

Curriculum Planning & Assessment Resource

Mathematics Grade 5



**Alberta Regional Professional
Development Consortia**

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Curriculum Planning & Assessment Resource

Mathematics

Grade 5 - Algebra

About This Document

This Curriculum Planning & Assessment Resource is intended to be a collection of sample activities, assessments, and resources that teachers may wish to use as they develop their unit plans. This document is not intended to be a sequential list of activities. Rather, the intent is that teachers choose from this resource what is appropriate for their context, and sequence it in their planning.

The sample activities, assessments and resources included in this document have undergone an initial review to determine appropriateness and alignment to the curriculum. However, it is expected that teachers use their professional judgment in selecting activities, assessments and resources that are appropriate for their context.

While every attempt has been made to provide credit and receive permissions, some errors or omissions may have occurred. Please contact info@arpdc.ab.ca to report any error or omissions.

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Acknowledgements

Thank you to all the teachers, numeracy specialists, and technical expertise from Alberta school divisions and ARPDC who collaborated to develop, review, and revise these planning and assessment documents to support curriculum implementation.

Grade 5 - Algebra

Organizing Idea

Algebra: Equations express relationships between quantities.

Guiding Question

How can expressions enhance communication of number?

Learning Outcome

5A1 Students interpret numerical and algebraic expressions.

Summative Assessment(s) - Transfer *(In Progress)*

Summative assessments can include the following.

- *Understanding/making sense of a novel context from the real world using one or more concepts (eg. "How are place value and money related?).*
- *Understanding/making sense of a novel context using one or more understandings (eg. Students use money to model the conversion of base 10 values and relate them to base 10 block').*
- *Being able to describe why (linking concepts) something is true, a result, or what might be an extension using learned concepts and understandings.*
- *Apply learning (create products; undertake projects; taking action such as creating a campaign) in a novel context or taking action using the understanding(s).*
- *Construct arguments by taking a position and verifying/proving it with known understandings.*

Summative Assessment(s)

[\[understanding surface vs deep vs transfer\]](#)

[5A1 Sample Summative](#)



KUSP 5A1.1

Prerequisite Knowledge

Students know that the order of operations is used to evaluate an expression with numbers; know that multiplication or division read from left to right are followed by addition or subtraction read from left to right; students know that expressions represent value; know the meaning of an equal sign; how to write equations that represent equality between a number and an expression or between two different expressions of the same number.

Pre-Assessments

Nelson Pre-Assessments 6: Finding Each Students Pathway

- Order of Operations - p.26

Student Language | Essential vocabulary & concepts

- **Expression:** is a general term that ultimately represents a number. An expression can consist of numbers, variables and operations such as (+, -, x, ÷). It does not have an equal sign or a not equal sign; for example: $3 + 7$ or 7×8 , $9y + 6$
- **Numerical expression:** a mathematical phrase containing only numbers or numbers and operator symbols, with no equal sign (e.g., $7 - 2 \times 6$)
- **Order of operations:** a specified sequence in which mathematical operations are to be performed: first, operations in brackets; second, multiplication and division in the order from left to right; third, addition and subtraction in order from left to right
- **Evaluate:** to calculate or find the value of.
- **Value:** a number, or the result of a calculation.
- **Parentheses:** a pair of symbols used to enclose sections of a mathematical expression, often called brackets ()

I Know Statements | Metacognition

- I know that the order of operations is used to evaluate an expression with numbers.
- I know I do the operations in parentheses first.
- I know multiplication and division are calculated from left to right.
- I know addition and subtraction are calculated from left to right.
- I know that expressions represent a value.

I Can Statements | Skills

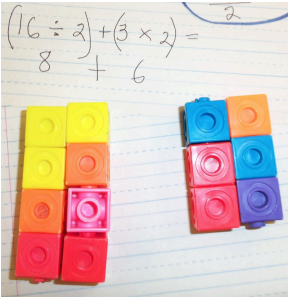
- I can use the order of operations to evaluate an expression.
- I can calculate the operations in parentheses first.
- I can calculate multiplication and division before addition and subtraction.

Learning Recovery

- Students struggle to understand that addition/subtraction multiplication/division are interchangeable regardless of how BEDMAS is worded; they are done in order they appear with multiplication and division being done before addition or subtraction.
- Order of operations is introduced in Grade 4, with parentheses added in Grade 5. Exponents are added in Grade 6.

Enhancement

- Introducing exponents.
- *Please consider sharing any great activities and ideas you have!*

Learning Outcome					
5A1.1 Students interpret numerical and algebraic expressions.					
Knowledge	Understanding	Skills & Procedures	Achievement Indicators	Illustrative Examples	Formative Assessments (Explainer)
<p>Numerical expressions with multiple operations may include parentheses to group numbers and operations.</p> <p>The conventional order of operations includes performing operations in parentheses before other operations.</p>	<p>Numerical expressions represent a quantity of known value.</p> <p>Parentheses change the order of operations in a numerical expression.</p>	<p>Evaluate numerical expressions involving addition or subtraction in parentheses according to the order of operations.</p>	<p>Explain, using examples, why there is a need to have standardized order of operations.</p> <p>Use the order of operations to evaluate numerical expressions including parentheses.</p> <p>Identify mistakes involving the order of operations.</p> <p>Solve problems that involve evaluating expressions using the order of operations</p>	<p>Teacher Notes:</p> <ul style="list-style-type: none"> All expressions should involve whole numbers when introducing order of operations. It is important for students to learn the conceptual process of the order of operations as opposed to linking the process only to an acronym. Showing students examples of proper order versus improper order in evaluating should precede any acronym. Consider reading through Khan Academy's website of Order of Operations - using Concepts rather than a confusing Acronym which offers a slightly different approach (no acronym) to the order of operations. It will use terms such as 'repeater' (multiplication - repeated addition or division - repeated subtraction) $12 + 3 \times 8 \div 2 - 14 =$ <p>Mark the Repeaters & Calculate ...same way you read a sentence.</p> $12 + 12 - 14 =$ <p>Only Singles remain (again, L → R)</p> <p>(Khan Academy)</p> <p>After students, have a better understanding of the order of operations you can expand to :</p> <ul style="list-style-type: none"> Multiplication up to 3-digit by 2-digit natural numbers Division up to 3-digit by 1-digit natural numbers (no remainder) Decimal addition and subtraction limited to thousandths. Addition and subtraction of fractional numbers with common denominators <hr/> <p>Visualizing Order of Operations with Parentheses</p> <p>Have students show $(16 \div 2) + (3 \times 2)$ using blocks or chips</p>  <p>Now, using manipulatives, investigate the difference between</p> $6 + 4 \times 3 \quad \text{and} \quad (6 + 4) \times 3$ <p>(picture from Mom and Me Math)</p>	<p>Whodunnit: In this activity, students have to use the correct order of operations to evaluate statements in order to check whether the correct answers have been given. By checking the given answers and spotting errors, students identify who committed the crime, who the victim was and who were the other two suspects, where the crime was committed and when.</p> <p>Source: STEM Learning</p> <p>a) $(7 + 8) \div 5$ b) $3 \times 7 + 3 - (2 \times 5)$ c) $12.345 - (2 + 3.14)$ d) $\left(\frac{13}{11}\right) - \left(\frac{4}{11} + \frac{8}{11}\right)$ e) $144 \div 4 + 163$</p> <p>Released 2013 Achievement Test Grade 6, p.36</p> <p>5A1.1 Order of Operations in Context - Exit Ticket</p>

Example:

Evaluate the expression.

