Senior Years
Literacy, Academics, and Language (LAL)
Foundational Numeracy Courses

Phase 1B—Half-Course Credit

LAL Numeracy Phase 1B: **Number: Represent Integers**

Big Ideas: Quantities can be represented concretely, pictorially, and symbolically. Classifying numbers provides information about their characteristics.

Outcomes 6N7

Numeracy

- Represent integers concretely, pictorially, and symbolically.
- Demonstrate an understanding that numbers, whether large or small, can be positive or negative.
- Demonstrate an understanding that a positive number is any number greater than 0.
- Demonstrate an understanding that a negative number is a number that is less than 0.
- Demonstrate an understanding that zero is neither negative nor positive and that zero is the additive identity (does not change the value of what is added to it).
- Demonstrate an understanding that numbers can be grouped in sets. The set of numbers consisting of the natural numbers (1, 2, 3, 4, ...), their opposites (−1, −2, −3, −4, ...), and 0 is called integers.

Language

- Respond to extensive modelling and guidance by beginning to recognize and gain meaning from simple words and sentences about familiar topics, supported with pictures, repetition, and patterns.
- Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids.
- Use visuals, realia, and their first language to add basic knowledge, concepts, and skills related to the core subject areas.
- Respond appropriately to basic personal questions and engage in short classroom or social interactions, using phrases or simple sentences; indicate understanding or lack of understanding with gestures or short phrases.
- Use cognitive strategies, with guidance and support, to enhance general learning (e.g., connect what they already know with what they are learning).
- Observe and experience problem-solving situations in the classroom (e.g., learning activities).

Connection to Prior Learning

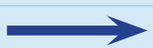
- Represent and describe whole numbers.
- Compare and order whole numbers.

Using emergent vocabulary, do the following:

- Demonstrate and explain orally and in writing
  - numbers greater and less than zero
  - numbers and their opposites
  - where an integer falls on a number line
  - the increasing or decreasing order of a group of integers

Instructional Strategies:

- Introduce integers using the following different models:
  - kinesthetic movement (steps to the right and left)
  - directed distances
  - coloured tiles and two-colour counters
- Use a graphic organizer to represent a positive quantity, negative quantity, and zero in each model.

	+4	–2	0
Coloured Tiles			
Directed Distances			
Kinesthetic Movement	4 steps to the right	2 steps to the left	2 steps to the right followed by 2 steps to the left

Assessment Criteria:

- Extend a horizontal or vertical number line by adding numbers less than zero, and explain the pattern on each side of zero.
- Place a set of integers on a horizontal or vertical number line, and explain how integers are ordered.
- Describe contexts in which integers are used (e.g., on a thermometer).
- Compare two integers, represent their relationship using the symbols <, >, and =, and verify using a horizontal or vertical number line.
- Order a set of integers in ascending or descending order.

LAL Numeracy Phase 1B: **Number: Represent Integers** *(continued)*

Instructional Strategies: ***(continued)***

- Draw a horizontal and vertical number line.
- Give students a list of whole numbers and their opposites, and estimate their placement on the number line. Discuss on which side of the zero they would place these numerals, and why.
- Explain that combining an integer and its opposite is zero.
- Explain that integers are all the whole numbers and their opposites on the negative part of the number line including zero.
- Give students a list of integers and estimate their placement on the number line. Discuss and compare.
- Discuss everyday applications of positive and negative numbers (thermometer, money, and distance above and below sea level). Recognize that integers get smaller in value as you move to the left on a horizontal number line (or up on a vertical number line), and larger as you move to the right on a horizontal number line (i.e., $-20 < -5$) (or down on a vertical number line).

Learning Experiences

Language Foundation:

- Develop foundational oral language skills in integers through kinesthetic movement, realia, visuals, and graphic organizers.
- Develop foundational written language skills through the use of a variety of writing strategies (e.g., sentence frames, word walls).

Key Vocabulary:

- Integer
- Negative number
- Number line
- Positive number
- Whole number
- Set
- Zero
- Opposite
- Horizontal
- Vertical

Sentence Frames:

- A _____ number is more than zero.
- A _____ number is less than zero.
- The opposite of _____ is _____.

Learning Supports:

- Thermometer
- Plastic coins
- Integer tiles
- Number line
- Pictures
- Math journal
- Word wall
- Dice games
- Clothesline math
- Integers (EduGAINS) (www.edugains.ca)

Mental Math:

- Have students read a thermometer.
- Have students place integers on a number line (clothesline math).
- Have students identify integers identified by coloured tiles.
- Have students identify integers represented by an arrow on a number line.

Problem Solving:

- Students work in small groups. Each group will choose a city and follow its temperature changes during a five-day period. Each morning and afternoon at the same time (or as close to the same time as possible), they will record the temperature on a chart.
- Students will make two number lines: one to represent the morning and one to represent the afternoon temperature of their city. Students will compare the morning and afternoon temperatures.
- Mohamad has a five-dollar bill and a note reminding him that he owes his mom $5. Using a number line, represent how much money Mohamad has before and after he pays his mom.
- Represent the following values on a number line: Melat has $10 in her wallet; Reem owes $5 to her sister.

LAL Numeracy Phase 1B: **Number: Representations of Fractions**

Big Ideas: There are different but equivalent representations of numbers. Quantities can be represented concretely, pictorially, and symbolically. Benchmark numbers are useful for comparing, relating, and estimating numbers.

	Numeracy	Language
Outcomes **3N13, 4N8, 5N7**	■ Explain that a fraction represents a portion of the whole. ■ Compare and order fractions with like and unlike denominators. ■ Create sets of equivalent fractions with like and unlike denominators. ■ Model and explain that equivalent fractions represent the same quantity. ■ Determine whether two fractions are equivalent using concrete materials or pictorial representations. ■ Formulate and verify a rule for developing a set of equivalent fractions. ■ Identify equivalent fractions for a given amount. ■ Compare two fractions with unlike denominators by creating equivalent fractions with like denominators.	■ Respond to extensive modelling and guidance by beginning to recognize and gain meaning from simple words and sentences about familiar topics, supported with pictures, repetition, and patterns. ■ Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids. ■ Use visuals, realia, and their first language to add basic knowledge, concepts, and skills related to the core subject areas. ■ Respond appropriately to basic personal questions and engage in short classroom or social interactions, using phrases or simple sentences; indicate understanding or lack of understanding with gestures or short phrases. ■ Use cognitive strategies, with guidance and support, to enhance general learning (e.g., connect what they already know with what they are learning). ■ Observe and experience problem-solving situations in the classroom (e.g., learning activities).
Connection to Prior Learning	■ Represent whole numbers concretely, pictorially, and symbolically. ■ Decompose numbers to relate parts of a whole.	Use short sentences and keywords to explain, orally and in writing, how to do the following: ■ Change the denominator and find equivalent fractions without changing the value of the fraction. ■ Determine whether two fractions are equivalent. ■ Determine which one is larger or smaller, given two fractions with different denominators.
	Instructional Strategies: ■ Compare and contrast fractions, using concrete, pictorial, and numeric representations. ■ Estimate placement of fractions on a number line using benchmarks. ■ Position a set of fractions with like and unlike denominators on a number line (vertical or horizontal), and explain strategies used to determine the order. ■ Model equivalent fractions using manipulatives. ■ Create equivalent fractions using manipulatives. ■ Discuss rules and features that make fractions equivalent.	**Assessment Criteria:** ■ Name and record the fraction represented by the shaded and non-shaded parts of a region. ■ Compare fractions with the same denominator using models. ■ Identify the numerator and denominator for a fraction. ■ Order a set of fractions that have the same numerator, and explain the ordering. ■ Order a set of fractions that have the same denominator, and explain the ordering. ■ Identify which of the benchmarks 0, $\frac{1}{2}$, or 1 is closest to a fraction. ■ Create a set of equivalent fractions and explain why there are many equivalent fractions for any fraction using concrete materials. ■ Model and explain that equivalent fractions represent the same quantity. ■ Distinguish between equivalent and non-equivalent fractions.

LAL Numeracy Phase 1B: **Number: Representations of Fractions** *(continued)*

Learning Experiences

Language Foundation:

- Develop foundational oral language skills in fractions, using concrete, pictorial, and numeric representations.
- Develop foundational written language skills through the use of a variety of writing strategies (e.g., sentence frames, word walls).

Key Vocabulary:

- Fraction
- Denominator
- Numerator
- Equivalent
- Non-equivalent
- Greater than
- Less than

Sentence Frames:

- _____ is equivalent to _____.
- An equivalent fraction to _____ is _____.
- _____ is less than _____.
- _____ is more than _____.

Learning Supports:

- Fraction bars
- Graph paper
- Paper folding
- Dot paper
- Cuisenaire rods
- Coloured counters
- Pattern blocks
- Clothesline math

Mental Math:

- Have students review division facts.
- Have students review multiplication facts.
- Given several pictorial representations of fractions, have students identify equivalent fractions.

Problem Solving:

- Juan and Peter both had small pizzas. Juan cut his pizza into four pieces and ate two. Peter cut his pizza into six pieces and ate four. Who ate more pizza?
- One chocolate chip cookie recipe required $\frac{2}{3}$ cup of chocolate chips, and another recipe required $\frac{3}{4}$ cup of chocolate chips. Which recipe uses more chocolate chips?

