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

Phase 2B—Half-Course Credit

LAL Numeracy Phase 2B: **Number: Ratios and Rates**

Big Ideas: There are different but equivalent representations of numbers.

	Numeracy	Language
Outcomes **8N4, 8N5**	■ Demonstrate an understanding of ratios and rates. ■ Solve problems that involve rates, ratios, and proportional reasoning.	■ Know and use a range of grammatical features required for everyday classroom and foundational academic subject-area learning. ■ Use visuals, realia, and/or their home language to add a developing range of new knowledge, concepts, and skills to complete simple structured mathematical tasks. ■ Demonstrate the foundational and essential knowledge, skills, and attitudes related to the outcomes. ■ Complete, with guidance and modelling, a range of academic tasks related to the outcomes. ■ Use a variety of simple cognitive and metacognitive strategies with guidance to enhance learning. ■ Listen and attempt to understand opinions expressed in academic classroom settings. ■ Working in pairs or in groups, share ideas, thoughts, opinions, and preferences in short statements.

Connections to Prior Learning	■ Demonstrate an understanding of fractions using concrete and pictorial representations to
	  ■ create sets of equivalent fractions
	  ■ compare fractions with like and unlike denominators
	■ Demonstrate an understanding of addition, subtraction, multiplication, and division of fractions.
	■ Describe, represent, and compare decimals, fractions, and percents.
		■ Use an emergent repertoire of words, phrases, and simple sentences to
		  ■ compare two quantities of ratios as a proportion
		  ■ describe rates as a ratio

	Instructional Strategies: ■ Use real-life examples. ■ Explain part-to-part ratios and part-to-whole ratios (e.g., Given the ratio of frozen juice to water is 1 can to 4 cans, this ratio can be written as $\frac{1}{4}$, 1 : 4, or 1 to 4 [part-to-part ratio]. Related part-to-whole ratios are $\frac{1}{5}$, 1 : 5, or 1 to 5, which is the ratio of juice to solution, $\frac{4}{5}$, 4 : 5, or 4 to 5, which is the ratio of water to solution.). ■ Use patterns and common multiples to create equivalent expressions of ratios. ■ Use pattern blocks to create designs that display a common ratio.	**Assessment Criteria:** ■ Express a two-term ratio from a context in the forms 3 : 5 or 3 to 5. ■ Demonstrate an understanding of part-to-part versus part-to-whole ratios. ■ Identify and describe ratios and rates from real-life examples, and record them symbolically. ■ Express a rate using words or symbols (e.g., 20 L per 100 km or 20 L/100 km). ■ Express a ratio as a percent, and explain why a rate cannot be represented as a percent. ■ Solve a problem involving rate, ratio, or percent, using proportional reasoning.

LAL Numeracy Phase 2B: **Number: Ratios and Rates** *(continued)*

Learning Experiences

Language Foundation:

- Express a rate using words or symbols (e.g., 20 L per 100 km or 20 L/100 km).
- Identify and describe ratios and rates from real-life examples, and record them symbolically.
- Provide rules for converting ratios to percents.

Key Vocabulary:

- Equivalent fraction
- Part-to-part ratio
- Part-to-whole ratio
- Proportion
- Rate
- Unit price
- Unit rate

Sentence Frames:

- The part-to-part ratio of _____ can be expressed as the part-to-whole ratio of _____.
- The part-to-whole ratio of _____ can be expressed as the part-to-part ratio of _____.
- The ratio of _____ expressed as a percent is _____.

Learning Supports:

- Coloured counters
- Pattern blocks
- Cuisenaire rods
- Fraction bars
- Number line

Mental Math:

- Convert part-to-part ratios into part-to-whole ratios and vice versa.
- Solve simple proportions such as $\frac{1}{2} = \frac{x}{10}$.

Problem Solving:

- A swimming club has 38 members, of which 14 are males and the rest are females. What is the ratio of females to males?
- A herd of 97 horses has 24 white and some black horses. What is the ratio of black horses to white horses?
- The price of gasoline is $1.54 per litre. How many litres can you purchase for $50.00?

LAL Numeracy Phase 2B: **Number: Squares, Perfect Squares, and Square Roots**

Big Ideas: There are different but equivalent representations of numbers. Benchmark numbers are useful for comparing, relating, and estimating numbers.

Outcomes 8N1, 8N2

Numeracy

- Demonstrate—concretely, pictorially, and symbolically—an understanding of perfect squares and square roots.

Extension:

- Determine the approximate square root of numbers that are not perfect squares.

Language

- Know and use a range of grammatical features required for everyday classroom and foundational academic subject-area learning.
- Use visuals, realia, and/or their first language to add a developing range of new knowledge, concepts, and skills to complete simple structured mathematical tasks.
- Demonstrate the foundational and essential knowledge, skills, and attitudes related to the outcomes.
- Complete, with guidance and modelling, a range of academic tasks related to the outcomes.
- Use a variety of simple cognitive and metacognitive strategies with guidance to enhance learning.
- Listen and attempt to understand opinions expressed in academic classroom settings.
- Working in pairs or in groups, share ideas, thoughts, opinions, and preferences in short statements.

Connections to Prior Learning

Demonstrate an understanding that

- a square is a 2-dimensional (2-D) shape with all four sides equal
- the total area the square covers is measured in square units
- to determine the side length of a square when given the area

- Demonstrate, orally and in writing, an understanding of the following:
  - how to determine whether a number is a perfect square
  - how to find the square root of a perfect square
  - how to approximate the square root of a non-perfect square number

Instructional Strategies:

- Using manipulatives such as grid paper or geoboards, represent squares to determine side length and area of perfect squares.
- Using manipulatives such as grid paper or geoboards, represent squares to estimate side length and determine area of non-perfect squares.
- Using manipulatives and strategies such as prime factorization, determine whether or not a number is a perfect square.
- Determine area as a power.
- Complete a chart that outlines the side length, area, area as a power, and side length as a square root.

Side Length (units)	Area 1(units^2)	Area as Power	Side Length as Square Root
1	1	1^2	$\sqrt{1}$
2	4	2^2	$\sqrt{4}$

- Use estimation and/or a calculator if needed to determine approximate square roots of imperfect squares.

Assessment Criteria:

- Represent a perfect square as a square region.
- Determine the factors of a perfect square, and explain why one of the factors is the square root and the others are not.
- Determine whether or not a number is a perfect square using materials and strategies such as square shapes, grid paper, or prime factorization, and explain the reasoning.
- Determine the square root of a perfect square, and record it symbolically.
- Determine the square of a number.
- Determine approximate square roots for imperfect squares.

LAL Numeracy Phase 2B: **Number: Squares, Perfect Squares, and Square Roots** *(continued)*

Learning Experiences

Language Foundation:

- Discuss the difference between side length and area.
- Describe how to determine if a whole number is a perfect square.
- Explain why the square root of a number shown on a calculator may be an approximation.

