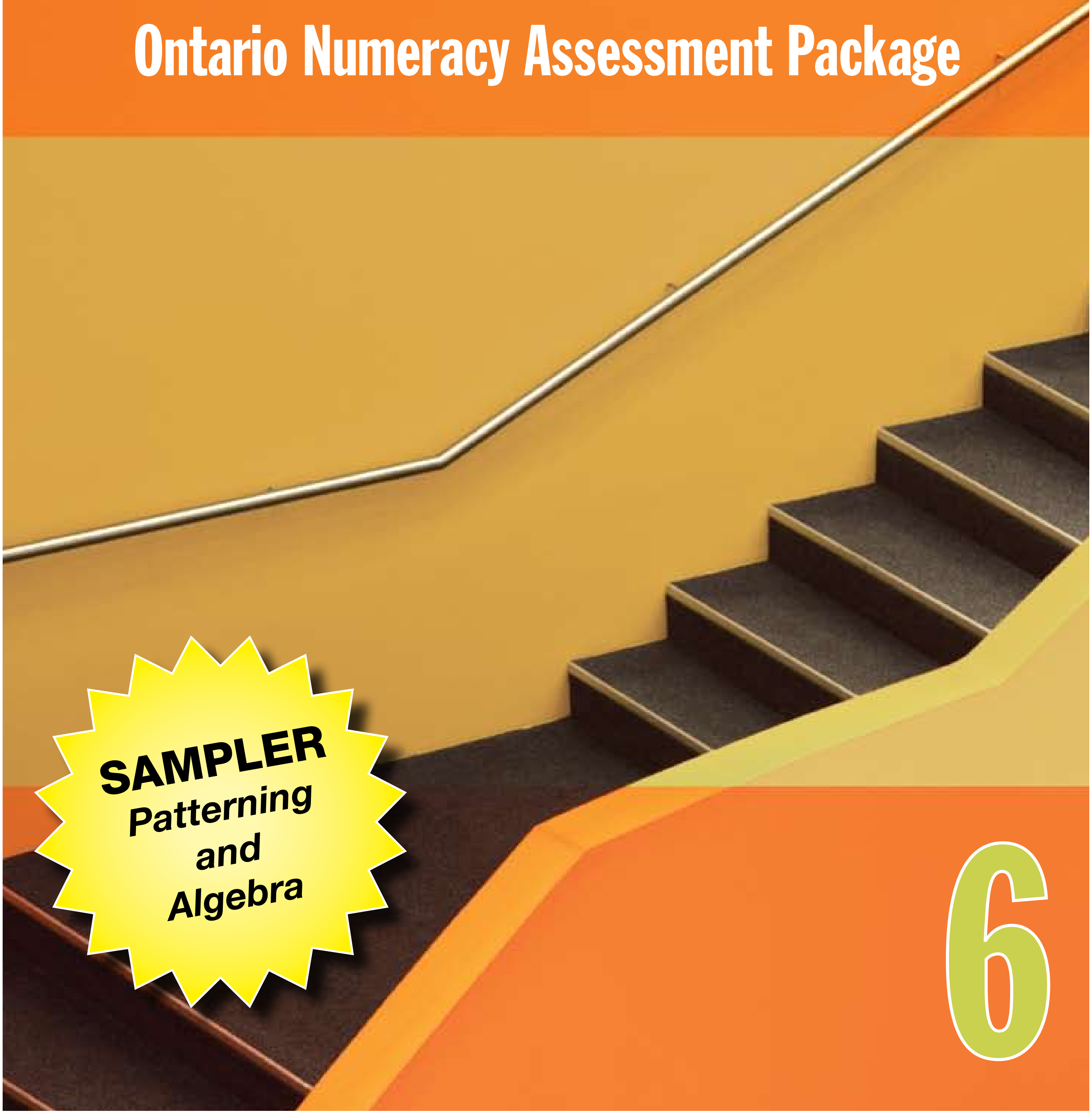
ONAP

Ontario Numeracy Assessment Package



SAMPLER
Patterning and Algebra

6

PATTERNING AND ALGEBRA

The Patterning and Algebra strand of the Ontario Curriculum for Grade 5 identifies seven Mathematical Process Expectations: problem solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating. Using these process expectations, students study, learn, and apply concepts and skills organized under the big ideas/headings of Patterns and Relationships; and Variables, Expressions, and Equations.

The following chart highlights key knowledge and skill development as students move from Grade 5 to Grade 6.

GRADE 5	GRADE 6
• create, identify, and extend numeric and geometric patterns	• identify geometric patterns and represent them numerically
• build a model to represent a number pattern presented in a table of values	
• create a table of values for a pattern, given the sequence or the pattern rule in words	• create tables of values for growing patterns given pattern rules in words, then list the ordered pairs and plot the points in the first quadrant
	• determine the term number of a given term in a growing pattern that is represented by a pattern rule in words, a table of values, or a graph
• make predictions related to growing and shrinking geometric and numeric patterns	• describe pattern rules that generate patterns by adding, or subtracting, multiplying, or dividing by a constant to get the next term, then distinguish such pattern rules from pattern rules that describe the general term by referring to the term number
	• determine a term, given its term number, by extending growing and shrinking patterns that are generated by adding, subtracting, multiplying, or dividing by a constant to get the next term
• extend and create repeating patterns that result from translations	• extend and create repeating patterns that result from rotations
• demonstrate an understanding of variables as changing quantities, given equations that describe relationships involving simple rates	• demonstrate an understanding of different ways in which variables are used

GRADE 5	GRADE 6
• demonstrate an understanding of variables as unknown quantities represented by a letter or other symbol	• identify the quantities in an equation that vary and those that remain constant • solve problems that use two or three symbols or letters as variables to represent different unknown quantities
• determine the missing number in equations involving addition, subtraction, multiplication, or division and one- or two-digit numbers	• determine the solution to a simple equation with one variable

For each strand of the curriculum, ONAP provides three types of assessment materials. Consider the following points when administering the assessments for the strand.

Part A: Activating Prior Knowledge (page 235)

- The activities in Part A have been created to activate students' knowledge before they complete the Part B assessment or the Part C performance tasks.
- No score is assigned during this part of the assessment.
- It is recommended that you spend one or two periods working on and discussing the activities provided in this part.

Part B: Concepts and Skills Assessment (page 246)

- The assessment in Part B addresses each of the specific expectations within the two overall expectations in the Patterning and Algebra strand.
- Students will be responding to a mix of questions: short response, fill-in-the-blank, and multiple choice.
- Most students will be able to complete the entire assessment in a 60-minute period. Individual students may be allowed additional time to complete the assessment if needed as long as they complete the assessment in one sitting.

Part C: Performance-Based Assessment (page 259)

- The two performance tasks in Part C are designed to provide insights into how well students are able to perform in terms of the categories of the Ontario Achievement Chart: Knowledge and Understanding, Thinking, Communication, and Application.
- All of the overall expectations for this strand have been assessed through the Concepts and Skills Assessment in Part B.
- It is recommended that you select one performance task for the Patterning and Algebra strand.
- Each task is designed to be completed in a 45- to 60-minute period. If necessary, provide additional time as long as students complete the task in one sitting.

Part A: Activating Prior Knowledge

Administration

To activate students' knowledge of the Patterning and Algebra strand, choose one or both of the following activities to work on prior to administering the assessments. Introductory and culminating suggestions have been provided for each activity. No score is assigned for these activities.

Timing

It is recommended that you spend one or two periods working on and discussing the activities provided in this part.

Accommodating Students with Special Needs

Observe students as they complete the activities. While the activities in this section are not designed as a formal diagnostic assessment, you may want to consider whether students who are having extreme difficulties with the activities are ready to participate in the full ONAP assessment for this grade level. Observations at this stage might also indicate students who will need special accommodations during the assessment, such as having someone read questions to them or scribe responses.

Activity 1: Growing Pattern Concentration

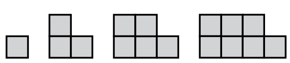
Materials

- BLM A1: *Activity 1: Growing Pattern Concentration* (one per student group)
- scissors
- overhead projector (optional)

Introducing the Activity

Review the different ways that growing patterns can be represented by posting the following four representations on the board or on an overhead transparency.

1, 3, 5, 7, …



Term number	Term value
1	1
2	3
3	5
4	7

Start at 1 and add 2 to get the next term.

For the first representation, ask students the following question:

- What is shown here?
  This is a growing or increasing pattern. It increases by 2 each time, or you have to add 2 to get the next term.

Label the first representation Number Pattern.

For the second representation, ask students the following question:

- What is shown here and how does it relate to the number pattern?
  It shows a drawing or a picture of the same growing pattern as the number pattern.

Label the second representation Visual Representation.

For the third representation, ask students the following question:

- What is shown here and how does it relate to the number pattern?
  It is a table of values that shows the term number and the term value of the same growing pattern as the number pattern. The numbers in the number pattern are the numbers in the second column.

Label the third representation Table of Values.

For the fourth representation, ask students the following question:

- What is shown here and how does it relate to the number pattern?
  It shows the pattern rule in words for the number pattern. The pattern rule states the number that the pattern starts at and what is added each time to get the next term.

Label the fourth representation Pattern Rule in Words.

Procedure

Provide students with copies of BLM A1: *Activity 1: Growing Pattern Concentration*. If a group finishes quickly, have them shuffle the cards and play the game again.

Number of players: two or more
Goal: to find pairs of cards that show the same growing pattern
How to play:

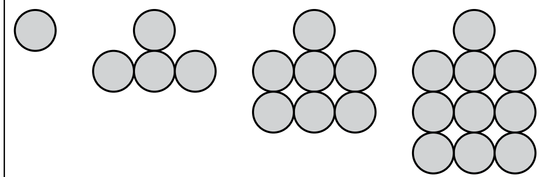
- Step 1—Cut out the 16 cards and place them face down in a 4×4 array.
- Step 2—Player 1 turns over two cards. If the two cards represent the same pattern, Player 1 keeps the cards. If not, turn the cards back over.
- Step 3—Play continues to the right with Player 2 selecting and turning over two cards and following Step 2.
- Step 4—The game is over when all cards have been matched up. The player with the most cards wins.

Culminating Discussion

1. Which representations were easiest to match and why?
   I found matching the visual representation with the number pattern easiest because the picture made it easy for me to see the pattern. I could count the number of shapes in each grouping and match that to the number pattern.
2. Which representations were most difficult to match and why?
   I found matching the pattern rule in words with the table of values more difficult because I had trouble visualizing what the pattern rule in words was describing.
3. Which representation did you like the best and why?
   I liked the table of values the best because I could see by how much each term number changed as the pattern went on.

Answers

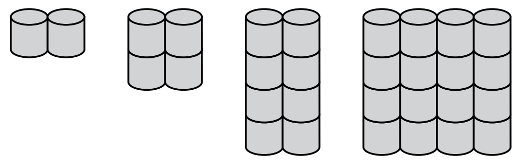
1, 4, 7, 10, …



Term number	Term value
1	1
2	4
3	7
4	10

Start at 1 and add 3 to get the next term value.

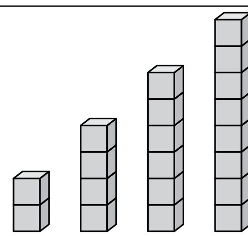
2, 4, 8, 16, …



Term number	Term value
1	2
2	4
3	8
4	16

Start at 2 and multiply by 2 to get the next term value.

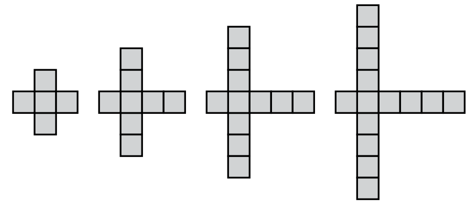
2, 4, 6, 8, …



Term number	Term value
1	2
2	4
3	6
4	8

Start at 2 and add 2 to get the next term value.

5, 8, 11, 14, …



Term number	Term value
1	5
2	8
3	11
4	14

Start at 5 and add 3 to get the next term value.

Activity 2: Variable and Equation Match Up

Materials

- BLM A2: *Activity 2: Variable and Equation Match Up* (one per student pair)
- scissors

Introducing the Activity

Write this statement and the following two equations on the board:
"The difference between two numbers is 10."
$a - b = 10$ $a + b = 10$
Ask students:

- Which equation matches the written statement? ($a - b = 10$)
- How do you know? (*I know that "difference" means to subtract.*)
- How do you know the other equation does not match the statement? (*The other equation involves addition, so the answer would be the sum.*)
- What might a and b be equal to? (e.g., *10 and 0, 11 and 1, 20 and 10*)
- Is there more than one possible answer? Why? (*There is more than one possible answer because* a *and* b *are variables. You can assign changing values to both* a *and* b *to make the equation true.*)

Using the statement $a - b = 10$ as an example, discuss with students that a and b are variables that represent a changing number or value. In this case, there are many possible answers for the values of a and b as long as a is greater than b by exactly 10.