LAL Numeracy Phase 1B: **Number: Represent Decimals**

Big Ideas: There are different but equivalent representations of numbers. The position of a digit in a number determines the quantity it represents. Our number system is based on patterns (place value).

	Numeracy	Language

Outcomes
4N9, 4N10, 5N8, 5N9, 5N10, 6N1, 6N7
	■ Describe and represent decimals (e.g., tenths, hundredths, thousandths) concretely, pictorially, and symbolically.
	■ Compare and order decimals (e.g., tenths, hundredths, thousandths) by using
	  ■ benchmarks
	  ■ place value
	  ■ equivalent decimals
	■ Relate decimals to fractions (e.g., tenths, hundredths, thousandths).
		■ Respond to extensive modelling and guidance by beginning to recognize and gain meaning from simple words and sentences about familiar topics, supported with pictures, repetition, and patterns.
		■ Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids.
		■ Use visuals, realia, and their first language to add basic knowledge, concepts, and skills related to the core subject areas.
		■ Respond appropriately to basic personal questions and engage in short classroom or social interactions, using phrases or simple sentences; indicate understanding or lack of understanding with gestures or short phrases.
		■ Use cognitive strategies, with guidance and support, to enhance general learning (e.g., connect what they already know with what they are learning).
		■ Observe and experience problem-solving situations in the classroom (e.g., learning activities).

Connection to Prior Learning	■ Represent an equivalent fraction (e.g., tenth, hundredth, or thousandth). ■ Express a tenth as an equivalent hundredth and thousandth. ■ Express a hundredth as an equivalent thousandth. ■ Demonstrate an understanding of fractions less than or equal to one.	Using emergent vocabulary, demonstrate and explain, orally and in writing, how to do the following: ■ Write a decimal in fractional form. ■ Write a fraction with a denominator of 10, 100, or 1000 as a decimal. ■ Express a pictorial or concrete representation as a fraction or decimal (e.g., 250 shaded squares on a thousandth grid can be expressed as 0.250). ■ Use proper syntax in relating decimals (e.g., 1.5 is read as one and five-tenths rather than “one point five”).
	Instructional Strategies: ■ Model contexts for decimals to the tenths using realia and manipulatives (e.g., pencils, pizza, gas prices, ten frames). Represent in decimal and fractional form. ■ Model contexts for decimals to the hundredths using realia and manipulatives (e.g., dimes, metre stick, hundred chart, base-10 blocks). Represent in decimal and fractional form. ■ Model contexts for decimals to the thousandths, using realia and manipulatives (e.g., millimetres, thousand chart, base-10 blocks, coins). Represent in decimal and fractional form. ■ Use realia and manipulatives to show equivalent hundredths as a thousandth (e.g., 0.25 and 0.250). ■ Model, using manipulatives or pictures, that a tenth can be expressed as hundredths (e.g., 0.9 is equivalent to 0.90 or 9 dimes is equivalent to 90 pennies). ■ Express a pictorial or concrete representation as a fraction or decimal (e.g., 250 shaded squares on a thousandth grid can be expressed as 0.250 or $\frac{250}{1000}$).	**Assessment Criteria:** ■ Represent a decimal using concrete materials or a pictorial representation. ■ Explain the meaning of each digit in a decimal with all digits the same. ■ Represent a decimal using money values (e.g., pennies and dimes). ■ Express orally and in written form a fraction with a denominator of 10 or 100 as a decimal. ■ Express orally and in written form the decimal equivalent for a fraction (e.g., $\frac{50}{100}$ can be expressed as 0.50). ■ Describe the value of each digit in a decimal. ■ Explain how the pattern of the place value system (e.g., the repetition of ones, tens, and hundreds) makes it possible to read and write numerals for numbers of any magnitude. ■ Provide examples of where large numbers and small decimals are used (e.g., media, science, medicine, technology).

LAL Numeracy Phase 1B: **Number: Represent Decimals** *(continued)*

Learning Experiences

Language Foundation:

- Develop foundational oral language skills in decimals, using concrete, pictorial and numeric representations.
- Develop foundational written language through the use of a variety of writing strategies (e.g., sentence frames, word walls).

Key Vocabulary:

- Decimal
- Decimal point
- Numerator
- Denominator
- Equivalent
- Fraction
- Hundredths
- Tenths
- Thousandths

Sentence Frames:

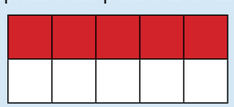
- _____ written as a decimal is _____.
- _____ written as a fraction is _____.
- _____ is equivalent to _____.

Learning Supports:

- Base-10 blocks
- Coins
- Ten frames
- Hundred chart
- Thousand chart
- Metre stick

Mental Math:

- Translate pictures, fractions, and decimals.
- Represent this picture as a fraction and a decimal.



- Represent this fraction as a picture and a decimal.

$\frac{3}{10} =$

- Represent this decimal as a picture and a fraction.

0.25 =

Problem Solving:

- A chocolate bar is divided into 10 pieces. Mohan eats 4 pieces. What fraction of the chocolate bar did he eat? How can this fraction be written as a decimal?
- Amber is reading a 100-page book. She has read 60 pages. What fraction of the book does she have left? How could this be written as a decimal?
- Maria went shopping. She had $10. She bought a pop for $3. What fraction of her money did she spend? How could this be written as a decimal?

LAL Numeracy Phase 1B: **Number: Ratios and Percents**

Big Ideas: Benchmark numbers are useful for comparing, relating, and estimating numbers. Ratios are not numbers; rather, they are comparisons of numbers or like items. Percents can be represented as a ratio comparing to 100 or as a fraction out of 100.

	Numeracy	Language
Outcomes **6N5, 6N6**	Demonstrate—concretely, pictorially, and symbolically—an understanding of ratios and percent. Ratios: ■ Provide a concrete and pictorial representation of ratio. ■ Write a ratio given concrete or pictorial representation. ■ Express a ratio in multiple forms, such as 3:5, $\frac{3}{5}$, or 3 to 5. ■ Identify and describe ratios from real-life contexts and record them symbolically. ■ Explain the part-to-whole and part-to-part ratios of a set (e.g., for a group of 3 girls and 5 boys, explain the ratios 3 : 5, 3 : 8, and 5 : 8). Percents: ■ Use concrete materials and pictorial representations to illustrate a percent. ■ Record the percent displayed in a concrete or pictorial representation. ■ Express a percent as a fraction and a decimal. ■ Identify and describe percents from real-life contexts and record them symbolically.	■ Respond to extensive modelling and guidance by beginning to recognize and gain meaning from simple words and sentences about familiar topics, supported with pictures, repetition, and patterns. ■ Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids. ■ Use visuals, realia, and their first language to add basic knowledge, concepts, and skills related to the core subject areas. ■ Respond appropriately to basic personal questions and engage in short classroom or social interactions, using phrases or simple sentences; indicate understanding or lack of understanding with gestures or short phrases. ■ Use cognitive strategies, with guidance and support, to enhance general learning (e.g., connect what they already know with what they are learning). ■ Observe and experience problem-solving situations in the classroom (e.g., learning activities).
Connection to Prior Learning	■ Demonstrate an understanding of fractions and decimals, using concrete and pictorial representations. ■ Relate decimals to fractions. ■ Decompose numbers to relate parts of a whole.	Using emergent vocabulary, demonstrate and explain the following, orally and in writing: ■ Relate decimals and fractions to percents. ■ Indicate a ratio as a percent (e.g., $\frac{1}{2}$ is 50%) and percent as a ratio (e.g., 40% is $\frac{40}{100}$ or equivalent). ■ Solve simple problems using percents and ratios.

Instructional Strategies:

- Use manipulatives and realia to model ratios (e.g., red cubes to blue cubes, pencils to erasers). Record ratios in multiple forms.
- Play games using ratios (e.g., "My ratio is … who has…." card game).
- Discuss percents in a real-life context (e.g., 20% off sale, 4% interest rate). Look through magazines, etc., to see examples.
- Use concrete materials and pictorial examples to demonstrate percent (e.g., hundred chart, counters).
- Use manipulatives to demonstrate the relationship among fractions, decimal, ratio, and percent.
- Students design a questionnaire for their classmates. Display the results as fractions, decimals, ratios, and percents.
- Explain that percent means "out of 100."
- Explain that percent is the ratio of a certain number of units to 100 units.

Assessment Criteria:

- Write a ratio from a concrete or pictorial representation.
- Express a ratio in multiple forms, such as 3 : 5, $\frac{3}{5}$, or 3 to 5.
- Identify and describe ratios from real-life contexts and record them symbolically.
- Explain that percent is the ratio of a certain number of units to 100 units.
- Record the percent displayed in a concrete or pictorial representation.
- Express a percent as a fraction and a decimal.
- Identify and describe percents from real-life contexts and record them symbolically.
- Solve a problem involving percents.

Learning Experiences

Language Foundation:

- Develop foundational oral language skills in ratios and percents, using concrete, pictorial, and numerical representations.
- Develop foundational written language through the use of a variety of writing strategies (e.g., sentence frames, word walls).