- a. $(6 - 4) \div 2$
- b. $12 \div 3 \times (2 + 5)$
- c. $245 \times 15 + 115 \div 5$
- d. $\frac{3}{7} + \left(\frac{6}{7} - \frac{2}{7}\right)$
- e. $0.566 - (0.127 + 0.238)$

(ARPDC created)

Example:

Can you solve the puzzle?

$$\text{📚} \times 3 + \text{📖} = \text{📖}$$

$$42 \div \text{📖} = \text{📖} - 7$$

$$\text{📖} - 1 = \text{👓} + \text{👓}$$

$$\text{👓} = 4 \div 2 \times 2$$

$$\text{📖} - \text{📚} \times \text{👓} = \boxed{?}$$

[Mashup Math](#)

Example:

Use brackets to make each number sentence true.

a) $2 \times 3 + 6 = 18$

b) $20 \times 15 - 2 = 260$

c) $5 + 4 \div 3 = 3$

d) $12 + 10 \div 11 = 2$

e) $6 + 8 \div 2 = 10$

f) $5 \times 4 \div 2 = 10$

(Math Makes Sense 6 Practice and Homework Book, Pearson Publishing, p.27)

Example:

Write an expression (number sentence) to show the order of operations you use to solve each problem.

- a) Sandar bought 4 bags of chips at \$2.99 each.
She used a \$2.00 coupon to pay part of the cost.
How much did Sandar pay for the chips?
-

- b) The decorating committee needs 3 balloons for each of 15 tables.
They also need 20 balloons for each of the 4 walls of the room.
How many balloons does the committee need?

(Math Makes Sense 6 Practice and Homework Book, Pearson Publishing, p.27)

Example:

EVALUATING EXPRESSIONS 1

Directions: Using the digits 0 through 9, at most one time each, place a digit in each box to create two true statements: one where the value on each side of the equal sign is greater than 30 and one where it's less than 30. You may reuse all the digits for each equation.

$$\square\square \div (\square - \square) = \square + \square \times \square$$

(Adapted from [Open Middle](#))

IMD

Resources

Mathology

[Link to Alberta Curriculum Correlations](#)

Mathology Activities

- Patterning Unit 2: Variables and Equations 4: The Order of Operations
- Patterning Unit 2: Variables and Equations 10: Consolidation

Mathology Practice Workbook 5

- Unit 16 Question 7 (p. 101)

Math UP

AB_Algebra

- Lesson 1: [Evaluating Numerical Expressions](#)

Existing Textbooks

Math Focus 6 - p. 98 - 102

Math Makes Sense 6 - p. 70-73

NCETM (teacher guides and resources)

[NCETM Order of Operations](#) (Year 6; Unit 12) Note: there are questions in British Pounds which could be changed to Canadian Dollars and cents.

Websites & Resources to Support Learning

Document: [Ontario PDF documents](#) - A Guide to Effective Instruction in Mathematics Kindergarten to Grade 6 (Ontario)

Website: [A Maths Dictionary for Kids](#) (Jenny Eather)

Website: [How to Teach Order of Operations](#) (Laura Candler's Teaching Resources)

Website: [Algebra 1](#) (MathBitsNotebook)

Interactive Math Activities: [Order of Operations](#) (Study Jams! by Scholastic)

Game: [Order of Operations Game](#) (Open Middle)

Game: [Order of Operations](#) (Desmos) - Students need to create expressions to make all the values in the table, using each number once and any operations.

Gizmos New Learn Alberta (Teacher Login Required)

New Learn Alberta

[Order of Operations](#)

For access to additional resources login to Gizmos account. Request an account

alberta@explorellearning.com

Indigenous Lesson Plans and Resources

[Infusing Indigenous Knowledge](#) - Grade 5 Math

[Patterns and Relations Games](#), from Math Central, University of Regina

[The Cedar Chevron Pattern Investigation](#), from Math First Peoples Teacher Resource Guide, pp. 56-59, First Nations Education Steering Committee (FNESC) and First Nations Schools Association (FNSEA)

Problem Solving

[Grade 5 Math Tasks](#) (Calgary Board of Education) - These tasks were curated by the Calgary Board of Education. Tasks listed in these documents support teaching and learning related to the learning outcomes from the 2022 Mathematics Curriculum for Grade 5.

- Interpreting Numerical and Algebraic Expressions (p.5)



KUSP 5A1.2

Prerequisite Knowledge

Students know that the order of operations is used to evaluate an expression with numbers; multiplication or division read from left to right is done first followed by addition or subtraction read from left to right; students know that expressions represent value.

Pre-Assessments

Nelson Pre-Assessments 4 : Finding Each Students Pathway

- Solving Equations - p. 44

Nelson Pre-Assessments 5 : Finding Each Students Pathway

- Solutions for Equations - p.44

Student Language | Essential vocabulary & concepts

- **Algebraic expression:** a mathematical phrase combining numbers and/or variables using mathematical operations (e.g., $3x + 9$ or $5y - 6$)
- **Variable:** a letter or symbol that represents a number or an unknown value (e.g., in $2x + 3$, x is the variable)
- **Product:** the result of a multiplication
- **Quotient:** the result of a division
- **Algebraic term:** the parts of an algebraic expression involving constant(s) and at least one variable
- **Coefficient:** a constant that multiplies a variable (e.g., in $3x$, 3 is the coefficient of the variable x)
- **Constant term:** a term that has a fixed value and does not contain a variable (e.g., 5 is the constant term in $2x + 5$)
- **Sum:** the result of an addition
- **Evaluate:** to evaluate an expression means to look at the simplified result of the expression when numbers are substituted into the variables of the expression.
- **Substitution:** the process of replacing a number for a variable in order to evaluate an expression or solve an equation.