Write this statement and the following two equations on the board: "A game costs $20 and I have already saved $12. How much more do I need to save?"
$20 + 12 = \square$ $20 = 12 + \square$
Ask students:

- Which equation matches the written statement? ($20 = 12 + \square$)
- How do you know? (*I know because I need to find an amount that when added to 12 will give me 20.*)
- How do you know the other equation does not match the statement? (*The other equation adds 20 and 12, which does not give me the amount I need to save.*)

- Is there more than one possible answer for the missing number? Why?
(*There is not more than one possible answer because only one value will make the statement true.*)

Using the statement $20 = 12 + \square$ as an example, discuss with students that $\square$ in this equation is an unknown value. In this case, only one value will make this statement true. (*8*)

Depending on the situation, variables can represent either

- a changing value (shown in the first example) OR
- an unknown value (shown in the second example)

Procedure

Provide students with BLM A2: *Activity 2: Variable and Equation Match Up*. Explain that they should follow the game rules on the blackline master and work together to match each equation card with a situation card.

If groups finish early, have them shuffle the cards to play again or have them create their own sets of matching equation and situation cards to challenge each other.

Number of players: two
Goal: to find pairs of matching cards (an equation and a situation)
How to play:

- Step 1—Cut out the equation cards and place them face down in a 4×2 array. Do the same with the situation cards.
- Step 2—Player 1 turns over two cards, one from each array. Decide if the two cards match (i.e., the equation represents that situation). If the two cards match, Player 1 keeps the cards. If not, turn the cards back over.
- Step 3—Play continues with Player 2 selecting and turning over two cards and following Step 2.
- Step 4—The game is over when all cards have been matched up. The player with the most cards wins.

Culminating Discussion

1. What strategy did you use to match up the equation cards with the situation cards?
We started with reading the situation card and making sure we knew what it meant, and then we looked at the equation card to see if it matched.
2. What is a variable?
A variable is a symbol, letter, or shape that represents an unknown or changing quantity in equations or expressions.
3. When have you seen variables before or where might they be used?
I have seen and used variables when we are trying to solve for the area of a rectangle ($A = l \times w$). Also at the movie theatre when they use an equation to figure out how much tickets cost.

Answers

$n \times 8 - 2 = G$	*I like to buy gum that comes in packages of 8 pieces. I always save 2 pieces for my brother. How many pieces of gum will I have left?*
$C = 10 \times p$	*The total cost for a ride is $10 per person.*
$4 \times \square = 20$	*I bought 4 identical packages of candy and now I have a total of 20 candies. How many candies were in each package?*
$3 \times 4 = \square + 2$	*Frank has 3 packages of 4 pens. I already have 2 pens but would like to buy enough so that I have the same number as Frank. How many more pens do I need?*
$a + b = 10$	*I have a basket of 10 pieces of fruit that has only apples and bananas. How many of each fruit might I have?*
$D = 3 \times 60$	*If our car is travelling 60 km/h, how far will it travel in 3 hours?*
$16 = \square \times 2 + 4$	*If I get $2 per week from my parents and already have $4 saved, how many weeks will it take for me to save a total of $16?*
$\square + 10 = 15 \times 2$	*There are 15 pairs of socks in my drawer. If I take out 10 socks, how many socks will still be in the drawer?*

Patterning and Algebra

Name: ________________________________ Date: ________________________

Activity 1: Growing Pattern Concentration (page 1)

Number of players: two or more

Goal: to find pairs of cards that show the same growing pattern

How to play:

Step 1 Cut out the 16 cards and place them face down in a 4 × 4 array.

Step 2 Player 1 turns over two cards. If the two cards represent the same pattern, Player 1 keeps the cards. If not, turn the cards back over.

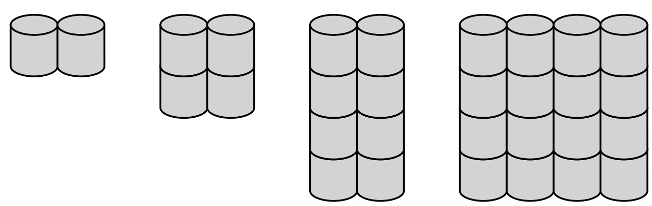
Step 3 Play continues to the right, with Player 2 selecting and turning over two cards and following Step 2.

Step 4 The game is over when all cards have been matched up. The player with the most cards wins.

5, 8, 11, 14, …

Term number	Term value
1	2
2	4
3	8
4	16

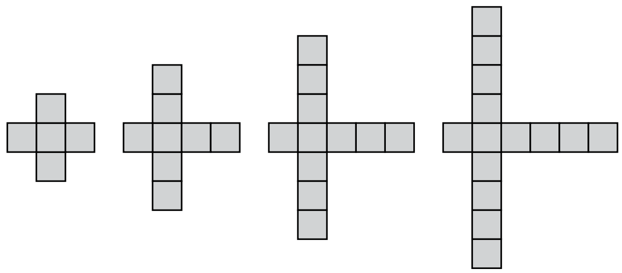
Term number	Term value
1	1
2	4
3	7
4	10



Start at 5 and add 3 to get to the next term value.

Start at 2 and add 2 to get to the next term value.

Activity 1: Growing Pattern Concentration (page 2)

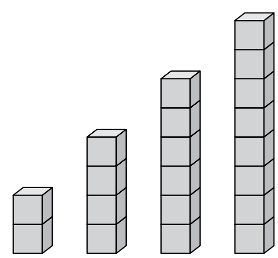


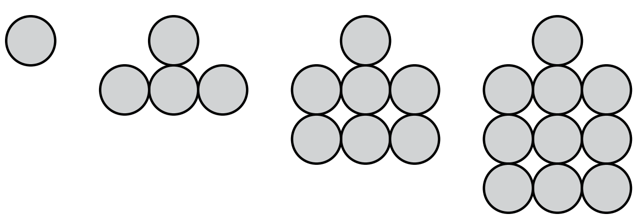
Start at 1 and add 3 to get to the next term value.

2, 4, 6, 8, …

Start at 2 and multiply by 2 to get to the next term value.

Term number	Term value
1	5
2	8
3	11
4	14





Term number	Term value
1	2
2	4
3	6
4	8

1, 4, 7, 10, …

2, 4, 8, 16, …

Activity 2: Variable and Equation Match Up (page 1)

Number of players: two

Goal: to find pairs of matching cards (an equation and a situation)

How to play:

Step 1 Cut out the equation cards and place them face down in a 4×2 array. Do the same with the situation cards.

Step 2 Player 1 turns over two cards, one from each array. Decide if the two cards match (i.e., the equation represents the situation).
If the two cards match, Player 1 keeps the cards. If not, turn the cards back over.

Step 3 Play continues with Player 2 selecting and turning over two cards and following Step 2.

Step 4 The game is over when all cards have been matched up. The player with the most cards wins.

Activity 2: Variable and Equation Match Up (page 2)

$4 \times \square = 20$	$n \times 8 - 2 = G$
$a + b = 10$	$C = 10 \times p$
$16 = \square \times 2 + 4$	$3 \times 4 = \square + 2$
$D = 3 \times 60$	$\square + 10 = 15 \times 2$

Activity 2: Variable and Equation Match Up (page 3)

Frank has 3 packages of 4 pens. I already have 2 pens but would like to buy enough so that I have the same number as Frank. How many more pens do I need?	I bought 4 identical packages of candies and now I have a total of 20 candies. How many candies were in each package?
I like to buy gum that comes in packages of 8 pieces. I always save 2 pieces for my brother. How many pieces of gum will I have left?	If I get $2 per week from my parents and already have $4 saved, how many weeks will it take for me to save a total of $16?
The total cost for a ride is $10 per person.	There are 15 pairs of socks in my drawer. If I take out 10 socks, how many socks will still be in the drawer?
If our car is travelling 60 km/h, how far will it travel in 3 hours?	I have a basket of 10 pieces of fruit that has only apples and bananas. How many of each fruit might I have?

Part B: Concepts and Skills Assessment

Administration

This assessment addresses all of the specific expectations within the two overall expectations in the Patterning and Algebra strand. Part B includes several styles of questions: short response, fill-in-the-blank, and multiple choice.

Timing

Most students will be able to complete the entire assessment in a 60-minute period. If necessary, provide students with additional time to complete the assessment as long as they complete it in one sitting.

Materials

FOR THE TEACHER	FOR EACH STUDENT	OPTIONAL MATERIALS
• Individual Student Scoring Guide: pp. 254–255 • Class Tracking Sheet: pp. 256–257 • ONAP 6 CD-ROM (optional)	• Assessment Part B: pp. 248–253 • pencil • eraser	• coloured tiles • linking cubes • pattern blocks • calculators

Introducing the Assessment

Inform students that they will be completing an assessment to help you get to know what they have learned about math in earlier grades. Tell students that it is important that they answer the questions as fully as possible. To communicate effectively, they can use pictures, numbers, words, and/or diagrams to represent their thinking.

Point out the materials you have provided to use throughout the assessment. Encourage students to use other materials available in the classroom that they think might help them to answer questions and/or solve problems.

Accommodating Students with Special Needs

If individuals or groups of students have difficulties with reading, consider reading the questions aloud as they complete the assessment.

If individual students have difficulties explaining their thinking in writing, consider providing scribes to record for the students or encourage students to show and explain their thinking using concrete materials.

Some students will require additional time to complete the assessment. You may want to note this accommodation in your anecdotal records about the student. However, there should be no reduction of the student's overall score in terms of the amount of time it takes the student to complete the assessment.

Scoring the Assessment

A detailed Individual Student Scoring Guide is provided on pages 254 and 255. The guide is designed to be completed for each student. The individual scores can then be used to fill in the Class Tracking Sheet on pages 256 and 257. Alternatively, you may record student results directly on the Class Tracking Sheet. The results may also be recorded electronically using the ONAP 6 CD-ROM.

While great care has been taken to consider the range of possible answers for each question, there will be times when you will need to apply your professional judgment to score an individual answer. You may use the Curriculum Correlation chart provided on page 258 to help you to determine whether the student has demonstrated the intended concept, knowledge, or skill based on the overall and specific expectations being assessed by the particular question.

At times a student may provide an answer that you think does not completely represent his or her knowledge and skill level. You may ask probing questions to better assess the student's overall understanding.

Some questions are delivered in more than one part (a and b) and are given more than one point. Should a student's answer in one part reveal that a correct answer in the other part was arrived at for the wrong reason, a score of zero should be given for both parts.

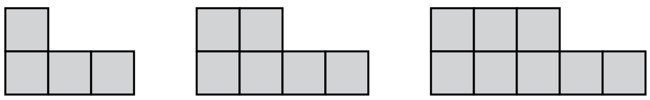
Name: ________________________ **Date:** ____________________

Patterning and Algebra

1. **a)** Write the next 3 terms in this pattern.

   256, 128, 64, 32, __________, __________, __________

   b) Sketch the next 3 terms in this pattern.



   c) Create your own growing or shrinking number or geometric pattern. Show at least the first 4 terms of your pattern.

   d) Describe your pattern in words.

Name: ______________________ **Date:** ______________________

2. Use manipulatives such as coloured tiles, linking cubes, or pattern blocks to build a model that matches the number pattern in the table of values below.

Term number	Term value
1	1
2	4
3	7
4	10

Sketch your model.

Name: ______________________________ **Date:** ______________________

3. Complete the table of values to match each pattern.

a) Divide the term value by 2 to get to the next term value.

Term number	Term value
1	96
2	
3	
4	

b) Subtract 5 from the term value to get to the next term value.

Term number	Term value
1	53
2	
3	
4	

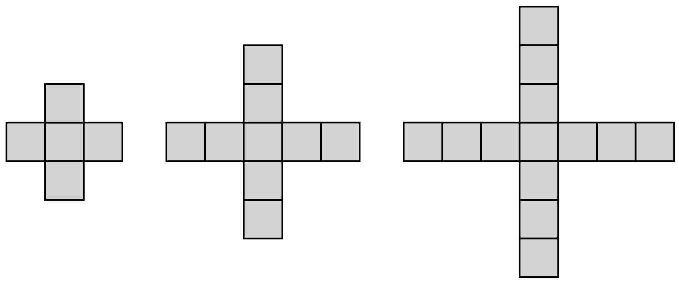
4. Predict the value of the 12th term for each of the following patterns.

a) 2, 4, 6, 8, . . . The 12th term is __________.

Explain your thinking.

Name: ______________________________ **Date:** ______________________

4. b) This growing design is built using square tiles.



term 1 term 2 term 3

Term 12 will have _________ tiles.

Explain your thinking.

5. Use translations to create a repeating pattern using at least 3 pattern blocks in each group. Sketch your pattern. Show your pattern repeating at least 2 times.