Key Vocabulary:

- Part/whole
- Part/part
- Percent
- Ratio
- Decimal
- Fraction

Sentence Frames:

- _____ is _____ % of _____.
- The ratio _____ is equal to _____ %.
- _____% is equal to the ratio _____.
- The ratio of _____ to _____ is _____.
- This picture shows a ratio of _____ to _____.

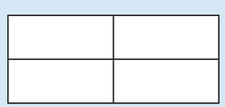
Learning Supports:

- Base-10 blocks
- Coins
- Ten frames
- Hundred chart
- Thousand chart
- Metre stick
- Coloured cubes
- Fraction pieces (e.g., bars, circles, etc.)

Mental Math:

- What is the ratio of triangles to squares in this picture?

- Write the ratio of 1 : 2 as
  - a percent
  - a decimal
- Shade in 25% of this shape.



Problem Solving:

- Billy has 4 pairs of brown socks, 3 pairs of blue socks, 1 pair of black socks, and 2 pairs of white socks. State the following ratios:
  a) brown socks to blue socks
  b) brown socks to black socks
  c) blue socks to white socks
  d) blue socks to total pair of socks
  e) express blue socks to total parts of socks as percent
- Shade in 60% of the squares in a hundred chart.
- 50% of the shapes are squares. If there are 7 squares in a diagram, how many shapes are there in total?

LAL Numeracy Phase 1B: **Number: Order of Operations**

Big Ideas: The four operations are intrinsically related. When a mathematics expression is composed of more than one operation, the solution depends on the standardized order in which the operations are done.

	Numeracy	Language
Outcomes **6N9**	■ Explain and apply the order of operations, excluding exponents (limited to whole numbers). ■ Demonstrate and explain with examples why there is a need to have a standardized order of operations. ■ Apply the order of operations to solve multi-step problems with or without technology.	■ Respond to extensive modelling and guidance by beginning to recognize and gain meaning from simple words and sentences about familiar topics, supported with pictures, repetition, and patterns. ■ Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids. ■ Use visuals, realia, and their first language to add basic knowledge, concepts, and skills related to the core subject areas. ■ Respond appropriately to basic personal questions and engage in short classroom or social interactions, using phrases or simple sentences; indicate understanding or lack of understanding with gestures or short phrases. ■ Use cognitive strategies, with guidance and support, to enhance general learning (e.g., connect what they already know with what they are learning). ■ Observe and experience problem-solving situations in the classroom (e.g., learning activities).

Connection to Prior Learning	■ Demonstrate an understanding of
	  ■ addition and subtraction
	  ■ multiplication and division
		Using emergent vocabulary, demonstrate and explain the following, orally and in writing:
		■ Complete a multi-step problem using the correct order of operations.

	Instructional Strategies: ■ Demonstrate and explain, with examples (i.e., $3 + 4 \times 5 - 2 =$), why there is a need to have a standardized order of operations. ■ Demonstrate how to take apart a multi-step problem.	**Assessment Criteria:** ■ Demonstrate and explain with examples why there is a need to have a standardized order of operations. ■ Apply the order of operations to solve multi-step problems, with or without technology.

LAL Numeracy Phase 1B: **Number: Order of Operations** *(continued)*

Learning Experiences

Language Foundation:

- Review key vocabulary.
- Express and write keywords and simple sentences to explain why having a standardized order of operations is necessary when solving problems with multiple operations.

Key Vocabulary:

- Order of operations
- Bracket/parenthesis
- Add
- Subtract
- Multiply
- Divide
- Operation

Sentence Frames:

- Given _____, the operation that should be completed (first/second/third) is _____.

Learning Supports:

- Calculator
- Grade 6 Math Support Document (Manitoba Education and Advanced Learning, 2014d) (https://www.edu.gov.mb.ca/k12/cur/math/support_gr6/index.html)

Mental Math:

- Multi-operation calculations consisting of a minimum of two of the following: addition, subtraction, multiplication, and division. For example:
  $(3)(2 + 4) =$
  or
  $3(2 + 4) =$

Problem Solving:

- Place brackets in the following equation to make it true:
  $10 + 4 - 2 \times 6 = 2$
- Place brackets in the following expression to make the value as large as possible:
  $10 + 4 - 2 \times 6$
- Place brackets in the following expression to make the value as small as possible:
  $10 + 4 - 2 \times 6$

LAL Numeracy Phase 1B: **Number: Factors and Multiples**

Big Ideas: Flexible methods of calculations involve composing and decomposing numbers in a wide variety of ways. Personal strategies and algorithms provide flexible and efficient methods of calculating that vary depending on the context and the numbers involved.

	Numeracy	Language

Outcomes
6N3
	■ Demonstrate an understanding of factors and multiples by
	  ■ determining multiples and factors of numbers less than 100
	  ■ identifying prime and composite numbers
	  ■ solving problems involving factors or multiples
		■ Respond to extensive modelling and guidance by beginning to recognize and gain meaning from simple words and sentences about familiar topics, supported with pictures, repetition, and patterns.
		■ Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids.
		■ Use visuals, realia, and their first language to add basic knowledge, concepts, and skills related to the core subject areas.
		■ Respond appropriately to basic personal questions and engage in short classroom or social interactions, using phrases or simple sentences; indicate understanding or lack of understanding with gestures or short phrases.
		■ Use cognitive strategies, with guidance and support, to enhance general learning (e.g., connect what they already know with what they are learning).
		■ Observe and experience problem-solving situations in the classroom (e.g., learning activities).

Connection to Prior Learning	■ Demonstrate an understanding of multiplicative thinking (multiplication and division), concretely, pictorially, and symbolically, by
	  ■ using personal strategies
	  ■ using the standard algorithm
	  ■ estimating products
	to solve problems.
		Using emergent vocabulary, demonstrate and explain the following, orally and in writing:
		■ Identify the difference between a factor and a multiple.
		■ State factors and/or multiples of a given number.
		■ Explain properties of a prime number.
		■ State the first 10 prime numbers and explain their choice.

	Instructional Strategies: ■ Identify multiples of a given number on a 100s chart. ■ Develop a process to find multiples of two numbers and determine lowest common multiple. ■ Demonstrate how to identify factors of a number using factor trees or arrays. ■ Develop a process to list all factors of two numbers and determine the largest common factor. ■ Sort a set of numbers as prime or composite. ■ Solve a problem involving factors, multiples, the largest common factor, or the lowest common multiple.	**Assessment Criteria:** ■ Identify multiples for a number and explain the strategy used to identify them. ■ Determine all the whole-number factors of a number using arrays. ■ Identify the factors for a number and explain the strategy used (e.g., concrete or visual representations, repeated division by prime numbers or factor trees). ■ Identify common factors and common multiples for two or three numbers. ■ Provide an example of a prime number and explain why it is a prime number. ■ Provide an example of a composite number and explain why it is a composite number. ■ Sort a set of numbers as prime and composite. ■ Solve a problem involving factors, multiples, the largest common factor, or the lowest common multiple. ■ Explain why 0 and 1 are neither prime nor composite.

LAL Numeracy Phase 1B: **Number: Factors and Multiples** *(continued)*

Learning Experiences

Language Foundation:

- Represent and describe whole numbers.
- Determine multiplication facts and related division facts.
- Review skip-counting.
- Review key vocabulary.
- Use age-appropriate vocabulary and examples.

Key Vocabulary:

- Factors
- Multiples
- Rows
- Columns
- Array
- Prime
- Composite
- Multiplication
- Common multiple

Sentence Frames:

- _____, _____, _____ are multiples of _____.
- The factors of _____ are _____.
- The greatest common factor of _____ and _____ is _____.
- Three common multiples of _____ and _____ are _____.
- _____ is a multiple of _____ since _____ × _____ equals _____.
- _____ is a prime number because _____.
- _____ is a composite number because _____.

Learning Supports:

- Hundred board
- Grid paper
- Cube links
- Number line
- Arrays

Mental Math:

- Use basic multiplication and division strategies.
- Use multiplication and division math facts up to 100.
- How many groups of 4 students can we make from a class of 24 students?

Problem Solving:

- Identify a number with five factors.
- Find three pairs of prime numbers that differ by two.
- Using a factor tree, find all the prime factors of 18 (use numbers less than 30).

LAL Numeracy Phase 1B: **Number: Decimal Addition and Subtraction**

Big Ideas: The four operations are intrinsically related. Flexible methods of calculation in all operations involve decomposing and composing numbers in a wide variety of ways.

	Numeracy	Language

Outcomes
4N11, 5N11
	■ Describe and represent decimals (tenths and hundredths) concretely, pictorially, and symbolically.
	■ Relate decimals to fractions (to hundredths).
	■ Demonstrate an understanding of addition and subtraction of decimals (to thousandths), concretely, pictorially, and symbolically, by
	  ■ using compatible numbers
	  ■ estimating sums and differences
	  ■ using personal strategies
	  ■ using the standard algorithms
	  ■ using estimation
	  ■ solving problems
		■ Respond to extensive modelling and guidance by beginning to recognize and gain meaning from simple words and sentences about familiar topics, supported with pictures, repetition, and patterns.
		■ Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids.
		■ Use visuals, realia, and their first language to add basic knowledge, concepts, and skills related to the core subject areas.
		■ Respond appropriately to basic personal questions and engage in short classroom or social interactions, using phrases or simple sentences; indicate understanding or lack of understanding with gestures or short phrases.
		■ Use cognitive strategies, with guidance and support, to enhance general learning (e.g., connect what they already know with what they are learning).
		■ Observe and experience problem-solving situations in the classroom (e.g., learning activities).

