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

LAL Foundational Numeracy 1A—
Half-Course Credit

LAL Foundational Numeracy 1B—
Half-Course Credit

LAL Transitional Numeracy 2A—
Half-Course Credit

LAL Transitional Numeracy 2B—
Half-Course Credit

LAL NUMERACY

VERSION 1.0

Manitoba

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2019
Manitoba Education and Training

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Contents

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Purpose of This Document

All students bring valuable experiences to the learning environment. This includes newcomer students in our schools who are learning the language of instruction and who have limited formal schooling. They also bring valuable experiences to add to our schools' cultures, but they face a more complex and challenging journey to success as they transition into Manitoba schools. Thus, in the Manitoba K–12 education system, the term *literacy*, *academics*, and *language (LAL) learner* is used to describe this subset of students who are learning English as an additional language (EAL) and who need to develop literacy and foundational academic knowledge and skills as well. For a variety of reasons, including war, environmental disasters, civil unrest, poverty, or culture, these students may have attended school sporadically or not at all. The content of their previous formal education may have been limited by resources, teacher training, or a narrow curriculum. This term does not denote cognitive abilities; it assumes the usual range of learner abilities while pointing to the emphasis on literacy, academics, and language. Although younger newcomer students may also have experienced similar disruptions in their education, the term *LAL* focuses on Middle and Senior Years students who will need intensive and accelerated learning to catch up with their Manitoba peers.

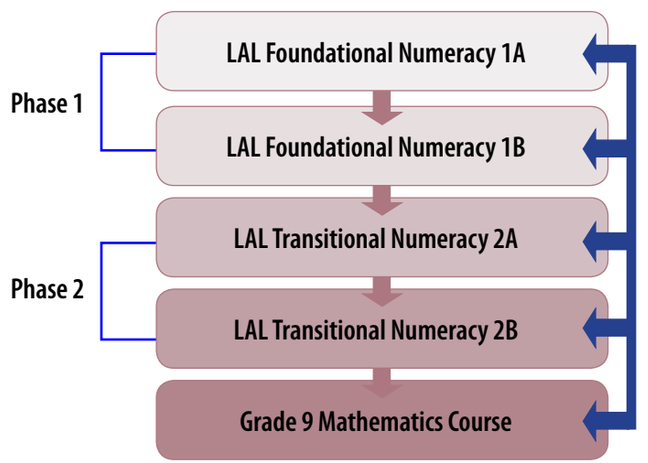
Learning literacy and academics is a more complex and challenging process for LAL learners because they need to develop foundational academic skills in the subject areas parallel to learning English. LAL learners may appear to progress more slowly than other EAL students in the classroom because they are learning the language of instruction and subject-area content at the same time as they are establishing the practices and processes of formal education and the classroom. They may have limited experience with writing implements and classroom technology and they may be unfamiliar with using books to find information. The students may have experienced grief and trauma in their home country and on their journey to Canada and thus benefit from psychological and well-being supports. LAL students may also need intensive supports as they develop an understanding of the culture and function of schools, the processes of a classroom, and their own academic skills, and as they plan for long-term learning.

Because strong numeracy skills are foundational to success in mathematics as well as other subjects, LAL learners will need intensive and focused foundational experiences with mathematical concepts OR focused and intensive supports for developing the conceptual understanding of mathematical concepts that in Manitoba are developed over time within the Kindergarten to Grade 8 Mathematics curriculum. At the same time, students need to learn English as used in mathematics and they also need to develop the practical applications of numeracy in everyday life in Canadian schools and communities. The courses represented in this document offer opportunities to develop background knowledge and processes in mathematics and language to enable the students to transition more successfully into the grade-level Grade 9 Mathematics course.

These courses are drawn from learning outcomes in *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes*. The big ideas presented and the groupings of outcomes have been drawn from the *Glance Across the Grades – Kindergarten to Grade 9 Mathematics* document. The intent of these courses is to clearly communicate high expectations for students in mathematics education to all educational partners across Manitoba, and to facilitate the development of common learning resources in order to successfully prepare students entering Grade 9 Mathematics. These courses will be delivered as four half-credit courses:

- LAL Foundational Numeracy Course Phase 1A
- LAL Foundational Numeracy Course Phase 1B
- LAL Transitional Numeracy Course Phase 2A
- LAL Transitional Numeracy Course Phase 2B

This curriculum is designed to address the mathematical and the language needs of individual LAL students. When it has been determined that a student already has the necessary skills for a particular half course, he or she can register directly for the next half course. When students show proficiency in any LAL numeracy half course, they can transition into the next half course. In the case of the LAL Transitional Numeracy Course Phase 2B, the expectation is that they transition into the grade-level Grade 9 Mathematics course, not Grade 9 E-credit mathematics.



Manitoba Education and Training requires that the grades in these courses be reported on the Provincial Report Card. When a final grade is reported, the LAL student will have shown proficiency in both the English language and the content represented in the course, and the half credit is recorded for that course. If a student is continuing in the course next semester or next year, a final term mark may be given but a final grade for the course should not appear on the report card.

Each course addresses selected topics within all four strands (Number, Patterns and Relations, Shape and Space, and Statistics and Probability) in the Manitoba mathematics curriculum. There are two sets of expectations for each math topic—mathematical outcomes and language goals. The LAL students will develop mathematical proficiency while they simultaneously build their language proficiency. The different components of the courses include scaffolds that enhance academic language, conceptual understanding, mathematical practice, mathematical reasoning, and problem solving. There is a financial literacy component added to these courses, as many LAL students may not have an understanding of income, expenses, debt, and budgeting needed in a Canadian context.

It is important to remember that the end of LAL Transitional Numeracy 2B is not the end of the students' linguistic and academic development. Successfully completing LAL Transitional Numeracy 2B means students are ready for the compulsory Grade 9 Mathematics course. As students have limited literacy, academic knowledge, and skills in numeracy, LAL programming will be more intensive and take more time. Furthermore, their literacy and academic learning will continue to require additional time and support as they transition to and continue in EAL and academic programming. It is important for LAL learners to develop the skills needed for future learning and work opportunities beyond high school.

Numeracy

Numeracy is the ability to use mathematics in everyday life. Literacy and numeracy enable us to understand, interpret, create, communicate, and interact with ideas, others, and the world around us. They are complex and dynamic processes that involve building on prior knowledge, language, culture, and experiences in order to develop new knowledge and deepen understanding. Being literate or numerate is a lifelong endeavour and is always evolving. Literacy and numeracy are fundamental to all learning, and they enable personal growth and active participation in society.

Students need both numeracy essentials and academic language in mathematics. Numeracy essentials are the mathematical skills and attitudes our LAL students require in order to use mathematical concepts to make competent and confident decisions at home and at work, including financial decisions. Academic language refers to the language necessary for students to acquire a deeper understanding of a subject area. Academic language in mathematics represents linguistic features specific to mathematical discourse that includes vocabulary development and grammatical features. "Academic language is developmental in nature, with increased complexity and sophistication in language use from grade to grade" (Gottlieb et al. 2).

Rationale

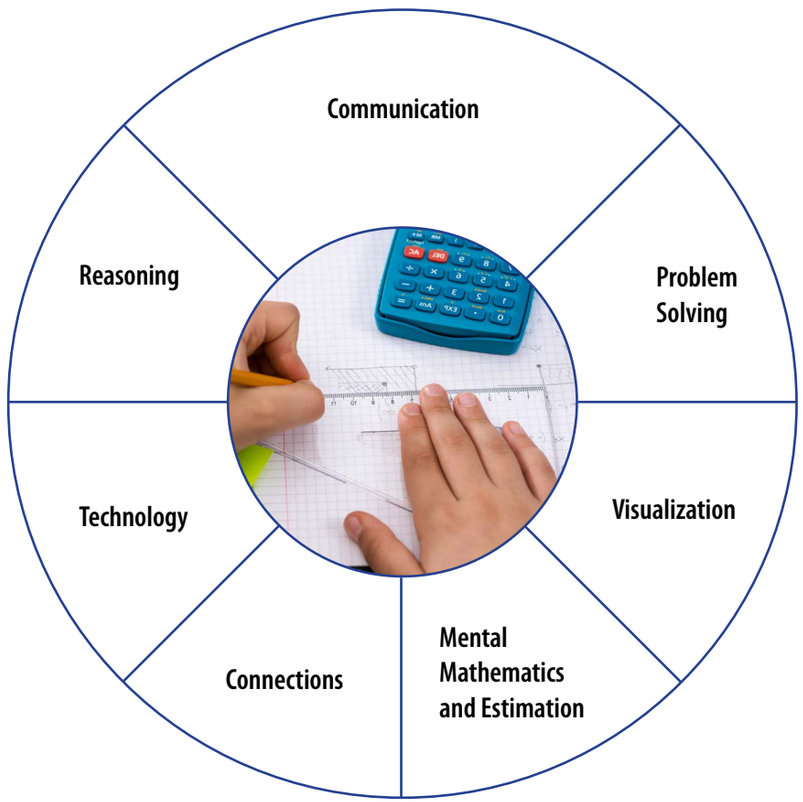
Increased literacy and numeracy skills have personal, social, and economic benefits for individuals, families, communities, and the province. Increased numeracy is associated with decision-making skills, logical thinking, enhanced employment, and opportunities to effectively participate in the digital age. The goal of these courses is to develop language skills parallel to the mathematical content. It is important to remember that language proficiency is more than learning specialized vocabulary; it also involves extended communication that includes syntax, organization, and academic and language registers.

Time Allotments

The time allotment for each half course will vary. The time spent on each topic will depend on individual student needs and abilities to acquire and apply the new terminology and operations along with language learning. Thus, it may take longer than a semester to complete two half courses. If we consider that, the time to complete these courses can be varied but the expectations for learning, content, and rigour cannot be compromised. The goal is to enable these students to transition more easily into mainstream math classes.

Mathematical Processes

The seven interrelated mathematical processes are intended to permeate teaching and describe the critical aspects of learning, doing, and understanding mathematics. The processes allow students to engage in thinking about mathematics, and they support the acquisition and the use of the mathematical knowledge and foundational skills that develop conceptual understanding. The processes are outlined in detail in *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013)* and in *Grades 9 to 12 Mathematics: Manitoba Curriculum Framework of Outcomes (2014)*.



Students are expected to

- communicate [C] in order to learn and express their understanding
- connect [CN] mathematical ideas to other concepts in mathematics, to everyday experiences, and to other disciplines
- demonstrate fluency with mental mathematics and estimation [ME]
- develop and apply new mathematical knowledge through problem solving [PS]
- develop mathematical reasoning [R]
- select and use technologies [T] as tools for learning and problem solving
- develop visualization [V] skills to assist in processing information, making connections, and problem solving

Students must encounter the math processes regularly in their mathematics program in order to achieve the goals of mathematics education. The main goals of mathematics education are to prepare students to

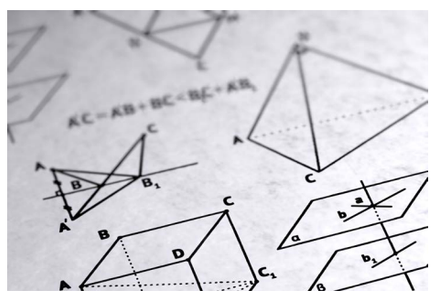
- communicate and reason mathematically
- use mathematics confidently, accurately, and efficiently to solve problems
- appreciate and value mathematics
- make connections between mathematical knowledge and skills and their applications
- commit themselves to lifelong learning
- become mathematically literate citizens, using mathematics to contribute to society and to think critically about the world (Manitoba Education, 2013, 5)

The mathematical processes underlie and support math content through all grade levels. In essence, they are the vehicles that allow students to engage in thinking about math content. The processes are interwoven – the development of one can help with the development of others.

A numeracy-rich community includes evidence of the following:

- problem solving as a way of teaching and learning
- reflection and dialogue about math
- math talk that focuses on student understanding of math
- risk taking in problem solving
- teacher plans for the development of “big ideas” in mathematics

- teacher plans for intentional math communication and vocabulary (e.g., word walls, graphic organizers, anchor charts, journals)
- using manipulatives and providing links among concrete, pictorial, and symbolic representations of mathematics
- integrating the seven mathematical processes into the teaching and learning of mathematics
- using literature that promotes exploration and application of math concepts
- established math routines/structures that promote understanding (math meetings, group work, journaling, number of the day, math word walls, math dictionaries, math fluency, and contests)
- promoting mathematics in the community through special math activities throughout the year (math Olympics, math day, bulletin boards that promote math in the school/class, math week, math nights, and writing articles in school newsletters)



Reference to Manitoba EAL Framework and the Manitoba Mathematics Curriculum

Manitoba Education and Training's EAL and LAL programming curriculum framework documents for Middle Years and Senior Years include descriptions of LAL students, the domains of LAL learning, as well as the LAL acquisition continuum. The language goals presented in this document are also listed in these frameworks. The mathematics outcomes are listed. The mathematics outcomes are listed in *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes* (Manitoba Education, 2013). In these LAL Numeracy courses, the mathematics outcomes described are intertwined with the language acquisition outcomes. It is important to keep in mind that LAL students are developing competencies in literacy, numeracy, and academics in addition to negotiating learning a new culture and adjusting to life in a school environment.