I Know Statements | Metacognition

- I know an algebraic expression is an expression with a variable.
- I know a variable represents an unknown value.
- I know that when I multiply with variables, I don't use a multiplication sign.
- I know that a fraction can be used to show division with variables.
- I know a coefficient is the number that the variable is multiplied by.
- I know that a product/quotient with a variable or a number is a single term.

I Can Statements | Skills

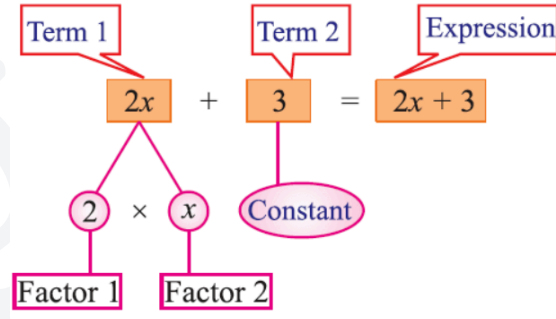
- I can show that multiplying a number and a variable is related to repeated addition of a variable.
- I can use a coefficient to demonstrate the product of a number and a variable.
- I can express the quotient of a variable and a number as a fraction.
- I can recognize that the sum of an algebraic term and a constant term are two considered terms in an algebraic expression..
- I can write an algebraic expression using one or two terms.
- I can evaluate an algebraic expression by substituting the variable with a given number.


Learning Recovery

- The new curriculum has a lot more vocabulary (e.g., coefficient and constant term have been pulled down from Grade 7).
- The Patterns and Algebra units have some similarities, and it may be a good idea to teach them together or one after the other.
- *Please consider sharing any great activities and ideas you have!*

Enhancement

- Use two-step patterns.
- *Please consider sharing any great activities and ideas you have!*

Learning Outcome		5A1.2 Students interpret numerical and algebraic expressions.			
Knowledge	Understanding	Skills & Procedures	Achievement Indicators	Illustrative Examples	Formative Assessments (Explainer)
<p>Expressions that include variables are called algebraic expressions.</p> <p>A variable can be interpreted as a specific unknown value and is represented symbolically with a letter.</p> <p>Products with variables are expressed without the multiplication sign.</p> <p>Quotients with variables are expressed using fraction notation.</p> <p>An algebraic term is the product of a number, called a coefficient, and a variable.</p> <p>A constant term is a number.</p> <p>A variable can be replaced by a given number in order to evaluate an expression.</p>	<p>Algebraic expressions use variables to represent quantities of unknown value.</p> <p>Algebraic expressions may be composed of one algebraic term or the sum of algebraic and constant terms.</p>	<p>Relate repeated addition of a variable to the product of a number and a variable.</p> <p>Express the product of a number and a variable using a coefficient.</p> <p>Recognize a product with a variable, a quotient with a variable, or a number as a single term. (a)</p>	<p>Identify and provide an example of a constant term, coefficient, and variable in an algebraic expression.</p> <p>Explain what a variable is and how it is used in a given expression.</p> <p>Express the product of a number and a variable using a coefficient.</p>	<p>Teacher Notes</p>  <p style="text-align: center;"><i>(Online Math 4 All)</i></p> <p>For Grade 5, constant terms are limited to whole numbers. Students should be aware that the constant term for $3n$ is 0.</p> <p>When introducing variables, it is common to stay away from certain letters to avoid confusion:</p> <ul style="list-style-type: none"> • “i” can be confused with addition • “o” can be confused with zero • “l” and “r” can be confused with the number 1 <p>Even though “x” can be confused with multiplication, by the end of Grade 5, it is hoped that we show multiplication using brackets.</p> <p>The coefficients are limited to natural numbers.</p> <p>The coefficient for $n + 3$ is 1.</p> <hr/> <p>Let’s Consider Variables Presentation</p> <p>Work through the Powerpoint presentation “Let’s Consider Variables and Algebraic Expressions.” (Some relates to Grades 6 as well) <i>(ARPDC Created)</i></p>	<p>5A1.2a Writing Expressions Using Variables - Deep</p>

				<p>Example: Write the following as a product of a variable and a natural number: a) $m + m + m + m$ b) $c + c + c + c + c + c$ c) $a + a$</p> <p>Example: Identify the variable, coefficient and constant in each expression. a. $7a + 8$ b. $8q$ c. $6 + 4n$ d. $c + 1$</p> <p>Which of the above expressions has only one term. (ARPDC created)</p>	
		<p>Express the quotient of a variable and a number as a fraction. (b)</p> <p>Write an algebraic expression involving one or two terms to describe an unknown value.</p>	<p>Express the quotient of a variable and a number as a fraction.</p> <p>Recognize a quotient with a variable as a single term.</p>	<p>Teacher Notes:</p> <ul style="list-style-type: none"> • This is an opportunity to spiral back to review proper and improper fractions. • This will be difficult for students since it is not until grade 6 that they express a fraction as a division statement and vice versa <hr/> <p>Activity:</p> <p>Ask students to draw a picture that would represent $12 \div 4$ Show using a fraction.</p> <p>Ask students to draw a picture that would represent $8 \div 4$ Show using a fraction.</p> <p>Ask students to draw a picture that would represent $4 \div 4$ Show using a fraction.</p> <p>Ask students to draw a picture that would represent $n \div 4$</p> <div style="text-align: center;">  </div> <p>Example: I don't know how many pizzas were ordered but I have to divide them amongst 5 friends. a. Write the expression using a division sign. b. Write the expression using a fraction.</p>	<p>5A1.2b Recognizing Expressions - Surface</p>

Example:
Express a number divided by 3.

$$\frac{b}{3}$$

Write an algebraic expression involving one or two terms to describe an unknown value.

Teacher Notes:

- Keywords that help determine the operation to use.
- Teachers can also relate this to the expressions created in the Patterns Organizing Idea.

Activity: Writing Algebraic Expression - Key Words

When writing an algebraic expression there are some keywords that give us a hint for which operation to perform.

Turning words into algebraic expressions is an important task in mathematics. Your goal is to take the words on the Math Operations Words List and match them to the words Addition, Subtraction, Multiplication, Division. Have students place each of the words into the correct column based on its meaning.

Math Operations Words List

Total	Factor	Divide
Sum	Out of	Triple
Take Away	Split	Times
Less Than	Twice	Product
Combine	Into	Decreased
Difference	Quotient	More Than
Increased	Plus	

Addition	Subtraction	Multiplication	Division

(ARPDC Created)

Explain how

“subtract eight from four times a number” is different from “subtract four times a number from eight”.