Key Vocabulary:

- Factors
- Perfect square
- Non-perfect square
- Square root
- Power
- Base
- Exponent

Sentence Frames:

- The square root of _____ is _____.
- _____ is a perfect square because _____.
- The side length of the square with an area of _____ is _____.
- _____ is a non-perfect square because _____.

Learning Supports:

- Grid paper
- Geoboards

Mental Math:

- Demonstrate the ability to use the following:
  - Multiplication facts
  - Division facts
  - Squaring of whole numbers
  - Square roots of perfect squares

Problem Solving:

- Maria has a square quilt on her bed. Each side has 10 squares. How many squares are on her quilt?
- The area of a square gym is 150 square metres. Is the gym a perfect square? Estimate the length of this quilt.

LAL Numeracy Phase 2B: **Number: Percent**

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

	Numeracy	Language
Outcomes **8N3**	■ Demonstrate an understanding of percent greater than or equal to zero.	■ Know and use a range of grammatical features required for everyday classroom and foundational academic subject-area learning. ■ Use visuals, realia, and/or their first language to add a developing range of new knowledge, concepts, and skills to complete simple structured mathematical tasks. ■ Demonstrate the foundational and essential knowledge, skills, and attitudes related to the outcomes. ■ Complete, with guidance and modelling, a range of academic tasks related to the outcomes. ■ Use a variety of simple cognitive and metacognitive strategies with guidance to enhance learning. ■ Listen and attempt to understand opinions expressed in academic classroom settings. ■ Working in pairs or in groups, share ideas, thoughts, opinions, and preferences in short statements.
Connections to Prior Learning	■ Understand place value to the thousandth. ■ Describe, represent, and compare decimals, fractions, and percents. ■ Understand place value to the thousandth. ■ The percents may represent a part of one whole item or a part of one whole group. Percent represents a special type of fraction with a denominator of 100.	■ Use visuals, realia, and/or their first language to add to a developing repertoire of percents greater than zero.

	Instructional Strategies:
	■ Represent a fractional percent using grid paper (10 × 10). Using the grid paper, demonstrate how to
	  ■ determine the value of one shaded square (1%)
	  ■ represent various percents (43 squares = 43%)
	■ Represent percents as fractions and decimals.
	■ Solve percent problems comparing a variety of procedures (e.g., calculating total cost including 7% PST and 6% GST on $24):
	  ■ $24 + \left(\frac{24}{1} \times \frac{13}{100}\right)$
	  ■ $\left(24 \times \frac{113}{100}\right)$
	  ■ $24 + (24 \times 0.13)$
	  ■ (24×1.13)
		Assessment Criteria:
		■ Provide a context where a percent may be more than 100% or between 0% and 1%.
		■ Represent a percent greater than 100%.
		■ Determine the percent represented by a shaded region on a grid, and record it in decimal, fractional, or percent form.
		■ Express a percent in decimal or fractional form.
		■ Express a decimal in percent or fractional form.
		■ Express a fraction in decimal or percent form.
		■ Solve a problem involving percents.
		■ Solve a problem involving combined percents (e.g., addition of percents, such as GST + PST).

LAL Numeracy Phase 2B: **Number: Percent** *(continued)*

Learning Experiences

Language Foundation:

- Read $\frac{7}{100}$ or 0.07 as 7 hundredths and also as 7 percent.
- Describe equivalent representations of fractions and decimals as percents.

Key Vocabulary:

- Percent
- Decimal
- Fraction
- GST (Goods and Services Tax)
- PST (Provincial Sales Tax)

Sentence Frames:

- The total cost including tax is $_____.
- There is _____ % tax.
- There is a _____ % savings.
- The total after a _____ %. increase/decrease is _____.

Learning Supports:

- Grid paper
- Geoboards
- Coloured counters
- Double number lines

Mental Math:

- Demonstrate the ability to use the following:
  - Multiplication
  - Division
  - Addition
  - Subtraction
  - Estimating percent using benchmarks

Problem Solving:

- A pair of jeans cost $29.99. What is the final cost after adding 6% GST and 7% PST?
- Headphones are on sale for $47.98. The regular price is $69.99. To the nearest tenth of a percent, what is the percent savings?
- Every year the population of Winnipeg increases by 2.59%. If the current population is 727 500, what will the population be in three years?
- Your boss gave you a 15% cut in your salary last week. Then your boss realized the mistake and gave you a 15% raise on your new salary. Is this fair to you?

LAL Numeracy Phase 2B: **Number: Multiplying and Dividing Rational Numbers**

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

	Numeracy	Language
Outcomes **8N6, 8N8**	■ Demonstrate—concretely, pictorially, and symbolically—an understanding of multiplying and dividing positive fractions and mixed numbers. ■ Solve problems involving positive rational numbers.	■ Know and use a range of grammatical features required for everyday classroom and foundational academic subject-area learning. ■ Use visuals, realia, and/or their first language to add a developing range of new knowledge, concepts, and skills to complete simple structured mathematical tasks. ■ Demonstrate the foundational and essential knowledge, skills, and attitudes related to the outcomes. ■ Complete, with guidance and modelling, a range of academic tasks related to the outcomes. ■ Use a variety of simple cognitive and metacognitive strategies with guidance to enhance learning. ■ Listen and attempt to understand opinions expressed in academic classroom settings. ■ Working in pairs or in groups, share ideas, thoughts, opinions, and preferences in short statements.
Connections to Prior Learning	It is important that students are able to work flexibly with the various meanings of multiplication and division: ■ Describe, represent, and compare rational numbers as fractions and decimals using concrete, pictorial, and symbolic representations. ■ Demonstrate an understanding of multiplication as repeated addition. ■ Demonstrate an understanding of multiplication as equal sets or groups. ■ Demonstrate an understanding of multiplication as an array and rectangular area. ■ Demonstrate an understanding of multiplication as combinations. ■ Demonstrate an understanding of multiplication as a rate. ■ Demonstrate an understanding of division as repeated subtraction. ■ Demonstrate an understanding of division as equal sharing and grouping. ■ Demonstrate an understanding of division as a rate.	Using an emergent repertoire of vocabulary, short phrases, and simple sentences, demonstrate an understanding of how to do the following: ■ Explain the process involved in multiplying and dividing positive fractions. ■ Describe the process involved in solving word problems involving fractions.
	Instructional Strategies: ■ Use manipulatives to represent various positive, mixed, proper, and improper fractions. ■ Express a positive mixed number as an improper fraction and a positive improper fraction as a mixed number. ■ Use manipulatives to represent multiplication as repeated addition, equal sets or groups, and as a rectangular area. ■ Discuss the patterns and develop a rule for multiplying fractions. ■ Ensure understanding of a rule/algorithm for multiplying fractions. ■ Use manipulatives to represent division as equal sharing, equal grouping, and repeated subtraction. ■ Discuss the patterns and develop a rule for dividing fractions. ■ Ensure understanding of a rule/algorithm for dividing fractions. ■ Solve problems involving multiplying and dividing rational numbers.	**Assessment Criteria:** ■ Provide a context involving the multiplying of two positive fractions. ■ Provide a context involving the dividing of two positive fractions. ■ Model—concretely or pictorially—multiplication of a positive fraction by a whole number, and record the process. ■ Model—concretely or pictorially—multiplication of a positive fraction by a positive fraction, and record the process. ■ Model—concretely or pictorially—division of a positive fraction by a whole number, and record the process. ■ Generalize and apply rules for multiplying and dividing positive fractions, including mixed numbers. ■ Solve a problem involving positive rational numbers.