Name: ______________________ **Date:** ______________________

6. A movie theatre charges \$8 per person for admission. The equations $C = 8 \times p$ and $8 \times p = C$ can both be used to calculate the total cost.

   What do the variables C and p represent in the equations?

7. Circle the equation that represents the problem.

   a) Jonas has 15 hockey cards and needs 16 more to make a complete set. How many cards make a complete set?

   A $15 + c = 16$

   B $15 + 16 = c$

   C $c + 15 = 16$

   D $15 + 16 + c$

   b) Neeva is saving money to buy a DVD that costs \$25.
   She has \$10 and her brother is giving her \$8.
   How much money does Neeva still need to buy the DVD?

   A $25 + m = 10 + 8$

   B $10 + 8 + 25 = m$

   C $10 + 8 + m = 25$

   D $10 + 8 - m = 25$

Name: ________________________________ **Date:** ____________________

8. **a)** Determine the missing number for each equation.

i) $36 - 12 =$ _____ $+ 10$

ii) $12 = 48 \div$ _____

iii) $5 \times$ _____ $= 30 \div 3$

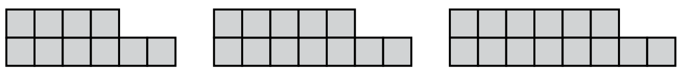
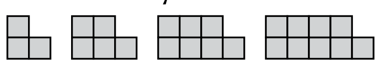
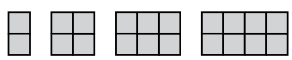
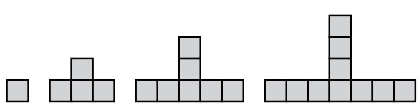
b) How did you determine the missing number in part iii)?

Explain your thinking.

ONAP INDIVIDUAL STUDENT SCORING GUIDE
GRADE 6: PATTERNING AND ALGEBRA — PART B

Name: ______________________________ **Date:** ______________________

Overall Expectation 5m61 (Patterns and Relationships):
Determine, through investigation using a table of values, relationships in growing and shrinking patterns, and investigate repeating patterns involving translations.

5m63 1. a)	16, 8, 4 **1 point**	
5m63 1. b)	 10 blocks 12 blocks 14 blocks **1 point**	
5m63 1. c)	**1 point** for correctly showing the first 4 terms of either a numeric or geometric pattern that grows or shrinks in a consistent way from one term to the next, e.g., 3, 5, 7, 9, . . . or  or 2, 4, 6, 8, . . . or 	
5m63 1. d)	**1 point** for a partial explanation that demonstrates some understanding; e.g., *My pattern grows by 2.* OR **2 points** for a complete explanation that demonstrates full understanding, e.g., *My pattern is a growing pattern that starts at 3 and adds 2 to each term to get the next term.*	
5m64 2.	**1 point** for providing drawings that match the table of values; e.g., 	
5m65 3. a)	48, 24, 12 **1 point** for three correct values	
5m65 3. b)	48, 43, 38 **1 point** for three correct values	

5m66 4. a)	**1 point** for correctly predicting that the 12^{th} term is 24 AND **1 point** for a complete explanation that demonstrates full understanding; e.g., *I continued the pattern as a list and the* 12^{th} *term was 24.* or *I noticed this was like skip counting by 2, so the* 12^{th} *term would have to be 24.* or *Since the* 1^{st} *term is 2, and you add 2 to get each of the next terms, the* 12^{th} *term would be* $2 + 11 \times 2 = 2 + 22$*, or 24.*	
5m66 4. b)	**1 point** for correctly predicting that the 12^{th} term has 49 tiles AND **1 point** for a complete explanation that demonstrates full understanding; e.g., *I continued the pattern as a list and the* 12^{th} *term was 49.* or *I continued the pattern as a drawing and the* 12^{th} *term had 49 tiles.* or *Since the* 1^{st} *term is 5, and you add 4 to get each of the next terms, the* 12^{th} *term would be* $5 + 11 \times 4 = 5 + 44$*, or 49.*	
5m67 5.	**1 point** for creating a repeating pattern that shows translation (either horizontal, vertical, or diagonal); e.g., 	
	Total for Overall Expectation 5m61	13
Overall Expectation 5m62 (Variables, Expressions, and Equations): **Demonstrate, through investigation, an understanding of the use of variables in equations.**		
5m68 6.	**1 point** for a reasonable response; e.g., *The C represents the total cost and the p represents the number of people.*	
5m69 7. a)	B $15 + 16 = c$ **1 point**	
5m69 7. b)	C $10 + 8 + m = 25$ **1 point**	
5m70 8. a)	i) 14 ii) 4 iii) 2 **1 point** for two correct answers OR **2 points** for three correct answers	
5m70 8. b)	**1 point** for an explanation that demonstrates some understanding; e.g., *I figured out in my head that the answer had to be 2.* OR **2 points** for a complete explanation that demonstrates full understanding; e.g., *The right side of the equation shows 30 divided by 3, which is 10. So the left side also has to be 10. The only way for this to work is for the unknown value to be 2.* or *5 times something has to equal 30 divided by 3 (or 10). So the unknown value has to be 2 because 5 times 2 equals 10.*	
	Total for Overall Expectation 5m62	7

ONAP GRADE 6: PATTERNING AND ALGEBRA

Date: ______________________ **Grade:** ________ **School:** ______________________________

Overall Expectation			**5m61 (Patterns and Relationships)** Determine, through investigation using a table of values, relationships in growing and shrinking patterns, and investigate repeating patterns involving translations.			
Specific Expectation #			5m63			
Question #			1. a)	1. b)	1. c)	1. d)
Student Name	Gender (M/F)	IEP/ ELL	**1**	**1**	**1**	**2**

CLASS TRACKING SHEET – PART B

Board: ____ **Teacher Name:** ____________________________________

5m61 (Patterns and Relationships) continued							**5m62 (Variables, Expressions, and Equations)** Demonstrate, through investigation, an understanding of the use of variables in equations.					
5m64	5m65		5m66		5m67	Total	5m68	5m69		5m70		Total
2.	3. a)	3. b)	4. a)	4. b)	5.		6.	7. a)	7. b)	8. a)	8. b)	
1	**1**	**1**	**2**	**2**	**1**	**13**	**1**	**1**	**1**	**2**	**2**	**7**

ONTARIO CURRICULUM CORRELATION TO ONAP PATTERNING AND ALGEBRA 6 — PART B
NOTE: This correlation is to the Grade 5 Ontario Curriculum Expectations.

Overall Expectation 5m61 (Patterns and Relationships):
Determine, through investigation using a table of values, relationships in growing and shrinking patterns, and investigate repeating patterns involving translations.

Question Number	Specific Expectation
1. a)–d)	**5m63:** create, identify, and extend numeric and geometric patterns, using a variety of tools (e.g., concrete materials, paper and pencil, calculators, spreadsheets)
2.	**5m64:** build a model to represent a number pattern presented in a table of values that shows the term number and the term
3. a)–b)	**5m65:** make a table of values for a pattern that is generated by adding or subtracting a number (i.e., a constant) to get the next term, or by multiplying or dividing by a constant to get the next term, given either the sequence (e.g., 12, 17, 22, 27, 32, …) or the pattern rule in words (e.g., start with 12 and add 5 to each term to get the next term)
4. a)–b)	**5m66:** make predictions related to growing and shrinking geometric and numeric patterns
5.	**5m67:** extend and create repeating patterns that result from translations, through investigation using a variety of tools (e.g., pattern blocks, dynamic geometry software, dot paper)

Overall Expectation 5m62 (Variables, Expressions, and Equations):
Demonstrate, through investigation, an understanding of the use of variables in equations.

Question Number	Specific Expectation
6.	**5m68:** demonstrate, through investigation, an understanding of variables as changing quantities, given equations with letters or other symbols that describe relationships involving simple rates (e.g., the equations $C = 3 \times n$ and $3 \times n = C$ both represent the relationship between the total cost (C), in dollars, and the number of sandwiches purchased (n), when each sandwich costs $3)
7. a)–b)	**5m69:** demonstrate, through investigation, an understanding of variables as unknown quantities represented by a letter or other symbol (e.g., $12 = 5 + \_$ or $12 = 5 + s$ can be used to represent the following situation: "I have 12 stamps altogether and 5 of them are from Canada. How many are from other countries?")
8. a)–b)	**5m70:** determine the missing number in equations involving addition, subtraction, multiplication, or division and one- or two-digit numbers, using a variety of tools and strategies (e.g., modelling with concrete materials, using guess and check with and without the aid of a calculator)

Part C: Performance-Based Assessment

Administration

The two performance tasks in Part C are designed to provide insight into how well students are able to perform in terms of the categories of the Ontario Achievement Chart: Knowledge and Understanding, Thinking, Communication, and Application.

Since all of the specific and overall expectations for this strand have been assessed through the Concepts and Skills Assessment in Part B, it is recommended that you select one performance task for the Patterning and Algebra strand.

Read all parts of the problem aloud to students. Tell students that they should provide detailed answers to the problem, including how they solved the problem. Remind students that they may use pictures, numbers, words, diagrams, and/or charts to explain effectively how they solved the problem.

Timing

Each task is designed to be completed in a 45- to 60-minute period. If necessary, provide additional time as long as students complete the task in one sitting.

Accommodating Students with Special Needs

If individual students have difficulties explaining their thinking in writing, consider providing scribes to record for the students or encourage students to show and explain their thinking using concrete materials.

Scoring the Assessment

A general rubric based on the Ontario Achievement Chart for Mathematics is provided on page 276 to assist with scoring student responses to the tasks. Spend some time reviewing the anchors and rationales provided for each level of achievement on pages 272 to 287. The four categories should be considered as interrelated, reflecting the wholeness and interconnectedness of learning. Each student's performance should therefore be determined holistically by selecting the level that best describes the student's overall achievement.

Sometimes a student will not achieve at the same level for each criterion within a category or across categories. For example, a student may perform at Level 3 on Knowledge and Understanding, Thinking, and Application, but at Level 2 on Communication. While you may determine that, overall, the student performed most consistently at Level 3, you may want to make a note that this student would benefit from additional instruction in the area of Communication.

Note: *When scoring student work on the performance tasks, it is appropriate to note what you observed and heard while the student worked on the task.*

Once you have completed scoring the students' assessments, you may record the results directly on the Class Tracking Sheet or electronically using the ONAP 6 CD-ROM.

Next Steps

Strategies for improving performance in the four areas of the Achievement Chart are provided in the ONAP introduction, pages 16 to 19.

Performance Task 1: How Much Will Riley Win?

Materials

FOR THE TEACHER	FOR EACH STUDENT	OPTIONAL MATERIALS
• Performance Task Class Tracking Sheet: p. 269 • Performance Task Rubric: p. 271 • Anchors and rationales: pp. 272–279 • ONAP 6 CD-ROM (optional)	• BLM C1: Performance Task 1: *How Much Will Riley Win?* pp. 264–266 • pencil • eraser • calculator	

Introducing the Task

In this task, students examine data for Riley's participation in a game show. In this game show, the more questions Riley answers correctly, the more money he wins. Students must solve problems related to this pattern and then create their own patterns for money won by Riley. Students then compare patterns.

Tell the students that they will

- look at a situation where Riley is a contestant on a game show and where the more questions he answers correctly, the more money he wins
- create other possible amounts of money for Riley to win that also follow a pattern
- compare possible prize-winning patterns to determine which one is best for Riley, depending on the situation

Have students use BLM C1: *Performance Task 1: How Much Will Riley Win?* to complete this task.

Answers:

1. *The prize money that can be won makes a growing pattern. Riley would get $4 for getting Question 1 correct and then his prize increases by $8 for each question he gets right. The rule for this pattern is: start at 4 and add 8 to get to the next term.*

2.

Question	*Money won ($)*
1	*4*
2	*12*
3	*20*
4	*28*
5	*36*
6	*44*
7	*52*
8	*60*
9	*68*
10	*76*

Patterning and Algebra

3. *Yes, Riley can reach his goal of winning at least $100. I extended the pattern to prove my answer: 4, 12, 20, 28, 36, 44, 52, 60, 68, 76, 84, 92, 100; 100 is the 13th number in the sequence, so Question 13 is when Riley will reach his goal of winning $100.*

4. Students' responses should include the following information:
   - Prize-winning amounts for at least the first three to five questions, described in numbers and/or words.
   - Prize-winning amounts increase by a constant amount for each question.
   - Prize-winning Option A has greater prize-winning amounts for the first five questions than Prize-winning Option B.
   - Prize-winning Option B has greater prize-winning amounts for Question 6 and beyond than Prize-winning Option A.
   - Each pattern is explained (e.g., where it starts and how much it increases for each question).

   Sample solution showing number pattern, table of values, and pattern in words:

Prize-winning Option A

(19, 21, 23, 25, 27, 29, ...)

Question	*Money won ($)*
1	*19*
2	*21*
3	*23*
4	*25*
5	*27*
6	*29*
7	*31*

This pattern starts at $19 and increases by $2 for each question answered correctly.