LAL Domains

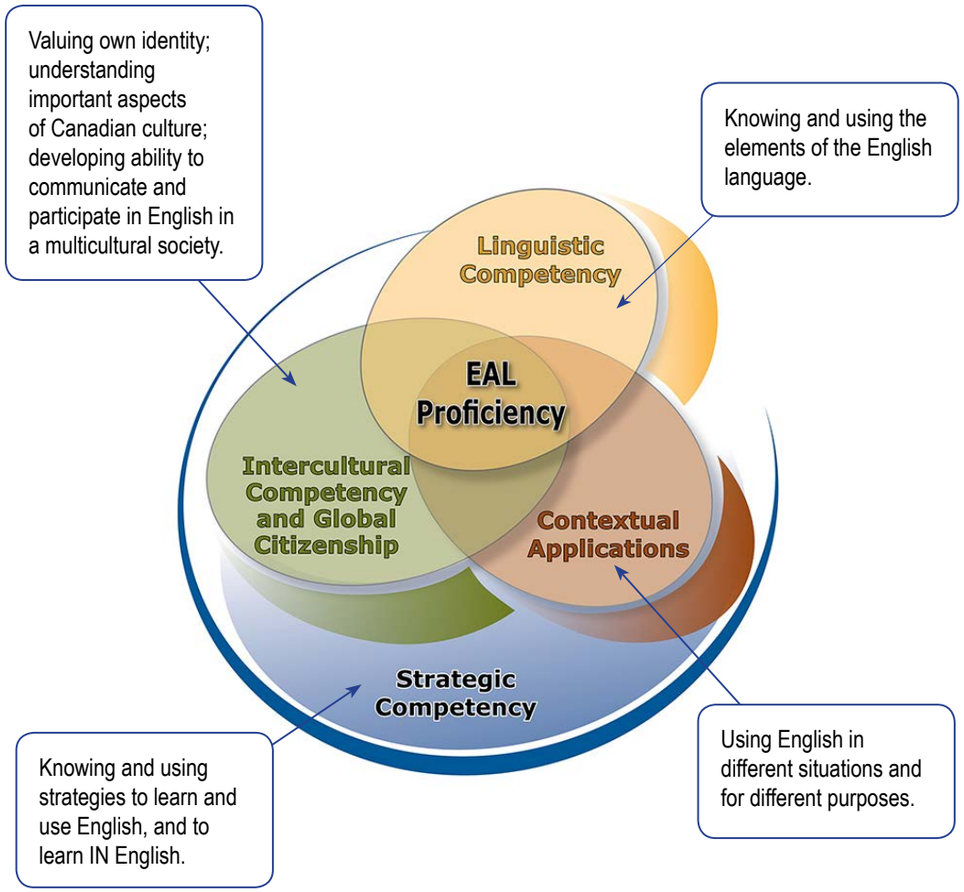
The four general domains of LAL learning include the knowledge, skills, strategies, and attitudes required to achieve EAL proficiency. The following are the four domains:

a) Foundational Linguistic Competency

b) Foundational Contextual Applications

c) Foundational Strategic Competency

d) Foundational Intercultural Communications and Global Citizenship



The students at the end of LAL Phase 2 are not expected to have achieved full linguistic competency or age-/grade-level appropriate academic development. The emphasis in all LAL programming is literacy, numeracy and foundational and transitional subject-area knowledge and skills.

a) Foundational Linguistic Competence

Students are learning the English language while learning the language of mathematics. Instruction on building vocabulary, using mathematical phrases, explaining how to derive a solution, solving word problems, and applying mathematical concepts to their everyday lives will allow them to talk and write about what they learn in mathematics.

Building on background knowledge by accessing what the student already knows will lead to new understandings and skill development. Using effective teaching and learning strategies, graphic organizers, scaffolding, realia (concrete manipulations) representing the math problem, and oral language development using mathematical concepts will enhance their linguistic competence.

b) Foundational Competence in Contextual Applications

Students will acquire and use English mathematical terminology and skills in a variety of contexts and for a variety of purposes.

a) In a variety of non-academic contexts and for a variety of non-academic purposes, students will use their developing mathematical terminology and skills as part of their everyday lives. These LAL numeracy courses' contexts include the following:

- Financial Literacy
  - shopping
  - banking
    - ordering/paying for food in cafeteria/restaurant
    - money exchange and checking change
    - paying with cash or credit card
    - paying bills, household expenses
    - using coupons
    - simple banking, reading and writing cheques

- Daily Living Skills
  - taking a bus, using bus tickets versus bus passes, reading a bus schedule
  - attending medical/dental appointments
  - following a recipe
  - using the telephone
  - reading flyers
  - locating addresses
  - being punctual, telling time
  - completing forms such as SIN, driver's license, job application, etc.
  - reading schedules
  - using a map
  - reading and following street signs
  - taking part in activities such as going to a movie

b) In a variety of academic contexts and for a variety of academic purposes, students will transfer prior knowledge, concepts, and skills.

c) Students will acquire new mathematical knowledge, concepts, and skills while using the mathematical vocabulary.

d) Students will become familiar with and accurately use the mathematical vocabulary and the symbols associated with it correctly, in mathematical situations.

- Currency: nickel, dime, quarter, loonie, toonie, $5, $10, $20, $50, $100, make change, exchange, trade
- Time: o'clock, minute(s), hour(s), week(s), day(s), month(s), year(s), timetable, morning, afternoon, evening, A.M., P.M., breakfast, lunch, supper, half hour, quarter hour, today, tomorrow, yesterday
- Ordinal numbers: first, second, third, fourth, fifth, etc.
- Shapes: circle, square, rectangle, triangle, oval
- Temperature: celsius, degree(s), thermometer, windchill
- Measurement: centimetre(s), metre(s), kilogram(s), gram(s), weight, weigh, litre(s), millilitre, metre stick, ruler
- Adjectives that denote size: small, smaller, smallest, tall, taller, tallest, big, bigger, biggest, little, littler, littlest, medium, large, larger, largest, extra large, extra small, few, fewer, fewest, odd, even

These themes will be interwoven throughout each topic of study presented in this document.

c) Foundational Strategic Competence

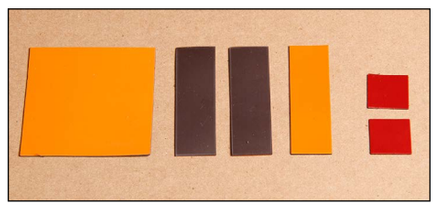
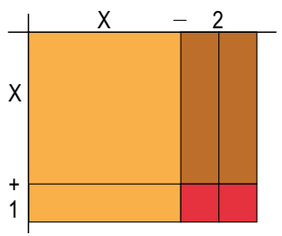
Students will learn to use a variety of mathematical strategies effectively to manage personal, social, and academic mathematical learning demands while learning English. It is recommended that teachers model strategies and provide scaffolding to develop students' conceptual understanding and strategic competence: For example:

- Strategies:
  - accessing prior knowledge
  - graphic organizers
  - peer-to-peer support
  - games
- Supports:
  - addition and multiplication tables
  - calculators (not recommended for the LAL Foundational Numeracy 1A course)
  - number lines
  - computer math programs and websites (e.g., Khan Academy library [Khan Academy, 2018a], Sense & Dollars [MPT], Mathies [OAME])
  - mental math
  - compass
  - protractor
  - ruler
  - bus schedules, other schedules

- Manipulatives:

Manipulatives are essential tools to help students reason, make connections, and communicate their thinking as they develop a conceptual understanding of the mathematics moving from the concrete to the pictorial to the symbolic.

> "Students learn by attaching meaning to what they do, and need to construct their own meaning of mathematics. This meaning is best developed when learners encounter mathematical experiences that proceed from the simple to the complex and from the concrete to the abstract. The use of manipulatives and a variety of pedagogical approaches can address the diversity of learning styles and developmental stages of students, and enhance the formation of sound, transferable mathematical concepts. At all levels, students benefit from working with a variety of materials, tools, and contexts when constructing meaning about new mathematical ideas. Meaningful student discussions can provide essential links among concrete, pictorial, and symbolic representations of mathematics." (Manitoba Education, 2013, 3)

Name/ Visual	Description/Possible Use
Algebra Tiles (Area Models)  	Algebra tiles represent algebraic concepts using an area model. Includes the following: ■ "integer tiles" (small squares) ■ "X" tiles (rectangles) ■ "X^2" tiles (large squares) ■ two colours to represent +/– ■ may contain other rectangles for "Y" and "Y^2" Useful for exploring and developing concepts involving ■ integers ■ expressions and equations ■ factoring ■ distributive property ■ fractions and ratios ■ perimeter and area

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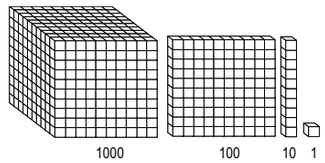
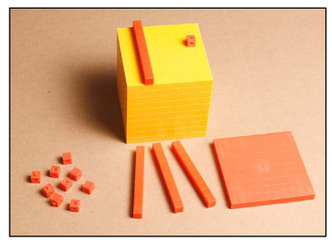
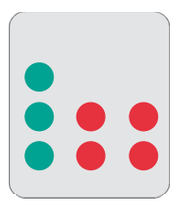
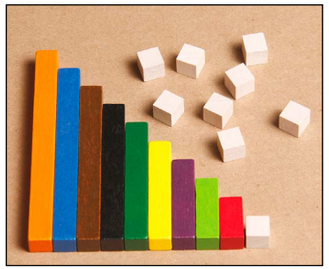
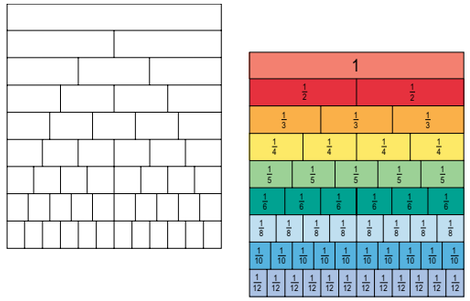
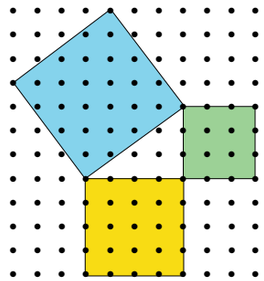
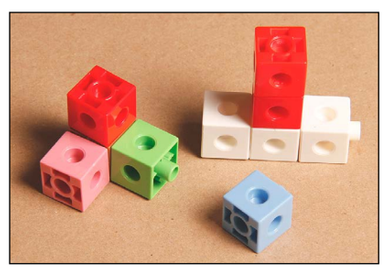
Name/Visual	Description/Possible Use
Base-10 Blocks  	Base-10 blocks are 3-dimensional models that include the following: ■ unit cubes (1s) ■ rods (10s) ■ flats (100s) ■ large cubes (1000) They are useful for exploring and developing concepts of ■ number ■ place value ■ perimeter, area, and volume ■ modelling operations with whole numbers and decimal values ■ establishing a helpful visual for problem solving
Coins/Currency 	Coins and currency are effective realia and useful for exploring and developing understanding of ■ whole numbers ■ equivalent values ■ decimals ■ place value
Coloured Counters 	Coloured counters are two-sided/two-coloured shapes that are useful for exploring and developing conceptual understanding of ■ number ■ proportional reasoning ■ probability ■ operations with whole numbers, fractions, and integers

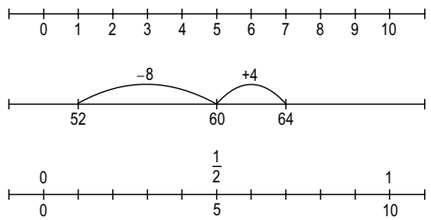
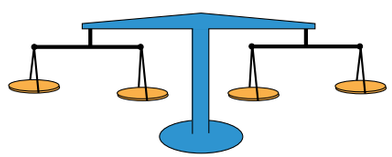
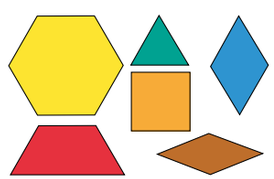
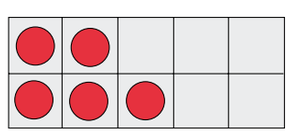
continued