LAL Numeracy Phase 2B: **Number: Multiplying and Dividing Rational Numbers** *(continued)*

Learning Experiences

Language Foundation:

- Discuss the conceptual understanding of fractions (parts of a whole).
- Describe the method of converting a mixed fraction to an improper fraction.
- Explain a method to multiply and divide fractions.

Key Vocabulary:

- Numerator
- Denominator
- Fraction
- Improper fraction
- Mixed number
- Order of operations
- Rational numbers
- Proper fraction
- Reciprocal
- Product
- Quotient

Sentence Frames:

- _____ is a whole number.
- _____ is a positive fraction.
- _____ is a mixed number.
- _____ is an improper fraction.
- The product of _____ and _____ is/equals _____.
- The quotient of _____ divided by _____ is/equals _____.

Learning Supports:

- Pattern blocks
- Fraction bars
- Cuisenaire rods
- Grid paper
- Coloured counters
- Number lines

Mental Math:

- Demonstrate the ability to use the following:
  - Multiplication
  - Division
  - Reciprocal fractions—for example:
    - — Find the reciprocal of $\frac{5}{7}$.
    - — Find the reciprocal of 8.
    - — Find the fraction in the following equations:

$$\frac{2}{5} \times \frac{\square}{\square} = 1$$

$$6 \times \frac{\square}{\square} = 1$$

Problem Solving:

- Greg has $\frac{4}{5}$ of a bag of sunflower seeds. He is going to share his sunflower seeds. There are four people in total. What fraction of the bag will each person get?
- Candice is using her phone. Its battery life is down to $\frac{1}{2}$, and it drains another $\frac{1}{8}$ every hour. How many hours will her battery last?
- Hunter was baking cookies. It called for $1\frac{3}{4}$ cup of flour. He was making $\frac{1}{2}$ of the recipe. How much flour does he need?
- Lynelle had $\frac{2}{3}$ cup of laundry detergent. She used $\frac{1}{2}$ of the detergent on Friday to wash her clothes. How much detergent does she have left?
- Steve has $6\frac{3}{4}$ pounds of ground beef to make hamburgers for a party. It takes $\frac{3}{8}$ pound of ground beef to make one hamburger. How many hamburgers can Steve make if he uses all the ground beef?

LAL Numeracy Phase 2B: **Patterns and Relations: Analyze Two-variable Linear Equations**

Big Ideas: Relationships can be described and generalizations made for mathematical situations that have numbers or objects that repeat in a predictable way. Data can be arranged to highlight patterns and relationships.

	Numeracy	Language
Outcomes **8PR1**	■ Graph and analyze two-variable linear relations.	■ Recognize and produce a limited range of simple text forms in guided situations, such as reports, stories, graphs, and charts, poems, and word problems. ■ 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.
Connections to Prior Learning	■ Demonstrate an understanding of words, tables, graphs, expressions, and equations that are different representations used for the same pattern. ■ Represent and describe patterns and relationships using charts and tables to solve problems. ■ Identify and explain mathematical relationships using charts and diagrams to solve problems. ■ Determine the pattern rule to make predictions about subsequent elements. ■ Demonstrate an understanding of oral and written patterns and their corresponding relations. ■ Construct a table of values from a relation, graph the table of values, and analyze the graph to draw conclusions and solve problems. ■ Identify and plot points in the four quadrants of a Cartesian plane using ordered pairs.	Use visuals, realia, and/or first language to add to a developing repertoire and do the following: ■ Represent a pattern established by a two-variable equation. ■ Set up a graph for a two-variable equation. ■ Analyze a two-variable equation graph.

	Instructional Strategies:
	■ Using a linear relation such as $y = 3x + 1$ or $d = 5t$, students will
	  ■ develop a table of values (a T-table) to show the relationship between the two variables
	  ■ construct a graph from the ordered pairs
	  ■ identify the appropriate title, label the axes, and scale numbers appropriately
	  ■ discuss the patterns represented in the table and the graph
	■ Evaluate a table of values with missing elements:
		Assessment Criteria:
		■ Determine the missing value in an ordered pair for an equation of a linear relation.
		■ Create a table of values for the equation of a linear relation.
		■ Construct a graph from the equation of a linear relation (limited to discrete data).
		■ Describe the relationship between the variables of a graph in words and using an equation.

x	3	4	5	
y	3	5		9

Connections to Prior Learning

Instructional Strategies: *(continued)*

- Plot the known ordered pairs, (x, y), as points on a graph.
- Estimate the missing x- and y-values and extend the graph.
- Discuss possible methods of finding missing values.
- Evaluate the various methods that students suggest.
- Describe in words the pattern rules and how to find the values of y that relate to each of the values of x.
- Write the pattern rule as an equation that describes how the values of y relate to the values of x in this pattern (i.e., $y = 2x - 3$).
- Using the equation, verify earlier predictions and extend the pattern rule for other points.
- Examine tables of values, graphs, and equations to determine if they are linear relations.

Learning Experiences

Language Foundation:

- Explain mathematical relations using tables of values and graphs.
- Label the titles and appropriate axes.
- Discuss the relationship between the variables.
- Explain the process of determining a pattern rule.
- Discuss the characteristics of a linear relation.

Key Vocabulary:

- Equation
- Formula
- Linear relation
- Pattern rule
- Table of values
- Variable
- x-value
- y-value
- Ordered pairs
- Plot
- Title
- Graph

Sentence Frames:

- The horizontal axis is referred to as the _____ axis.
- The vertical axis is referred to as the _____ axis.
- For the equation _____, if the x-value is _____, then the y-value must be _____.
- For the equation _____, if the y-value is _____, then the x-value must be _____.
- I know this is a linear relation because _____.

Learning Supports:

- Graph paper
- Coloured counters
- Linking cubes
- Online graphing tools such as *Desmos*

Mental Math:

- In the equation $y = 4x + 2$, when $x = 10$, then $y =$ _____.
- In the equation $y = 4x + 2$, when $y = 2$, then $x =$ _____.
- The next three ordered pairs in the T-chart of this linear relation are the following:

x	5	6	7	
y	1	6	11	

Problem Solving:

- The sum of two numbers, n and m, is 25. Create a T-chart with three or more pairs of values for n and m.
- A rectangle has a length of x and a width of 6. Write an expression to describe an attribute of the rectangle in terms of x.
- Starting at the Ontario border, you drive at a steady speed of 90 km/h on the Trans-Canada Highway across Manitoba.
  a) Create a T-chart showing both the number of hours and the distance travelled.
  b) Plot the ordered pairs (time, distance).
  c) Use the graph to estimate how far you will travel in 5 hours.
  d) Use the graph to estimate how long it will take to reach Brandon, Manitoba.