Connection to Prior Learning	■ Illustrate, concretely and pictorially, the meaning of place value for numbers to 1000.
	■ Describe and represent fractions with denominators of 1, 10, and 100.
	■ Demonstrate an understanding of addition and subtraction of whole numbers and fractions with denominators of 10
	  ■ using personal strategies
	  ■ using the standard algorithms
		Using emergent vocabulary, demonstrate and explain the following, orally and in writing:
		■ Explain how to use pace values to perform addition and subtraction of decimal numbers.
		■ Demonstrate an understanding of adding and subtracting decimal numbers.

	Instructional Strategies:
	■ Represent a decimal number on a number line given benchmarks.
	■ Estimate a sum or difference.
	■ Solve problems using addition and subtraction using personal strategies and then the standard algorithms for
	  ■ whole numbers
	  ■ fractions (tenths, hundredths)
	  ■ decimals
		Assessment Criteria:
		■ Explain why keeping track of place value positions is important when adding and subtracting decimals.
		■ Determine the sum and difference using the standard algorithms of vertical addition and subtraction (numbers are arranged vertically with corresponding place value digits aligned).
		■ Find the difference of two decimals by lining up the decimal points and then subtracting the digits in each column.
		■ Solve problems, including money transactions, which involve addition of subtraction of decimals, limited to hundredths.

LAL Numeracy Phase 1B: **Number: Decimal Addition and Subtraction** *(continued)*

Learning Experiences

Language Foundation:

- Discuss place value, rounding, estimation, and sum or difference.
- Align decimals in standard algorithm with an understanding that a whole number has a decimal of 0.
- Use age-appropriate vocabulary and examples.

Key Vocabulary:

- Decimal point
- Tenths, hundredths, thousandths
- Equivalent
- Close to
- Approximate
- Zero
- Estimate

Sentence Frames:

- _____ is (more than/less than) _____ (e.g., 21.0 is more than 0.21).
- For the decimal number _____, the tenths/hundredths digit is _____.
- The sum of _____ and _____ is _____.
- The difference between _____ and _____ is _____.

Learning Supports:

- Base-10 blocks
- Number line
- Word wall
- Math journal
- L1 text and translating tools

Mental Math:

- Estimate decimal sums and differences.
- Skip-count by tenths, starting at various numbers

Problem Solving:

- Normal body temperature is 37°C. Suppose your temperature rises to 38.1°C. How much above normal is your temperature?
- You buy three packages of ground beef. They weigh 1.01 kg, 0.97 kg, and 0.87 kg. How many kilograms (kg) do you have altogether?
- You purchased a large soda for $3.49, a bag of chips for $0.89, and a $2 chocolate bar. You had to pay $0.83 in taxes.
  a) How much will you owe for your purchases?
  b) How much change will you get back from a $10 bill?

LAL Numeracy Phase 1B: **Number: Decimal Multiplication and Division**

Big Ideas: The four operations are intrinsically related. Flexible methods of calculation in all operations involve decomposing and composing numbers in a wide variety of ways. There are a variety of appropriate ways to estimate sums, differences, products, and quotients, depending on the context and the numbers involved.

	Numeracy	Language

Outcomes 6N8	■ Demonstrate— concretely, pictorially, and symbolically—an understanding of multiplication and division of decimals (to thousandths) by
	  ■ using personal strategies
	  ■ using the standard algorithms
	  ■ using estimation
	  ■ solving problems
		■ Respond to extensive modelling and guidance by beginning to recognize and gain meaning from simple words and sentences about familiar topics, supported with pictures, repetition, and patterns.
		■ Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids.
		■ Use visuals, realia, and their first language to add basic knowledge, concepts, and skills related to the core subject areas.
		■ Respond appropriately to basic personal questions and engage in short classroom or social interactions, using phrases or simple sentences; indicate understanding or lack of understanding with gestures or short phrases.
		■ Use cognitive strategies, with guidance and support, to enhance general learning (e.g., connect what they already know with what they are learning).
		■ Observe and experience problem-solving situations in the classroom (e.g., learning activities).

Connection to Prior Learning	■ Determine products and quotients using whole numbers and the standard algorithms of vertical multiplications (numbers arranged vertically and multiplied using single digits, which are added to form a final product) and long division (the multiples of the divisor are subtracted from the dividend). ■ Relate multiplication and division of decimals to repeated addition and subtraction.	Using emergent vocabulary, demonstrate and explain the following, orally and in writing: ■ Explain how to multiply and divide decimal numbers. ■ Compute products and quotients of multiplication and division of decimal numbers.
	Instructional Strategies: ■ Model multiplication and division of decimals using concrete and visual representations, and record the process symbolically. ■ Check reasonableness of solutions by estimating a quotient. ■ Check reasonableness of solutions by estimating products. ■ Investigate how to solve one-step word problems.	**Assessment Criteria:** ■ Estimate a product using front-end estimation (e.g., for 15.205 m × 4, think 15 m × 4, so the product is greater than 60 m), and place the decimal in the appropriate place. ■ Estimate a quotient using front-end estimation (e.g., for \$26.83 ÷ 4, think 24 ÷ 4, so the quotient is greater than \$6), and place the decimal in the appropriate place. ■ Solve a problem that involves multiplication and division of decimals using multipliers from 0 to 9 and divisors from 1 to 9. ■ Use mental math to determine products or quotients involving decimals when the multiplier or divisor is a multiple of 10 (e.g., 2.47 × 10 = 24.7; 31.9 ÷ 100 = 0.319). ■ Determine products and quotients using the standard algorithms of vertical multiplication (i.e., numbers arranged vertically and multiplied using single digits, which are added to form a final product) and long division (i.e., the multiples of the divisor are subtracted from the dividend). ■ Solve multiplication and division problems in context using personal strategies, and record the process.

LAL Numeracy Phase 1B: **Number: Decimal Multiplication and Division** *(continued)*

Learning Experiences

Language Foundation:

- Discuss multiplication of decimals to addition and division.
- Describe the position of the decimal point with respect to multiplication and division.
- Use age-appropriate vocabulary and examples.

Key Vocabulary:

- Multiply
- Times
- Carry
- Divided by
- Into
- Quotient
- Divisor
- Dividend
- Remainder
- Factor
- Decimal
- Array

Sentence Frames:

- _____ times _____ equals _____.
- Multiplying _____ and _____ is approximately _____.
- _____ divided by _____ = _____.
- The quotient of _____ divided by _____ is _____.
- The product of _____ and _____ is about _____.

Learning Supports:

- Base-10 blocks
- Number line
- Area models/grid multiplying
- Word wall
- Math journal
- Categorizing and labelling
- L1 test and a translating app
- Pictures and graphics
- Counters
- Multiplication chart

Mental Math:

- Multiply decimals by 0, 1, 10, 100, or 1000.
- Divide decimals by 1, 10, 100, or 1000.
- Estimate the product of 5.8×4.1.
- Identify and correct errors of decimal point placement in a product or quotient by estimating.

Problem Solving:

- David's mother works for $13.75 an hour. If she works for 40 hours in one week, how much does she earn that week?
- Do you think the product of 3×8.3 is greater than or equal to 0.3×83? Explain.
- When you divide a number by 10, the decimal point in the number moves to the right. True or false?

LAL Numeracy Phase 1B: **Patterns and Relations: Use Table of Values and Graphs to Solve Problems**

Big Ideas: Data can be arranged to highlight patterns and relationships. Patterns can be represented in a variety of ways.

	Numeracy	Language
Outcomes **4PR3, 5PR1, 6PR1, 6PR2**	■ Identify, represent, and describe patterns and relationships using graphs and tables.	■ Observe and experience problem-solving situations in the classroom. ■ Listen and attempt to understand opinions expressed in classroom settings. ■ Respond appropriately to basic questions and engage in short classroom interactions, using phrases or simple sentences. ■ Indicate understanding or lack of understanding with gestures or short phrases.
Connection to Prior Learning	■ Describe, translate, and extend patterns. ■ Progress from repeating patterns (e.g., AB AB AB or AAB AAB AAB) to increasing and decreasing patterns (e.g., 1, 4, 7, 10, …).	Using emergent vocabulary, demonstrate and explain the following, orally and in writing: ■ Create a table of values and describe any patterns. ■ Plot bar graphs and line graphs from a table of values. ■ Explain the relationship between the data and the graph.
	Instructional Strategies: ■ Describe, using everyday language, orally or in writing, the relationship shown on a graph. ■ Predict the value of an unknown term using the relationship in a table of values, and verify the prediction. ■ Formulate a rule to describe the relationship between two numbers in a pattern. ■ Use real-world examples.	**Assessment Criteria:** ■ Predict the value of an unknown term using the relationship in a table of values, and verify the prediction. ■ Predict the value of an unknown term using the relationship in a table of values, and verify the prediction. ■ Translate a pattern to a table of values and graph the table of values (limit to linear graphs with discrete elements). ■ Create a table of values, a pattern, and/or a graph given a table of values, a pattern, or a graph. ■ Describe, using everyday language, orally or in writing, the relationship shown on a graph or a chart.