Name/ Visual	Description/Possible Use
Cuisenaire Rods® (Relational Rods) 	Cuisenaire rods are rectangular solids of related lengths that are useful for exploring and developing concepts involving ■ proportional reasoning (parts-whole) ■ fractions ■ model problems and operations with both whole and rational numbers
Fraction Bars (Fraction Strips)  	Fraction bars use a visual of area to compare one whole with possible parts. These fraction bars may be used as a whole or cut into strips (or individual segments). Fraction bars are helpful for exploring and developing conceptual understanding of ■ part-whole relationships ■ meaning of fractions ■ equivalent fractions ■ operations with fractions
Geoboard 	Geoboards are a grid arrangement of pegs that hold elastic bands in position. The visual model of the shapes created by the elastics are helpful for exploring and developing conceptual understanding of ■ area and perimeter ■ exponents ■ square roots ■ Pythagorean theorem ■ patterns and transformations

continued

Name/Visual	Description/Possible Use
Hundred Chart (Hundred Grid) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100	A hundred chart is a ten-by-ten grid of the numbers 1-100 or 0-99. A hundred grid is a ten-by-ten array without numbers. Both are useful for exploring and developing conceptual understanding of ■ place value ■ area ■ patterns ■ algebra ■ operations with natural numbers
Linking Cubes 	Linking cubes are interlocking 2-cm cubes of various colours. They are useful for exploring and developing concepts involving ■ spatial sense ■ number sense ■ measurement ■ patterns ■ fractions ■ ratios ■ probability
Multiplication Table X 0 1 2 3 4 5 6 7 8 9 10 0 0 0 0 0 0 0 0 0 0 0 1 0 1 2 3 4 5 6 7 8 9 10 2 0 2 4 6 8 10 12 14 16 18 20 3 0 3 6 9 12 15 18 21 24 27 30 4 0 4 8 12 16 29 24 28 32 36 40 5 0 5 10 15 20 25 30 35 40 45 50 6 0 6 12 18 24 30 36 42 48 54 60 7 0 7 14 21 28 35 42 49 56 63 70 8 0 8 16 24 32 49 48 56 64 72 80 9 0 9 18 27 36 45 54 63 72 81 90 10 0 10 20 30 40 50 60 70 80 90 100	A multiplication table is a chart that displays the product of whole numbers. It is useful for exploring and developing a conceptual understanding of ■ arrays ■ multiplication of whole numbers ■ commutative property ■ patterns

continued

Name/Visual	Description/Possible Use
Number Lines **(open number lines and double number lines)** 	Number lines use equal segments to compare numbers and are helpful for exploring and developing conceptual understanding of ■ counting ■ comparing quantities ■ operations whole numbers, integers, and rational numbers ■ graphing Open number lines do not include pre-marked divisions with numbers. Double number lines visualize equivalent ratios and describe a relationship between two quantities.
Pan Balance 	A pan balance is an equal-arm balance that is useful for exploring and developing understanding of ■ equality (as a relationship, not an operation) ■ order of operations for number and algebra
Pattern Blocks 	Pattern blocks are colour-coded geometric solids that are useful for exploring and developing conceptual understanding of ■ fractions ■ angles ■ patterns ■ transformations
Tens Frames 	Tens frames are 2-by-5 arrays that are large enough to hold two-coloured counters and provide visual references to explore and develop ■ number sense with benchmarks of 5 and 10 ■ composing and decomposing numbers ■ operations with whole numbers

Virtual Manipulatives (As virtual representations, these are no longer concrete.)

- www.edugains.ca/newsite/math/manipulative_use.html
  Tip sheets and support videos describe each manipulative and ways it can help; recommended sample activities are also provided.
- https://illuminations.nctm.org/
  Organized by strand and grade level, these interactive tools, lessons, apps, and games use a variety of visual models to explore mathematical relationships.
- https://mathies.ca/learningTools.php
  Digital math learning tools from Ontario Ministry of Education for exploring and visualizing mathematics. Can be searched by topics and includes browser based activities and free apps.
- http://nlvm.usu.edu/en/nav/vlibrary.html
  The National Library of Virtual Manipulatives understands that mathematics is not a spectator sport. This is a collection of interactive manipulatives and concept tutorials of many concrete manipulatives.
- https://www.edu.gov.mb.ca/k12/cur/math/support_gr7/index.html
  Manitoba Education and Training has provided teachers with a variety of blackline masters that are helpful with developing conceptual understanding.

d) Foundational Intercultural Competence and Global Citizenship

Students will acquire knowledge, skills, and attitudes that will enable them to participate, communicate, and contribute to an interdependent, multilingual, and multicultural local and global society by

a) affirming and valuing first language and culture

b) developing and using knowledge and understanding of themselves as bilingual/bicultural or multilingual/multicultural learners

c) valuing diversity from which the origins of numeracy developed

d) developing and using knowledge and understandings concerning Canada's Indigenous Peoples, their contributions, and their use of numeracy in their cultures and traditions

e) developing and using knowledge and understanding of the global society

f) engaging in intercultural communication

g) building community and recognizing community interdependence

Spiral Learning

As students are progressing in numeracy development, revisiting content and ideas, skills, vocabulary, and language over a period of time is essential to numeracy and literacy success. Repeated and ongoing contact allows students to practise these skills and language until it is learned. Revisiting previously taught content will solidify content knowledge and enhance connections as students move forward with new knowledge.

Lesson Planning Considerations

LAL students may not have formal background knowledge in mathematics, but they may have experiences in numeracy by working in a market, manufacturing items to sell and use, or buying and reselling goods. When presenting mathematical concepts and developing numeracy skills, build on background knowledge by

- supporting students to use their first or home language to access the content
- connecting content with what students already know
- using visual aids, manipulatives, and technology to provide opportunities for the student to actively participate in the math lesson
- making cultural connections
- interweaving language outcomes and supports within each lesson
- connections between concrete ↔ pictorial ↔ symbolic representations

Instructional Focus

Consider the following when planning for instruction:

- Instructional design focused on conceptual understanding, procedural thinking, and problem solving will enable students to master the mathematical skills and concepts of the curriculum.
- Integration of the mathematical processes within each strand is expected.
- Problem solving, conceptual understanding, reasoning, making connections, and procedural thinking are vital to increasing mathematical fluency, and must be integrated throughout the program.
- Concepts should be introduced using manipulatives and gradually developed from the concrete to the pictorial to the symbolic.
- Students in Manitoba bring a diversity of learning styles and cultural backgrounds to the classroom and they may be at varying developmental stages. Methods of instruction should be based on the learning styles and abilities of the students.
- Use educational resources by adapting to the context, experiences, and interests of students.
- Collaborate with teachers at other grade levels to ensure the continuity of learning of all students.
- Familiarize yourself with exemplary practices supported by pedagogical research in continuous professional learning.
- Provide students with several opportunities to communicate mathematical concepts and to discuss them in their own words. (Manitoba Education, 2013)

See the Instructional Focus section (page 17) in *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013).*
www.edu.gov.mb.ca/k12/cur/math/framework_k-8/index.html

Resources for Lesson Planning

1. Documents:
   - *Glance Across the Grades: Kindergarten to Grade 9 Mathematics*
     This resource is a compilation of the outcomes into suggested categories or learning targets. These learning targets sort the outcomes and allow teachers to preview the outcomes across grade levels. It should be noted that this is only one way to sort the outcomes across the grades; however, this breakdown will enable teachers to differentiate teaching within each strand of the curriculum.
     www.edu.gov.mb.ca/k12/cur/math/glance_K-9/index.html
   - *Manitoba Curriculum Frameworks for EAL and LAL Programming: Middle Years and Senior Years*
     These documents include the curriculum frameworks for Early, Middle, and Senior Years EAL/LAL education in Manitoba, as well as assessment guidelines. These frameworks set out the goals and principles for EAL/LAL programming in Manitoba schools, providing a description of the students, the EAL/LAL stages, the relationship of the framework to other provincial curricula, programming models, practical information, theoretical approaches, and research related to welcoming and planning for new students who are learning EAL.
     www.edu.gov.mb.ca/k12/cur/eal/framework/index.html
   - *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013)*
     The framework identifies beliefs about mathematics, general and specific learning outcomes, and achievement indicators agreed upon by the seven jurisdictions.
     www.edu.gov.mb.ca/k12/cur/math/framework_k-8/index.html
   - *Manitoba Education and Training Mathematics*
     Kindergarten to Grade 8 Mathematics Support Documents for Teachers
     These documents provide various instructional activities, assessment strategies, and learning resources meant to promote the meaningful engagement of math learners. They are meant to be used as an aid to teachers as they work with students in achieving the prescribed outcomes and achievement indicators as outlined in the Manitoba mathematics curriculum.
     www.edu.gov.mb.ca/k12/cur/math/index.html
2. Lesson Plan Template
   - A sample lesson plan template, a corresponding guide, and some examples of using this template can be found in the Appendix.
3. Instructional Strategies
   - *Manitoba Education and Training Mathematics*
     Kindergarten to Grade 8 Mathematics Support Documents for Teachers
     www.edu.gov.mb.ca/k12/cur/math/index.html
   - *Teaching Student-Centered Mathematics: Developmentally Appropriate Instruction for Grades Pre-K–2* (2018) by John A. Van de Walle, LouAnn H. Lovin, Karen S. Karp, and Jennifer M. Bay-Williams
   - *Great Ways to Differentiate Secondary Mathematics Instruction* (2010) by Marian Small and Amy Lin
   - Web resources:
     - Nzmaths: The Home of Mathematics Education in New Zealand
       “Cuisenaire Mats”
       https://nzmaths.co.nz/resource/cuisenaire-mats
       “Material Masters”
       https://nzmaths.co.nz/material-masters
     - Province of Ontario Edugains Website
       Edugains is an Ontario Ministry of Education resource that supports improved learning and teaching strategies in K–12 schools.
       www.edugains.ca
       “Manipulatives”
       www.edugains.ca/newsite/math/manipulative_use.html
       “Lessons and Supports”
       www.edugains.ca/newsite/math/lesson_supports.html
     - Utah State University
       National Library of Virtual Manipulatives
       “The National Library of Virtual Manipulatives (NLVM) is a National Science Foundation–supported project that began in 1999 to develop a library of uniquely interactive, web-based virtual manipulatives or concept tutorials, mostly in the form of Java applets, for mathematics instruction (K–12 emphasis). The project includes dissemination and extensive internal and external evaluation.”
       http://nlvm.usu.edu/en/nav/vlibrary.html

- Math Learning Center
  "Pattern Shapes"
  "Students use Pattern Shapes to explore geometry and fractions, creating their own designs, or filling in outlines. As they work with the shapes, students explore geometric relationships, think about angles, investigate symmetry, and compose and decompose larger shapes. Many of these explorations lead naturally to thinking about fractions as parts of a whole."
  https://apps.mathlearningcenter.org/pattern-shapes/

- Ontario Ministry of Education Math Clips (Critical Learning Instructional Paths Supports)
  Mathclips provides interactive activities that are grounded in educational research.
  "Pattern Block Template"
  http://mathclips.ca/tools/PatternBlocks.pdf

- Youcubed.org
  Youcubed is a website created by Dr. Jo Boaler that works to "inspire, educate and empower teachers of mathematics, transforming the latest research on math into accessible and practical forms."

4. Key Vocabulary
   - *Kindergarten to Grade 8 Mathematics Glossary: Support Document for Teachers*
     This glossary for Manitoba teachers provides an understanding of the mathematical terms used in Kindergarten to Grade 8 mathematics, as reflected in *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes*.
     www.edu.gov.mb.ca/k12/cur/math/glossary_k-8/index.html
5. Language
   - Curriculum Frameworks for EAL and LAL Programming: Middle Years and Senior Years
     www.edu.gov.mb.ca/k12/cur/eal/framework/index.html
6. Assessment
   - Mathematics Support Documents for Teachers
     www.edu.gov.mb.ca/k12/cur/math/index.html
   - Assessment *for*/*as*/*of* learning
7. Problem Solving
   - *Making Math Meaningful*, 3rd edition (2015) by Marian Small
8. Financial Literacy
   - Bow Valley College Centre for Excellence in Immigrant and Intercultural Advancement
     Financial ESL Literacy Toolkit
     https://globalaccess.bowvalleycollege.ca/sites/default/files/financial_ESL_literacy_toolkit_0.pdf
   - Centre for Family Literacy
     Dollars & $ense: Financial Literacy Course, Curriculum Manual
     www.famlit.ca/resources/Dollars_&_Sense2012.pdf
   - Canadian Foundation for Economic Education
     Money and Youth: A Guide to Financial Literacy
     https://www.kobo.com/ca/en/ebook/money-and-youth

   Teachers may use other resources that may be available and appropriate.