LAL Numeracy Phase 2B: **Patterns and Relations: Solve Linear Equations**

Big Ideas: Patterns can be represented in a variety of ways. The equals sign describes the balance that exists between the qualities on either side of the equals sign. Relationships between quantities can be described using rules involving variables.

	Numeracy	Language
Outcomes 8PR2	■ Model and solve problems—concretely, pictorially, and symbolically—using linear equations of the form: ■ $ax = b$ ■ $ax + b = c$ ■ $\frac{x}{a} = b, a \neq 0$ ■ $\frac{x}{a} + b = c, a \neq 0$ ■ $a(x + b) = c$ where a, b, and c are integers.	■ 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—concretely, pictorially, and symbolically—an understanding of equations and expressions by ■ describing orally and in writing ■ creating ■ Know and use a developing repertoire of words and phrases in familiar classroom, academic, and social contexts within the suggested areas of experience. ■ 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.
Connections to Prior Learning	■ Apply mental mathematics strategies for decomposing numbers and multiplication using the distributive property. ■ Demonstrate— concretely, pictorially, and symbolically—an understanding of adding/subtracting and multiplying/dividing positive fractions, mixed numbers, and integers. ■ Solve problems involving single-variable (expressed as symbols or letters), one-step equations with whole-number coefficients and whole-number solutions. ■ Explain the difference between an expression and an equation. ■ Evaluate an expression given the values of the variable(s).	■ Demonstrate orally and in writing an understanding of the steps involved in solving a one-variable equation, written in different forms.

LAL Numeracy Phase 2B: **Patterns and Relations: Solve Linear Equations** *(continued)*

Connections to Prior Learning

Instructional Strategies:

- Review the distributive property and the decomposition of numbers. For example, 7×14 can be thought of as
  - $7(10 + 4)$, 7×10 added to 7×4
  - $7(7 + 7)$, 7×7 added to 7×7
- Use counters and a pan balance concretely and pictorially to solve an equation using whole numbers. Describe and connect this strategy to a symbolic representation of equation solving.
- Use coloured counters or algebra tiles with a balance metaphor to solve equations using integers. Describe and connect this strategy to a symbolic representation of equation solving.
- Demonstrate the connection between the pictorial representation and the symbolic equation.
- Students may substitute a value for a variable. Substitution may be used as a guess-and-check strategy.
- Create a table of values and a graph to solve the equation.
- Solve equations symbolically, maintaining equality.

Assessment Criteria:

- Model a problem with a linear equation, and solve the equation using concrete models.
- Verify the solution to a linear equation using a variety of methods, including concrete materials, diagrams, and substitution.
- Draw a visual representation of the steps used to solve a linear equation and record each step symbolically.
- Solve a linear equation symbolically.
- Identify and correct errors in an incorrect solution of a linear equation.
- Solve a linear equation by applying the distributive property. For example:
  - $2(x + 3) = 5$
  - $2x + 6 = 5$
  - $2x = -1$
  - $x = -\frac{1}{2}$
- Solve a problem using a linear equation, and record the process.

Learning Experiences

Language Foundation:

- Compare algebraic expressions to pattern rules.
- Discuss the process of solving linear equations.
- Describe the steps involved in solving equations algebraically and graphically.

Key Vocabulary:

- Constant
- Equation
- Equivalent
- Evaluate
- Expression
- Formula
- One-step linear equation
- Opposite
- Operation
- Substitution
- Two-step linear equation
- Variable
- Solve
- Simplify
- Solution

Sentence Frames:

- To solve $2x + 5 = -3$, you can _____ (add/subtract) 5 on both sides of the _____ (equation).
- For the _____ (equation), $3x = 12$, $x = 4$ is the _____ (solution)
- When $x = 2$, the expression _____ evaluates to _____.
- To solve the equation $3(y + 6) = 27$, the first step is _____.

Learning Supports:

- Algebra tiles
- Coloured counters
- Pan balance
- Math journal

Mental Math:

- Determine the value of each variable mentally:
  - $-3b = 21$
  - $\frac{x}{5} = 30$
  - $2y + 4 = 10$
  - $4(r - 5) = -12$

Problem Solving:

- The area of a rectangle is 36 cm. The length is 6 cm and the width is $3w$ cm. Determine the width.
- Describe a situation that uses the equation $5x = 50$.
- The solution to a two-step linear equation is -3. What might the equation be?
- Samuel works in a restaurant in Winnipeg for minimum wage plus tips. In one week, he earned $290. He earned $103 in tips.
  a) Research the minimum wage in Manitoba.
  b) Write an equation to represent the situation.
  c) Determine how many hours Samuel worked that week.

LAL Numeracy Phase 2B: **Shape and Space: Pythagorean Theorem**

Big Ideas: It is necessary to understand the attributes of the object before anything can be measured. 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 8SS1	■ Develop and apply the Pythagorean theorem to solve problems, using Pythagorean triples (e.g., 3, 4, 5 or 5, 12, 13).	■ Know and use a **developing** repertoire of words and phrases in familiar classroom, academic, and social contexts within the suggested areas of experience. ■ 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. ■ Demonstrate the foundational and essential knowledge, skills, and attitudes related to the core subject areas. ■ Complete, with guidance and modelling, a range of academic tasks related to a cross-section of subject areas. ■ 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. ■ Listen to and understand the main points of an oral presentation or interaction on a familiar topic with guidance, with or without visual aids such as gestures, role-playing/acting out, pictures, realia, or other representations. ■ Begin to initiate interactions and respond to questions on familiar topics; manage simple, routine interactions without undue difficulty, asking for repetition or clarification when necessary; respond to English-speaking peers. ■ Initiate interactions, and respond using simple social interaction patterns in face-to-face situations (e.g., request acceptance/refusal). ■ Collaborate with other learners of diverse backgrounds and interests, and begin to identify the value of different languages, cultures, and other forms of diversity.

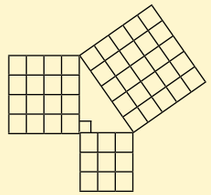
Connections to Prior Learning	■ Demonstrate an understanding of angles using 90˚ as a benchmark.
	■ Construct and compare triangles, including
	  ■ isosceles
	  ■ equilateral
	  ■ right
	  ■ acute
	in different orientations.
	■ Demonstrate an understanding
	  ■ that area is measured in square units
	  ■ of how to determine and record area (cm^2 or m^2)
	■ Demonstrate an understanding of perfect squares and square roots.
		■ Using an emergent repertoire of vocabulary, phrases, and short sentences, demonstrate orally and in writing an understanding of the steps involved in applying the Pythagorean theorem.