LAL Numeracy Phase 1B: **Patterns and Relations: Use Table of Values and Graphs to Solve Problems** *(continued)*

Learning Experiences

Language Foundation:

- Analyze data from a graph.
- Describe patterns and pattern rules.
- Make predictions based on a rule.
- Compare charts, graphs, and tables.

Key Vocabulary:

- Relationship
- Count
- Horizontal
- Vertical
- Table of values
- Patterns
- Prediction

Sentence Frames:

- The next number in the pattern is _____.
- The fifth number in _____ pattern is _____.

Learning Supports:

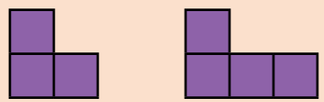
- Grid paper
- Graphic organizers
- L1 text
- Colour counters
- Linking cubes

Mental Math:

- Given 1, 3, ____, 7, 9, …,
  a) what is the missing third term?
  b) what are the next two terms?
- Create five terms for a decreasing pattern and state the pattern rule in your own words.

Problem Solving:

- The Summer Olympic Games are held in 2020, 2024, 2028, …. The Winter Olympic Games are held 2022, 2026, 2030, ….
  a) Ask students to determine whether 2036 will be a Summer or Winter Olympic Games.
  b) Ask students to determine the next year for Winter Olympic Games after 2032.
- Given two shapes:



  a) Draw the next two shapes to create a pattern.
  b) Predict the number of blocks in the fifth shape for your pattern.

LAL Numeracy Phase 1B: **Patterns and Relations: Preservation of Equality—One-Step Problems**

Big Ideas: Relationships between quantities can be described using rules involving variables. The equals sign describes the balance that exists between the quantities on either side of the equals sign. Relationships can be described and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways.

	Numeracy	Language
Outcomes **2PR3, 3PR3, 4PR6, 5PR2, 6PR3**	■ Represent generalizations arising from number relationships using equations with letter variables. ■ Demonstrate and explain the meaning of preservation of equality, concretely, pictorially, and symbolically. ■ Solve one-step equations involving a symbol to represent an unknown number. ■ Solve problems involving single-variable one-step equations (expressed as symbols or letters) with whole-number solutions. ■ Express addition and subtraction problems in context as an equation where the unknown is represented by a letter variable. ■ Express multiplication and division problems in context as an equation where the unknown is represented by a letter variable. ■ Solve a one-step equation using manipulatives.	■ Use visuals and realia to add new knowledge, concepts, and skills for communication and participation in the classroom. ■ Express ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids such as physical movement, gestures, realia, pictures, or acting out. ■ Observe and experience problem-solving situations in the classroom. ■ Listen and attempt to understand opinions expressed in familiar social and classroom settings. ■ Share ideas, thoughts, opinions, and preferences in short statements.
Connection to Prior Learning	■ Represent, describe, compare, and order whole numbers. ■ Demonstrate and explain the meaning of equality and inequality, using manipulatives or diagrams. ■ Demonstrate the relationship between addition and subtraction (i.e., the sum of a number with its opposite results in 0). ■ Demonstrate the relationship between multiplication and division (i.e., multiplying a number by its reciprocal results in 1).	Using emergent vocabulary, demonstrate and explain the following, orally and in writing: ■ Identify key information in a word problem, using a symbol to represent a variable. ■ Compose equations and solve for the variable.
	Instructional Strategies: ■ Solve a one-step equation using guess and test. ■ Describe, orally, the meaning of a one-step equation with one unknown. ■ Solve an equation when the variable is to the left or right of the equation. ■ Express a problem in context as an equation where the unknown is represented by a letter variable. ■ Create a problem in context for an equation.	**Assessment Criteria:** ■ Model the preservation of equality for addition, subtraction, multiplication, or division of one-step equations, using concrete materials such as a balance or using pictorial representations, and orally explain the process. ■ Write equivalent forms of an equation by applying the preservation of equality, and verify using concrete materials.

LAL Numeracy Phase 1B: **Patterns and Relations: Preservation of Equality—One-Step Problems** *(continued)*

Learning Experiences

Language Foundation:

- Understand vocabulary related to
  - addition and subtraction
  - multiplication and division
  - problem-solving routines
  - mathematical expressions

Key Vocabulary:

- Variable
- Equation
- Symbol
- Expression
- Solution
- Unknown
- Terms
- Letter variable (such as *x*)
- Equality
- Opposite operation
- Reciprocal

Sentence Frames:

- _____ is an equation because _____.
- _____ is an expression because _____.
- If $x +$ _____ = _____, then x is _____.
- $\square = 7 + 2$
- $6 + 2 = \square$
- $5 + \square = 8$
- $9 - \square = 6$
- $21 + 55 = \square + 56$
- $x + 7 = 9$
- $x - 4 = 3$
- 8 (< or >) 10
- 15 (< or >) 11
- $\square < \square$
- $\square > \square$

Learning Supports:

- Realia
- Pan balance with marbles, coins, and blocks
- Coloured counters

Mental Math:

- Compatible numbers
- Basic arithmetic facts
- Equivalent expressions
- Combining opposite numbers
- Multiplying reciprocals

Problem Solving:

- Juan needed to buy 40 pencils but pencils come in packages of eight. How many packages does he need to buy?
- Ali picked 10 apples, and Josh picked three times as many as Ali. How many more apples does Josh pick?
- Jenna has $15. She purchases ice cream for her friends that costs $2.50 for each ice cream. How many can she buy?

LAL Numeracy Phase 1B: **Patterns and Relations: Preservation of Equality—Solving Multi-Step Equations**

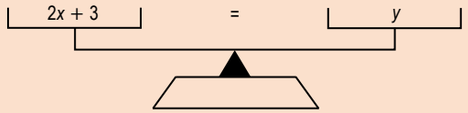
Big Ideas: Relationships between quantities can be described using rules involving variables. The equals sign describes the balance that exists between the quantities on either side of the equals sign. Relationships can be described and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways.

	Numeracy	Language
Outcomes **6PR4**	■ Demonstrate—concretely, pictorially, and symbolically—the meaning of preservation of equality.	■ Use visuals and realia to begin to add new knowledge, concepts, and skills for communication and participation in the classroom. ■ Express ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids such as physical movement, gestures, realia, pictures, or acting out. ■ Observe and experience problem-solving situations in the classroom. ■ Listen and attempt to understand opinions expressed in familiar social and classroom settings. ■ Share ideas, thoughts, opinions, and preferences in short statements. ■ Demonstrate orally and in writing an understanding of equality using concrete objects such as a balance scale. ■ Demonstrate an understanding of the word *equal*. ■ Know and use a developing repertoire of words and phrases in familiar classroom, academic, and social contexts, within the suggested areas of experience. ■ Know and use with some consistency a range of simple grammatical features required for everyday classroom and foundational academic subject-area learning. ■ Experiment (with support) with a developing range of simple English structures to express their own ideas in familiar social and classroom situations, attempting to generate rules and to self-correct. ■ Use visuals, realia, and/or their first language to add a developing range of new knowledge, concepts, and skills to complete simple structured academic tasks. ■ Complete, with guidance and modelling, a range of academic tasks related to a cross-section of subject areas.
Connection to Prior Learning	■ Equations have an equality that must always be preserved. This preserves the value of the expressions on both sides of the equals sign. ■ The order of operation rules must be followed when working with expressions on each side of the equals sign. ■ Note that the student can verify whether the answer is accurate by substituting the answer into the original equation and working it out to see if the equality is maintained. ■ Model the preservation of equality using concrete materials, such as a balance, or using pictorial representations, and orally explain the process for addition, subtraction, multiplication, and division. ■ Write equivalent forms of an equation by applying the preservation of equality, and verify using concrete materials. Note that the equation $3b = 15$ has the same value as $9b = 45$ or as $3b + 5 = 12 + 5$.	Know and use emergent repertoires of words and phrases, orally and in writing, to do the following: ■ Explain what is needed to preserve an equality when manipulating realia or an equation. ■ Identify the opposite operation needed to solve an equation. ■ Use order of operations when solving an equation. ■ Verify that the response is accurate.

LAL Numeracy Phase 1B: **Patterns and Relations: Preservation of Equality—Solving Multi-Step Equations** *(continued)*

Instructional Strategies:

- Use a balance scale to demonstrate and experience equality and the effects of removing and adding objects (e.g., marbles, coins, blocks) from one or both sides of the balance.
- Use a balance scale metaphor (e.g., changing the mass on one side of the fulcrum will tip the scale, and making an identical change on the opposite side of the fulcrum will rebalance the scale).



- Represent the balance scale metaphor symbolically as an equation with variables.
- To both sides of a balance, add objects, remove objects, double or triple the number of objects, and remove half of the objects. Represent these actions symbolically by modifying an equation.
- Use paper bags or cups filled with objects (e.g., blocks, coins, marbles) to represent an unknown number of objects. Balance the scale using a combination of a bag of objects and single objects on one side and single objects on the other side. Have students perform operations on both sides (e.g., remove objects) to determine the unknown number of objects in a bag.
- Use counters and a balance metaphor to model the equation. For example, to model $3n = 24$, a student could distribute 24 counters into 3 equal groups and count 8 in each group. To model $3n + 4 = 22$, a student could distribute 22 counters so that there are an equal number in 3 groups and a group of 4 by themselves.
- Use coloured tiles and a balance metaphor to model equations using integers. One colour represents positive integers and another colour represents negative integers.