[5A1.2b Writing an Expression - Exit Ticket - Surface](#)

				<p>Example: Write an algebraic expression.</p> <ol style="list-style-type: none"> A number added to 6 Double a number Half a number A number subtracted from 18 Triple a number and add two more Subtract six from four times a number Subtract four times a number from six <p><i>(ARPDC created)</i></p> <p>Example: What is the meaning of the expression $6n + 2$? What is the coefficient? What is the constant term? <i>(ARPDC created)</i></p> <p>Example: Write an expression for each cost.</p> <ol style="list-style-type: none"> \$4 to sharpen each pair of skates for a class skating party hamburgers at \$3 each \$2 per hour plus \$5 to rent skates hats on sale for \$10 each <p><i>(Math Focus 7, Nelson Publishing p. 387)</i></p> <p>Example: Tehya won some money in a competition. She has two choices as to how she gets paid. Option 1: \$20 per week for one year Option 2: \$400 cash now plus \$12 per week for one year Write an algebraic expression to represent each option. <i>Adapted from (Math Makes Sense 7, Pearson Education Canada, p. 16)</i></p>							
		<p>Evaluate an algebraic expression by substituting a given number for the variable. (c)</p>	<p>Substitute a value for an unknown in a given expression, and evaluate the expression.</p>	<p>Teacher Notes: When multiplying:</p> <ul style="list-style-type: none"> When substituting the value for the variable, the goal is to move away from the multiplication sign. Use brackets to show multiplication. If a student experiences difficulty understanding, use the multiplication sign, but change the variable to something other than x to avoid confusion. Students do need to have a good understanding of the order of operations. <div style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;"> <p>Example: Evaluate the expression $2a - 5$, when $a = 7$.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Start with the expression</td> <td style="text-align: right; padding: 2px;">$2a - 5$</td> </tr> <tr> <td style="padding: 2px;">Substitute the value of 7 into the variable a</td> <td style="text-align: right; padding: 2px;">$2(7) - 5$</td> </tr> <tr> <td style="padding: 2px;">Use the order of operations to calculate</td> <td style="text-align: right; padding: 2px;">$14 - 5 = 9$</td> </tr> </table> </div> <p>The value of $2a - 5$ is 9</p>	Start with the expression	$2a - 5$	Substitute the value of 7 into the variable a	$2(7) - 5$	Use the order of operations to calculate	$14 - 5 = 9$	<p>5A1.2c Evaluating by Substituting - Deep</p>
Start with the expression	$2a - 5$										
Substitute the value of 7 into the variable a	$2(7) - 5$										
Use the order of operations to calculate	$14 - 5 = 9$										

Example:

Evaluate the following algebraic expressions for $n = 3$.

- a. $n + 6$
- b. $11 - n$
- c. $9n$
- d. $33 \div n$
- e. $5n - 4$
- f. $n \div 3 + 1$
- g. $n \times (3 + 1)$

(ARPDC created)

Example:

- a. On graph paper, draw diagrams of $a + a + a + a$ and $4a$ when $a = 1$, 2, and 3. What do you notice?
- b. Do $a + a + a + a$ and $4a$ have the same value for any value of a ? Explain how you know.

(Core Knowledge Grade 6 Unit 6 Expressions and Equations, p. 54)

Example: (from above)

Tehya won some money in a competition.

She has two choices as to how she gets paid.

Option 1: \$20 per week for one year

Option 2: \$400 cash now plus \$12 per week for one year

Write an algebraic expression to represent each option.

Which Option would pay Tehya more money?

For what reasons might Tehya choose each Option of payment?

Work with another pair of classmates.

For each choice, describe a method you can use to calculate the total money Tehya has received at any time during the year.

Adapted from (Math Makes Sense 7, Pearson Education Canada, p. 16)

Example:

We know that there is $100 \text{ cm} = 1 \text{ m}$.



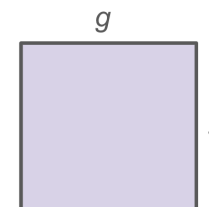
- a. Write an expression for the number of centimeters in any number of meters.
- b. Evaluate the expression for 5 m.
- c. How many centimeters would be equivalent to 3.4 m.

(Adapted from Math Makes Sense 7, Pearson Education Canada, p. 16)

Example:

- a. Write an expression for the perimeter of the square.
- b. Write the expression in simplified form.
- c. Calculate the perimeter of the square if $g = 124 \text{ cm}$.

(ARPDC created)



Resources

Mathology

[Link to Alberta Curriculum Correlations](#)

Mathology Activities

- Patterning Unit 1: Patterns and Relations 2: Investigating Numeric Sequences
- Patterning Unit 1: Patterns and Relations 3: Consolidation
- Patterning Unit 2: Variables and Equations 5: Using Variables
- Patterning Unit 2: Variables and Equations 7: Solving Multiplication and Division Equations
- Patterning Unit 2: Variables and Equations 8: Using Equations to Solve Problems
- Patterning Unit 2: Variables and Equations 9: Using Equations with Two Operations to Solve Problems
- Patterning Unit 2: Variables and Equations 10: Consolidation

Mathology Practice Workbook 5

- Unit 16 Question 1-4, 6, 7, 9, 10, 13 (pp. 99, 101-104)

Mathology Interactive Tools

- [Number Charts](#)
- [Counters](#)
- [Pan Balance](#)

Math UP

AB_Algebra

- Lesson 2: [Representing Relationships Using Algebra](#)
- Lesson 3: [Interpreting and Modelling Algebraic Expressions](#)
- Lesson 4: [Evaluating Algebraic Expressions](#)
- Lesson 5: [Solving Equations](#)

Existing Textbooks

Math Makes Sense 6: Unit 1: Lesson 8 - Keeping Equations Balanced - Pages 36-39
Math Focus 6 - Chapter 1 - pages 2 - 23

NCETM (teacher guides and resources)

NCETM: none at this time

[Core Knowledge:](#) Grade 6 Unit 6 Expressions and Equations

Websites & Resources to Support Learning

Manipulative: [Interactive Number Line](#) (coolmath4kids.com)
Manipulative: [Interactive Cuisenaire Rods](#) (pbslearningmedia.org)
Manipulative: [Interactive Counters](#) (toytheater.com)
Manipulative: [Interactive Scale](#) (toytheater.com)
Game: [Patterns with Algebra](#) (Matific)
Game: [Substituting with Algebra](#) (Matific)
Game: [Substituting Numbers](#) (Matific)

Gizmos

New Learn Alberta (Teacher Login Required)

[Using Algebraic Expressions](#)

For access to additional resources login to Gizmos account. Request an account alberta@explorellearning.com

Indigenous Lesson Plans and Resources

[Numeracy Promising Practices videos](#), Empowering the Spirit, by Alberta Regional Professional Development Consortia (ARPDC)
[Shared Learnings, Integrating BC Aboriginal Content K-10, BC Ministry of Education, p. 45](#)
[Math Catcher Outreach Program: Mathematics through Aboriginal Storytelling](#), from Simon Fraser University
[Math First Peoples Teacher Resource Guide](#), First Nations Education Steering Committee (FNESC) and First Nations Schools Association (FNSA)

Problem Solving

[Grade 5 Math Tasks](#) (Calgary Board of Education) - These tasks were curated by the Calgary Board of Education. Tasks listed in these documents support teaching and learning related to the learning outcomes from the 2022 Mathematics Curriculum for Grade 5.