LAL Numeracy Phase 2B: **Shape and Space: Pythagorean Theorem** *(continued)*

Learning Experiences

Instructional Strategies:

- Using geoboards or grid paper, explore the unique relationship between the squares on the legs and hypotenuse of right triangles.
- Describe the patterns and relationships leading to the symbolic representation $c^2 = a^2 + b^2$.



Assessment Criteria:

Use keywords, short phrases, and short sentences to do the following:

- Model and explain the Pythagorean theorem concretely, pictorially, or by using technology.
- Explain, using examples, that the Pythagorean theorem applies only to right triangles.
- Determine whether or not a triangle is a right triangle by applying the Pythagorean theorem.
- Solve a problem using Pythagorean triples (e.g., 3, 4, 5 or 5, 12, 13) to determine the measure of the third side of a right triangle, given the measures of the other two sides.

Language Foundation:

- Describe that
  - a perfect square is a square with whole number sides (e.g., 1×1, 2×2, 3×3)
  - a perfect square is a number with an integer square root
  - a power is a short-hand, symbolic representation of repeated multiplication (e.g., $5^2 = 5 \times 5$)
  - a base is a factor in a power; it is what is being repeatedly multiplied (e.g., in 5^2, 5 is the base)
  - an exponent is a number in a power that tells how many factors there are; it is the number of factors in a repeated multiplication (e.g., in 5^2, 2 is the exponent)

Key Vocabulary:

- Factors
- Hypotenuse
- Legs
- Perfect square
- Right triangles
- Square root
- Multiples
- Pythagorean triples
- Pythagorean theorem

Sentence Frames:

- The Pythagorean theorem tells us the relationship between _____ and _____.
- In any right triangle, the square of the hypotenuse is equal to the _____.
- The Pythagorean formula is _____ + _____ = _____.

Learning Supports:

- Grid paper
- Ruler
- Protractor
- Geoboards

Mental Math:

- $\sqrt{81} = \square$
- $\sqrt{64} = \square$
- $5^2 = \square$
- Solve for c^2:
  - $c^2 = 3^2 + 4^2$
  - $c^2 = 5^2 + 12^2$
- If the two sides of a right triangle have measures of 6 mm and 8 mm, find the hypotenuse.

Problem Solving:

- Ryad wants to build a triangular vegetable garden in his backyard. The 3 pieces of wood he wants to use are 2 metres, 5 metres, and 7 metres long. Will Ryad be able to make a right triangle garden? Why or why not?
- To walk to her friend's house, Jolie walks 36 metres north and 15 metres east. How many metres shorter will it be if Jolie takes a diagonal shortcut?

LAL Numeracy Phase 2B: **Shape and Space: Surface Area**

Big Ideas: It is important to understand the attributes of an object before anything can be measured. All measurements are comparisons. The use of standard measurement units simplifies communication about the size of an object.

	Numeracy	Language

Outcomes 8SS3	■ Determine the surface area of
	  ■ right rectangular prisms
	  ■ right triangular prisms
	  ■ right cylinders
	to solve problems.
		■ Know and use a developing repertoire of words and phrases in familiar classroom, academic, and social contexts within the suggested areas of experience.
		■ Draw on prior life experiences for a limited range of academic tasks.
		■ 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.
		■ Demonstrate the foundational and essential knowledge, skills, and attitudes related to the core subject areas.
		■ Complete, with guidance and modelling, a range of academic tasks related to a cross-section of subject areas.
		■ Use basic print conventions with developing consistency (e.g., numbers, letters, capitalization, spacing, basic punctuation, abbreviations).
		■ Listen to and understand the main points of an oral representation or interaction on a familiar topic with guidance, with or without visual aids such as gestures, role-playing/acting out, pictures, realia, or other representations.
		■ Express meaning spontaneously and/or with guidance, through an interaction on a familiar topic and some supported unfamiliar routines and contexts in a structured situation.

Connections to Prior Learning	■ Demonstrate an understanding of measuring length (cm, m) by selecting and justifying referents for the units cm and m.
	■ Model and describe the relationship between the units cm and m.
	■ Estimate length using referents.
	■ Measure and record length, width, and height.
	■ Describe 3-D objects according to the shape of the faces and the number of edges and vertices.
	■ Demonstrate an understanding of area of regular and irregular 2-D shapes by recognizing that area is measured in square units.
	■ Select and justify referents for the units cm^2 or m^2.
	■ Estimate area by using referents cm^2 or m^2.
	■ Determine and record area (cm^2 or m^2).
	■ Construct different rectangles for a given area (cm^2 or m^2) in order to demonstrate that many different rectangles may have the same area.
	■ Develop and apply a formula for determining the area of
	  ■ triangles
	  ■ parallelograms
	  ■ circles
	■ Solve problems involving 2-D shapes and 3-D objects.
	■ Describe and construct rectangular and triangular prisms.
		Use visuals, realia, and/or first language to add to a developing repertoire of new knowledge and do the following:
		■ Describe an understanding of surface area.
		■ Differentiate between surface areas of right rectangular prisms, right triangular prisms, and right cylinders.
		■ Describe the process of calculating the surface area of right rectangular prisms, right triangular prisms, and right cylinders.

LAL Numeracy Phase 2B: **Shape and Space: Surface Area** *(continued)*

Learning Experiences

Instructional Strategies:

- Construct and deconstruct 3-D objects using nets.
- Calculate the total surface area by adding all of the 2-D shapes within each net.
- From these calculations, develop formulas for calculating surface areas of right rectangular prisms, right triangular prisms, and right cylinders.

Assessment Criteria:

Use keywords, short phrases, and short sentences to do the following:

- Explain, using examples, the relationship between the surface area of a 3-D object.
- Identify all the faces of a prism, including right rectangular and right triangular prisms.
- Describe and apply strategies for determining the surface area of a right rectangular or right triangular prism.
- Describe and apply strategies for determining the surface area of a right cylinder.
- Solve a problem involving surface area.

Language Foundation:

- Describe the process of drawing a net and determining how many faces the object has.
- Explain how many faces are the same and develop a formula to calculate the total surface area.
- Discuss the importance of the circumference for determining the surface area of a right cylinder.

Key Vocabulary:

- 3-D objects
- Area
- Base of a prism
- Diameter
- Circumference
- Edge
- Face
- Height of a prism
- Net
- Orientation of a shape
- Radius
- Right cylinder
- Right rectangular prism
- Right triangular prism
- Vertex

Sentence Frames:

- The surface area of any prism is the total area of all its _____ and _____.
- A prism has _____ rectangular sides and _____ triangular sides.
- To find the area of the rectangular sides, use the formula $A = lw$, where $A =$ _____, $l =$ _____, and $w =$ _____.
- To find the area of the triangular faces, use the formula $A = \frac{1}{2}bh$, where $A =$ _____ $b =$ _____, and $h =$ _____.
- Once you have the areas of all sides and faces, you _____ them together to get the surface area.