Language Goals

- Know and use an emergent repertoire of mathematical words and phrases.
- Recognize and use basic English mechanical features in modelled situations, such as by copying number symbols and words with appropriate spacing.
- Express simple 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.
- Add basic knowledge, concepts, and skills related to mathematics using realia and visuals.

What Is a Language Objective?

Language objectives are learning targets that specifically outline the type of language that students will need to learn and use in order to accomplish the goals of the lesson. Quality language objectives complement the content knowledge and skills identified in content-area standards and address the aspects of academic language that will be developed or reinforced during the teaching of grade-level content concepts.

These objectives involve the four language skills (speaking, listening, reading, and writing), but they also include the following:

- the language functions related to the topic of the lesson (e.g., justify, hypothesize)
- vocabulary essential for a student to be able to fully participate in the lesson (e.g., *x*-axis, locate, graph)
- language learning strategies to aid in comprehension (e.g., questioning, making predictions)

Possible Language Objectives

- Students will **record** ideas in a graphic organizer showing the steps in the process.
- Students will **write** a summary of the process followed to solve the problem.
- Students will **define and use** key math vocabulary (list key vocabulary).
- Students will **read** a story problem, identify key information, and solve the problem.
- Students will **create** their own story problems.

Possible Teaching Strategies

The organization *Teaching Tolerance* created the following nine suggested anti-bias strategies for use with ELL students:

1. *Anchor charts* remind students of prior learning built over multiple lessons. They help level the playing field by providing all students, regardless of prior knowledge or background, with visual reminders of the vocabulary they are responsible for.
2. *Realia* are real-life objects that enable students to make connections to their own lives as they try to make sense of new concepts and ideas. Realia also evoke physical responses that help students recall ideas and themes from the text in later discussions.
3. *Readers' theatre* helps children gain reading fluency and engage fully with texts. The strategy involves attention to pronunciation, unfamiliar vocabulary, and interpretation.
4. Students *make connections* to read-aloud texts by relating the text to themselves (lived experiences), to other texts (read in any setting), and to the world (current and historical events).
5. During *shared reading*, learners observe experts reading with fluency and expression while following along or otherwise engaging with the text. This strategy improves targeted reading comprehension skills while promoting the joy of reading.
6. The *think-aloud* strategy encourages conversations about reading for understanding, providing insight into how students are processing texts. This strategy fosters the metacognition skills necessary for students to become successful independent readers.
7. Students use *vocabulary frames* to identify a word's meaning, its parts, and its opposite. Vocabulary frames combine several word-learning strategies in a single diagram, helping students retain the new word.
8. *Word walls* reinforce sight-word acquisition and build content literacy across grades and disciplines. They also help students see relationships between words and ideas. (Note: Use large print and match words with pictures or diagrams. Keep word wall accessible during tests.)
9. A personal *picture dictionary* is an individual vocabulary and spelling resource students make themselves. This strategy allows students to take ownership of their learning.

It may also be useful for students to document their thinking and problem-solving steps in a *math journal.* They may write in English or their home language and create diagrams and charts to clarify the content for themselves. They may also find using graphic organizers and think-pair-share-write strategies to be helpful.

Language Acquisition Strategies

- Metacognitive Development: Providing students with skills and vocabulary to talk about their learning. Examples: self-assessments, note taking and studying techniques, and vocabulary assignments.
- Bridging: Establishing a link between the students' prior knowledge and the material. Examples: think-pair-share, quick-writes, and anticipatory charts.
- Schema Building: Helping students see the relationships between various concepts. Examples: compare and contrast, jigsaw learning, peer teaching, and projects.
- Contextualization: Familiarizes unknown concepts through direct experience. Examples: Demonstrations, media, manipulatives, repetition, and local opportunities.

- Text Representation: Inviting students to extend understandings of text and apply them in a new way. Examples: student-created drawings, videos, and games.
- Modelling: Speaking slowly and clearly, modelling the language you want students to use, and providing samples of student work.
- L1 Scaffolding: A review of literature shows that supporting ELL students' use of their native language helps them comprehend and learn English. It develops greater brain density in areas related to language, memory, and attention (Moughamian et al., 2009; Protheroe, 2011).
- Know who your LAL students are and their proficiency in English. This can be obtained from the EAL/bilingual teacher, guidance counsellor, social worker, or administration. It is important to note that EAL student proficiency in listening, reading, speaking, and writing will vary.
- As with all your students, set high expectations.
- Embed multicultural education throughout the curriculum.
- Assess and utilize the background knowledge of your students.
- Learn to pronounce student names correctly to help develop rapport.
- Use technology and multimedia such as class websites, blogs, and videos.
- Provide opportunities for students to use their home language, as they may not be able to demonstrate their learning exclusively in English.
- Use structured note-taking formats such as graphic organizers.
- Utilize classroom routines and play music as appropriate.

Instructional Strategies

- Slow down your speech and use shorter sentences, present tense of words, synonyms, examples, gestures, and demonstrations.
- Avoid expressions or sayings that are only common locally.
- Use as many ways as possible to convey information. Examples: oral, written, videos, teacher demonstrations, student demonstrations.
- Use think-alouds and think-pair-shares when asking questions, and don't forget to give students enough time to process the question.
- Use student-developed bilingual dictionaries.
- Use metaphors and imagery for cues.

Environmental Strategies

In its web resource "Teaching Strategies for English Language Learners," SupportREALTeachers.org listed the following useful strategies that teachers can use for student success:

- Create a warm, inviting, and welcoming classroom environment.
- Create print-rich environments using bulletin boards (see PE Central at www.pecentral.org/bulletinboard/bulletinboardmenu.asp for an example). The website *Top Notch Teacher Products* also provides useful strategies for creating print-rich environments (Melinda).
- Use visual displays, portable white boards, and posters when giving instructions.
- Create word walls: displays of high-frequency words for a unit, arranged alphabetically. The organization *We Are Teachers* created an album (www.buzzfeed.com/weareteachers/19-word-walls-that-will-blow-your-mind-h0xt) of particularly effective word walls.
- Display numeracy-rich examples.

Teachers can enhance their lessons by

- providing a low-stress environment and setting high expectations for students to learn
- concentrating on meaning and process rather than grammar
- including and engaging all LAL students in the class
- explicitly modelling the steps and processes students need to learn
- using slower speech and simpler language, and paying attention to enunciation and pronunciation
- highlighting key vocabulary on a word wall so it is accessible throughout the lesson
- using simple vocabulary and sentences and visual supports with modelling, manipulatives, realia, graphic organizers, and cooperative learning strategies
- enabling students to interact with questions and comments during the lesson
- having students draw pictures or act out what is happening
- using sentence frames to prompt students during class discussions and when formulating answers to questions
- practising an extended wait time and giving students time to process the content of the lesson
- providing comprehensible input with hands-on, experiential learning
- talking in a normal voice, with proper enunciation and pronunciation, gestures, and body language
- repeating instructions several times, perhaps in a different way

- encouraging students to incorporate their first or home language in their learning
- providing contextual mathematical exercises that promote rigour
- modelling language as well as mathematical concepts
- reinforcing previous lessons throughout the course
- triangulating your assessment – what the student demonstrates, what the student explains, and what you observe with regards to language learning and mathematical concepts
- encouraging students to use pictures, manipulatives, realia, etc. to explain their learning and to be aware of non-verbal responses

Calculators and Technology

The use of calculators and technology is encouraged. When a student is working on basic arithmetic skills, mental math, or developing a new concept, other strategies may be more effective for numerical fluency.

As the LAL Numeracy Phase 1A deals with patterns and basic numerical computations, pen-and-paper strategies are encouraged for this half course.

Problem Solving

Problem solving is much more than a list of word problems done at the end of a unit. The goal is to have students apply math skills and concepts to find solutions to a variety of math problems, and it is the vehicle through which students are able to discuss, explore, and develop math skills. Students should learn about and learn through problem solving.

Open Problems

Some problems can be classified as "open" since there may be more than one answer or more than one solution path to arrive at an answer. The following is an example of an open-ended problem: "If the area of a rectangle is 36 m^2, what might the length and width be?" The following are examples of open-middle problems: "Find the product of 15×4" or "What is the sum of $98 + 17$?" There is only one answer: "The product is 60" or "The sum is 115"; however, different students may have used different strategies to find an answer. For the open-middle problems, it is important for students to share their strategies and thinking with the class and/or with the teacher.

Word Problems That Focus on Operations

Word problems or story problems are one type of problem that can help students connect different meanings and relationships to the four operations of addition, subtraction, multiplication, and division. There are many different types of problem structures involving the operations. Students should have experience with all types. For an overview of addition and subtraction problems and division and multiplication problems, see pages 24–25 of *First Steps in Mathematics: Operation Sense* by the Government of Western Australia Department of Education and Training at https://arpdcresources.ca/resources/first_steps_in_mathematics/documents/operation-sense.pdf.

Problem-Solving Teaching Strategies

Problem solving can be useful to create interdisciplinary connections to broaden students' field of learning. Problems can pose a challenge for LAL students because of their language, literacy, and contextual needs. As with non-LAL students, they may have difficulty reading the problem, understanding the meaning of what is given and what is asked for, and identifying relevant and irrelevant information. Depending on their experience in their native country, even the form of the word problem may be new to some students. They may need some strategies to tackle the language and the mathematics of word problems. For example:

- Students must be able to comprehend the vocabulary that is used in the word problem.
  - The vocabulary used in the word problem may be in a new mathematical context and may not be simple and clear.
- Students may not be able to understand complex sentences.
  - Read word problems slowly and carefully several times.
  - Consider using sentences limited to a subject, verb, and an object.
  - Break long sentences into multiple, short sentences.
  - If possible, break up the problem into smaller segments.
- Assess the word problem by asking questions like the following:
  - What is the problem about?
  - What is the problem asking for?
  - What information will you need to solve the problem?
  - What information is given?

    - What information is missing?
    - What information is not needed?
    - What can you do to begin to solve the problem?
- Students may be able to act out the word problems to better comprehend what they are being asked to solve.
- Supplement the word problem with an illustration.
    - Share a simpler example of a similar problem.
    - Draw a picture to represent the problem.
- Provide manipulatives.
- Write a format for the solution of a word problem on the board as a sentence frame. For example, "The distance is miles because the route is a (square, rectangle, triangle, . . .)."
- Modelling Thinking through Think-Alouds
    - During a think-aloud, the teacher or student says aloud what they are thinking while they work through a problem. The teacher verbalizes the math content, talks about strategies they are using, and says what to do to solve the problem.
    - In think-alouds, students are able to hear what the teacher or other students are thinking as they analyze the problem and make decisions on how to solve it.

When doing problem solving of all types, it is often effective for students to work in pairs or small groups rather than individually. Working with others facilitates students in communicating ideas, sharing solution strategies, and posing questions, and it can bring misunderstanding to light. If there is another student in the classroom who speaks a particular student's first language, you could pair the two of them up. Reading the problem and working together can build the confidence of both students. The website *YourDictionary.com* has a useful resource on teaching mathematics to EAL students that can be found at http://esl.yourdictionary.com/esl/esl-lessons-and-materials/tips-for-teaching-math-to-esl-students.html.

The Understanding Language Initiative at Stanford University has compiled some additional useful strategies in its 2013 document *Supporting ELLs in Mathematics*, which can be found at https://ell.stanford.edu/sites/default/files/math_archives/Full%20set_UL%20Math%20Resources%2010-28-13%20updated.pdf.

Financial Literacy

Becoming proficient in financial literacy allows students to make wise financial decisions in their day-to-day lives, get insights into planning for their futures, and to become debt aware while making charges and payments to credit cards. There are suggested topics for each half course:

1A: Money, shopping (groceries and other shopping), and household expenses

1B: Spending, sales taxes, importance of receipts

2A: Banking (chequing and savings accounts, RRSP)

2B: Credit cards, debt, fraud

Financial literacy can be a context to apply problem solving to mathematical concepts. Teachers can intersperse these financial literacy topics throughout the half course or explicitly teach them. These topics are discussed in greater detail in Grades 10 and 11 Essential Mathematics. It is more important to expose students to the concepts presented in each half course. It is important for the students to be familiar with financial literacy concepts to make wise financial decisions, to know the consequences of credit card debt, and to avoid being victims of fraud.