- Interpreting Numerical and Algebraic Expressions (p.5)



KUSP 5A1.3

Prerequisite Knowledge

Students know that the order of operations is used to evaluate an expression with numbers; parentheses then multiplication or division read from left to right is done first followed by addition or subtraction read from left to right; students know that expressions represent value; writing expression; adding, subtracting, multiplying and dividing numbers to thousandths.

Pre-Assessments

Nelson Pre-Assessments 5 : Finding Each Students Pathway

- Adding to 100 000 - p. 14
- Adding Decimals to thousandths - p. 15
- Subtracting to 100 000 - p. 18
- Subtracting Decimals to thousandths - p.19
- Mental Multiplication - p.22
- Multiplying by 1 Digit Numbers - p.25
- Multiplying by 2-Digit Numbers - p.26
- Dividing 2 Digit Numbers - p. 33
- Increasing easing Patterns - p. 38
- Increasing Number Patterns - p. 39
- Solutions for Equations - p.44

Nelson Pre-Assessments 6 : Finding Each Students Pathway

- Choosing Operations - p. 25
- Using a Balance Scale - p. 30

I Know Statements | Metacognition

- I know how to use inverse operations to help me solve an equation.
- I know that to preserve equality, I must perform the same inverse operation to both sides of an equation.

Learning Recovery

- *Please consider sharing any great activities and ideas you have!*

Student Language | Essential vocabulary & concepts

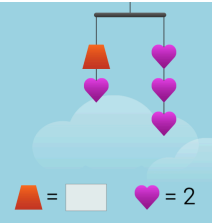
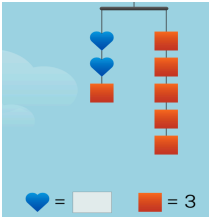
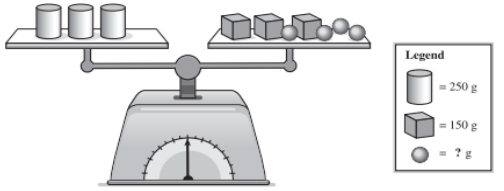
- **Inverse operation:** an operation that is the opposite of, or undoes, another operation; addition and subtraction are inverse operations; multiplication and division are inverse operations
- **Equation:** a number sentence that shows that two expressions are equal. An equation has an equal sign; for example, $13 + 5 = 18$
- **Equality:** having the same amount or value
- **Preservation of equality:** when each side of the equation is changed in the same way
- **Algebraic expression:** a mathematical phrase combining numbers and/or variables using mathematical operations (e.g., $3x + 5y - 9$)
- **Order of operations:** a specified sequence in which mathematical operations are to be performed: first, operations in brackets; second, multiplication and division in the order from left to right; third, addition and subtraction in order from left to right
- **Solve:** To solve an equation means to find the solution set to an equation involving variables.
- **Verify:** Verifying a solution ensures the solution satisfies any equation or inequality by using substitution.
- **Isolate:** to rewrite the equation in a form where the variable appears on one side of the equal sign and its value is on the other side.

I Can Statements | Skills

- I can write equations involving one or two operations.
- I can investigate how to use the order of operations when performing inverse operations on both sides of an equation.
- I can use inverse operations to solve equations with one or two operations.
- I can solve problems using equations with one or two operations.

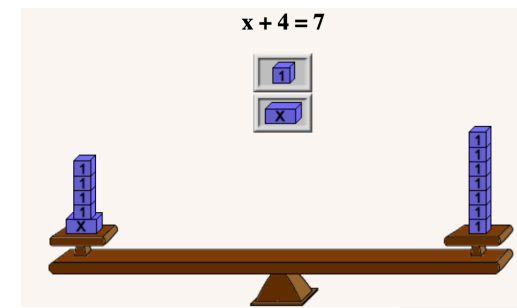
Enhancement

- Solve equations with more than two operations.
- *Please consider sharing any great activities and ideas you have!*

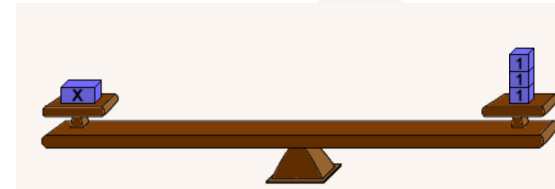
Learning Outcome					
5A1.3 Students interpret numerical and algebraic expressions.					
Knowledge	Understanding	Skills & Procedures	Achievement Indicators	Illustrative Examples	Formative Assessments (Explainer)
<p>The process of applying inverse operations can be used to solve an equation.</p> <p>The value of the variable obtained by solving an equation is the solution.</p>	<p>Equality is preserved by applying inverse operations to algebraic expressions on each side of an equation.</p> <p>The expressions on each side of an equation will be equal when evaluated using the correct solution.</p>	<p>Write equations involving one or two operations to represent a situation. (a)</p>	<p>Using context, write an equation with one unknown, limited to one or two operations.</p>	<p>Teacher Note:</p> <ul style="list-style-type: none"> It is important that all variables are italicized so as not to confuse them with units of measurement. <hr/> <p>Example:</p> <p>Tom paid a total of \$22.25 for a pizza with some toppings. The pizza without toppings cost \$18.50. Write an equation to show the cost of toppings, <i>t</i>. (ARPDC created)</p> <p>Example:</p> <p>Fabian charges \$3 for each bag of leaves he rakes, and \$5 for mowing the lawn. On Sunday, Fabian mowed 1 lawn and raked leaves. He earned \$14. How many bags of leaves did Fabian rake? Write an equation to represent this problem. (adapted from <i>Math Makes Sense 8</i>, Pearson Education Canada, p. 328)</p> <p>Example:</p> <p>Gina answered all the questions on her science test but got 8 answers wrong. She received 2 points for every correct answer, and there was no penalty for wrong answers. Her score was 38 points. How many questions were on the science test? Express this problem using an equation. (ARPDC created)</p>	<p>5A1.3a & b Writing Equations and Solving Equations Using Inverse Operations - Deep</p> <p>Journal: How are expressions and equations similar? How are they different? (ARPDC created)</p>
		<p>Apply inverse operations to solve an equation, limited to equations with one or two operations.</p> <p>Investigate order of operations when performing inverse operations on both sides of an equation. (b)</p>	<p>Model the preservation of equality using manipulatives, such as a balance or using a pictorial representation. (limit to subtract and division of natural numbers for inverse operations)</p> <p>Apply inverse operations to solve equations, limited to equations with one or two operations. (limit to subtract and division of natural numbers for inverse operations)</p> <p>Investigate preservation of equality when performing</p>	<p>Teacher Notes: Some strategies to consider. ALL solutions must be positive.</p> <ol style="list-style-type: none"> Manipulatives such as Equation Strips or Pan Balance Systematic Trial and Error Inspection Inverse Operations <hr/> <p>Introduce solving equations using no variables (Grade 4)</p> <p>Example: Solve for the missing value.</p> <p>a. </p> <p>b. </p> <p>(solve.me.edc.org)</p>	<p>Example:</p>  <p>What is the mass of one \odot?</p> <p>A. 50 g B. 75 g C. 150 g D. 300 g</p> <p>Source: Released PAT 2013 p. 15</p> <p>Reasoning and Problem Solving - (Note: Only use cards #1 - #5) Deep - Students could work in pairs to take a card from the pile and determine</p>

