 77

36, 35, 33, 31, 29

(3PR2.9)

Journal

- Present students with the following shrinking pattern.



Ask them to find the error and explain how they know. (3PR2.9)

Performance

- Pattern BANG! – Students previously played this game using increasing patterns (p. 43). Create cards that have a variety of decreasing patterns that either ask students to find a missing element, extend the pattern or tell the pattern rule. Place these in a paper bag and include 1 BANG card for every 4 or 5 question cards.

Give each small group a bag. Students take turns drawing a card out and answering the question. If the student answers correctly, she/he gets to keep the card, (group members can help each other with the answer). They then pass the bag to the next player. If a student pulls out a BANG card, she/he must put all of her/his cards back into the bag (leaving the BANG card out). They continue playing until there are no cards left in the bag and whoever has the most cards wins.

(3PR2.1, 3PR2.2, 3PR2.9, 3PR2.10)

Resources/Notes

*Math Makes Sense 3***Lesson 8 (Cont'd):** Decreasing Number Patterns

3PR2

TG pp. 26 - 29

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

3PR2 Continued**Achievement Indicators:**

3PR2.10 Continued

3PR2.11 Describe the strategy used to determine missing elements in a given decreasing pattern.

Elaborations—Strategies for Learning and Teaching

555, 550, 545, 540, ____, 530, 525, 520, 515 Start at 555. Subtract 5 each time.

233, 230, ____, 224, 221, 218, 215 Start at 233. Subtract 3 each time.

Students practice finding missing elements by making decreasing patterns, covering a step and asking a partner “What’s missing?” This activity can be done with the whole class using an interactive white board.

Students identify the pattern rule and then describe the strategy they used to determine the rule.

E.g., 47, 43, 39, ____, 31, 27

The rule is: Start at 47. Subtract 4 each time.

Possible strategies to determine missing elements include use of:

Number lines

Hundreds chart

Drawing a picture

Build it with Manipulatives

Skip counting

Note: Discuss and accept other possible strategies that students use.

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Each student makes a decreasing pattern using manipulatives. Next they cover one element of their pattern and have a partner guess and recreate the missing element. Uncover to check accuracy.
(3PR2.7, 3PR2.10)

Paper and Pencil/Portfolio

- Wanted Poster – students will create ‘wanted’ posters, asking readers to find the missing element of an decreasing pattern.
(3PR2.11, 3PR2.10)

Journal

- Present students with a decreasing pattern that includes a missing element. E.g., 225, 215, ____, 195, 185. Ask them to find the missing element and explain how they know. (3PR2.11)

Resources/Notes

Math Makes Sense 3

Lesson 8 (Cont’d): Decreasing Number Patterns

3PR2

TG pp. 26 - 29