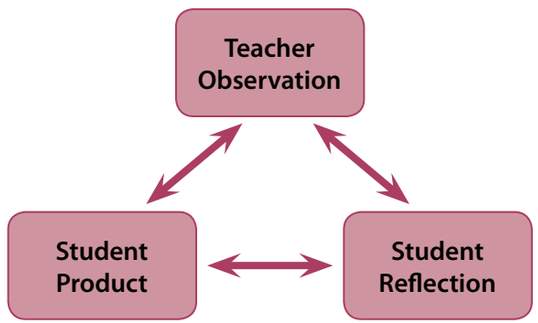
Assessment

EAL assessment in these numeracy courses will provide information to

- assist in determining the mathematics course placement and programming plans
- identify and diagnose student needs, strengths, and next steps
- monitor and measure linguistic and mathematical progress
- determine whether changes are needed in instructional approaches, content, and associated mathematics and language development activities
- help students participate in their learning process by giving constructive feedback that encourages them to reflect on their learning
- inform parents of student progress

Whether conducting assessment *for*, *as*, or *of* learning, a teacher needs sufficient evidence of language learning and mathematics learning. By using triangulation of data for assessment, teachers can get an accurate indication of whether the student has met curricular goals. Triangulation is a process by which a teacher collects evidence about student learning from three different sources:

- Teacher observation in class
- Conversation with the student and/or student reflection
- Student production, such as projects, tasks, tests, etc.



A mathematics assessment can be developed and administered to LAL students to determine which mathematics course is most appropriate when they register.

A mathematics assessment can also be developed and administered to LAL students to determine if they are ready for the next LAL half-credit course or for Grade 9 Mathematics.

Please note that when students have successfully completed the LAL Transitional Numeracy 2B half course, they will register for the Grade 9 Mathematics 10F course.

Grade Reporting

Because LAL students are developing their English language skills in addition to their numeracy background knowledge, it may take them longer than the allotted time to develop language and numeracy proficiency in these courses. The expectations for learning, content, and rigour cannot be compromised. Manitoba Education and Training requires that the grades in these courses be reported as either Complete (CO) or Incomplete (IN) on the Provincial Report Card. When Complete (CO) is reported as a final grade, the LAL student will have shown proficiency in both the English language and the content represented in the course, and the ½ credit will be recorded for that course. An Incomplete can be given as a final term mark but should not appear as a final grade on the report card. This will indicate that the student is continuing in the course in the next semester or the next school year.

According to *Manitoba Provincial Report Card Policy and Guidelines* (Manitoba Education and Training, 2018, p. 22), the following curriculum expectations indicate an understanding and application of concepts:

Criteria for Complete:	
Good understanding and application of concepts and skills	*Very good to excellent understanding and application of concepts and skills*
■ understands most concepts and skills ■ often makes connections to similar concepts and skills ■ sometimes applies to own life and to support new learning	■ thoroughly understands all or nearly all concepts and/or skills ■ routinely makes connections to similar concepts and skills ■ applies creatively to own life and to support new learning

An indication of Complete reflects good, very good, or excellent understanding and application of concepts and skills and consistent learning with respect to learning goals addressed from the beginning of the course. This requires the teacher's professional judgment and evidence of learning. Achievement should be based on clear evidence of the achievement of the learning goals and what the students know and can do relative to the curriculum. Non-academic factors, such as attendance, punctuality, attitude, effort, and behaviour, should not be included in academic achievement.

An Incomplete can be given as a term mark but should not appear as a final grade on the report card. This will indicate that the student is continuing in the course in the next semester or the next school year. The circumstances should be explained in the comment box.

For an interim mark, Incomplete may be given. An explanation in the comment box should indicate areas that the student has met criteria and areas they will be continuing on next.

LAL Numeracy: Progression of Mathematics Learning

Pages 19–28 provide an overview of the learning outcomes for all four LAL numeracy courses organized by strand and big ideas. Consolidation of the learning outcomes is not prioritizing some outcomes as more important than others; it is grouping outcomes to help move student learning forward through conceptual understanding of mathematics.

<table>
<tr><th colspan="5">NUMBER STRAND</th></tr>
<tr><td colspan="5">Processes and language development — Interwoven through each lesson and topic:
Communication Connections Visualization Reasoning Mental math and estimation Problem solving Technology
Oral and academic language supports</td></tr>
<tr><th></th><th>1A</th><th>1B</th><th>2A</th><th>2B</th></tr>
<tr><td colspan="5">Learning Target: Counting
Big Ideas
■ Counting tells how many or how much.
■ Numbers are related to each other through a variety of number relationships.
■ Quantities can be estimated by using referents.</td></tr>
<tr><td>Consolidation of Learning Outcomes
■ Counting
▪ Counting sequence
▪ One-to-one correspondence
▪ Cardinality
▪ Conservation
■ Estimating</td><td colspan="4">■ Counting</td></tr>
</table>

Number Strand (continued)

	1A	1B	2A	2B
Learning Target: Representation of Whole and Rational Numbers **Big Ideas** ■ *Quantities can be represented concretely, pictorially, and symbolically.* ■ *There are different but equivalent representations of numbers.* ■ *Benchmark numbers are useful for comparing, relating, and estimating numbers.* ■ *Our number system is based on patterns (place value).* ■ *The position of a digit in a number determines the quantity it represents.* ■ *Classifying numbers provides information about their characteristics.*				

Consolidation of Learning Outcomes
■ Number relationships
  ■ Spatial relationships
  ■ Using a number line
  ■ Benchmark of numbers
■ Parts—whole
  ■ Composing and decomposing numbers
■ Place value
■ Ratios and relationships
	■ Represent whole numbers by comparing and ordering numbers to a billion.
	■ Demonstrate an understanding of even and odd numbers.
	■ Illustrate place value up to thousands values.
		■ Represent integers concretely, pictorially, and symbolically.
		■ Describe and represent decimals (tenths, hundredths, thousandths) concretely, pictorially, and symbolically.
		■ Relate decimals to fractions (tenths, hundredths, thousandths).
		■ Relate improper fractions to mixed numbers.
		■ Create sets of equivalent fractions with like and unlike denominators.
		■ Demonstrate an understanding of place value to ten-thousandths.
		■ Demonstrate an understanding of ratios and percent with relation to whole numbers.
			■ Demonstrate an understanding of repeating decimals and their relationships to fractions.
			■ Compare and order decimals (to thousandths), fractions, and integers using benchmarks, place values, and/or equivalent fractions and/or decimals.
			■ Demonstrate—concretely, pictorially, and symbolically—an understanding of adding and subtracting positive fractions and mixed numbers with like and unlike denominators.
				■ Demonstrate an understanding of ratios and relationships.
				■ Demonstrate—concretely, pictorially, and symbolically—an understanding of perfect squares and square roots.
				■ Determine the approximate square root of numbers that are not perfect squares.
				■ Demonstrate an understanding of percent greater than or equal to zero.

Number Strand (continued)

	1A	1B	2A	2B
Learning Target: Operations with Whole and Rational Numbers **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.* ■ *Flexible methods of calculation require a strong understanding of the operations and properties of the operations.* ■ *There are a variety of appropriate ways to estimate sums, differences, products, and quotients, depending on the context and the numbers involved.* ■ *Personal strategies and algorithms provide flexible and efficient methods of calculating that vary depending on the context and the numbers involved.*				

Consolidation of Learning Outcomes
■ Developing the meanings of the four operations
  ■ Addition and subtraction
  ■ Multiplication and division
  — Factors and multiples
  — Squares and square roots
■ Order of operations
■ Problem solving
	■ Add and subtract up to 3-digit numbers with answers less than 10,000, estimating sums and differences.
	■ Multiply whole numbers (up to 3 digits each) and divide whole numbers (up to 2 digits), estimating products and quotients.
	■ Explain how equal groupings relate multiplication and division to repeated addition or repeated subtraction.
	■ Explain and apply order of operations (excluding exponents and limited to whole numbers).
	■ Represent rational numbers (e.g., numerator and denominator, part of a whole); compare fractions with like denominators.
	■ Compare and order fractions less than or equal to one.
		■ Derive factors and multiples for numbers less than 100, identifying prime and composite numbers.
		■ Add and subtract decimals to thousandths, concretely, pictorially, and symbolically.
		■ Multiply and divide decimals to thousandths, concretely, pictorially, and symbolically.
		■ Solve problems involving factors and multiples.
			■ Demonstrate—concretely, pictorially, and symbolically—an understanding of addition, subtraction, multiplication, and division of integers.
			■ Demonstrate an understanding of the addition, subtraction, multiplication, and division of decimals to solve problems (for more than 1-digit divisors or 2-digit multipliers).
			■ Solve problems involving percent from 1% to 100%.
				■ Solve problems that involve rates, ratios, and proportional reasoning.
				■ Demonstrate—concretely, pictorially, or symbolically—an understanding of multiplying and dividing positive fractions and mixed numbers.
				■ Solve problems using positive rational numbers.

Patterns and Relations Strand

Processes and language development — Interwoven through each lesson and topic:

Communication Connections Visualization Reasoning Mental math and estimation Problem solving Technology

Oral and academic language supports

	1A	1B	2A	2B
Learning Target: Patterning and Algebraic Thinking **Big Ideas** ■ *Patterns can be represented in a variety of ways.* ■ *Relationships can be described and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways.* ■ *Data can be arranged to highlight patterns and relationships.*				
Consolidation of Learning Outcomes ■ Recognize, compare, and analyze pattern rules. ■ Represent relations with tables of values, graphs, and equations.	■ Represent repeating patterns. ■ Identify and describe patterns found in tables and charts (including a multiplication chart). ■ Determine a pattern rule to make predictions about subsequent elements.	■ Use a table of values to solve problems. ■ Represent and describe patterns and relationships using graphs and tables.	■ 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.	■ Graph and analyze two-variable linear equations.

Patterns and Relations Strand (continued)

	1A	1B	2A	2B
Learning Target: Algebraic Representation with Equations **Big Ideas** ■ *Algebra, with the use of symbols or variables, expressions, and equations, is a tool for generalizing arithmetic and representing mathematical situations and patterns in our world.* ■ *The equals sign describes the balance that exists between the two quantities on either side of it.* ■ *Equality and inequality are used to express relationships between two quantities.* ■ *Relationships between quantities can be described using rules involving variables.*				
Consolidation of Learning Outcomes ■ Understand equality and inequality. ■ Model and solve equations. ■ Explain the difference between an expression and an equation.		■ Use equality and inequality to express relationships between two quantities. ■ Describe relationships between quantities using rules involving variables. ■ Express problems as an equation where a symbol is used to represent an unknown number. ■ Solve one-step equations involving a symbol to represent an unknown number. ■ Demonstrate and explain—concretely, pictorially, and symbolically—the importance of preserving equality.	■ Explain the difference between an expression and an equation. ■ Evaluate an expression given the value of the variable(s). ■ Demonstrate an understanding of preservation of equality by ▪ modelling preservation of equality concretely, pictorially, and symbolically ▪ applying preservation of equality to solve equations ■ Model and solve problems that can be represented by ▪ one-step equations of the form $x + a = b$ ▪ linear equations of the form: — $ax + b = c$ — $ax = b$ — $\frac{x}{a} = b, a \neq 0$	■ Model and solve problems using linear equations of the form: ▪ $ax = b$ ▪ $ax + b = c$ ▪ $\frac{x}{a} = b, a \neq 0$ ▪ $\frac{x}{a} + b = c, a \neq 0$ ▪ $a(x + b) = c$ concretely, pictorially, or symbolically.