inverse operation on both sides of the equation.
(limit to subtract and division of natural numbers for inverse operations)

Balance Model: One Inverse Operation
Solve $x + 4 = 7$ using a balance model.



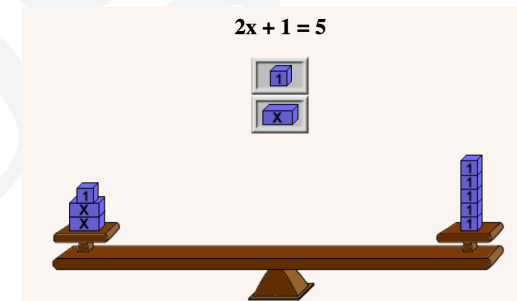
Remove 4 blocks from both sides.



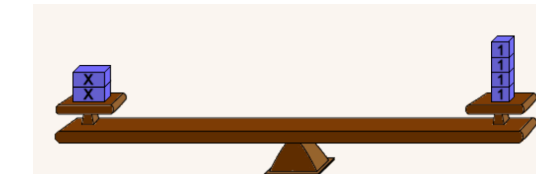
And show that $x = 3$.

(images created by www.hoodamath.com)

Balance Model: Two Inverse Operations
Solve $2x + 1 = 5$ using a balance model.



Remove 1 block from both sides.



Ask the students if 2 variables equal 4, then how much will one variable equal. Encourage students to see grouping that will later represent dividing both sides of the equation. In the end it is important for students to recognize we are looking for the value of one 'x'.



And show that $x = 2$.

(images created by www.hoodamath.com)

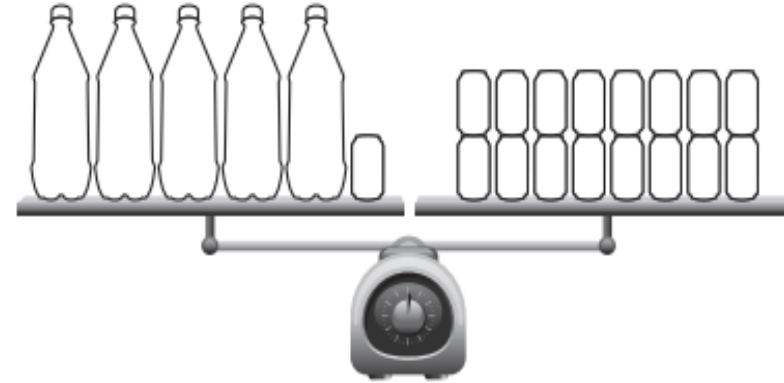
whether it is correct. If it is incorrect, they should show how they would write the equation and solve it.

Source: [Classroom Secrets](#)

[5A1.3a & b Writing Equations and Solving Equations Using Inverse Operations - Deep](#)

Example:

Tom balances bottles and cans on a scale.



1. If Tom removes 2 bottles, how many cans need to be removed to keep the scale balanced?

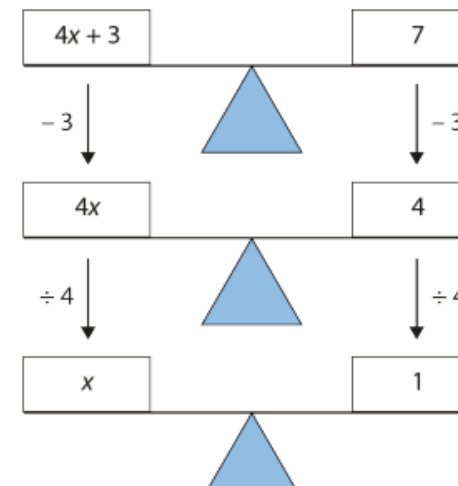
- A. 3
- B. 4
- C. 5
- D. 6

(Released 2013 Achievement Test MC #2, p. 8)

Example: Using Inverse Operations

Solve $4x + 3 = 7$ using a balance model.

Solution:



(NCETM: 2.2 Solving Linear Equations p. 10)

Activity: [Desmos Equation Strips](#)

This is meant to be an introduction to solving equations activity. Here we use equations strips where you have two strips on top of each other with some lengths given and others not. Students have to determine the length of the equally sized white strips. Once they are done, they can then create their own Equation Strip using the Challenge Creator and submit it to the class so they can solve it. Note that it is purposeful to not mention an "x" anywhere as this is an introductory task. You may, however, wish to extend students' thinking by asking them to write an equation to represent each strip.

Example:

Match each equation to one of the diagrams:

- a) $12 - m = 4$
- b) $12 = 4m$
- c) $m - 4 = 12$
- d) $\frac{m}{4} = 12$



(Core Knowledge: Grade 6 Unit 6 Expressions and Equations Student Workbook p. 18)

Solving Equations Using Inverse Operations

Example:

Multiple Choice: What would you do to isolate the variable in this equation in one step?

$$x + 10 = 65$$

- A. Add 10 to both sides of the equation.
- B. Subtract 10 from the left side of the equation only.
- C. Add 65 to both sides of the equation.
- D. Subtract 10 from both sides of the equation.

(ARPD created)

Solving Equations: Systematic Trial and Error

Solve this equation by Systematic Trial. $3c - 5 = 16$

Solution:

Estimate what you think the answer may be.