Prize-winning Option B

(5, 10, 15, 20, 25, 30, ...)

Question	*Money won ($)*
1	*5*
2	*10*
3	*15*
4	*20*
5	*25*
6	*30*
7	*35*

This pattern starts at $5 and increases by $5 for each question answered correctly.

5. a) *If Riley answers Question 4 correctly, he will win $25 with Option A, but only $20 with Option B. Option A is better because Riley will win $5 more.*

   b) *If Riley answers Question 9 correctly, he will win $35 with Option A, but he will win $45 with Option B. This makes Option B the better choice because Riley will win $10* more.

   Note: Some students may have interpreted the question as, "What prize-winning option gives Riley more money cumulatively over time?" If this is the case, students will keep a running total of money that Riley accumulates after each question. Even though this was not the intent of this question, students should be given credit for this approach as long as their prize-winning patterns still follow the constraints of the question and they show correct solutions.

Performance Task 2: Babysitting

Materials

FOR THE TEACHER	FOR EACH STUDENT	OPTIONAL MATERIALS
• Performance Task Class Tracking Sheet: p. 269 • Performance Task Rubric: p. 271 • Anchors and rationales: pp. 280–287 • ONAP 6 CD-ROM (optional)	• BLM 2: Performance Task 2: *Babysitting:* pp. 267–268 • pencil • eraser • calculator	

Introducing the Task

In this task, students solve problems related to payment for various babysitting jobs.

Tell students that they will

- use patterning and equations to solve problems related to determining how much a person should be paid for some babysitting jobs

Have students use BLM C2: *Performance Task 2: Babysitting* to complete this task.

Answers

1. *The variables are* P *and* h.
   P *represents the pay Callie will receive and* h *represents the number of hours she works.*
2. *Callie would be paid for a total of five hours (some at $4.00 per hour and some at $6.00 per hour).*
3. *There are six different possibilities of hours Callie could have worked during this week*

From 6:00–9:00	P = *\$4* × h P = *\$4* × *3* P = *\$12*
From 9:00–11:00	P = *\$6* × h P = *\$6* × *2* P = *\$12*
Total pay for evening	P = *\$24*

Patterning and Algebra

to earn a total of $60.00.

4. Students' solutions here will vary, since they are creating and solving their own

	Using: **P** $= \$4 \times$ **h**		***Using:*** **P** $= \$6 \times$ **h**		***Total pay ($)***
	# of hours	*Pay ($)*	*# of hours*	*Pay ($)*	
1	*15*	*60*	–	–	*60*
2	*12*	*48*	*2*	*12*	*60*
3	*9*	*36*	*4*	*24*	*60*
4	*6*	*24*	*6*	*36*	*60*
5	*3*	*12*	*8*	*48*	*60*
6	–	–	*10*	*60*	*60*

problem that requires the use of equations. Problems should be realistic and clearly communicated. Students should identify their equations and explain what their equations mean in words. The solution to the problem should effectively communicate the thinking and calculations required.

Sample solution:

My problem/situation:	*Sue is going to babysit for her neighbour's children. She will be paid in the following way:* *For times Monday to Friday* M $= \$6 \times$ n *; and for times Saturday and Sunday* M $= \$8 \times$ n. *If Sue worked for 10 hours from Monday to Friday and another 10 hours on the weekend, how much should she be paid?*
My equations in this problem:	*1.* M $= \$6 \times$ n *2.* M $= \$8 \times$ n
What my equations mean in words:	*1. The total amount of money paid (*M*) is equal to $6 times the number of hours worked (*n*).* *2. The total amount of money paid (*M*) is equal to $8 times the number of hours worked (*n*).*
My solution:	*Sue will be paid for 10 hours for her work from Monday to Friday.* M $= \$6 \times$ n M $= \$6 \times 10$ M $= \$60$ *She will also be paid for 10 hours on the weekend.* M $= \$8 \times$ n M $= \$8 \times 10$ M $= \$80$ *Therefore, her total amount of pay should be* $\$60 + \$80 = \$140$.

Name: ______________________________ **Date:** ______________________

Performance Task 1: How Much Will Riley Win?
(page 1)

Riley has been selected to be on a game show. The more questions he answers correctly, the more prize money he wins. For example:

- If Riley gets Question 1 correct, he wins $4.
- If Riley gets Question 2 correct, he wins $12.
- If Riley gets Question 3 correct, he wins $20.
- If Riley answers Question 1 and Question 2 correctly, but gets Question 3 wrong, he wins $12.

1. Describe the pattern for the prize money Riley might win. Write a rule to describe this pattern.

2. Create a table of values that shows the question numbers and the prize money won for the first 10 questions.

Question	Money won ($)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Name: ______________________ Date: ______________

Performance Task 1: How Much Will Riley Win?

(page 2)

3. Riley has a goal of winning at least $100. Is this possible according to the prize-winning pattern described on page 1? When will he have won $100? Explain your answer.

4. Riley is asked to be a contestant on a different game show. Create 2 different prize-winning options for Riley to choose from.

- Each of the prize-winning options should be based on a growing pattern.
- Prize-winning Option A should be the better choice for getting each of the first five questions correct.
- Prize-winning Option B should be the better choice for getting Question 6 correct and every question after that.

Create and describe your 2 prize-winning options.

Prize-winning Option A	Prize-winning Option B

Name: ______________________________ Date: ____________________

Performance Task 1: How Much Will Riley Win?
(page 3)

5. a) If Riley answers Question 4 correctly, how much more money will he win with prize-winning Option A than with prize-winning Option B?

b) If Riley answers Question 9 correctly, how much more money will he win with prize-winning Option B than with prize-winning Option A?

Name: ______________________________ **Date:** ______________________

Performance Task 2: Babysitting (page 1)

For babysitting her neighbour's children, Callie gets paid per hour based on the equations below. She gets paid $2.00 per hour more after 9:00 p.m. because it is late at night.

Time	Equation
Before 9:00 p.m.	$P = \$4 \times h$
After 9:00 p.m.	$P = \$6 \times h$

1. What are the variables in these equations and what do they represent?

2. Callie was babysitting one evening from 6:00 p.m. until 11:00 p.m. How much should she be paid? Use the equations above to help you determine your answer.

3. Callie received a total of $60.00 for babysitting. Use the equations above to help determine how many hours before 9:00 p.m. and how many hours after 9:00 p.m. she could have worked in total to earn this amount of pay. Try to find many possibilities.

Name: ______________________ **Date:** ______________________

Performance Task 2: Babysitting (page 2)

4. Create a problem of your own that would require the use of two equations to solve it. Do not use the same equations as on page 1. Your problem could be about babysitting, or it could be about a different situation. Complete all areas of the chart below.

My problem/situation:	
My equations in this problem:	
What my equations mean in words:	
My solution:	

ONAP PERFORMANCE TASK CLASS TRACKING SHEET
GRADE 6: PATTERNING AND ALGEBRA
PART C

Date: ______________________ **Grade:** ______________________

School: ______________________ **Board:** ______________________

Teacher Name: ______________________

Performance Task Title: ______________________

Student Name	Level 1–4	Comments

Performance Task Rubric

Assessment of Learning – What to Look For in Student Work

CATEGORY	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
Knowledge and Understanding	• demonstrates a limited or inaccurate understanding of the concepts needed to solve the problem • demonstrates a limited or inaccurate knowledge of the specific concepts, terms, or procedural skills that have been taught	• demonstrates some understanding of the concepts needed to solve the problem • demonstrates some knowledge of the specific concepts, terms, or procedural skills that have been taught	• demonstrates considerable understanding of the concepts needed to solve the problem • demonstrates considerable knowledge of the specific concepts, terms, or procedural skills that have been taught	• demonstrates a thorough understanding of the concepts needed to solve the problem • demonstrates a thorough knowledge of the specific concepts, terms, or procedural skills that have been taught
Thinking	• demonstrates a limited understanding of the problem • shows little or no evidence of a plan • uses a strategy and attempts to solve the problem but does not arrive at an answer	• demonstrates some understanding of the problem • shows some evidence of a plan • carries out the plan to some extent by using a strategy and develops a partial and/or incorrect solution	• demonstrates considerable understanding of the problem • shows evidence of an appropriate plan • carries out the plan effectively by using an appropriate strategy and solving the problem	• demonstrates a thorough understanding of the problem • shows evidence of a thorough plan • shows flexibility and insight when carrying out the plan by trying and adapting when necessary one or more strategies to solve the problem
Communication	• provides a limited or inaccurate explanation/ justification that lacks clarity or logical thought • communicates with limited effectiveness (may include words, pictures, symbols, and/or numbers)	• provides a partial explanation/justification that shows some clarity and logical thought • communicates with some effectiveness (may include words, pictures, symbols, and/or numbers)	• provides a complete, clear, and logical explanation/ justification • communicates with considerable effectiveness (may include words, pictures, symbols, and/or numbers)	• provides a thorough, clear, and insightful explanation/justification • communicates with a high degree of effectiveness (may include words, pictures, symbols, and/or numbers)
Application	• demonstrates a limited ability to apply mathematical knowledge and skills	• demonstrates some ability to apply mathematical knowledge and skills	• demonstrates considerable ability to apply mathematical knowledge and skills	• demonstrates a sophisticated ability to apply mathematical knowledge and skills

Performance Task 1: How Much Will Riley Win? LEVEL 1 (Anchor 1)

Knowledge and Understanding
- demonstrates a limited understanding of the concepts related to growing patterns required to solve the problem

Communication
- articulates a limited explanation of how the problem was solved in question 3 and provides an incorrect answer for question 5

Thinking
- demonstrates limited evidence of a plan (creates patterns for Options A and B that do not correspond to the criteria given)
- chooses a strategy but calculates incorrectly and makes pattern rule errors in question 4

Application
- displays a limited ability to apply knowledge of growing patterns to solve the problem
- incorrectly attempts to apply the use of variables and an equation in questions 1, 2, and 4

Performance Task 1: How Much Will Riley Win? (page 1)

Riley has been selected to be on a game show. The more questions he answers correctly, the more prize money he wins. For example:

- If Riley gets Question 1 correct, he wins $4.
- If Riley gets Question 2 correct, he wins $12.
- If Riley gets Question 3 correct, he wins $20.
- If Riley answers Question 1 and Question 2 correctly, but gets Question 3 wrong, he wins $12.

1. Describe the pattern for the prize money Riley might win. Write a rule to describe this pattern.

When Riley gets a question, his money increses by 8 each time.
x=y+8

2. Create a table of values that shows the question numbers and the prize money won for the first 10 questions.

Question X	Money Won ($) Y
1	$4
2	$12
3	$20
4	$28
5	$36
6	$44
7	$52
8	$60
9	$68
10	$76

Performance Task 1: How Much Will Riley Win? (page 2)

3. Riley has a goal of winning at least $100. Is this possible according to the prize-winning pattern described on page 1? When will he have won $100? Explain your answer.

yes it is possible because if you Keep adding 8 to the number. that you just added you will a evental come to $100

4. Riley is asked to be a contestant on a different game show. Create 2 different prize-winning options for Riley to choose from.

- Each of the prize-winning options should be based on a growing pattern.
- Prize-winning Option A should be the better choice for getting each of the first five questions correct.
- Prize-winning Option B should be the better choice for getting Question 6 correct and every question after that.

Create and describe your 2 prize-winning options.

3X2x1=Y Prize-winning Option A		Prize-winning Option B	
Question	Money earned($)	Question	Money earned ($)
1	3	1	4
2	5	2	4
3	25	3	8
4	125	4	16
5	625	5	32
6	3125	6	64
7	15625	7	128
8	[illegible]	8	256

Performance Task 1: How Much Will Riley Win? (page 3)

5. a) If Riley answers Question 4 correctly, how much more money would he win with prize-winning Option A than with prize-winning Option B?

he will win a caple 1000 more then Option B

b) If Riley answers Question 9 correctly, how much more money will he win with prize-winning Option B than with prize-winning Option A?

512

Performance Task 1: How Much Will Riley Win? LEVEL 1 (Anchor 2)

Knowledge and Understanding
- demonstrates a limited understanding of the concepts related to growing patterns required to solve the problem (includes a shrinking pattern in question 4 and counts only by 5s)

Communication
- articulates a limited explanation of the solution in question 5 by not showing how the answer was calculated

Thinking
- demonstrates limited evidence of a plan and carries it out with limited effectiveness (applies both growing and shrinking patterns in question 4 without adhering to the criteria)

Application
- displays a limited ability to apply knowledge of growing patterns to solve the problem
- incorrectly applies a doubling strategy in question 3 and a shrinking pattern in question 4

Performance Task 1: How Much Will Riley Win? (page 1)

Riley has been selected to be on a game show. The more questions he answers correctly, the more prize money he wins. For example:

- If Riley gets Question 1 correct, he wins $4.
- If Riley gets Question 2 correct, he wins $12.
- If Riley gets Question 3 correct, he wins $20.
- If Riley answers Question 1 and Question 2 correctly, but gets Question 3 wrong, he wins $12.