Shape and Space Strand

Processes and language development — Interwoven through each lesson and topic:

Communication Connections Visualization Reasoning Mental math and estimation Problem solving Technology

Oral and academic language supports

	1A	1B	2A	2B
Learning Target: Measurement **Big Ideas** ■ *Length/Area/Volume (Capacity)/Mass (Weight)/Time/Angles* ▪ *It is necessary to understand the attributes of the object before anything can be measured.* ▪ *Measurement involves a selected attribute of an object (length, area, mass, volume, capacity) and a comparison of the object being measured against non-standard and standard units of the same attribute.* ▪ *The longer the unit of measure, the fewer units it takes to measure the object.* ▪ *The use of standard measurement units simplifies communication about the size of objects.*				
Consolidation of Learning Outcomes ■ Compare measurable attributes directly. ■ Estimate and use physical models for length, mass, area, volume, and capacity. ■ Estimate and measure with standard units for length, mass, area, volume, and capacity. ■ Develop measurement formulas. ■ Develop concepts of time and reading clocks. ■ Estimate and measure angles.	■ Measure attributes such as length, mass, and volume; calculate perimeter and area of regular and irregular shapes; describe an object by its mass; describe the passage of time; and read and record events related to time. ■ Demonstrate an understanding of volume by ▪ justifying referents for the units cm^3 and m^3 ▪ estimating volume by using referents for the units cm^3 and m^3 ▪ measuring and recording volume ■ Describe and provide examples of lines that are parallel, intersecting, perpendicular, vertical, and horizontal.	■ Design and construct different rectangles given either the perimeter or area or both (whole numbers). ■ Develop and apply a formula for determining ▪ the perimeter of polygons ▪ area of a rectangle ▪ volume of right rectangular prisms ■ Represent capacity by ▪ describing the relationship between mL and L ▪ justifying referents for the units mL and L ▪ estimating capacity by using referents mL and L ▪ measuring and recording capacity mL and L ■ Identify and classify angles according to their measure.	■ Demonstrate an understanding of circles by ▪ describing the relationships among radius, diameter, and circumference of circles ▪ relating circumference to pi (π) ▪ determining the sum of central angles ▪ constructing circles with a given radius or diameter ▪ solving problems involving radii, diameter, and circumference of a circle ■ Develop and apply formulas for determining areas of ▪ triangles ▪ parallelograms ▪ circles	■ Develop and apply the Pythagorean theorem to solve problems. ■ Describe the surface areas of ▪ right rectangular prisms ▪ right triangular prisms ▪ right cylinders to solve problems. ■ Develop and apply formulas for determining the volume of right prisms and right cylinders.

Shape and Space Strand (continued)

	1A	1B	2A	2B
Learning Target: 3-D Objects and 2-D Shapes **Big Ideas** ■ *Identifying, Sorting, Comparing, and Constructing* ▪ *Two- and three-dimensional objects can be described, classified, and analyzed by their attributes.*				
Consolidation of Learning Outcomes ■ Compare and sort 2-D and 3-D shapes based on different attributes. ■ Compose and decompose shapes. ■ Construct and classify lines and 2-D and 3-D shapes.	■ Name the characteristics of a given two-dimensional shape (e.g., triangle, quadrilateral, square, rectangle, pentagon, hexagon, and circle). ■ Describe, sort, classify, and analyze 2-D shapes (e.g., rectangles, squares, and trapezoids, parallelograms, rhombuses) and 3-D objects (e.g., rectangular and triangular prisms, and spheres).	■ Describe and compare sides and angles of regular triangles. ■ Construct and compare triangles in different orientations, including scalene, isosceles, right, equilateral, obtuse, and acute. ■ Represent that the sum of interior angles is ▪ 180° in a triangle ▪ 360° in a quadrilateral		
Learning Target: Transformations **Big Ideas:** ■ *Position and Motion* ▪ *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.*				
Consolidation of Learning Outcomes ■ Perform transformations (e.g., translation, rotation, and reflection). ■ Use a Cartesian plane to locate and transform 2-D shapes.		■ Identify, describe, and perform a symmetry, a single transformation, and a combination of successive transformations (e.g., translation, rotation, or reflection) on a 2-D shape.	■ Identify and plot points in the first quadrant of a Cartesian coordinate plane, using whole number ordered pairs. ■ Identify and plot points in the four quadrants of a Cartesian coordinate plane using ordered pairs. ■ Perform transformations of 2-D shapes (i.e., translations, rotations, and reflections) in all four quadrants of a Cartesian coordinate plane, limited to integral vertices.	■ Demonstrate an understanding of shapes that make tessellations possible; create tessellations; identify tessellations in the environment.

Statistics and Probability Strand

Processes and language development — Interwoven through each lesson and topic:

Communication Connections Visualization Reasoning Mental math and estimation Problem solving Technology

Oral and academic language supports

	1A	1B	2A	2B
Learning Target: Collection, Organization, and Analysis of Data **Big Ideas** ■ *Data is gathered and organized in order to answer questions.* ■ *The question that needs to be answered determines the data that will be collected.* ■ *The type of data determines the best way to organize and represent it.* ■ *Visual displays quickly reveal information about data.* ■ *Information from data representations is used.*				

Consolidation of Learning Outcomes
■ Question, collect, organize, and analyze data.
■ Represent data graphically.
■ Calculate measures of central tendency.
	■ Represent, organize, and construct charts and bar and line graphs of data collected or provided.
	■ Select, justify, and use appropriate methods of collecting data, including questionnaires, experiments, databases, etc.
	■ Differentiate between first-hand and second-hand data.
	■ Graph collected data and analyze the graph to solve problems.
		■ Describe the likelihood of a single outcome occurring using words such as *impossible*, *possible*, and *certain*.
		■ Describe the likelihood of a "two" outcome occurring, using words such as *less likely*, *equally likely*, and *more likely*.
		■ Demonstrate an understanding of the probability of an event.
		■ Identify all possible outcomes of a probability in an experiment.
		■ Differentiate between and determine experimental and theoretical probabilities.
		■ Compare results of theoretical and experimental probabilities for an experiment.
			■ Construct, label, and interpret a circle graph to solve problems.
			■ Demonstrate an understanding of central tendency and range by
			  ■ determining the central tendencies and the range
			  ■ determining the most appropriate measure of central tendency to report findings
				■ Critique ways in which data is presented; describe the effect of bias.

Statistics and Probability Strand (continued)				
	1A	1B	2A	2B
Learning Target: 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.*				
Consolidation of Learning Outcomes ■ Use vocabulary of probability for everyday events. ■ Determine experimental and theoretical probability of independent events.			■ Express probabilities as ratios, fractions, and percentages.	■ Identify a sample space (36 or fewer elements) for a probability experiment involving two independent events. ■ Calculate theoretical probability (using a tree diagram, table, or another graphic organizer) of two independent events. ■ Conduct a probability experiment to compare the theoretical probability and an experimental probability of two independent variables. ■ Solve problems involving the probability of events. ■ Describe the role probability plays in society.

Financial Literacy Strand

Processes and language development — Interwoven through each lesson and topic:

Communication Connections Visualization Reasoning Mental math and estimation Problem solving Technology

Oral and academic language supports

	1A	1B	2A	2B
	Teachers can infuse these financial literacy topics throughout each half course or explicitly teach the concepts. Some resources that may be of help are Financial Literacy Resource by Manitoba Education and Training, *Financial ESL Literacy Toolkit* (https://globalaccess.bowvalleycollege.ca/sites/default/files/financial_ESL_literacy_toolkit_0.pdf) from Bow Valley, *Dollars & $ense: Financial Literacy Course, Curriculum Manual* (www.famlit.ca/resources/Dollars_&_Sense2012.pdf) by Centre for Family Literacy, and/or *Money and Youth: A Guide to Financial Literacy* (https://www.kobo.com/ca/en/ebook/money-and-youth) by Canadian Foundation for Economic Education (2012). Teachers may also use other resources that may be available.			

	■ Money
	■ Shopping
	  ▫ Groceries
	  ▫ Etc.
	■ Household expenses
		■ Spending
		  ▫ Sales tax
		  ▫ Receipts
		■ Income
		  ▫ Deductions
		■ Take-home pay
			■ Banking
			  ▫ Chequing account
			  ▫ Savings account
			  ▫ RRSP
			■ Budgeting
				■ Credit
				  ▫ Loans
				  ▫ Credit cards
				■ Fraud

LAL Numeracy: Topic Layout and Explanation

The mathematical topics, language learning goals, and resources for teaching are created in a frame with the following sections:

<table>
<tr><td colspan="4">LAL Course Strand: Topic
Big Ideas: Big ideas for topic derived from Glance Across the Grades document.</td></tr>
<tr><td></td><td colspan="2">Numeracy</td><td>Language</td></tr>
<tr><td rowspan="2">Outcomes
This section will include targeted outcomes from the K–8 Math curriculum.</td><td colspan="2">Targeted outcomes from the K–Grade 8 Math curriculum</td><td>Targeted outcomes from the LAL curriculum</td></tr>
<tr><td rowspan="2">Connection to Prior Learning</td><td colspan="2">Prerequisite numeracy skills that students will require to understand the targeted outcomes</td><td>Perequisite language skills that students will require to understand the targeted outcomes</td></tr>
<tr><td colspan="2">Instructional Strategies:
Targeted outcomes from the K–Grade 8 Math curriculum</td><td>Assessment Criteria:
Targeted outcomes from the K–Grade 8 Math curriculum</td></tr>
<tr><td rowspan="2">Suggested Language Learning Experiences</td><td>Language Foundation:
How language is integrated in teaching the targeted mathematics learning goals</td><td>Key Vocabulary:
Combination of concept words and tier-two words that would be critical for students to understand the targeted concept in the unit</td><td>Sentence Format:
Suggested sentence frames to reinforce and enhance math concept</td></tr>
<tr><td>Learning Supports:
Supports and manipulatives that assist in meeting the numeracy and language outcomes</td><td>Mental Math:
Suggestions for building fluency and automaticity in the targeted outcomes</td><td>Problem Solving:
Suggestions to connect the targeted outcomes to real-world contexts, critical in reinforcing the learned numeracy and language skills</td></tr>
</table>

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

Phase 1A—Half-Course Credit

LAL Numeracy Phase 1A: **Number: Counting**

Big Ideas: Counting tells how much or how many.

	Numeracy	Language
Outcomes **KN5, 1N1, 1N3, 2N1, 3N1**	Develop early number sense by attaching meaning to counting: ■ Say, read, and write number sequences between two given numbers, forward and backward, 1–30. ■ Skip-count by 2s and 10s between two given numbers from 0 to 30. ■ Skip-count by 5s, 3s, and 4s using multiples of the number from 0 to 30. ■ Understand each object counted must be touched or "included" once as the numbers are said (one-to-one-correspondence). ■ Understand the last number said in a count tells "how many" in a collection (cardinality). ■ Understand the arrangement of the objects does not affect how many there are (conservation). ■ Identify the number that is one more, two more, one less, and two less than a given number up to 30.	■ Listen to and understand simple words, phrases, or simple sentences, with or without visual aids such as physical movement, gestures, realia, and pictures. ■ Express simple ideas using keywords, short phrases, and short sentences in structured, familiar situations. ■ Use visuals, realia, and their first language to begin 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 basic cognitive strategies, with guidance and support, to enhance language learning (e.g., learn new words, etc.).
Connection to Prior Learning	Count from 1 to 10. ■ Say the number sequence by 1s starting anywhere from 1 to 10 and 10 to 1.	Know and use the basic elements of the sound-symbol system in order to do the following: ■ Sound out numbers using simple sentences. ■ Follow directions of single words and gestures. ■ Demonstrate and explain orally how to count up to 30. ■ Relate numbers from other cultures/languages to the English system. ■ Count realia in the school/classroom (e.g., students, supplies, books, classrooms, etc.).
	Instructional Strategies: ■ Provide many opportunities for students to practise counting using a variety of everyday items by 1s (forward and backward) and skip-counting. ■ Use hundred charts ■ Use number lines (start with number cards on a clothesline). ■ Use manipulatives, visual representations and symbols, and coins to teach counting. ■ Use manipulatives and coins to count groups (count by steps) and do collections. ■ Conduct subitizing activities. ■ Create number cards (in English numerals, words, and in L1) to represent numbers. ■ Provide students with lots of opportunities to count—concrete and visual supports such as pencils, fingers, number of ears in the room, etc. ■ Use one-to-one correspondence strategies such as *By the Numbers*, a one-to-one correspondence game (Essdack). ■ Use manipulatives, visual representations, and symbols to demonstrate one-to-one correspondence. ■ Have students create a number line to indicate one-to-one correspondence.	**Assessment Criteria:** ■ Count forward and backward by 1s the number sequence between two given numbers (0 to 100). ■ Display a set of counters (start with up to 10 and then expand)—say, for example, number of fingers. ■ Print numbers when represented orally in a sequence (e.g., 1, 2, 3, 4, … or 3, 6, 9, …). ■ Print numbers when represented orally or on a number line in a random order. ■ Count objects and observe one-to-one correspondence, cardinality, and conservation. ■ Observe that students relate number to quantity or that numbers can be used in ways that do not refer to quantity (ordinal numbers, bar codes, telephone numbers, house numbers, etc.). ■ Read a numeral (0 to 100) when it is presented symbolically. ■ Skip-count by 2s, 5s, and 10s starting at 0. ■ Identify and correct errors and omissions in a number sequence. ■ Determine the value of a set of coins (nickels, dimes, quarters, loonies) by using skip-counting.