Assessment Criteria:

- Model the preservation of equality for addition, subtraction, multiplication, or division of equations using concrete materials, such as a balance, or using pictorial representations, and orally explain the process.
- Write equivalent forms of an equation by applying the preservation of equality, and verify using concrete materials.
- Solve a multi-step problem by applying preservation of equality.

Learning Experiences

Language Foundation:

- Review the vocabulary related to a balance scale.
- Understand the use of a balance scale as a metaphor.
- Use appropriate vocabulary and mathematical language to explain equality.
- Use the word "equality" in different contexts.
- Demonstrate knowledge of the preservation of equality and apply it.
- Demonstrate understanding of equality and inequality.
- Explain mathematical relationships using charts and diagrams.
- Solve one-step equations.
- Use *x* to represent an unknown.

Key Vocabulary:

- Balance
- Rebalance
- Same
- Equal
- Equality
- Equivalent
- Opposite operation
- Reciprocal
- Variable

Sentence Frames:

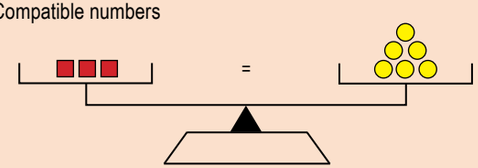
- In an equation, the value of the left side is _____ the value of the right side.
- The opposite of _____ is _____.
- The reciprocal of _____ is _____.
- To solve for *x* in the equation $3x - 1 = 2$, the first step is _____.

Learning Supports:

- Pan balance with marbles, coins, and blocks
- Coloured counters
- Coins
- Math journal
- Math dictionary

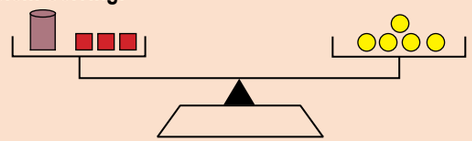
Mental Math:

- Basic math facts
- Compatible numbers

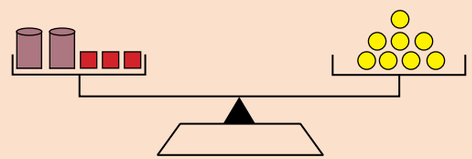


- How many circles balance one square?
- How many circles balance six squares?

Problem Solving:



- Use an equals sign and write an equation representing an unknown number of objects in the bag on the balance shown.



- Starting with diagram above, draw a new diagram showing the balance after performing an operation on both sides (i.e., doubling, removing, adding, dividing). Represent your balance diagram symbolically. (Note: the bags contain the same number of objects.)
- You spent $5 on two medium drinks and a $1.50 hot dog. What was the cost of each drink?

LAL Numeracy Phase 1B: **Shape and Space: Developing Formulas for Perimeter, Area, and Volume**

Big Ideas: Measurement involves a selected attribute of an object (e.g., length, area, mass, volume, capacity) and a comparison of the object being measured against non-standard and standard units of the same attribute.

	Numeracy	Language

Outcomes
5SS1, 6SS3
	■ Design and construct different rectangles, given either perimeter or area or both (whole numbers), and draw conclusions.
	■ Develop and apply a formula for determining the
	  ■ perimeter of polygons
	  ■ area of rectangles
	  ■ volume of right rectangular prisms
		■ Use visuals and realia to begin to add basic knowledge, concepts, and skills related to the core subject areas.
		■ Use simple cognitive strategies, with guidance, to enhance general learning (e.g., connect what they already know with what they are learning).

Connection to Prior Learning	■ Compare objects with two attributes (length and width). ■ Understand measurement (perimeter) as a process of comparing objects. ■ Measure perimeter (cm or m) of an object to the nearest unit. ■ Calculate the perimeter of a rectangle. ■ Understand that a rectangle is a quadrilateral, which is a polygon with four sides. ■ Area is measured in square units. ■ Generalize a rule for determining the volume of right rectangular prisms. ■ Solve a problem involving the perimeter of polygons, the area of rectangles, or the volume of right rectangular prisms.	Using emergent vocabulary, demonstrate and explain the following, orally and in writing: ■ Describe how to create equations given a perimeter or an area of square and/or a rectangle. ■ Solve perimeter/area equations.
	Instructional Strategies: ■ Use manipulatives for non-standard measurement. ■ Calculate and compare perimeters of rectangles and polygons, and find a rule to determine their perimeter. ■ Calculate and compare areas of rectangles and polygons, and find a rule to determine their area. ■ Use a given perimeter or area to find the dimensions of a rectangle. ■ Estimate area in cm^2 and m^2. ■ Using manipulatives, create right rectangular prisms of different volumes. Measure their height, width, and length, and find a rule to determine the volume.	**Assessment Criteria:** ■ Explain, using models, how the perimeter of any polygon can be determined. ■ Generalize a rule for determining the perimeter of polygons. ■ Explain, using models, how the area of any rectangle can be determined. ■ Generalize a rule for determining the area of rectangles. ■ Explain, using models, how the volume of any right rectangular prism can be determined. ■ Generalize a rule for determining the volume of right rectangular prisms. ■ Solve a problem involving the perimeter of polygons, the area of rectangles, or the volume of right rectangular prisms. Using keywords, short phrases, and short sentences, the student will do the following: ■ Explain a rectangle is a parallelogram with right angles. ■ Explain that changing the orientation of an object does not change the dimensions of the object. ■ Determine which units are most effective for measuring the length and width of the rectangle (cm or m). ■ Explain how to derive the perimeter of the rectangle. ■ Explain orally and in writing how to find areas of rectangles.

LAL Numeracy Phase 1B: **Shape and Space: Developing Formulas for Perimeter, Area, and Volume** *(continued)*

Learning Experiences

Language Foundation:

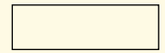
- Categorize and label polygons.
- Review key vocabulary.
- Use age-appropriate vocabulary and examples.
- Identify and describe the rectangle as a 2-D shape.
- Identify and name the length and width with these measurements (cm and m).
- Describe the measurement process in L1.
- Represent the perimeter of a rectangle and explain the process in the calculation.
- Describe perimeter as the distance around the outside of a closed figure, measured in linear units.
- Demonstrate how to estimate and calculate the area of a rectangle.

Key Vocabulary:

- Length
- Width
- Unit
- Measure
- Centimetre (cm)
- Metre (m)
- Compare
- Side
- Rectangle
- Polygon
- $(cm)^2$
- $(m)^2$
- Perimeter
- Area
- Volume
- Right rectangular prism
- Base

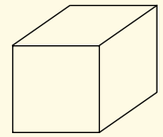
Sentence Frames:

Consider this rectangle:



- The width of a rectangle is _____ than its length.
- The length of this rectangle cab be _____ (units) and the width can be _____ units.
- Using these values for length and width, the perimeter must be _____ units.
- Using these values for length and width, the area is _____ $units^2$.

Consider this figure:



- If the side of this cube is _____ cm, then the volume will be _____ cm^3.

Learning Supports:

- Pictures and graphics
- Grid paper
- Geoboards
- Process support such as guided practice, labelled number line, and graphic organizers
- Word wall
- Math journal
- Manipulatives and rulers

Mental Math:

- Comparing objects with different perimeters
- Comparing objects with different areas
- Determining perimeters of rectangles
- Determining areas of rectangles
- One-step word problems

Problem Solving:

- How many metres of fencing are required to enclose a rectangle garden 58 m long and 42 m wide?
- How many metres of ribbon are needed for a border or a bedspread 160 cm by 225 cm?
- A schoolroom is 9 m long and 8 m wide. What is its area?
- If the area of a frame is 20 cm^2 and its length is 5 cm, what is its width?

LAL Numeracy Phase 1B: **Shape and Space: Capacity**

Big Ideas: All measurements are comparisons. Length, area, volume, capacity, and mass are measurable properties of objects. The unit of measure must be of the same nature as the property of the object being measured.

	Numeracy	Language

Outcomes
5SS4
	■ Demonstrate an understanding of volume by
	  ■ selecting and justifying referents for cm^3 or m^3 units
	  ■ estimating volume by using referents for cm^3 or m^3
	  ■ measuring and recording volume (cm^3 or m^3)
	  ■ constructing rectangular prisms for a given volume
	■ Demonstrate an understanding of capacity by
	  ■ describing the relationship between mL and L
	  ■ selecting and justifying referents for mL or L units
	  ■ estimating capacity by using referents for mL or L
	  ■ measuring and recording capacity (mL or L)
		■ Use visuals and realia to begin to add basic knowledge, concepts, and skills related to the core subject areas.
		■ Use simple cognitive strategies, with guidance, to enhance general learning (e.g., connect what they already know with what they are learning).