1. Describe the pattern for the prize money Riley might win. Write a rule to describe this pattern.

For each question riley gets right he wins eight more dollars than the question before it.

2. Create a table of values that shows the question numbers and the prize money won for the first 10 questions.

x Question	Money Won ($) y
1	4
2	12
3	20
4	28
5	36
6	44
7	52
8	60
9	68
10	76

Performance Task 1: How Much Will Riley Win? (page 2)

3. Riley has a goal of winning at least $100. Is this possible according to the prize-winning pattern described on page 1? When will he have won $100? Explain your answer.

I dont think riley can win exactly 100$ but if he won 52 on the 7th round he could win 104$on the 14th.

4. Riley is asked to be a contestant on a different game show. Create 2 different prize-winning options for Riley to choose from.
- Each of the prize-winning options should be based on a growing pattern.
- Prize-winning Option A should be the better choice for getting each of the first five questions correct.
- Prize-winning Option B should be the better choice for getting Question 6 correct and every question after that.

Create and describe your 2 prize-winning options.

Prize-winning Option A			Prize-winning Option B	
1 50$	5 30$	9 10$	1.5	9.45
2 45$	6 25$	10 5$	2.10	10.50
3 40$	7 20$		3.15	
4 35$	8 15$		4.20	
			5.25	
			6.30	
			7.35	
			8.40	

Performance Task 1: How Much Will Riley Win? (page 3)

5. a) If Riley answers Question 4 correctly, how much more money would he win with prize-winning Option A than with prize-winning Option B?

He will win 15 more dollars.

b) If Riley answers Question 9 correctly, how much more money will he win with prize-winning Option B than with prize-winning Option A?

he will win 35 more dollars

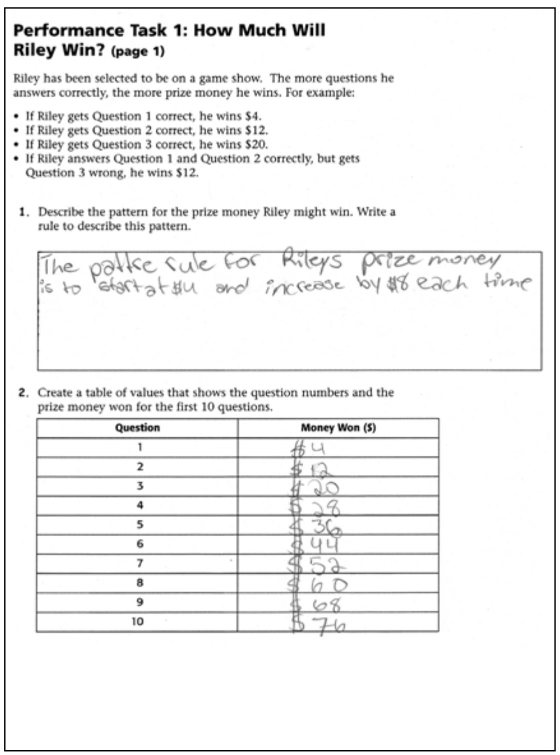
Performance Task 1: How Much Will Riley Win? LEVEL 2 (Anchor 1)

Knowledge and Understanding
- exhibits some understanding of the concepts involved in solving the problem by organizing and extending the tables of values in questions 2 and 3
- creates a pattern in question 4 that does not grow by a consistent amount

Communication
- organizes mathematical thinking into tables of values with some effectiveness
- provides complete and clear answers to questions 1 and 3

Thinking
- indicates some understanding of the problem (accurately describes the pattern rule in question 1 and extends the tables of values in questions 2 and 3)

Application
- applies knowledge to create patterns in question 4 with some accuracy
- applies some data from question 4 accurately to solve question 5
- makes connections and uses the information in questions 1 and 2 to solve question 3 accurately



Performance Task 1: How Much Will Riley Win? (page 1)

Riley has been selected to be on a game show. The more questions he answers correctly, the more prize money he wins. For example:

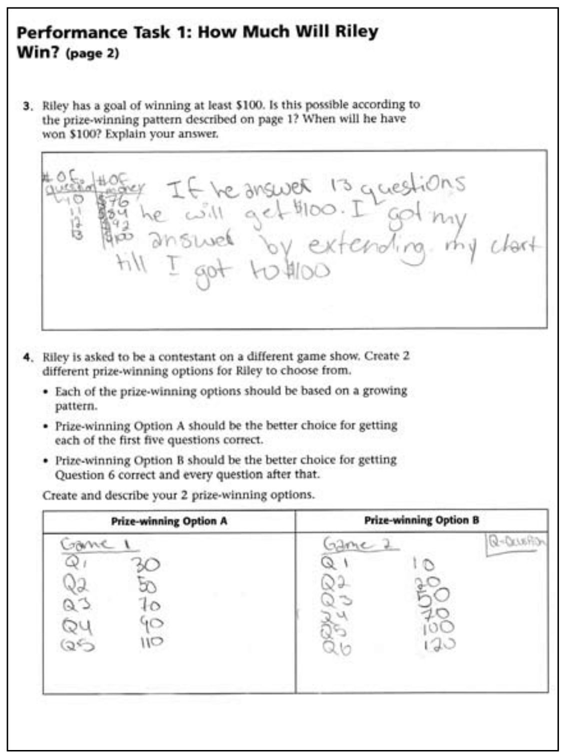
- If Riley gets Question 1 correct, he wins $4.
- If Riley gets Question 2 correct, he wins $12.
- If Riley gets Question 3 correct, he wins $20.
- If Riley answers Question 1 and Question 2 correctly, but gets Question 3 wrong, he wins $12.

1. Describe the pattern for the prize money Riley might win. Write a rule to describe this pattern.

The pattke rule for Rileys prize money is to start at $4 and increase by $8 each time

2. Create a table of values that shows the question numbers and the prize money won for the first 10 questions.

Question	Money Won ($)
1	$4
2	$12
3	$20
4	$28
5	$36
6	$44
7	$52
8	$60
9	$68
10	$76



Performance Task 1: How Much Will Riley Win? (page 2)

3. Riley has a goal of winning at least $100. Is this possible according to the prize-winning pattern described on page 1? When will he have won $100? Explain your answer.

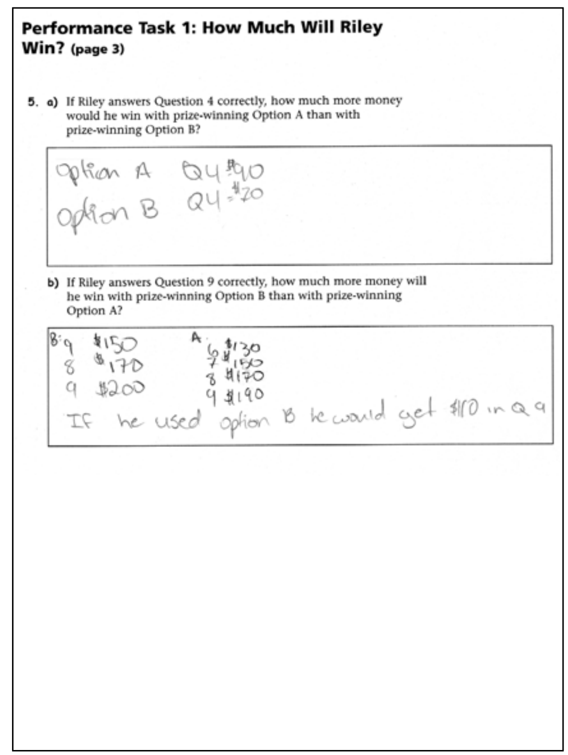
# of question	# of money
10	$76
11	$84
12	$92
13	$100

If he answer 13 questions he will get $100. I got my answer by extending my chart till I got to $100

4. Riley is asked to be a contestant on a different game show. Create 2 different prize-winning options for Riley to choose from.
   - Each of the prize-winning options should be based on a growing pattern.
   - Prize-winning Option A should be the better choice for getting each of the first five questions correct.
   - Prize-winning Option B should be the better choice for getting Question 6 correct and every question after that.

   Create and describe your 2 prize-winning options.

Prize-winning Option A	Prize-winning Option B
Game 1 Q1 30 Q2 50 Q3 70 Q4 90 Q5 110	Game 2 (Q-Question) Q1 10 Q2 20 Q3 50 Q4 70 Q5 100 Q6 120



Performance Task 1: How Much Will Riley Win? (page 3)

5. a) If Riley answers Question 4 correctly, how much more money would he win with prize-winning Option A than with prize-winning Option B?

option A Q4 $90
option B Q4 $70

b) If Riley answers Question 9 correctly, how much more money will he win with prize-winning Option B than with prize-winning Option A?

B: 9 $150
8 $170
9 $200

A: 6 $130
7 $150
8 $170
9 $190

If he used option B he would get $10 in Q 9

Performance Task 1: How Much Will Riley Win? LEVEL 2 (Anchor 2)

Knowledge and Understanding
- exhibits some understanding of the concepts related to growing patterns by solving questions 2 and 3
- demonstrates a limited ability to describe patterns clearly and write a rule in question 1

Communication
- provides a partial explanation of how the problem was solved in questions 1 and 3
- demonstrates the ability to appropriately organize growing patterns into tables of values

Thinking
- chooses a strategy and carries out a plan but does not satisfy the criteria in question 4 or extend the pattern to answer question 5 correctly
- demonstrates some understanding of the problem by accurately extending the pattern in question 2 and creating patterns in question 4

Application
- applies some of the information provided in the problem to solve question 1
- provides limited evidence of applying knowledge in question 4 to create patterns that follow the criteria

Performance Task 1: How Much Will Riley Win? (page 1)

Riley has been selected to be on a game show. The more questions he answers correctly, the more prize money he wins. For example:

- If Riley gets Question 1 correct, he wins $4.
- If Riley gets Question 2 correct, he wins $12.
- If Riley gets Question 3 correct, he wins $20.
- If Riley answers Question 1 and Question 2 correctly, but gets Question 3 wrong, he wins $12.

1. Describe the pattern for the prize money Riley might win. Write a rule to describe this pattern.

Riley might win $12
if Riley got answer the Question 3 he would get a prize money of $20

2. Create a table of values that shows the question numbers and the prize money won for the first 10 questions.

Question	Money Won ($)
1	4
2	12
3	20
4	28
5	36
6	44
7	52
8	60
9	68
10	76
11	84
12	92
13	100

Performance Task 1: How Much Will Riley Win? (page 2)

3. Riley has a goal of winning at least $100. Is this possible according to the prize-winning pattern described on page 1? When will he have won $100? Explain your answer.

yes he will have $100 on his 13 question I got this answer because I add like 4+9=12 12+8=20 so I got this answer. I add 8

4. Riley is asked to be a contestant on a different game show. Create 2 different prize-winning options for Riley to choose from.
   - Each of the prize-winning options should be based on a growing pattern.
   - Prize-winning Option A should be the better choice for getting each of the first five questions correct.
   - Prize-winning Option B should be the better choice for getting Question 6 correct and every question after that.

   Create and describe your 2 prize-winning options.

Prize-winning Option A		Prize-winning Option B	
win 1	$ 4	win 1	$ 8
win 2	$ 8	win 2	$ 16
win 3	$ 16	win 3	$ 32
win 4	$ 32	win 4	64
win 5	$ 64	win 5	128
win 6	$ 128	win 6	$ 256

Performance Task 1: How Much Will Riley Win? (page 3)

5. a) If Riley answers Question 4 correctly, how much more money would he win with prize-winning Option A than with prize-winning Option B?

Riley could win if Riley answer all the question on Option A he could win. $ 128
Riley could win on option if Riley answer all the question he could win $256

b) If Riley answers Question 9 correctly, how much more money will he win with prize-winning Option B than with prize-winning Option A?

Riley could win in Option B $ 512
Riley could win in Option A $ 128

Performance Task 1: How Much Will Riley Win? LEVEL 3 (Anchor 1)

Knowledge and Understanding
- demonstrates a considerable understanding of the concepts involved in the problem by using and extending tables of values accurately
- creates two different growing patterns that follow most of the criteria in question 4

Communication
- uses appropriate words and numbers to explain thinking
- provides a logical explanation/justification for solutions

Thinking
- demonstrates an understanding of the problem by describing the pattern rule and generating tables of values in questions 1 and 2; creates tables of values in question 4 that follow some of the criteria
- chooses an appropriate strategy of extending a table of values to solve question 3 and carries out the plan accurately

Application
- applies data generated by question 4 appropriately to solve question 5, but does not calculate the difference
- demonstrates the ability to create and apply pattern rules in a new context in question 4

Performance Task 1: How Much Will Riley Win? (page 1)

Riley has been selected to be on a game show. The more questions he answers correctly, the more prize money he wins. For example:

- If Riley gets Question 1 correct, he wins $4.
- If Riley gets Question 2 correct, he wins $12.
- If Riley gets Question 3 correct, he wins $20.
- If Riley answers Question 1 and Question 2 correctly, but gets Question 3 wrong, he wins $12.