I think $c = 3$

Verify the equation for $c = 3$

Left Hand Side	Right Hand Side
$3c - 5$	16
$3 \times 3 - 5$	
4	

That number is too small. So try another value. I think $c = 7$.
Verify the equation for 7

Left Hand Side	Right Hand Side
$3c - 5$	16
$3 \times 7 - 5$	
16	

Since the Left Hand Side = Right Hand Side, $c = 7$ is the solution of the equation.
Note: Trial and Error allows the solution to a problem with subtraction.

(ARPDC created)

Solving Equations: Inspection

Solve this equation by Inspection $4n = 24$.

Solution:

Students ask themselves, what number multiplied by 4 equals 24. The answer is 6, therefore $n = 6$.

(ARPDC created)

Example:

Using any method, solve the equations below. Explain your strategy. Verify your solutions.

- $x + 15 = 89$
- $5a = 125$
- $6c + 14 = 32$

(ARPDC created)

Example:

Using the preservation of equality to solve $6n + 8 = 62$, first subtract 8 from both sides of the equation.

Then, divide both sides of the equation by 6.

The answer is 8.

True or false? Explain your reasoning.

(ARPDC created)

Verify the solution to an equation by evaluating expressions on each side of the equation.
(c)

Verify the solution to a given equation, using concrete materials and diagrams.
Substitute a possible solution for the variable in a given equation into the original equation to verify the equality.

Teacher Notes:

- Remember an equation is TWO expressions equal to each other. The vertical line means equal.
- Students require a solid understanding of evaluating expressions before verifying algebraically.
- Students may model verifying Solutions Using Concrete materials and diagrams by using Number Lines, Counters or Cuisenaire Rods. (Please note there are other manipulatives that students may use)

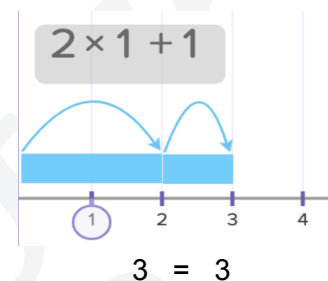
5A1.3c Verifying Solutions to Equations - Surface

Example:

Model verification of the equation $2a + 1 = 3$ for $a = 1$.

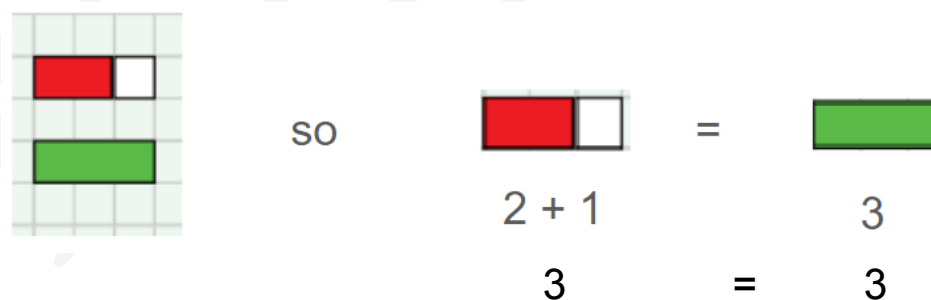
Solution:

Show on a number line. This means that there is 1 group of 2 and then 1 more and the answer will be three.



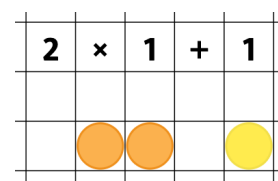
(image created by coolmath4kids.com)

Show using Cuisenaire rods. This means that there is 1 group of 2 and then 1 more and the answer will be three.



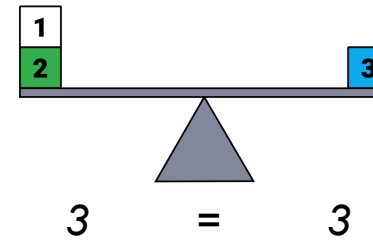
(image created by pbslearningmedia.org)

Show using counters.



(image created by toytheater.com)

Show using a scale.



(image created by toytheater.com)

Example:

Verify for the equation $13n = 39$ that the solution is $n = 3$.

Left Hand Side	Right Hand Side
$13n$	39
$13(3)$	
39	

(Remember that you can also write $13(3)$ as 13×3)

Example:

Verify for the equation $2a + 1 = 3$ that the solution is $a = 1$.

$2a + 1$	3
$2 \times 1 + 1$	
$2 + 1$	
3	

Example:

Without solving the equation $3n - 1 = 8$, how can you determine if the solution is $n = 3$.

Solve problems using equations, limited equations with one or two operations. (d)

Solve a given problem by applying the preservation of equality. (limit to subtract and division of natural numbers for inverse operations)

Create a problem for a given equation that contains a

Activity: Algebraic Riddles

Part 1: Write an equation for these statements.

- Think of a number
- Multiply it by 3
- Add 4
- The answer is 13

What is the original number?

[5A1.3d Writing Word Problems with Variables - Deep - K5 Learning](#) - For each question, have students write the equations [Writing equations with variables worksheet](#) and solve for the variable. **Note:** Omit question 5

variable and one or two operations.
(limit to subtract and division of natural numbers for inverse operations)

Part 2: Write your own Riddle. Trade riddles with a partner. Write an algebraic equation for your partner's riddle. Find your partner's original number. Verify your answer.
(adapted from *Math Makes Sense 7*, Pearson Education Canada, p. 35)

Example:

On the way home from school, 10 students got off the bus at the first stop. There were then 16 students on the bus. How many students were on the bus when it left the school? How many different ways can you solve the problem?

Discuss your strategies for finding the answer with another pair of classmates. Did you use an equation? Did you use reasoning? Did you draw a picture? Justify your choice.

(*Math Makes Sense 7*, Pearson Education Canada, p. 220)

Example:

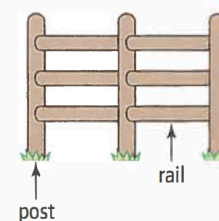
The formula for the perimeter of an equilateral triangle is $P = 3s$. What side length is needed to make an equilateral triangle with a perimeter of 36 cm?

Verify your answer.

(*MathLinks 7 Textbook*, Nelson/McGraw Hill Ryerson, p. 423)

Example:

The diagram shows the posts and rails of a fence. How many posts are needed for a fence with 72 rails?



This problem may be approached using a table of values.

(*MathLinks 7 Textbook*, Nelson/McGraw Hill Ryerson, p. 423)

Example:

The Student Council is planning a year-end party. It costs \$300 for the D.J. for the evening. They plan to spend \$5 per student on food.