Connection to Prior Learning	■ Note that changing the orientation of an object does not alter the measurement of its attributes. ■ Demonstrate an understanding of measuring length and calculating area. ■ Demonstrate an understanding of volume of right rectangular prisms.	Using emergent vocabulary, demonstrate and explain the following, orally and in writing: ■ Describe when to use cubic centimetre and cubic metre. ■ Estimate and determine the volume of a given 3-D object. ■ Convert millilitres to litres. ■ Determine the capacity of a container using materials that take the inside shape of the container.
	Instructional Strategies: ■ Use manipulatives to measure objects of different volumes. ■ Use everyday objects as referents for the cubic centimetre (e.g., a die) and cubic metre (e.g., a large garbage bin). ■ Use linking cubes to make several different rectangular prisms all with the same volume.	**Assessment Criteria:** ■ Identify the cube as the most efficient unit for measuring volume, and explain why. ■ Provide a referent for a cubic centimetre, and explain the choice. ■ Provide a referent for a cubic metre, and explain the choice. ■ Determine which standard cubic unit is represented by a given referent. ■ Estimate the volume of a 3-D object using personal referents. ■ Determine the volume of a 3-D object using manipulatives, and explain the strategy. ■ Construct a rectangular prism for a given volume. ■ Explain that many rectangular prisms are possible for a given volume by constructing more than one rectangular prism for the same volume. ■ Demonstrate that 1000 millilitres is equivalent to 1 litre by filling a 1-litre container using a combination of smaller containers. ■ Provide a referent for a litre, and explain the choice. ■ Provide a referent for a millilitre, and explain the choice.

LAL Numeracy Phase 1B: **Shape and Space: Capacity** *(continued)*

Assessment Criteria: ***(continued)***

- Determine which capacity unit (mL or L) is represented by a given referent.
- Estimate the capacity of a container using personal referents.
- Determine the capacity of a container using materials that take the shape of the inside of the container (e.g., a liquid, rice, sand, beads), and explain the strategy

Learning Experiences

Language Foundation:

- Review key vocabulary.
- Use age-appropriate vocabulary and examples.
- Compare exemplars of containers with different volumes/capacities.

Key Vocabulary:

- Cubic unit (centimetre and metre)
- Dimension
- Volume
- Capacity
- More, less, same capacity
- Litre
- Millilitre referent

Sentence Frames:

- This (object) has a greater volume than this (object) because _____.
- _____ has a volume of _____ (cm^3/m^3).
- _____ has a capacity of _____ (mL/L).
- I can find the volume of this (object) by _____.
- I can find the capacity of this (object) by _____.

Learning Supports:

- A variety of containers (some of which should be transparent)
- Funnels, water, sand, or any other material that will take the shape of containers
- Paper towels, sponges, and markers
- Models of cubic metres
- Linking cubes
- Cuisenaire rods

Mental Math:

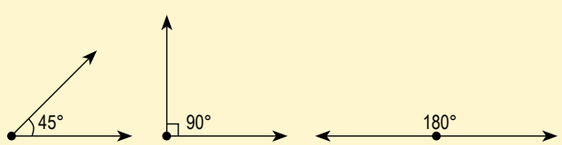
- Comparing/ordering values of volume or capacity
- One-step word problems
- Determining which unit of measurement would be most appropriate for finding a particular volume/capacity

Problem Solving:

- Given a container, determine the appropriate units for measuring the capacity.
- Given three different containers, order them from greatest capacity to least capacity.
- Construct a rectangular prism of a certain volume.
- Construct several rectangular prisms of equal volume.

LAL Numeracy Phase 1B: **Shape and Space: Angles**

Big Ideas: Measurement involves a selected attribute of an object and a comparison of the object being measured against non-standard and standard units of the same attribute. The use of standard measurement units simplifies communication about the size of objects.

	Numeracy	Language
Outcomes **6SS1, 6SS5**	Demonstrate an understanding of angles by ■ identifying examples of angles in the environment ■ classifying angles according to their measure ■ estimating the measure of angles using benchmarks of 45°, 90°, and 180° ■ determining angle measures in degrees ■ drawing and labelling angles when the measure is specified ■ constructing right-angle triangles	■ Use visuals and realia to begin to add basic knowledge, concepts, and skills related to the core subject areas. ■ Use simple cognitive strategies, with guidance, to enhance general learning (e.g., connect what they already know with what they are learning).
Connection to Prior Learning	■ Sort polygons according to number of sides and vertices. ■ Identify the difference between angles of a right-angle triangle.	Using emergent vocabulary, demonstrate and explain the following, orally and in writing: ■ Use visuals and realia to begin to add new knowledge, concepts, and skills for communication and participation in the classroom. ■ Express ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids such as physical movement, gestures, realia, pictures, or acting out. ■ Observe and experience problem-solving situations in the classroom (learning activities). ■ Listen and attempt to understand opinions expressed in familiar social and classroom settings. ■ Working in pairs, share ideas, thoughts, opinions, and preferences in short statements.
	Instructional Strategies: ■ An angle is the space between two rays or line segments that are joined at a common point. There are many different sizes of angles; some are small and some are large. Angles can be seen by observing different geometric shapes as well as the environment around us. Angles are measured in degrees using a protractor. ■ Use total physical response (TPR) to illustrate angle measures of 0°, 45°, 90°, and 180°. ■ Construct a sketch of a polygon. Recognize the vertices (interior angles) in the polygons and determine the relationship between the number of sides and number of interior angles. ■ Identify and describe angles in the environment (e.g., angle between wall and floor, angle between stair rail and wall, angle between roof and chimney, angle between two branches on a tree). ■ Use 45°, 90°, and 180° angles as reference angles when estimating the angle measures:  	**Assessment Criteria:** Use keywords, short phrases, and short sentences to do the following: ■ Provide examples of angles found in the environment. ■ Classify a set of angles according to their measure (e.g., acute, right, obtuse, straight, reflex). ■ Sketch 45°, 90°, and 180° angles without the use of a protractor, and describe the relationship among them. ■ Estimate the measure of an angle using 45°, 90°, and 180° as reference angles. ■ Measure, using a protractor, angles in various orientations. ■ Draw and label an angle in various orientations using a protractor. ■ Describe the measure of an angle as the measure of rotation of one of its sides. ■ Describe the measure of angles as the measure of an interior angle of a polygon, including right-angle triangles.

LAL Numeracy Phase 1B: **Shape and Space: Angles** *(continued)*

Instructional Strategies: ***(continued)***

- Sort and compare regular polygons according to the size of angles.
- Sketch the benchmark angles (0°, 45°, 90°, and 180°) and estimate measures of angles between benchmark values, without the use of a protractor.
- Estimate the measure of angles on a page in various orientations, and describe them as "less or more than 45°," "less or more than 90°," and "less or more than 180°."
- Classify angles according to their measure as "acute," "right," "obtuse," "straight," and "reflex."
- Introduce measurement with a protractor. Describe the process of measuring angles in degrees with a protractor.
- Draw an angle (e.g., acute, obtuse, etc.) on paper (in various orientations). Estimate its measure. Use a protractor to determine the measure in degrees.
- Use a protractor to draw two angles with the same measure in different orientations.

Learning Experiences

Language Foundation:

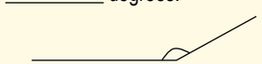
- Discuss the meaning of *angle* and *rotation*.
- Discuss the meaning of *degrees* in terms of rotation rather than temperature.
- Review key vocabulary.

Key Vocabulary:

- Degree
- Acute angle
- Obtuse angle
- Right angle
- Straight angle
- Reflex angle
- Interior angle
- Polygon
- Quadrilateral

Sentence Frames:

- An example of a right angle in this room is _____.
- _____ is an example of a _____ (acute/obtuse/right) angle.
- The angle shown is more than _____ and less than _____ degrees.



Learning Supports:

- Protractor
- Graph paper
- Geoboard
- Ruler

Mental Math:

- Given image of an angle, estimate the measure in degrees in comparison to 0°, 45°, 90°, and 180°.
- Draw angles with approximate measures of 0°, 45°, 90°, and 180°.

Problem Solving:

- Measure the angles of several right triangles. What can you conclude about the measures of these angles?
- Students draw several triangles. How many acute angles can a triangle have? What are the measures of the angles? What is the sum of the measures of the angles?

LAL Numeracy Phase 1B: **Shape and Space: Transformations**

Big Ideas: Shapes can be relocated and reoriented using mathematical procedures. Shapes can be described in terms of their location in a plane or in a space.

	Numeracy	Language

Outcomes
4SS6, 5SS7, 5SS8, 6SS6
	■ Demonstrate an understanding of line symmetry by
	  ■ identifying symmetrical 2-D shapes
	  ■ creating symmetrical 2-D shapes
	  ■ drawing one or more lines of symmetry in a 2-D shape
	■ Perform a single transformation (e.g., translation, rotation, or reflection) of a 2-D shape, and draw and describe the image.
	■ Describe the kind of movement of an object that is rotating in place or rotating (revolving) around a point.
	■ Draw a 2-D shape, translate the shape, and record the translation by describing the direction and magnitude of the movement (e.g., the circle moved 3 cm to the left).
	■ Draw a 2-D shape, rotate the shape, and describe the direction of the turn (i.e., clockwise or counter-clockwise), the fraction of the turn, and point of rotation.
	■ Draw a 2-D shape, reflect the shape, and identify the line of reflection and the distance of the image from the line of reflection.
	■ Predict the result of a single transformation of a 2-D shape, and verify the prediction.
	■ Demonstrate that a 2-D shape and its transformation image are congruent.
	■ Model a combination of two different types of transformations of a 2-D shape.
	■ Draw and describe a 2-D shape and its image, given a combination of transformations.
	■ Describe the transformations performed on a 2-D shape to produce a given image.
	■ Model a set of successive transformations (e.g., translation, rotation, or reflection) of a 2-D shape.
	■ Perform and record one or more transformations of a 2-D shape that will result in a given image.
		■ Use visuals and realia to begin to add new knowledge, concepts, and skills for communication and participation in the classroom.
		■ Express ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids (e.g., physical movement, gestures, realia, pictures, or acting out).
		■ Observe and experience problem-solving situations in the classroom (learning activities).
		■ Listen and attempt to understand opinions expressed in familiar social and classroom settings.
		■ Working in pairs or in groups, share ideas, thoughts, opinions, preferences in short statements.