LAL Numeracy Phase 1A: **Number: Counting** *(continued)*

Learning Experiences

Language Foundation:

- Explicitly teach classroom direction words (such as *read*, *print*, *show*, etc.) and phrasal verbs (e.g., *pick up*, *hand in*, *look over*, etc.).
- Expose students to grade-level vocabulary as well as the simpler language (e.g., next to *How many*, also write *Count*).
- Be aware of confusing numbers (such as 12 and 21, 15 and 50 or 51, etc.).
- Use examples from the classroom and around the school to reinforce vocabulary.
- Promote dialogue with students thinking and working in pairs or groups.
- Encourage students to use key vocabulary, either in their L1 or English.
- Use age-appropriate vocabulary and examples.

Key Vocabulary:

- How many
- Count
- Number
- From
- By
- Skip-count
- Up to
- Forward
- Backward
- Next
- Before
- After
- Digit
- Multiples

Sentence Frames:

- The number is _____.
- Counting by _____ starting at _____ is _____.
- I can show this _____ (number) with _____.
- Starting at _____, I can count (up/down/forward/backward) by _____, _____, _____, _____.

Learning Supports:

- Open and labelled number line
- Word wall
- Math journal
- Pictures and graphics
- Tens frame
- Decks of cards
- Dice
- Hundred chart
- Games involving counting (*I have …, who has …?*)
- Board and dice games
- Translating apps (*Google Translate*, *iTranslate*, *Microsoft Translate*, etc.)
- See “What is Subitizing?” (www.pre-kpages.com/subitizing/) at Pre-Kpages.com

Mental Math:

- Fill in missing spaces in a hundred chart.
- Fill in missing spaces on a number line.
- Demonstrate skip-counting concretely, pictorially, and symbolically.
- Subitize activities.

Problem Solving:

- How many pencils do we have?
- How many pencils do we need for all students to have one pencil each?
- How many pencils do we need for all students to have two pencils each?
- How many loonies are there in this container?

LAL Numeracy Phase 1A: **Number: Representation of Whole Numbers**

Big Ideas: Quantities can be represented concretely, pictorially, and symbolically. There are different but equivalent representations of numbers. Our number system is based on patterns (place value). The position of a digit in a number determines the quantity it represents.

	Numeracy	Language

Outcomes
1N1, 1N7, 2N1, 3N1, 1N4, 2N4, 3N2, 3N5
	■ Develop number sense through counting more efficiently:
	  ■ Say, read, and write number sequences between two given numbers, forward and backward 1– 00, then to 1000.
	  ■ Skip-count by 2s and 10s between two given numbers from 1 to 100, then to 1000.
	  ■ Skip-count by 5s, 3s, and 4s using multiples of the number from 1 to 100.
	  ■ Understand that the patterns in the way we say and write numbers help us to remember their order.
	■ Compare and order numbers to 100 and then to 1000.
	■ Estimate quantities less than 1000 using benchmark numbers such as, but not limited to, 50s, 100s, and 500s.
	■ Illustrate concretely and pictorially the meaning of place value for numerals to 1000.
		■ Listen to and understand simple words, phrases, or sentences, with or without visual aids such as physical movement, gestures, realia, and pictures.
		■ 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 begin 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 basic cognitive strategies, with guidance and support, to enhance language learning (e.g., memorize new words, etc.).

Connection to Prior Learning	■ Understand that each counted object must be touched or “included” once as the numbers are said (one-to-one correspondence). ■ Say, read, and write number sequences between given numbers, forward and backward, 1–30. ■ Understand that the last number said in a count tells “how many” in a collection (cardinality). ■ Understand that the arrangement of the objects does not affect how many there are (conservation).	Know and use emergent repertoires of words and phrases to do the following: ■ State the numbers before and after a given number using a number line. ■ Determine which set of objects is bigger or smaller orally, using manipulatives, and print the corresponding numbers in L1 and in English. ■ Relate numbers from other cultures/languages to the English system. ■ Count realia in the school/classroom (e.g., students, supplies, books, etc.). ■ Compare nickels, dimes, quarters, and loonies, represented in cents. ■ Relate numbers from other cultures/languages to the English system. ■ Using place values, compare the amounts of two different currencies as to which one has a larger value.
	Instructional Strategies: ■ Use varied number charts to understand the patterns in our numeration system. ■ Understand and use the cyclical patterns in whole numbers. ■ Represent numbers to 1000 in standard, expanded, and word form. ■ Use the constant feature on a calculator to predict and generate numbers. ■ Make odometers with students by placing the numbers 0–9 vertically on a piece of paper. Discuss with students the pattern of the number sequence. Ask questions such as, “What happens after each 9?”, “What number is after 99, 109, 1 099?”. ■ Compare how we say numbers to how students could say them in their first language. ■ Investigate how a collection of items can be broken into parts.	**Assessment Criteria:** Use keywords, short phrases, and short sentences to do the following: ■ Order, in print and/or orally, a set of given numbers. ■ Say and write numbers that come before, after, next to, or between a given number(s). ■ Represent a number in different ways and explain how they are equivalent, concretely, using base-10 blocks, pictorially using tally charts, and symbolically (e.g., 351 can be represented as three 100s, five 10s and one 1, or as two 100s, fifteen 10s, and one 1, or as three 100s, four 10s, and eleven 1s). ■ Explain, and show with counters, the meaning of each digit for a 3-digit numeral with all digits the same (e.g., for the numeral 222, the first digit represents two hundreds [two hundred counters], the second digit represents two tens [twenty counters], and the third digit represents two ones [two counters]).

LAL Numeracy Phase 1A: **Number: Representation of Whole Numbers** *(continued)*

Instructional Strategies: *(continued)*

- Flash different quantities of items to students and ask them to say how many without counting one-to-one.
- Use ten frames and ask students how many they see and how they see it.
- Use a 100 grid to have students decompose 100 in different ways.
- Use Base-10 blocks to show all the regular (56 is 5 tens, 6 ones) and irregular (56 is 4 tens and 16 ones) place value notations.
- In your daily routine, you may use the "Number of the Day" strategy to develop and observe students' different representations of numbers.
- Using manipulatives, create a number and identify its place value.
- Identify the units, tens, hundreds, and thousands digit of a given number.
- Demonstrate place value by using activities such as *Race to 100*, dice games, Base-10 block games/activities; create largest and smallest numbers using 3 or 4 digits.

Learning Experiences

Language Foundation:

- Demonstrate understanding that *decompose* a number means breaking it up into parts.
- Show that *expand* means to get bigger.
- Demonstrate an understanding that each digit of a number has a different value.

Key Vocabulary:

- Place value
- Ones
- Tens
- Hundreds
- Thousands
- Together
- Expanded form
- Standard form
- Word form

Sentence Frames:

- The number _____ can be written as _____.
- For the number 3728,
  _____ is the ones place digit.
  _____ is the tens place digit.
  _____ is the hundreds place digit.
  _____ is the thousands place digit.
- Decomposing _____ can be represented as _____ 100s, _____ 10s, and _____ ones.

Learning Supports:

- Hundred chart
- Base-10 blocks
- Tens frame
- Place-value charts
- Place-value cards

Mental Math:

- Identify digits and their place value.
- Decompose a number and write it in the expanded form (3000 + 600 + 50 + 9).
- Given a number in expanded form, have students write the number in a standard form.

Problem Solving:

- What is the distance from Vancouver to Winnipeg? What is the distance from Toronto to Winnipeg? Which city is closer? Explain using place values.
- Given two, three, or four number cards, create the largest and the smallest value number.

LAL Numeracy Phase 1A: **Number: Representation of Whole Numbers**

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

	Numeracy	Language
Outcomes **2N2, 2N3**	Develop an awareness of number characteristics: ■ Demonstrate whether a number is even or odd. ■ Describe order or relative position using ordinal numbers.	■ Listen to and understand simple words, phrases, or simple sentences with or without visual aids such as physical movement, gestures, realia, and pictures. ■ 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 begin 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 basic cognitive strategies, with guidance and support, to enhance language learning (e.g., memorize new words, etc.).
Connection to Prior Learning	■ Say, read, and write numbers to 1000. ■ Have some understanding of place value.	Using keywords, express ideas by doing the following: ■ Using a number line, state whether the number before and after a given number is an even or odd number. ■ Determine which set of objects is odd or even orally and by using manipulatives, and print the corresponding numbers in L1 and in English. ■ Relate odd and even numbers from other cultures/languages to the English system. ■ Count realia in the school/classroom (e.g., students, supplies, books, girls, boys, etc.), and classify them as even or odd numbers. ■ Pair objects and determine whether they are even or odd. ■ Subitize to determine odd or even numbers. ■ Sort a set of numbers by whether they are even or odd.

	Instructional Strategies:
	■ Using manipulatives, start with a given number of samples of an object and select them two at a time. If there are no objects left, it is an even number; if there is one object left, it is an odd number.
	■ Extend the pattern to bigger numbers.
	■ Identify the ones digit of a given number, noting the following:
	  ■ If it is a 0, 2, 4, 6, or 8, then it is an even number.
	  ■ If it is a 1, 3, 5, 7, or 9, then it is an odd number
	■ Have students line up and decide which student is first, second, third, fourth....
	■ Ask students to make an ordered list of jobs they need to do for school.
	■ Solve problems using ordinal numbers.
		Assessment Criteria:
		Using keywords, short phrases, and short sentences, assess whether the student can do the following:
		■ Determine whether a number is even or odd by using concrete materials or pictorial representations.
		■ Identify even and odd numbers in a sequence, such as in a hundred chart.
		■ Sort a set of numbers into even and odd.
		■ Indicate the position of an object in a sequence by using ordinal numbers.
		■ Compare the relative position of an object in two different sequences.

LAL Numeracy Phase 1A: **Number: Representation of Whole Numbers** *(continued)*

Learning Experiences

Language Foundation:

- Explain how to determine whether a number is even or odd.
- Discuss the difference between *even* and *odd*, as well as the last digit or the units digit.
- Use age-appropriate vocabulary and examples.

Key Vocabulary:

- Even
- Odd
- Units/ones digit
- First and last digit
- Ends in
- Pair

Sentence Frames:

- _____ is equal to _____.
- _____ is (odd/even) because it ends in a _____.
- When I identify pairs of _____ (object), there is _____ left over so the number is _____ (odd/even).

Learning Supports:

- Coloured counters
- Decks of cards
- Various games such as *Mancala*, *NIM*, backgammon, *Snakes and Ladders*, *Race to One Hundred*
- Number line
- Hundred chart
- Calendar

Mental Math:

- Identify odd and even numbers.
- Place this set of numbers in increasing and then in decreasing order:
  a) {24, 8, 17, 3}
  b) {952, 236, 100, 750}
- Using benchmarks, estimate the placement of this set of numbers on a number line:
  a) {24, 8, 17, 3}
  b) {952, 236, 100, 750}

Problem Solving:

- If you want to make equal teams, explain if you will need an even or odd number of students.
- There are 24 students in a class. If you divide them into 2 teams, how many students will be left over?

LAL Numeracy Phase 1A: **Number: Addition and Subtraction with Whole Numbers**

Big Ideas: The four operations are intrinsically related. Flexible methods of calculation require a strong understanding of operations and properties of the operation. There are a variety of ways to estimate sums, differences, products, and quotients.

	Numeracy	Language

Outcomes
1N9, 2N8, 2N9, 3N6, 3N7, 3N8, 3N9
	Develop number sense:
	■ Describe meanings of addition as "joining" and "part-part-whole."
	■ Describe meanings of subtraction as "taking away," "comparing (or difference)," and "whole-part-part."
	■ Demonstrate an understanding of addition and subtraction of numbers with answers to 1000 (limited to 1-, 2-, and 3-digit numerals) by
	  ■ using personal strategies for adding and subtracting with and without the support of manipulatives
	  ■ creating and solving problems in contexts that involve addition and subtraction of numbers, concretely, pictorially, and symbolically
	■ Apply estimation strategies to predict sums and differences of two 2-digit numerals.
	■ Show that addition and subtraction are inverse operations.
	■ Understand the effect of adding and subtracting zero to and from a number.
	■ Demonstrate an understanding of equality concretely, pictorially, and symbolically.
		■ Listen to and understand simple words, phrases, or simple sentences, with or without visual aids such as physical movement, gestures, realia, and pictures.
		■ 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 begin 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 basic cognitive strategies, with guidance and support, to enhance language learning (e.g., memorize new words, etc.).