- a) What is the total cost for s students?
- b) The school budgeted \$1000 for the party. How many students can attend?
- c) How did you solve this problem? What other strategy might you use?

(*MathLinks 7 Textbook*, Nelson/McGraw Hill Ryerson, p. 414)

				<p>Example: Describe a situation that can be modeled by the equation $2a + 5 = 21$. (ARPD created)</p> <p>Example: Khalid is 1 year older than 3 times his son's age. Khalid is 31 years old. Explain why both $31 = 3s + 1$ and $1 + 3s = 31$ can be used to model this situation. (MathLinks 7 Textbook, Nelson/McGraw Hill Ryerson, p. 414)</p>	
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Resources

Mathology

[Link to Alberta Curriculum Correlations](#)

Mathology Activities

- Patterning Unit 2: Variables and Equations 5: Using Variables
- Patterning Unit 2: Variables and Equations 6: Solving Addition and Subtraction Equations
- Patterning Unit 2: Variables and Equations 7: Solving Multiplication and Division Equations
- Patterning Unit 2: Variables and Equations 8: Using Equations to Solve Problems
- Patterning Unit 2: Variables and Equations 9: Using Equations with Two Operations to Solve Problems
- Patterning Unit 2: Variables and Equations 10: Consolidation

Mathology Practice Workbook 5

Unit 16 Questions 2, 3, 5-10,13 (pp. 100-104)

Mathology Interactive Tools

- [Number Charts](#)
- [Counters](#)
- [Pan Balance](#)

Math UP

AB_Algebra

- Lesson 2: [Representing Relationships Using Algebra](#)
- Lesson 5: [Solving Equations](#)

Existing Textbooks

Math Focus 6 - Chapter 1 - pages 2 - 23

Math Makes Sense 6 - Unit 1 - pages 4 - 42

MathLinks 7 - Chapter 11 - pages 395 - 415 (do not use questions with negative integers or fractions)

Math Makes Sense 7 - Unit 6 - pages 218 - 251 (do not use questions with negative integers or fractions)

Math Focus 7 - Chapter 9 - pages 400 - 411 (do not use questions with negative integers or fractions)

NCETM (teacher guides and resources)

[NCETM](#): Operating on Number: 2.2 Solving Linear Equations

[Core Knowledge](#): Grade 6 Unit 6 Expressions and Equations (do not use questions with negative integers or fractions)

Websites & Resources to Support Learning

Gizmos

<p>Modelling Solving Equations - Texas Online Resources</p> <p>Manipulative: Interactive Number Line (coolmath4kids.com)</p> <p>Manipulative: Interactive Cuisenaire Rods (pbslearningmedia.org)</p> <p>Manipulative: Interactive Counters (toytheater.com)</p> <p>Manipulative: Interactive Scale (toytheater.com)</p> <p>Manipulative: Algebra Balance Equations (hoodamath.com)</p> <p>Website: JrMath 6 -8 (MathBitsNotebook)</p> <p>Game: SolveMe Mobiles (solveme.edc.org)</p> <p>Game: Finding Unknowns (Matific)</p> <p>Virtual Activity: Creating Equations from Word Problems (Study Jams! by Scholastic)</p>	<p>New Learn Alberta (Teacher Login Required)</p> <p>Modeling One-Step Equations</p> <p>Modeling and Solving Two-Step Equations</p> <p>Solving Equations on the Number Line</p> <p>Solving Two-Step Equations</p> <p>Using Algebraic Equations</p> <p>For access to additional resources login to Gizmos account. Request an account alberta@explorellearning.com</p>
<p>Indigenous Lesson Plans and Resources</p> <p>Numeracy Promising Practices videos, Empowering the Spirit, by Alberta Regional Professional Development Consortia (ARPDC)</p> <p>Shared Learnings, Integrating BC Aboriginal Content K-10, BC Ministry of Education, p. 45</p> <p>Math Catcher Outreach Program: Mathematics through Aboriginal Storytelling, from Simon Fraser University</p> <p>Math First Peoples Teacher Resource Guide, First Nations Education Steering Committee (FNESC) and First Nations Schools Association (FNSA)</p>	<p>Problem Solving</p> <p>Grade 5 Math Tasks (Calgary Board of Education) - These tasks were curated by the Calgary Board of Education. Tasks listed in these documents support teaching and learning related to the learning outcomes from the 2022 Mathematics Curriculum for Grade 5.</p> <ul style="list-style-type: none"> • Interpreting Numerical and Algebraic Expressions (p.5) <p>The Math Learning Centre, Bridges Mathematics - Algebra Puzzles</p>



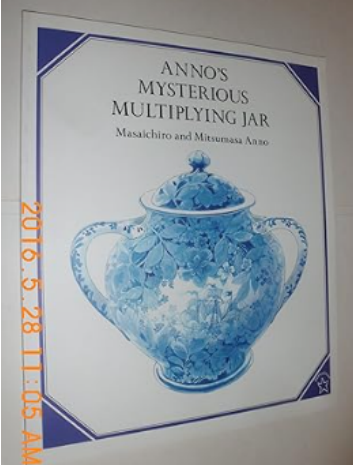
[KUSP 5A1.1](#)

[KUSP 5A1.2](#)

[KUSP 5A1.3](#)

[Literature Connections](#)

Literature Connections

Title & Author	Format (Picture Book, Novel, Non-fiction, other)	Publisher & ISBN	Notes
<p><i>Anno's Mysterious Multiplying Jar</i> by Masaichirō Anno</p> <p>"Superbly demonstrating the conception of factorials in mathematics, the text and pictures combine to present a lesson in a palatable form as well as the pleasure of looking at pictures that only Mitsumasa Anno could invent." Publishers Weekly" The book moves logically and elegantly from the concrete to the abstract. Once made clear, the concept is unforgettable, but the book entices the reader to return for further appreciation of the artistry with which it was designed. The Horn Book" If you want a book that does a good selling job on the factorial concept, this one works. School Library Journal</p> <p>"On the island, there were 2 countries. Within each country, there were 3 mountains. On each mountain, there were 4 walled kingdoms. Within each walled kingdom, there were 5 villages. In each village, there were 6 houses. In each house, there were 7 rooms. In each room, there were 8 cupboards. Within each cupboard, there were 9 boxes. Within each box, there were 10 jars. But how many jars were in all the boxes together? The answer is surprising. There were 10! jars"</p>	<p>Juvenile Fiction</p>	<p>Philomel Books, 1983</p> <p>10- 0399209514, 13-9780399209512</p>	 <p>YouTube - Ms. Stetser Activity to do with the story at NZMaths Printer Friendly Version</p>