Connection to Prior Learning	■ Name and classify polygon shapes according to the number of sides. ■ Describe and construct polygons. ■ Demonstrate that changing the orientation of an object does not alter the measurements of its attributes.	Using emergent vocabulary, demonstrate and explain the following, orally and in writing: ■ After movement from a point of origin, classify the end position as being in one of four quadrants (i.e., right and up, left and up, left and down, right and down). ■ Translate, rotate, reflect, and demonstrate symmetry of 2-D shapes.

LAL Numeracy Phase 1B: **Shape and Space: Transformations** *(continued)*

Instructional Strategies:

- Express the movement of objects (e.g., themselves TPR, actual objects in the room, shapes on a page) orally using key vocabulary such as *slide*, *translation*, *turn*, *rotation*, *flip*, and *reflection*.
- Describe examples of translations (e.g., draws, sliding doors, riding an escalator or elevator), reflections (e.g., image in a mirror, symmetrical logos), and rotations (e.g., door knobs, hands on a clock).
- Use Mira to draw reflections on graph paper.
- Draw translation images using graph paper.

Assessment Criteria:

- Sort shapes as symmetrical and non-symmetrical.
- Identify lines of symmetry of 2-D shapes.
- Demonstrate that a 2-D shape and its transformation image are congruent.
- Model a set of successive translations, successive rotations, or successive reflections of a 2-D shape.
- Model a combination of two different types of transformations of a 2-D shape.
- Draw and describe a 2-D shape and its image, given a combination of transformations.
- Describe the transformations performed on a 2-D shape to produce a given image.
- Model a set of successive transformations (e.g., translation, rotation, or reflection) of a 2-D shape.
- Perform and record one or more transformations of a 2-D shape that will result in a given image.

Learning Experiences

Language Foundation:

- Identify and describe polygon shape, size, and location.
- Describe transformations of reflection, rotation, and translation.
- Use pictures, graphics, and realia.
- Review key vocabulary.

Key Vocabulary:

- Clockwise
- Counter-clockwise
- Flip
- Turn
- Slide
- Reflection
- Congruent
- Rotation
- Origin
- Vertices
- Line of reflection
- Line of symmetry
- Symmetrical
- Non-symmetrical
- Transformation
- Image

Sentence Frames:

Showing an object and its image after successive transformations:

- The _____ (polygon name) is translated _____ units to the _____ (direction).
- The _____ (polygon name) is rotated _____ degrees _____ (clockwise/counter-clockwise).
- The _____ (polygon name) is reflected over the _____ (vertical line horizontal line, *y*-axis, *x*-axis)

Learning Supports:

- Vertical and horizontal number lines
- Geoboards
- Graph paper
- Linking cubes

Mental Math:

- Addition and subtraction for translation properties (e.g., move a point three units to the right).
- Draw a reflection of an object (e.g., an arrow).

Problem Solving:

- Describe a series of transformations that will move a given object to a given image of the object (on graph paper).
- Analyze a design created by transforming one or more 2-D shapes, and identify the original shape and the transformations used to create the design.

LAL Numeracy Phase 1B: **Statistics and Probability: Introduction to Probability**

Big Ideas: Probability involves the use of mathematics to describe the level of certainty that an event will occur. Probabilities, both theoretical and experimental, can be determined in different ways. Experimental results of a small-scale experiment may be quite different from the theoretical probability, while experimental results of a very large-scale experiment should be approaching the theoretical probability.

	Numeracy	Language

Outcomes
5SP1, 5SP3, 5SP4, 6SP3, 6SP4
	■ Describe the likelihood of a single outcome occurring using words such as *impossible*, *possible*, or *certain*.
	■ Describe examples of events that are impossible, possible, or certain from personal contexts.
	■ Classify data as discrete (e.g., shoe size, number of people) or continuous (e.g., age, height).
	■ Demonstrate an understanding of probability by
	  ■ identifying all possible outcomes of an experiment
	  ■ differentiating between the experimental and theoretical probability of outcomes of an experiment
	  ■ determining the experimental probability
	  ■ comparing experimental results with theoretical probability
		■ Respond to extensive modelling and guidance by beginning to recognize and gain meaning from simple words and sentences about familiar topics, supported with pictures, repetition, and patterns.
		■ Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids.
		■ Use visuals, realia, and their first language to add basic knowledge, concepts, and skills related to the core subject areas.
		■ Respond appropriately to basic personal questions and engage in short classroom or social interactions, using phrases or simple sentences. Indicate understanding or lack of understanding with gestures or short phrases.
		■ Use cognitive strategies, with guidance and support, to enhance general learning (e.g., connect what they already know with what they are learning).
		■ Observe and experience problem-solving situations in the classroom (e.g., learning activities).

Connection to Prior Learning	■ Collect first-hand data and organize it using tally marks, line plots, charts, and lists.
	■ Construct and interpret bar graphs and pictographs involving many-to-one correspondence to draw conclusions.
	■ Classify objects or items into groups.
	■ Students require an understanding of fractions and ratios.
		Using emergent vocabulary, demonstrate and explain the following, orally and in writing:
		■ Collect first-hand and second-hand data and differentiate between them.
		■ Draw graphs using this data.
		■ Draw conclusions based on data and graphs.
		■ Describe theoretical and experimental probability to possible outcomes of
		  ■ a coin toss
		  ■ rolling a die or dice
		  ■ using a spinner
		■ Describe and classify data as discrete or continuous.

	Instructional Strategies:
	■ Create a class list of events that are possible, impossible, likely, or certain. Provide reasoning.
	■ Describe the possible outcomes of a coin toss, the roll of a die, or the choices on a spinner.
	■ Describe a probability experiment using coins, dice, and spinners.
	■ Design and conduct a probability experiment in which the likelihood of a single outcome occurring is impossible, possible, or certain.
	■ Using words, such as “less likely,” “equally likely,” and “more likely,” compare the likelihood of two possible outcomes occurring.
		Assessment Criteria:
		■ List the possible outcomes of a probability experiment, such as
		  ■ tossing a coin
		  ■ rolling a die with any number of sides
		  ■ spinning a spinner with any number of sectors
		■ Determine the theoretical probability of an outcome occurring for a probability experiment.
		■ Predict the probability of an outcome occurring for a probability experiment by using theoretical probability.
		■ Explain that as the number of trials in a probability experiment increases, the experimental probability approaches theoretical probability of a particular outcome.
		■ Distinguish between theoretical probability and experimental probability, and explain the differences.

LAL Numeracy Phase 1B: **Statistics and Probability: Introduction to Probability** *(continued)*

Instructional Strategies: ***(continued)***

- Conduct a probability experiment, with or without technology, and compare the experimental results to the theoretical probability.
- Explain that as the number of trials in a probability experiment increases, the experimental probability approaches theoretical probability of a particular outcome.

Learning Experiences

Language Foundation:

- Review the key vocabulary.
- Describe the characteristics of dice, coins (i.e., heads and tails), spinners, decks of cards.
- Design "experiments" that allow students to talk about collected data regarding their likes/dislikes.

Key Vocabulary:

- Graph
- Bar graph
- Data
- Discrete data
- Continuous data
- First-hand data
- Second-hand data
- Horizontal axis
- Vertical axis
- Impossible
- Possible
- Certain
- Less likely
- More likely
- Equally likely
- Favourable outcome
- Possible outcomes
- Theoretical probability
- Experimental probability
- Experimental results

Sentence Frames:

- I am less likely to _____ than to _____.
- I am more likely to _____ than to _____.
- It is impossible for me to _____.
- I am certain to _____.
- It is equally likely that _____ and _____.
- It is possible that I will _____.

Learning Supports:

- Dice
- Coins
- Spinners
- Graph paper

Mental Math:

- What is the probability of rolling a number less than 3 on a six-sided die?
- What is the probability of drawing a Jack in a deck of cards?
- Given data shown in the form of a bar graph, answer questions requiring students to read or interpret the graph.

Problem Solving:

- You have seven shirts of different colours. What is the probability of randomly selecting a green shirt?
- Determine the theoretical probability of drawing a red card from a deck of cards. Record the experimental probability of drawing a red card when you draw 10 cards. Record the experimental probability when you draw 20 cards. Record the experimental probability when you draw 100 cards. Analyze the results by comparing theoretical and experimental probabilities.