1. Describe the pattern for the prize money Riley might win. Write a rule to describe this pattern.

It starts at $4 you add $8 each time he wins and if he get's 3 wrong you decrease $8 then it goes back to $12 then the game is over

2. Create a table of values that shows the question numbers and the prize money won for the first 10 questions.

Question	Money Won ($)
1	$4
2	$12
3	$20
4	$28
5	$36
6	$44
7	$52
8	$60
9	$68
10	$76
11	84
12	92
13	100

Performance Task 1: How Much Will Riley Win? (page 2)

3. Riley has a goal of winning at least $100. Is this possible according to the prize-winning pattern described on page 1? When will he have won $100? Explain your answer.

Yes he could win $100 because at page 1 question 2 if riley goes upto question 13 it would be $100

4. Riley is asked to be a contestant on a different game show. Create 2 different prize-winning options for Riley to choose from.
   - Each of the prize-winning options should be based on a growing pattern.
   - Prize-winning Option A should be the better choice for getting each of the first five questions correct.
   - Prize-winning Option B should be the better choice for getting Question 6 correct and every question after that.

   Create and describe your 2 prize-winning options.

Prize-winning Option A

qestion1	$7
qestion2	$14
question3	$21
question4	$28
question5	$35
question6	$42
question7	$49
question8	$56
question9	$63

Prize-winning Option B

question	many
1	$10
2	$20
3	$30
4	$40
5	$50
6	$60
7	$70
8	$80

Performance Task 1: How Much Will Riley Win? (page 3)

5. a) If Riley answers Question 4 correctly, how much more money would he win with prize-winning Option A than with prize-winning Option B?

option A=$28
option B=$40

b) If Riley answers Question 9 correctly, how much more money will he win with prize-winning Option B than with prize-winning Option A?

option A=$63
option B= $90

Performance Task 1: How Much Will Riley Win? LEVEL 3 (Anchor 2)

Knowledge and Understanding
- demonstrates considerable understanding of the concepts involved in the problem by creating, using, and extending tables of values accurately
- creates two different growing patterns that follow the criteria in question 4

Communication
- uses appropriate words and numbers to clearly explain thinking
- provides logical and complete explanations to justify solutions

Thinking
- demonstrates an understanding of the problem by accurately creating tables of values that follow the criteria
- carries out a plan and solves questions 2 to 5 accurately

Application
- connects data from different parts of the problem appropriately and accurately
- demonstrates some difficulty applying the information in the problem to write a pattern rule in question 1 (describes the pattern but does not generalize to create a rule)

Performance Task 1: How Much Will Riley Win? (page 1)

Riley has been selected to be on a game show. The more questions he answers correctly, the more prize money he wins. For example:

- If Riley gets Question 1 correct, he wins $4.
- If Riley gets Question 2 correct, he wins $12.
- If Riley gets Question 3 correct, he wins $20.
- If Riley answers Question 1 and Question 2 correctly, but gets Question 3 wrong, he wins $12.

1. Describe the pattern for the prize money Riley might win. Write a rule to describe this pattern.

If Riley gets Question 1 correct, he wins $4. If Riley keeps getting the questions correct, the money will keep adding $8 each time. So, on Question 2, and 3, he will win $20 if he gets them correct.

2. Create a table of values that shows the question numbers and the prize money won for the first 10 questions.

Question	Money Won ($)
1	4
2	12
3	20
4	28
5	36
6	44
7	52
8	60
9	68
10	76

Performance Task 1: How Much Will Riley Win? (page 2)

3. Riley has a goal of winning at least $100. Is this possible according to the prize-winning pattern described on page 1? When will he have won $100? Explain your answer.

If I extended this pattern, then I will get to $100. For Question 11, he would get $84. For Question 12, he would get $92. And for Question 13, he would get $100. So, if he gets Question 13. correct, then he wins $100.

4. Riley is asked to be a contestant on a different game show. Create 2 different prize-winning options for Riley to choose from.
   - Each of the prize-winning options should be based on a growing pattern.
   - Prize-winning Option A should be the better choice for getting each of the first five questions correct.
   - Prize-winning Option B should be the better choice for getting Question 6 correct and every question after that.

   Create and describe your 2 prize-winning options.

Prize-winning Option A		Prize-winning Option B	
Question	Money Won ($)	Question	Money Won ($)
1	8	1	3
2	24	2	6
3	40	3	12
4	56	4	24
5	72	5	48
6	88	6	96
7	104	7	192
8	120	8	384

Performance Task 1: How Much Will Riley Win? (page 3)

5. a) If Riley answers Question 4 correctly, how much more money would he win with prize-winning Option A than with prize-winning Option B?

For Option A, he would win $56 for Question 4, and for Option B, he would win $24 for Question 4. So, if 56 subtract 24 is 32, then he would win $32 more than with Option B.

b) If Riley answers Question 9 correctly, how much more money will he win with prize-winning Option B than with prize-winning Option A?

For Option B, he would win $768 for Question 9, and for Option A, he would win $136 for Question 9. So, if 768 subtract 136 is 632, then he would win $632 more than with Option A.

Performance Task C1: How Much Will Riley Win? LEVEL 4 (Anchor 1)

Knowledge and Understanding
- indicates an in-depth understanding of the concepts involved by accurately creating, extending, and representing growing patterns
- clearly describes the pattern and identifies a rule for question 1 that relates the term number (question number) to the term value (money won)

Communication
- provides logical and complete explanations that include numbers and words to justify solutions
- organizes answers clearly to convey thinking

Thinking
- shows clear evidence of a plan and implements it accurately to solve all parts of the problem
- chooses and carries out an effective strategy to create two different growing patterns that follow the criteria in question 4

Application
- applies reasoning appropriately and accurately; connects data from different parts of the problem (uses data from question 4 and extends the table of values to solve question 5)
- applies the pattern rule from question 1 to solve question 3 accurately

Performance Task 1: How Much Will Riley Win? (page 1)

Riley has been selected to be on a game show. The more questions he answers correctly, the more prize money he wins. For example:

- If Riley gets Question 1 correct, he wins $4.
- If Riley gets Question 2 correct, he wins $12.
- If Riley gets Question 3 correct, he wins $20.
- If Riley answers Question 1 and Question 2 correctly, but gets Question 3 wrong, he wins $12.

1. Describe the pattern for the prize money Riley might win. Write a rule to describe this pattern.

Start at 4 and increase by 8 each time
$y=(x\times8)-4$

2. Create a table of values that shows the question numbers and the prize money won for the first 10 questions.

Question	Money Won ($)
1	4
2	12
3	20
4	28
5	36
6	44
7	52
8	60
9	68
10	76

Performance Task 1: How Much Will Riley Win? (page 2)

3. Riley has a goal of winning at least $100. Is this possible according to the prize-winning pattern described on page 1? When will he have won $100? Explain your answer.

Riley can get 100 dollars by getting all the questions up to question 13 because if he goes to question 12, 11, 10 the prize money would be less than 100 dollars

4. Riley is asked to be a contestant on a different game show. Create 2 different prize-winning options for Riley to choose from.
- Each of the prize-winning options should be based on a growing pattern.
- Prize-winning Option A should be the better choice for getting each of the first five questions correct.
- Prize-winning Option B should be the better choice for getting Question 6 correct and every question after that.

Create and describe your 2 prize-winning options.

Prize-winning Option A		Prize-winning Option B	
Question	Money Won	Question	Money Won
1	7	1	1
2	10	2	2
3	13	3	4
4	16	4	8
5	19	5	16
6	22	6	32
7	25	7	64
8	28	8	128
9	31	9	256

Performance Task 1: How Much Will Riley Win? (page 3)

5. a) If Riley answers Question 4 correctly, how much more money would he win with prize-winning Option A than with prize-winning Option B?

16 - 8 = 8
Riley would win 8 dollars more with option A than option B.

b) If Riley answers Question 9 correctly, how much more money will he win with prize-winning Option B than with prize-winning Option A?

256 - 31 = 225
Riley would win 225 dollars more with option B than option A

Performance Task 1: How Much Will Riley Win? LEVEL 4 (Anchor 2)

Knowledge and Understanding
- indicates an in-depth understanding of the concepts involved by accurately creating, extending, and representing growing patterns

Communication
- provides clear and thorough explanations to prove that the solutions are correct

Thinking
- shows clear evidence of a plan and implements it accurately
- chooses and carries out an effective strategy to create two different growing patterns that follow the criteria in question 4
- demonstrates evidence of checking that the solutions are appropriate and correct in question 5 (provides number sentences that confirm the answers)

Application
- applies reasoning and connects data from different parts of the problem to determine the solution (applies pattern rule from question 4 to answer question 5 correctly)

Performance Task 1: How Much Will Riley Win? (page 1)

Riley has been selected to be on a game show. The more questions he answers correctly, the more prize money he wins. For example:

- If Riley gets Question 1 correct, he wins $4.
- If Riley gets Question 2 correct, he wins $12.
- If Riley gets Question 3 correct, he wins $20.
- If Riley answers Question 1 and Question 2 correctly, but gets Question 3 wrong, he wins $12.

1. Describe the pattern for the prize money Riley might win. Write a rule to describe this pattern.

The pattern rule can be, start at four and add 8 each time

2. Create a table of values that shows the question numbers and the prize money won for the first 10 questions.

Question	Money Won ($)
1	4
2	12
3	20
4	28
5	36
6	44
7	52
8	60
9	68
10	76

Performance Task 1: How Much Will Riley Win? (page 2)

3. Riley has a goal of winning at least $100. Is this possible according to the prize-winning pattern described on page 1? When will he have won $100? Explain your answer.

On the chart 10 questions is $76, I'll continue the pattern. 84, 92, 100. It is possible, he will get $100 13 questions into the game.

4. Riley is asked to be a contestant on a different game show. Create 2 different prize-winning options for Riley to choose from.
   - Each of the prize-winning options should be based on a growing pattern.
   - Prize-winning Option A should be the better choice for getting each of the first five questions correct.
   - Prize-winning Option B should be the better choice for getting Question 6 correct and every question after that.

   Create and describe your 2 prize-winning options.

Prize-winning Option A			Prize-winning Option B		
1	1	Start at one add four each time	1	1	Start at one double previous number
2	5		2	2	
3	9		3	4	
4	13		4	8	
5	17		5	16	
6	21		6	32	

Performance Task 1: How Much Will Riley Win? (page 3)

5. a) If Riley answers Question 4 correctly, how much more money would he win with prize-winning Option A than with prize-winning Option B?

	Option A	Option B	$8 + \underline{5} = 13$
4	13	8	He will win $5 more.

b) If Riley answers Question 9 correctly, how much more money will he win with prize-winning Option B than with prize-winning Option A?

	Option A	Option B	$33 + \underline{223} = 256$
9	33	256	He will win $223 more.

Performance Task 2: Babysitting LEVEL 1 (Anchor 1)

Knowledge and Understanding
- demonstrates a limited understanding of using variables and equations to solve the problem (incorrectly uses equation and variables in questions 1 and 2)

Communication
- provides limited or inaccurate explanations that lack clarity

Thinking
- indicates a limited understanding of the problem (misinterprets the variables needed to solve the problem)
- exhibits limited evidence of a plan and carries it out with errors in questions 1 to 3

Application
- displays a limited ability to apply knowledge of variables and equations to solve the problem (creates and solves a simple problem that uses only one equation in question 4)

Performance Task 2: Babysitting (page 1)

For babysitting her neighbour's children, Callie gets paid per hour based on the equations below. She gets paid $2.00 per hour more after 9:00 p.m. because it is late at night.

Time	Equation
Before 9:00 p.m.	$P = \$4 \times h$
After 9:00 p.m.	$P = \$6 \times h$

1. What are the variables in these equations and what do they represent?

$2 = $4 x 9.00 pm
p = $4 x h
$2 = $6x 9.00 pm
p = $6 x h

2. Callie was babysitting one evening from 6:00 p.m. until 11:00 p.m. How much should she be paid? Use the equations above to help you determine your answer.

Callie is babysitting for $2 anhour so callie is working before 9.00 and after so =
$2x 5 h = 10
Callie should be paid $100

3. Callie received a total of $60.00 for babysitting. Use the equations above to help determine how many hours before 9:00 p.m. and how many hours after 9:00 p.m. she could have worked in total to earn this amount of pay. Try to find all the possibilities.

2h×$30 = $60.00
6h×$10 = $60.00

Performance Task 2: Babysitting (page 2)

4. Create a problem of your own that would require the use of two equations to solve it. Do not use the same equations as on page 1. Your problem could be about babysitting, or it could be about a different situation. Complete all areas of the chart below.