Learning Supports:

- Various 3-D objects (e.g., books, rectangular erasers, boxes, CD cases, cans, cylinders)
- Linking cubes
- Graph paper
- Nets
- Rulers
- String

Mental Math:

- What is the approximate value of pi?
- Estimate the area of a circle with a radius of 3 cm.
- What is the surface area of a cube with an edge length of 4 cm?

Problem Solving:

- Find the surface area of a rectangular prism with a length of 6 cm, a width of 4 cm, and a height of 2 cm.
- A triangular prism has a triangle end with a base of 5 m and a height of 4 m. The length of each side is 8 m. What is the surface area of the prism?
- Find the total surface area of a cylinder with a base radius of 5 m and a height of 7 m.
- What are the possible dimensions of a right rectangular prism (box) that has a total surface area between 1500 and 2000 square units?

LAL Numeracy Phase 2B: **Shape and Space: Volume**

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 **8SS4**	■ Develop and apply formulas for determining the volume of right prisms and right cylinders.	■ Know and use a developing repertoire of words and phrases in familiar classroom, academic, and social contexts within the suggested areas of experience. ■ 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. ■ Demonstrate the foundational and essential knowledge, skills, and attitudes related to the core subject areas. ■ Complete, with guidance and modelling, a range of academic tasks related to a cross-section of subject areas. ■ 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. ■ Listen to and understand the main points of an oral presentation or interaction on a familiar topic with guidance, with or without visual aids such as gestures, role-playing/acting out, pictures, realia, or other representations. ■ Begin to initiate interactions and respond to questions on familiar topics; manage simple, routine interactions without undue difficulty, asking for repetition or clarification when necessary; respond to English-speaking peers. ■ Initiate interactions and respond using simple social interaction patterns in face-to-face situations (e.g., request–acceptance/refusal). ■ Collaborate with other learners of diverse backgrounds and interests, and begin to identify the value of different languages, cultures, and other forms of diversity.

Connections to Prior Learning	Students may have had experience with the following:
	■ Demonstrate an understanding of measuring length (cm, m) by selecting and justifying referents for the units *cm* and *m*.
	■ Model and describe the relationship between the units *cm* and *m*.
	■ Estimate length using referents.
	■ Measure and record length, width, and height.
	■ Describe 3-D objects according to the shape of the faces and the number of edges and vertices.
	■ Demonstrate an understanding of area of regular and irregular 2-D shapes by
	  ■ recognizing that area is measured in square units
	  ■ selecting and justifying referents for the units cm^2 or m^2
	  ■ estimating area by using referents for the units cm^2 or m^2
	  ■ determining and recording area (cm^2 or m^2)
	  ■ constructing different rectangles for a given area (cm^2 or m^2) in order to demonstrate that many different rectangles may have the same area
		Use visuals or realia to add to a developing repertoire of new knowledge and do the following:
		■ Describe an understanding of the difference between area and volume.
		■ Differentiate between volumes of right prisms and right cylinders.
		■ Describe the process of calculating the volume of right prisms and right cylinders.

LAL Numeracy Phase 2B: **Shape and Space: Volume** *(continued)*

- Solve problems involving 2-D shapes and 3-D objects.
- Describe and construct rectangular and triangular prisms.
- 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, and measuring and recording volume (cm^3 or m^3).
- Describe and provide examples of edges and faces of 3-D objects and sides of 2-D shapes that are
  - parallel
  - intersecting
  - perpendicular
  - vertical
  - horizontal
- Develop and apply a formula for determining the
  - perimeter of polygons
  - area of rectangles
  - volume of right rectangular prisms
- Develop and apply a formula for determining the area of
  - triangles
  - parallelograms
  - circles

Instructional Strategies:

- Using non-standard measurement, estimate the number of linking cubes needed to construct certain shapes.
- Develop and compare strategies to determine the volume of right prisms and right cylinders.

Assessment Criteria:

Use keywords, short phrases, and short sentences to do the following:

- Determine the volume of a right prism, given the area of the base.
- Generalize and apply a rule for determining the volume of right cylinders.
- Explain the relationship between the area of the base of a right 3-D object and the formula for the volume of the object.
- Demonstrate that the orientation of a 3-D object does not affect its volume.
- Apply a formula to solve a problem involving the volume of a right cylinder or a right prism.

LAL Numeracy Phase 2B: **Shape and Space: Volume** *(continued)*

Learning Experiences

Language Foundation:

- Describe the process of calculating the volume of right prisms and right cylinders.
- Explain the relationship between area of the base of the shape and its volume.

Key Vocabulary:

- 2-D shapes
- 3-D objects
- Area
- Base of a prism
- Capacity
- Diameter
- Edge
- Face
- Formula
- Orientation of a shape
- Radius
- Right cylinder
- Right rectangular prism
- Right triangular prism
- Vertex
- View
- Volume
- Height of a prism

Sentence Frames:

- Volume can also be referred to as _____.
- To find the volume of a cylinder, multiply the _____ of the base by the _____ of the cylinder ($V = Bh$).
- A right rectangular prism is a prism in which the angles between the _____ and _____ are right angles.
- To find the volume of a rectangular prism, multiply the _____ of the base by the _____ of the prism ($V = Bh$).

Learning Supports:

- Various 3-D objects (e.g., books, rectangular erasers, boxes, CD cases, cans, cylinders)
- Linking cubes
- Graph paper
- Nets
- Rulers
- String

Mental Math:

- Apply a formula to find the volume of the following:
  - a right cylinder with a diameter of 8 cm and a height of 2 cm
  - a right square prism with the height of 10 cm and a base of 4 cm
- Estimate the volume of a cylinder with a radius of 3 cm and a height of 10 cm.
- What is the volume of a cube with an edge length of 4 cm?

Problem Solving:

- Mohamad has a cylindrical water bottle with a diameter of 6 centimetres and a height of 18 centimetres. If he filled the water bottle $\frac{3}{4}$ full of water, how much water is in the bottle?

  (Note: 1 mL of water = 1 cm^3)
- Hasnaa received a birthday gift wrapped in a cardboard box. The box measured 30 centimetres on each side. How many cubic centimetres will the box hold?
- Given specific volumes, determine the possible dimensions and construct 3-D shapes.