My problem/situation:	I bought 4 packages of cards and now I have a total of 20 cards how many cards were in each package.
My equations in this problem:	4 x h = 20
What my equations mean in words:	4X h = 20 Stands for how many is in each package.
My solution:	4 X 5 = 20

Performance Task 2: Babysitting LEVEL 1 (Anchor 2)

Knowledge and Understanding
- demonstrates a limited understanding of using variables and equations to solve the problem (identifies variables but does not use them appropriately to answer questions 2 and 3 correctly)

Communication
- provides limited or inaccurate explanations (does not fully explain the problem created in question 4)

Thinking
- indicates a limited understanding of the problems in questions 2 and 3 (does not apply equations correctly)
- exhibits limited evidence of creating and carrying out a plan in question 4

Application
- displays a limited ability to apply knowledge of variables and equations to solve the problems in questions 2 and 3
- shows limited evidence of applying a simple equation to solve question 4

Performance Task 2: Babysitting (page 1)

For babysitting her neighbour's children, Callie gets paid per hour based on the equations below. She gets paid $2.00 per hour more after 9:00 p.m. because it is late at night.

Time	Equation
Before 9:00 p.m.	$P = \$4 \times h$
After 9:00 p.m.	$P = \$6 \times h$

1. What are the variables in these equations and what do they represent?

P=Pay & h=hour

2. Callie was babysitting one evening from 6:00 p.m. until 11:00 p.m. How much should she be paid? Use the equations above to help you determine your answer.

Callie worked before and After 9:00 so she should be payed $10 from 6:00p.m. to 11:00p.m.

3. Callie received a total of $60.00 for babysitting. Use the equations above to help determine how many hours before 9:00 p.m. and how many hours after 9:00 p.m. she could have worked in total to earn this amount of pay. Try to find all the possibilities.

P=$6x10, P=5x12, P=3x20, P=4x15, P=60x1, P=

Performance Task 2: Babysitting (page 2)

4. Create a problem of your own that would require the use of two equations to solve it. Do not use the same equations as on page 1. Your problem could be about babysitting, or it could be about a different situation. Complete all areas of the chart below.

My problem/situation:	Vanessa is walking dogs for $10 everyday from 2:00 p.m. to 4:10 p.m.
My equations in this problem:	P=$10×h
What my equations mean in words:	Payed=P hour=h P=$10×h
My solution:	P=5×2

Performance Task 2: Babysitting LEVEL 2 (Anchor 1)

Knowledge and Understanding
- exhibits some knowledge of variables in question 1
- demonstrates some understanding of using equations with variables to solve problems in questions 2 and 4

Communication
- provides partial explanations for solutions that show some clarity and thought

Thinking
- indicates a limited understanding of the problems
- uses a strategy and carries out a plan to some extent to develop partial and/or incorrect solutions (creates a scenario in question 4)

Application
- demonstrates some ability to use and apply knowledge of equations in question 4 but does not to use variables

Performance Task 2: Babysitting (page 1)

For babysitting her neighbour's children, Callie gets paid per hour based on the equations below. She gets paid $2.00 per hour more after 9:00 p.m. because it is late at night.

Time	Equation
Before 9:00 p.m.	$P = \$4 \times h$
After 9:00 p.m.	$P = \$6 \times h$

1. What are the variables in these equations and what do they represent?

The variables are p and h they represent the numbers you multiply it with and the answer.

2. Callie was babysitting one evening from 6:00 p.m. until 11:00 p.m. How much should she be paid? Use the equations above to help you determine your answer.

She gets $24.00 from 6:00pm to 11:00pm because 4x3=12 and 6x2=12 so 12+12= 24.

3. Callie received a total of $60.00 for babysitting. Use the equations above to help determine how many hours before 9:00 p.m. and how many hours after 9:00 p.m. she could have worked in total to earn this amount of pay. Try to find all the possibilities.

12:00 pm - 11:00pm
11:00a.m - 10:00p.m
1:00 p.m - 12:00pm
2:00 p.m - 1:00 a.m

Performance Task 2: Babysitting (page 2)

4. Create a problem of your own that would require the use of two equations to solve it. Do not use the same equations as on page 1. Your problem could be about babysitting, or it could be about a different situation. Complete all areas of the chart below.

My problem/situation:	1 year of 1 dance class is $200.00 but solo's are $150.00, if I take 5 dance class's and 1 solo how much money would it cost?
My equations in this problem:	5x$200.00 = 1x$150.00= answer + answer
What my equations mean in words:	5 dance classes 1 =$200.00 so $200.00 x 5 = 1 solo =$150.00 = 5 dances + 1 solo
My solution:	5x$200.00=$1000.00 1x$150.00 =150.00 1000+150.00 =3000.00

Performance Task 2: Babysitting LEVEL 2 (Anchor 2)

Knowledge and Understanding

- demonstrates some understanding of using variables and equations to solve the problems (identifies and uses variables and simple equations in questions 1 and 2)

Communication

- provides some clear explanations for questions 1 and 2
- justifies solutions with some clarity and organization in questions 3 and 4

Thinking

- exhibits evidence of carrying out a plan, sometimes leading to an accurate solution
- demonstrates limited understanding of the problems in questions 3 and 4 (uses factors in question 3 that are not part of the solution and do not fulfill all the requirements of question 4)

Application

- demonstrates some ability to connect and relate variables and equations in a new situation
- applies a simple equation to help solve a problem but does not create a problem requiring multiple equations in question 4

Performance Task 2: Babysitting (page 1)

For babysitting her neighbour's children, Callie gets paid per hour based on the equations below. She gets paid $2.00 per hour more after 9:00 p.m. because it is late at night.

Time	Equation
Before 9:00 p.m.	$P = \$4 \times h$
After 9:00 p.m.	$P = \$6 \times h$

1. What are the variables in these equations and what do they represent?

P $4 x h P= Payed
P= $6 x h h= hour

2. Callie was babysitting one evening from 6:00 p.m. until 11:00 p.m. How much should she be paid? Use the equations above to help you determine your answer.

P= 4 x h 6:00p.m to 9:00 p.m
P= 6 x h $12
9:00 p.m to 11.p.m
$12
she gets 24 dollars for baby sitting

3. Callie received a total of $60.00 for babysitting. Use the equations above to help determine how many hours before 9:00 p.m. and how many hours after 9:00 p.m. she could have worked in total to earn this amount of pay. Try to find all the possibilities.

$10 x $6 = $60 → $30 x 2 = $60 12 x 5 = $60 20 x 3 = $60 15 x 4 = $60

Performance Task 2: Babysitting (page 2)

4. Create a problem of your own that would require the use of two equations to solve it. Do not use the same equations as on page 1. Your problem could be about babysitting, or it could be about a different situation. Complete all areas of the chart below.

My problem/situation:	I have 10 action figures I give h to my brother.
My equations in this problem:	10 - H = 5
What my equations mean in words:	H = 5
My solution:	10 - H = 5 I give 5 action figures to my brother

Performance Task 2: Babysitting LEVEL 3 (Anchor 1)

Knowledge and Understanding
- demonstrates considerable understanding of the concepts of variables and equations involved in solving simple and more complex problems; makes some minor errors

Communication
- clearly communicates thinking and solutions with appropriate organization
- provides a complete explanation of how the problem was solved in question 4

Thinking
- exhibits a good understanding of the problems and accurately carries out a plan in question 4
- demonstrates evidence of using an effective strategy and providing multiple solutions to question 3

Application
- applies an understanding of variables and equations in a variety of situations
- creates and solves question 4, which requires two equations, making only minor errors

Performance Task 2: Babysitting (page 1)

For babysitting her neighbour's children, Callie gets paid per hour based on the equations below. She gets paid $2.00 per hour more after 9:00 p.m. because it is late at night.

Time	Equation
Before 9:00 p.m.	$P = \$4 \times h$
After 9:00 p.m.	$P = \$6 \times h$

1. What are the variables in these equations and what do they represent?

P= $4 x h
P= $6 x h
P represents paid.
H represents hours

2. Callie was babysitting one evening from 6:00 p.m. until 11:00 p.m. How much should she be paid? Use the equations above to help you determine your answer.

Before 9:00pm.	After 9:00pm.
P=$2x4h	P=$6x3h
$8=$2x4h	$18=$6x3h

3. Callie received a total of $60.00 for babysitting. Use the equations above to help determine how many hours before 9:00 p.m. and how many hours after 9:00 p.m. she could have worked in total to earn this amount of pay. Try to find all the possibilities.

Before 9:00	After 9:00
$60=$12x5h	+ $ 24$6x4h
$36=$4 x 9h	$60=$6x10h

Performance Task 2: Babysitting (page 2)

4. Create a problem of your own that would require the use of two equations to solve it. Do not use the same equations as on page 1. Your problem could be about babysitting, or it could be about a different situation. Complete all areas of the chart below.

My problem/situation:	Melanie is a member of 12 websites on the computer. She plays on the computer exactly 6h a day for 7days a week. How many hours can she go to 12 websites in 6days?
My equations in this problem:	6h x 6 = h h ÷ 12 = 3
What my equations mean in words:	6 hours a day times 6 days divided by 12 websites equals how many times
My solution:	Melanie could go to each website 3 times. 6h x 6 days = 36 36 ÷ 12 webs = 3

Performance Task 2: Babysitting LEVEL 3 (Anchor 2)

Knowledge and Understanding
- demonstrates considerable understanding of the concepts related to variables and equations
- solves simple and more complex problems accurately

Communication
- expresses and organizes solutions with considerable clarity (gives complete explanations in questions 2 and 4)

Thinking
- exhibits a good understanding of the problems and accurately carries out a plan
- demonstrates the ability to choose an effective strategy and check that it is appropriate (provides proof through re-statement in question 4)

Application
- applies an understanding of variables and equations in unfamiliar contexts but does not apply this understanding to question 3
- creates and logically solves a problem involving two equations in question 4

Performance Task 2: Babysitting (page 1)

For babysitting her neighbour's children, Callie gets paid per hour based on the equations below. She gets paid $2.00 per hour more after 9:00 p.m. because it is late at night.

Time	Equation
Before 9:00 p.m.	$P = \$4 \times h$
After 9:00 p.m.	$P = \$6 \times h$

1. What are the variables in these equations and what do they represent?

The variables in the equations are P and h. The first equation represents the pay and the hour.

2. Callie was babysitting one evening from 6:00 p.m. until 11:00 p.m. How much should she be paid? Use the equations above to help you determine your answer.

Callie should be paid $24 because from 6.00pm to 9:00pm she gets paid $12, and from 9:00pm to 11:00pm she gets paid $12 because she gets $2 extra per hour.

3. Callie received a total of $60.00 for babysitting. Use the equations above to help determine how many hours before 9:00 p.m. and how many hours after 9:00 p.m. she could have worked in total to earn this amount of pay. Try to find all the possibilities.

She could have worked 9 hours before 9:00pm and 4 hours after 9:00pm. or 12 hours before 9:00pm and 12 hours after 9:00pm.

Performance Task 2: Babysitting (page 2)

4. Create a problem of your own that would require the use of two equations to solve it. Do not use the same equations as on page 1. Your problem could be about babysitting, or it could be about a different situation. Complete all areas of the chart below.

My problem/situation:	Anne works as a casher she gets paid $7 an hour until 7:00pm then she is paid $10 an hour. How much would Anne get paid if she worked from 3:00pm to 10:00 pm.
My equations in this problem:	Before 7:00 pm. = P = $7 x h After 7:00 p.m = P= $10 x h
What my equations mean in words:	My first equation means pay is $7 every hour, and the second one means pay is $10 every hour,
My solution:	4 hours × $7 = $28; 3 hours × $10 = $30; $28 + $30 = $58 ∴ Anne will get paid $58 if she works from 3:00pm to 10:00pm

Performance Task 2: Babysitting LEVEL 4 (Anchor 1)

Knowledge and Understanding
- demonstrates a thorough understanding of using variables and equations to solve simple and more complex problems
- uses variables and equations with a high degree of accuracy in questions 2 to 4

Communication
- provides thorough and clear explanations with justification for solutions to questions 2 to 4

Thinking
- exhibits an in-depth understanding of the problems and accurately implements effective strategies in questions 2 to 4
- demonstrates strong reasoning and thinking skills in solutions to questions 2 and 3

Application
- creates and logically solves a problem involving two equations in question 4
- makes connections and transfers knowledge of variables and equations to unfamiliar contexts to create a problem in question 4

Performance Task 2: Babysitting (page 1)

For babysitting her neighbour's children, Callie gets paid per hour based on the equations below. She gets paid $2.00 per hour more after 9:00 p.m. because it is late at night.

Time	Equation
Before 9:00 p.m.	$P = \$4 \times h$
After 9:00 p.m.	$P = \$6 \times h$

1. What are the variables in these equations and what do they represent?

P=$4×h Variables are P and h.
P=$6×h P represents pay and h represents how many hours.

2. Callie was babysitting one evening from 6:00 p.m. until 11:00 p.m. How much should she be paid? Use the equations above to help you determine your answer.

Before 9:00pm, she worked 3 hours, from 6:00pm to 9:00pm. (P=$4×3=$12) She worked 2 hours after 9:00pm. (P=$6×2=$12) $12+$12=$24)
She should be payed $24.

3. Callie received a total of $60.00 for babysitting. Use the equations above to help determine how many hours before 9:00 p.m. and how many hours after 9:00 p.m. she could have worked in total to earn this amount of pay. Try to find all the possibilities.

P=$4×9=$36 P=$6×4=$24 $60	P=$4×6=$24 P=$6×6=$36 60	P=$4×12=$48 P=$6×2=$12 $60 P=$6×8=$48 > 60 P=$4×3=$12

Performance Task 2: Babysitting (page 2)

4. Create a problem of your own that would require the use of two equations to solve it. Do not use the same equations as on page 1. Your problem could be about babysitting, or it could be about a different situation. Complete all areas of the chart below.

My problem/situation:	Clair babysat and was payed $5 on weekdays and $10 on weekends. How many hours can she work to get $70.00?
My equations in this problem:	$5×☐ + $10×☐ = $70.00
What my equations mean in words:	Multiply $5 by a number and add that to the product of $10.00 by a number, which has to equal $70.00
My solution:	There are many possibilities; eg. 15×4=60 10×1=10 $70

Performance Task 2: Babysitting LEVEL 4 (Anchor 2)

Knowledge and Understanding
- demonstrates a thorough understanding of using variables and equations to solve simple and complex problems
- uses variables and equations with a high degree of accuracy in questions 2 to 4

Communication
- provides thorough and clear explanations in questions 2 to 4
- shows a high degree of organization in communicating ideas in question 4

Thinking
- exhibits an in-depth understanding of the problems and accurately implements effective strategies in questions 2 to 4
- demonstrates strong reasoning and thinking skills (uses a combination of two formulas to find possibilities for question 3)

Application
- creates and logically solves a problem involving two equations in question 4
- makes connections and transfers knowledge of variables and equations to unfamiliar contexts to create a complex scenario in question 4

Performance Task 2: Babysitting (page 1)

For babysitting her neighbour's children, Callie gets paid per hour based on the equations below. She gets paid $2.00 per hour more after 9:00 p.m. because it is late at night.

Time	Equation
Before 9:00 p.m.	$P = \$4 \times h$
After 9:00 p.m.	$P = \$6 \times h$

1. What are the variables in these equations and what do they represent?

P =$4 × h   P = $6 × h
P means paid to see how much money she gets for babysitting
h means hours to see how many hours to babysit.

2. Callie was babysitting one evening from 6:00 p.m. until 11:00 p.m. How much should she be paid? Use the equations above to help you determine your answer.

P = $4 × h   P = $6 × h
9:00 − 6:00 = 3.00   3 × $4 = $12.00
11:00 − 9:00 = 2:00   2 × $6 = $12.00
$12.00 + $12.00 = $24.00
She should be paid $24.00 for babysitting.

3. Callie received a total of $60.00 for babysitting. Use the equations above to help determine how many hours before 9:00 p.m. and how many hours after 9:00 p.m. she could have worked in total to earn this amount of pay. Try to find all the possibilities.

P = $4 × h P = $6 × h 12 hours at day 2 hours at night $48.00 + $12.00 = $60.00 14 hours	9 hours at day 4 hours at night $36 + $24 = $60.00 13 hours	

Performance Task 2: Babysitting (page 2)

4. Create a problem of your own that would require the use of two equations to solve it. Do not use the same equations as on page 1. Your problem could be about babysitting, or it could be about a different situation. Complete all areas of the chart below.

My problem/situation:	Kristen works at a restaurant, she gets paid $2 every time she helps a costumer. If she helps a group of 4 or more she gets paid triple the $2. She helps 6 costumers and 12 costumers of 4. How much does she get?	
My equations in this problem:	Costumer	Equation
	costumers less than 4	P = $2 × C
	Costumers of 4 or greater	P = $6 × C
What my equations mean in words:	The P stands for how much she will be paid. The C stands for the costumers she helps.	
My solution:	2 × 6 = $12.00 16 × 12 = $72.00 $72.00 + $12.00 = $84.00 She will be paid $84.00.	

Next Steps for Patterning and Algebra

Instructional Next Steps for Overall Expectations

After summarizing individual and class performance on each overall expectation, you may find that there are areas that could be retaught to some students. The following suggestions have been provided to assist you in preparing tasks for individuals or small groups of students.

Overall Expectation 5m61 (Patterns and Relationships)
Determine, through investigation using a table of values, relationships in growing and shrinking patterns and investigate repeating patterns involving translations.

Background

This overall expectation is about students having multiple and varied opportunities to work with growing and shrinking patterns. Students should see multiple representations of growing and shrinking patterns (numerically, geometrically, in tables of values, graphically, and as pattern rules). Students at this grade level should be identifying pattern rules that are *recursive* (defining each term in the pattern based on the previous term) and *relational* (determining the relationship between the term number and the term value). Students will typically have the most experience using recursive rules, which are valid but limited in their use. In this grade and beyond, students need opportunities to determine the relational rule for patterns.

Strategies

Students may attempt to extend what they believe to be repeating patterns but that could instead be growing and shrinking patterns. Provide contexts that will support students in recognizing, describing, and then representing and extending patterns as growing and shrinking. At this grade level, most patterns that students encounter will either grow or shrink by a constant amount from term to term.

Multiple Representations
Assist students to see that there are different but equivalent representations for a given pattern. A particular growing pattern can be represented using a model or a drawing, a table of values, a graph with plotted points, a pattern rule, or a series of numbers. Help students develop strategies to decide whether two representations are the same. For example, when viewing a geometric pattern, suggest that they count the number of individual items used in each figure. When viewing a graph, suggest that they relate that graph to a table of values. At first, many students may see these different representations as different patterns, but with some analysis, students should just see them as different ways of representing the same pattern.

Provide individual students or small groups with one or two representations of a particular growing pattern and challenge them to create as many other ways as they can to represent the pattern.

Numerically: 3, 5, 7, 9, ...

Geometrically: (using blocks, counters, tiles, etc.)

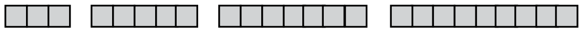
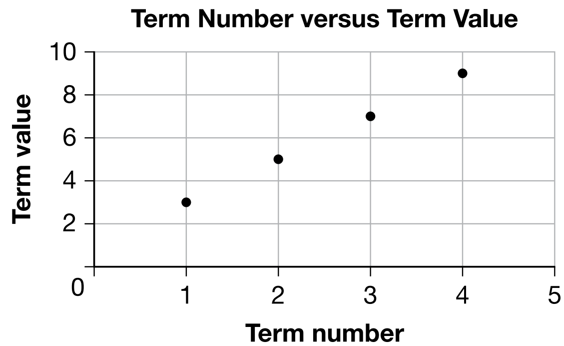


Table of Values:

Term number	Term value
1	3
2	5
3	7
4	9

Graphically:



Pattern Rules:

- Recursive Rule: looking down the table of values
  Start at 3 and add 2 to get the next term
- Relational Rule: looking across the table of values
  Term number $\times$ 2 + 1 = Term value

Students could put different representations of patterns on cards and challenge each other to identify patterns that match.

Recursive versus Relational

Relational rules are much more powerful generalizations for a pattern than recursive rules. Write a numerical pattern on the board and ask students which strategy they could use to determine a term in the pattern and why one strategy might be preferable to another.

For example: Determine the 100^{th} term in the sequence 3, 5, 7, 9, ...

Recursive Thinking:

- Rule: start at 3 and add 2 to get the next term.
- Typically, determine the pattern by looking down a table of values.
- Strategy: list the first 99 terms and then add 2 to get the 100^{th} term.

Relational Thinking:

- Rule: term number $\times$ 2 + 1 = term value.
- Determine the relationship by looking across a table of values.
- Strategy: substitute the value 100 in place of the term number and evaluate (100 $\times$ 2 + 1).

Comparison of Recursive versus Relational Thinking/Rules:

- Both methods are valid and can result in the correct answer.
- Recursive thinking requires listing the first 99 terms to determine the 100th term (could be lots of work and hard to organize without making an error).
- Relational thinking allows you to determine the 100th term quite quickly, but generally depends on some number sense.

Guess My Rule

To help students with relational thinking, you can use an input/output activity. Students see a number (input) go into a "mystery machine." Using any of the four operations, the input number becomes transformed into an output number.
Draw the figure below on the board.

Input #	Mystery machine	Output #
2	?	5
6		13
10		21

Ask students to try to determine what the machine did to the input numbers to create the output numbers. Based on the data shown, the machine is doubling the input number and then adding 1. The relational rule for this pattern is the same:
Term number $\times$ 2 + 1 = Term value.

Overall Expectation 5m62 (Variables, Expressions, and Equations)
Demonstrate, through investigation, an understanding of the use of variables in equations.

Background

As algebraic thinking develops, students will become more comfortable seeing and using variables as elements of expressions and equations. Algebraic thinking is much more than just using an x to represent an unknown value and/or solving an equation to determine the value of x. Students need to see how variables, expressions, and equations can describe relationships and generalize real-life situations. A solid understanding in this area can prepare students for further study in algebra as it becomes more abstract.

Students may see the use of variables as something new to them, but they have been using variables and solving equations for many years (i.e., in Grade 1, when they solved 3 + 4 = ?). When given an open number sentence such as $2 + m = 7$, students will identify that m must have a value of 5. The variable is m, but any letter or shape could have been used. In this way, students can see that a variable can represent an unknown quantity. Students should have opportunities to encounter equations that have only one solution (e.g., $4m = 24$) and equations that have many solutions (e.g., $4m = 3m + m$).

Strategies

When solving equations to determine the value of unknowns (variables), students should have access to a variety of tools. Manipulatives such as counters can be used to make a concrete representation of an equation. Likewise, calculators can aid students who still need time to consolidate their math facts or function as time-saving tools when using a guess-and-check strategy.

Determine the Solution

Encourage students to use a variety of strategies to solve an equation and determine the value of an unknown (variable).

What are some possible strategies that could be used to solve $4 \times m = 24$?

- *Using number facts:*
  I know that $4 \times 6 = 24$, therefore $m = 6$.

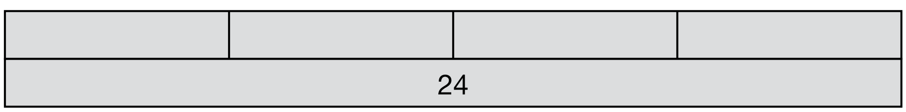
- *Using manipulatives:*
  I took 24 counters and divided them into 4 equal groups.
  Each group has 6, therefore $m = 6$.

- *Working backwards:*
  I know that multiplication and division are opposite operations,
  so $4 \times m = 24$ means the same as $24 \div 4 = m$. Therefore, $m = 6$.

- *Guessing and checking:*
  I think the m might equal 10. $4 \times 10 = 40$ (too big).
  I'll try $m = 5$. $4 \times 5 = 20$ (too small but close)
  I'll try $m = 6$. $4 \times 6 = 24$ (correct) Therefore, $m = 6$.

- *Using a balance:*
  On one side of a balance I have 24 cubes. On the other side I have 4 paper bags with the same number of cubes in each. How many cubes are in each bag?
  Each bag must have 6 cubes inside. Therefore, $m = 6$.

- *Using a diagram:*
  I can draw 4 equal lengths to match a total length of 24.



Each length must be 6. Therefore, $m = 6$.

When given a fairly easy question to solve (such as $4 \times m = 24$), many students may not see this as "solving an equation for the value of a variable." They will simply use number facts to get the answer, but assure them that they are solving the equation.

To encourage students to think flexibly, ask them to solve the problem using more than one strategy.

Building Connections

Draw a rectangle 10 cm long and 4 cm wide and ask students how they can determine its area. Many strategies are possible, but the most likely method to determine the answer of 40 cm^2 is to multiply 10 by 4. Replace the 10 cm and 4 cm measurements on the rectangle with l and w and ask students to determine the area of the rectangle. Students will arrive at $A = l \times w$.

Here students have created a generalized formula that can be used to determine the area of any rectangle in addition to using variables to represent an unknown or changing quantity. Applying the formulas for perimeter and area is a great opportunity to build connections between concepts in measurement and algebra.

Now that students have had an example to work from, provide pairs of students with a variety of tools (e.g., colour tiles, square graph paper, a calculator, etc.) and a list of area measurements of various rectangles (e.g., 30 cm^2, 40 cm^2, and 60 cm^2). Have students apply the formula $A = l \times w$ to determine all the possible rectangles that have these areas.