LAL Numeracy Phase 2B: **Shape and Space: Tessellations**

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
8SS6
	■ Demonstrate an understanding of tessellation by
	  ■ explaining the properties of shapes that make tessellating possible
	  ■ creating tessellations
	  ■ identifying tessellations in the environment
		Express and write keywords and simple sentences to do the following:
		■ Know and use a developing repertoire of words and phrases in familiar classroom, academic, and social contexts within the suggested areas of experience.
		■ Draw on prior life experiences for a limited range of academic tasks.
		■ 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.
		■ Demonstrate the foundational and essential knowledge, skills, and attitudes related to the core subject areas.
		■ Complete, with guidance and modelling, a range of academic tasks related to a cross-section of subject areas.
		■ Use basic print conventions with developing consistency (e.g., numbers, letters, capitalization, spacing, basic punctuation, abbreviations).
		■ Listen to and understand the main points of a presentation or interaction on a familiar topic with guidance, with or without visual aids such as gestures, role-playing/acting out, pictures, realia, or other representations.
		■ Express meaning spontaneously and/or with guidance, through an interaction on a familiar topic and some supported unfamiliar routines and contexts in a structured situation.

Connections to Prior Learning	■ Identify a single transformation (e.g., translation, rotation, or reflection) of 2-D shapes.
	■ 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 45°, 90°, and 180° as reference angles
	  ■ determining angle measures in degrees
	  ■ drawing and labelling angles when the measure is specified
	■ Describe and compare the sides and angles of regular and irregular polygons.
	■ Perform a combination of transformations (e.g., translations, rotations, or reflections) on a single 2-D shape, and draw and describe the image.
	■ Perform a combination of successive transformations of 2-D shapes to create a design, and identify and describe the transformations.
	■ Perform and describe transformations of a 2-D shape in all four quadrants of a Cartesian plane (limited to integral vertices).
		Use visuals, realia, and/or first language to add to a developing repertoire of new knowledge and do the following:
		■ Describe different types of transformations.
		■ Describe the process of performing transformations on a 2-D image.

LAL Numeracy Phase 2B: **Shape and Space: Tessellations** *(continued)*

Learning Experiences

Instructional Strategies:

- Explore tessellating regular polygons by
  - sorting a variety of shapes to determine which shapes tessellate and which shapes do not
  - investigating the meaning of tessellating the plane
- Draw tessellating shapes and then do the following:
  - Predict what shapes might tessellate.
  - Using grid paper, test predictions.
- Identify tessellations in the environment (e.g., tiles in the ceiling, tiles in the floor, artwork, sidewalk blocks, chain-link fence).

Assessment Criteria:

- Identify in a set of regular polygons those shapes and combinations of shapes that will tessellate, and use angle measurements to justify choices.
- Identify in a set of irregular polygons those shapes and combinations of shapes that will tessellate, and use angle measurements to justify choices.
- Identify a translation, reflection, or rotation in a tessellation.
- Identify a combination of transformations in a tessellation.
- Create a tessellation using one or more 2-D shapes, and describe the tessellation in terms of transformations and conservation of area.
- Create a new tessellating shape (polygon or non-polygon) by transforming a portion of a tessellating polygon, and describe the resulting tessellation in terms of transformations and conservation of area.
- Identify and describe tessellations in the environment.

Language Foundation:

- Discuss the difference between translation, reflection, and rotation.
- Describe a tessellation in terms of transformations and conservation of area.
- Identify and describe tessellations in the environment.

Key Vocabulary:

- Irregular polygon
- Regular polygon
- Quadrilaterals
- Reflection
- Rotation
- Tessellation
- Transformation
- Translation
- Conservation
- Hexagon
- Pentagon
- Square

Sentence Frames:

- A _____ tessellation is a pattern made by repeating a regular polygon.
- The three types of transformations are
  a) _____
  b) _____
  c) _____

Learning Supports:

- Regular polygons
- Paper and clipboard
- Grid paper
- Scissors
- Rulers
- Geoboards
- Pattern blocks

Mental Math:

- List the various shapes that tessellate.
- Explain why the area of a tessellating shape stays the same.

Problem Solving:

- Explain how the following make a regular tessellation:
  - squares
  - rectangles
  - equilateral triangles
  - regular hexagons
- Create a tessellation using one or more 2-D shapes.

LAL Numeracy Phase 2B: **Statistics and Probability: Bias and Critiquing Data**

Big Ideas: Data is organized in order to answer questions. The question that needs to be answered determines the data that will be connected.

Outcomes 8SP1, 9SP1

Numeracy

- Critique ways in which data is presented.
- Demonstrate an understanding of the type of data being collected and the information that is to be communicated before deciding on what type of graph to use.

Advantages and Disadvantages of Graphs

Graphs	Purpose(s)	Advantage(s)	Disadvantage(s)
Bar graphs	■ compare frequency of data (usually discrete)	■ are easy to read and interpret ■ can be used to compare two or more related sets of data	■ can be misleading if part of the scale along one axis is compressed
Line graphs	■ show changes in a single variable over time	■ can be used to observe changes over time ■ can be used to find individual pieces of data	■ can be used only if data changes over time ■ can be misleading if part of the scale along one axis is compressed
Circle graphs	■ compare groups of data to the whole set of data	■ can be used to see the ratio of each part to the whole group	■ cannot retrieve individual pieces of data because data are grouped

Language

- Know and use a range of grammatical features required for everyday classroom and foundational academic subject-area learning.
- Use visuals, realia, and/or their first language to add a developing range of new knowledge, concepts, and skills to complete simple structured mathematical tasks.
- Demonstrate the foundational and essential knowledge, skills, and attitudes related to the outcomes.
- Complete, with guidance and modelling, a range of academic tasks related to the outcomes.
- Use a variety of simple cognitive and metacognitive strategies with guidance to enhance learning.
- Listen and attempt to understand opinions expressed in academic classroom settings.
- Working in pairs or in groups, share ideas, thoughts, opinions, and preferences in short statements.

Connections to Prior Learning

- Construct, label, and interpret bar graphs, line graphs, and circle graphs to solve problems.

- Using emerging repertoire of vocabulary, phrases, and simple sentences, explain why a data set may be biased and why bias does not give an accurate analysis of the data.

LAL Numeracy Phase 2B: **Statistics and Probability: Bias and Critiquing Data** *(continued)*

Learning Experiences

Instructional Strategies:

- Examine graphs showing effects of bias including misleading graphs.
- Use various data and determine which graph would be the most appropriate means of displaying the data, and justify the decision.
- Select appropriate graphs to display data, and analyze the advantages and disadvantages of the graph by answering the following questions:
  - What can be said about these graphs?
  - What scenario do the data display?
  - Is there something that can be done to each graph to make it more clear? Explain.
  - Do the graphs display the same or different data? Explain.
  - What are the advantages and disadvantages of each graph?
  - Which graph is more appropriate? Explain.

Assessment Criteria:

- Compare the information that is provided for the same data set by a set of graphs, such as circle graphs, line graphs, bar graphs, double bar graphs, or pictographs, to determine the strengths and limitations of each graph.
- Identify the advantages and disadvantages of different graphs, such as circle graphs, line graphs, bar graphs, double bar graphs, or pictographs, in representing a specific set of data.
- Justify the choice of a graphical representation for a situation and its corresponding data set.
- Explain how a formatting choice, such as the size of the intervals, the width of bars, or the visual representation, may lead to misinterpretation of the data.
- Identify conclusions that are inconsistent with a data set or graph, and explain the misinterpretation.

Language Foundation:

- Discuss the advantages and disadvantages of each type of graph.
- Describe the advantages and disadvantages of different graphs, such as circle graphs, line graphs, bar graphs, double bar graphs, or pictographs, in representing a specific set of data.

Key Vocabulary:

- Bar graph
- Double bar graph
- Line graph
- Double line graph
- Circle graph
- Pie chart
- Data
- Frequency
- Axis
- Plot

Sentence Frames:

- A _____ graph is appropriate because _____.
- It is best to use a _____ graph because _____.

Learning Supports:

- Graphs from various sources
- Graph paper
- Open number lines

Mental Math:

- 50% of 360 is _____.
- $\frac{\square}{360^\circ} = 25\%$
- $\frac{14}{20} = \_\_\_\%$
- Read information from graphs.

Problem Solving:

- Reformat the scale of an axis on a bar or a line graph. How does this change the possible interpretation of the data?
- A survey students at Cool Math High School showed that 12 students walked to school, 4 students biked to school, 16 students took the bus, and 8 students took a car to school. Choose an appropriate graph and present this data in a manner that shows the school to be environmentally responsible.

LAL Numeracy Phase 2B: **Statistics and Probability: Sample Space, Theoretical, and Experimental Probabilities**

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.

	Numeracy	Language
Outcomes **7SP4, 7SP5, 7SP6**	■ Express probabilities as ratios, fractions, and/or percents. ■ Identify a sample space (36 or fewer elements) for a probability experiment involving two independent events. ■ Using experiments and/or calculations, explore theoretical and experimental probability using one and two independent variables.	■ Know and use a range of grammatical features required for everyday classroom and foundational academic subject-area learning. ■ Use visuals, realia, and/or their first language to add a developing range of new knowledge, concepts, and skills to complete simple structured mathematical tasks. ■ Demonstrate the foundational and essential knowledge, skills, and attitudes related to the outcomes. ■ Complete, with guidance and modelling, a range of academic tasks related to the outcomes. ■ Use a variety of simple cognitive and metacognitive strategies with guidance to enhance learning. ■ Listen and attempt to understand opinions expressed in academic classroom settings. ■ Working in pairs or in groups, share ideas, thoughts, opinions, preferences in short statements.

Connections to Prior Learning	■ Demonstrate an understanding of ratios, fractions, decimals, and percents using concrete, pictorial, and symbolic representations.
	■ Solve problems involving operations with ratios, fractions, decimals, and percents.
	■ 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
	  ■ describing the likelihood of a single outcome occurring using words such as “impossible,” “possible,” or “certain”
		■ Explain how to convert probabilities into ratios, fractions, and percents.
		■ Explain what is meant by sample space.
		■ Identify the sample space of a given event.
		■ Explain the difference between experimental and theoretical probabilities.
		■ Explain how to calculate the probability of a given event.

	Instructional Strategies:
	Experimental Probability:
	■ Conduct experiments to collect data
	  ■ using one independent event
	  ■ using two independent events
	■ Play simple games of chance (e.g., board games, dice games).
	■ Identify the components of a sample space.
	■ Record results using a variety of graphic organizers (e.g., chart, list, table, tree diagram).
	Theoretical Probability:
	■ Use a tree diagram, table, or other graphic organizer to create a sample space and determine theoretical probability.
	■ Compare experimental results with theoretical calculations.
		Assessment Criteria:
		■ Determine the probability of an outcome occurring for a probability experiment, and express it as a ratio, fraction, or percent.
		■ Provide an example of an event with a probability of 0 or 0% (impossible) and an event with a probability of 1 or 100% (certain).
		■ Provide an example of two independent events.
		■ Identify the sample space (all possible outcomes) for an experiment involving two independent events using a tree diagram, a table, or another graphic organizer.
		■ Determine the theoretical probability of an outcome for an experiment involving two independent events.
		■ Conduct a probability experiment involving one or two independent events, with or without technology.
		■ Solve a probability problem involving one or two independent events using two different graphic organizational strategies (e.g., chart, list, table, tree diagram).

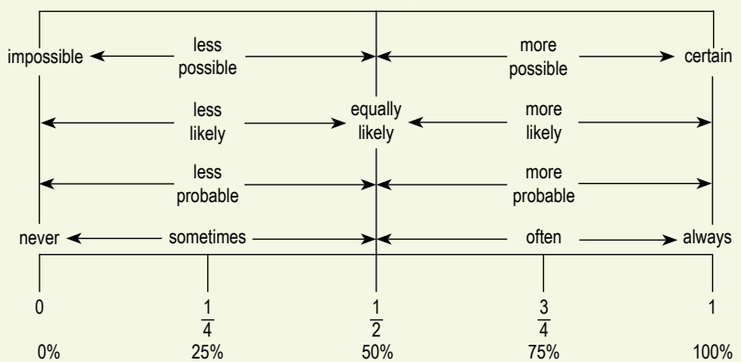
LAL Numeracy Phase 2B: **Statistics and Probability: Sample Space, Theoretical, and Experimental Probabilities** *(continued)*

Learning Experiences

Language Foundation:

- Describe equivalent representations of probabilities as fractions, ratios, decimals, and percents.
- Discuss why experimental results may be different than theoretical calculations.

Sample Probability Line



$$P = \frac{\text{Number of Favourable Outcomes}}{\text{Number of Possible Outcomes}}$$

Key Vocabulary:

- Certain
- Dependent
- Experimental probability
- Frequency
- Impossible
- Independent
- Likely
- Outcome
- Possible
- Probable
- Probability
- Random
- Relative frequency
- Sample size
- Sample space
- Theoretical probability
- Tree diagram

Sentence Frames:

- Outcome A is more/less likely to occur than outcome B.
- Outcome A is more/less likely to occur than outcome B.
- The probability of _____ happening is _____ (expressed as a fraction, decimal, or percent).
- _____ and _____ are examples of independent events.

Learning Supports:

- Cards
- Dice/numbered cubes
- Coloured counters
- Spinners
- Coins

Mental Math:

- Express equivalent forms.

Fraction	Decimal	Percent	Ratio (part/whole)
$\frac{1}{2}$			1 : 2
	0.75		
		90%	
	0.05		

Problem Solving:

- When randomly selecting a playing card from a shuffled deck, which has a greater probability of occurring?
  - drawing a face card or drawing a club
  - drawing a red card or drawing a card less than 5
- Create a spinner for an event that has a greater probability of happening than tossing a coin once and having it land on tails.
- Create the sample space that shows all the possible sums when rolling two dice.
  - What sum(s) are least likely to occur? Why?
  - What sum is most likely to occur? Why?
  - Name three sums that cannot occur.