Connection to Prior Learning	■ Represent and describe numbers to 1000, concretely, pictorially, and symbolically. ■ Count forwards and backwards from a starting point by 2s, 3s, 5s, and 10s. ■ Using benchmarks, estimate the placement of a set of numbers on a number line.	■ Write solutions to addition and subtraction questions using an equals sign. ■ Demonstrate the result when zero is added or taken away from a number. ■ Derive and explain an estimate of an addition and a subtraction computation.

	Instructional Strategies:
	■ Counting on
	■ Counting back
	■ One more
	■ One less
	■ Making 10
	■ Using benchmarks and friendly numbers
	■ Building on known doubles
	■ Using part-part-whole relationships for addition
	■ Using whole-part-part relationships for subtraction
	■ Estimate, strategy:
	  ■ Example: 34 + 251 using benchmarks of 100, this can be written as: 0 + 300
	  Estimate is: 300
	  ■ Example: 34 + 251 using benchmarks of 10, this can be written as: 30 + 250
	  Estimate is: 280
		Assessment Criteria:
		■ Model the addition of two or more numbers using concrete or visual representations, and record the process symbolically.
		■ Model the subtraction of two numbers using concrete or visual representations, and record the process symbolically.
		■ Create an addition or subtraction story problem for a solution.
		■ Determine the sum of two numbers using a personal strategy (e.g., for 326 + 48, record 300 + 60 + 14).
		■ Determine the difference of two numbers using a personal strategy (e.g., for 127 − 38, record 38 + 2 + 80 + 7 or 127 − 20 − 10 − 8).
		■ Solve a problem involving the sum or difference of two numbers.

LAL Numeracy Phase 1A: **Number: Addition and Subtraction with Whole Numbers** *(continued)*

Learning Experiences

Language Foundation:

- Value vocabulary.
- Describe calculations using place value.
- Explain the process of adding and subtracting two numbers.
- Discuss how addition and subtraction are related.
- Describe similarities and differences between groups of calculations that are equal, such as:
  - 10 + 4 = _____
  - 9 + 5 = _____
  - 8 + 6 = _____
  - 15 − 1 = _____

    or
  - 92 + 17 = _____
  - 90 + 19 = _____
  - 89 + 20 = _____
  - 100 + 9 = _____
- Discuss and compare possible estimation strategies.
- Use age-appropriate vocabulary and real-life examples.

Key Vocabulary:

- Number pairs
- Remaining
- Regroup
- Borrow
- Carry
- Approximate
- Exact
- Around
- Accurate

Sentence Frames:

- The sum of _____ and _____ is _____.
- _____ plus _____ equals _____.
- When I subtract _____ from _____, I get _____.
- The difference between _____ and _____ is _____.
- The estimate for adding _____ and _____ is _____ because _____.
- To prove my answer is correct, I can _____.
- Subtracting _____ from _____ can be thought of as _____ plus a number is _____.

Learning Supports:

- Coloured counters
- Ten frames
- Number lines
- Pan balance
- Decks of cards
- Various games such as *Mancala*, *NIM*, backgammon, *Snakes and Ladders*, etc.
- Mental Math Strategies (BLM 5-8.8) (https://www.edu.gov.mb.ca/k12/cur/math/mm_gr8/index.html)

Mental Math:

- Single- and double-digit subtraction.
- Add and subtract zero.
- Double values (8 + 8).
- Subtract the same value (5 − 5).
- Given 12 + 16 = 28, determine the related subtraction.

Problem Solving:

- Juan sold 13 tomatoes in the market on Thursday. He sold 15 on Friday.
  - On what day did he sell more tomatoes?
  - How many more did he sell on Friday?
  - How many tomatoes did he sell altogether in the two days?
- Amar started with $100 in the morning. He bought a cap for $30. How much money does he have left?
- Metro is saving for a new laptop. So far, he saved $175. A new laptop costs $500. How much more money does Metro need to save?

LAL Numeracy Phase 1A: **Number: Multiplication and Division with Whole Numbers**

Big Ideas: The four operations are intrinsically related. Flexible methods of calculation require a strong understanding of operations and properties of the operation. There are a variety of ways to estimate sums, differences, products, and quotients.

	Numeracy	Language

Outcomes
3N11, 3N12
	Develop number sense:
	■ Describe meanings of multiplication as "repeated addition," "equal groups," and "an array."
	■ Describe meanings of division as "equal sharing (partitive)," "equal grouping," and "repeated subtraction."
	■ Demonstrate an understanding of multiplication (2- or 3-digit numerals by 1-digit numerals) to solve problems by
	  ■ using personal strategies for multiplication with and without concrete materials
	  ■ using arrays to represent multiplication
	  ■ connecting concrete representations to symbolic representations
	  ■ estimating products
	■ Demonstrate an understanding of division (1-digit divisor and up to 2-digit dividend) to solve problems by
	  ■ using personal strategies for dividing with and without concrete materials
	  ■ deriving remainders in division problems
	  ■ estimating quotients
	  ■ relating division to multiplication
	■ Explain properties of 0 and 1 in multiplication and the property of 1 in division.
	■ Explain why a number cannot be divided by 0.
		■ Listen to and understand simple words, phrases, or sentences with or without visual aids such as physical movement, gestures, realia, and pictures.
		■ 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 begin 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 basic cognitive strategies, with guidance and support, to enhance language learning (e.g., memorize new words, etc.).

Connection to Prior Learning	■ Represent, compare, and order whole numbers concretely, pictorially, and symbolically. ■ Demonstrate the ability to do repeated addition and skip-counting forwards, using number lines and counters. ■ Demonstrate the ability to do repeated subtraction and skip-counting backwards, using number lines and counters.	Use visuals and realia to add knowledge and skills about multiplication and division. ■ Explain—orally, pictorially, symbolically, and in writing—the strategy chosen for multiplication and division in a series of simple sentences. ■ Explain how to derive the solution to multiplying and dividing two numbers. ■ Write solutions to multiplication and division using symbols and an equals sign. ■ Demonstrate the result when a number is multiplied by zero or one, and when for division the divisor is 1. ■ Derive and explain an estimate of a multiplication and division computation.
	Instructional Strategies: ■ Represent and explain multiplication and division using equal groups and arrays. ■ Learn multiplication facts at the same time as related division facts. ■ Model multiplication and division using concrete and visual representations, and record the process symbolically. ■ Explore commutative property (knowing 3×8 is the same as 8×3). ■ Represent multiplication facts as repeated addition and skip-counting forwards. ■ Represent division facts as repeated subtraction and skip-counting backwards.	**Assessment Criteria:** Use mathematical keywords, short phrases, and short sentences to do the following: ■ Represent a multiplication expression as repeated addition. ■ Represent a repeated addition as multiplication. ■ Create and illustrate a story problem for a number sentence. ■ Represent, concretely or pictorially, equal groups for a number sentence. ■ Represent a multiplication expression using an array. ■ Create an array to model the commutative property of multiplication. ■ Relate multiplication to division by using arrays and by writing related number sentences.

LAL Numeracy Phase 1B: **Number: Multiplication and Division with Whole Numbers** *(continued)*

Instructional Strategies: *(continued)*

- Use known facts and doubling and halving to determine the answer:
  - 7×4, think double of (7×2)—both are 28
  - $48 \div 6$, think double of $(24 \div 6)$—both are 8
- Play multiplication and division games using cards, dice, arrays, etc.

Assessment Criteria: *(continued)*

- Identify events from an experience that can be described as equal sharing.
- Identify events from an experience that can be described as equal grouping.
- Illustrate, with counters or a diagram, a story problem involving equal sharing, presented orally or through shared reading, and solve the problem.
- Illustrate, with counters or a diagram, a story problem involving equal grouping, presented orally or through shared reading, and solve the problem.
- Listen to a story problem, represent the numbers using manipulatives or a sketch, and record the problem with a number sentence.
- Create and illustrate, with counters, a story problem for a number sentence.
- Represent a division expression as repeated subtraction.
- Represent a repeated subtraction as a division expression.
- Relate division to multiplication by using arrays and by writing.
- Solve problems involving multiplication and division.
- Explain the meaning of a remainder when the remainder is greater than 0.

Learning Experiences

Language Foundation:

- Describe multiplication using addition.
- Describe multiplication using division.
- Discuss the meaning of place value in calculations.

Key Vocabulary:

- Multiply
- Product
- Times
- Carry
- Divided by
- Into
- Per
- Quotient
- Remainder
- Groups
- Shaping
- Array

Sentence Frames:

- _____ multiplied by 5 is _____.
- _____ times _____ equals _____.
- Multiplying _____ and _____ is approximately _____.
- _____ divided by _____ equals _____.
- The quotient of _____ divided by _____ is _____.
- The product of _____ and _____ is about _____.

Learning Supports:

- Coloured counters
- Number line
- Ten frames
- Base-10 blocks
- Multiplication chart
- Grid paper
- Games such as *Race to 100*, *Shikaku*, and *Ken-Ken*
- Anchor chart of words that represent multiplication and division

Mental Math:

- Use basic multiplication and division strategies.
- Use multiplication and division facts (single digit).
- Multiply by 1 and 0.
- Divide single digits into single digits and single digits into double digits (less than 20).
- Divide by 1.

Problem Solving:

- In the market, Nina's father earns $290 per week. Estimate how much he will earn in four weeks.
- Dogs have two ears and four feet. If you have eight dogs in your yard, how many ears and feet will you see?
- Six people share 18 bananas.
  - How many bananas will each person get?
- Max baked three cherry pies.
  - If he cut each pie into eight slices, how many slices will Max get altogether?
  - If six of his friends share all the slices of the pie, how many slices did each friend get?

LAL Numeracy Phase 1A: **Number: Representation of Fractions**

Big Ideas: Quantities can be represented concretely, pictorially, and symbolically. There are different but equivalent representations of numbers; our number system is based on patterns; classifying numbers provides information about their characteristics.

	Numeracy	Language

Outcomes 3N13	Develop number sense:
	■ Describe meanings of fractions as “a set or group,” “region,” “measure,” and “division.”
	■ Demonstrate an understanding of fractions by
	  ■ explaining that a fraction represents a portion of a whole divided into equal parts
	  ■ describing situations in which fractions are used
	  ■ comparing fractions of the same whole with like denominators
	■ Compare fractions to a benchmark of 1 whole. Are they less then, equal to, or greater than 1?
	■ Represent and explain how 1 whole can be represented as a fraction concretely, pictorially, and symbolically
	■ Compare fractions with the same numerator.
	■ Identify unit fractions on a number line between zero and one.
	■ Order unit fractions on a number line and symbolically.
	■ Relate improper fractions to mixed numbers.
		■ Listen to and understand simple words, phrases, or simple sentences, with or without visual aids such as physical movement, gestures, realia, and pictures.
		■ 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 begin 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 basic cognitive strategies, with guidance and support, to enhance language learning (e.g., memorize new words, etc.).

Connection to Prior Learning	■ Compose and decompose whole numbers using part-part-whole relationships. ■ Represent, describe, and compare whole numbers to 1000. ■ Represent whole numbers on a number line.	Using oral language and visuals to develop knowledge about fractions, students are able to do the following: ■ Demonstrate how fractions represent parts of a whole by writing appropriate fractions using diagrams and symbols. ■ Demonstrate their comprehension of fractions by drawing out the parts of the whole from a problem and writing it in a fractional format. ■ Draw and represent unit fractions on a number line and explain, using key vocabulary, how to represent these fractions. ■ Demonstrate how shapes can be divided into equal parts and how various parts of a whole can be represented in a fractional format.
	Instructional Strategies: ■ Concretely and pictorially represent fractions as sets of objects and shaded areas, and numbers on a number line. ■ Concretely and pictorially compare and order fractions with like denominators. Note: Understand that for different wholes, identical fractions will not represent the same quantity. For example, half of a package of 10 cookies is not the same as half of a bag of 30 cookies. ■ Concretely and pictorially compare and order fractions with like numerators. ■ Symbolically represent and order fractions using benchmarks. ■ Extend an understanding of fractions for values greater than 1 whole. ■ Symbolically convert improper fractions to mixed numbers.	**Assessment Criteria:** Using keywords, short phrases, and short sentences, students are able to demonstrate the following: ■ Identify common characteristics of a set of fractions. ■ Describe everyday situations where fractions are used. ■ Cut or fold a whole into equal parts, or draw a whole in equal parts; demonstrate that the parts are equal and name the parts. ■ Sort a set of diagrams of regions into those that represent equal parts and those that do not, and explain the sorting. ■ Represent a fraction concretely or pictorially. ■ Name and record the fraction represented by the shaded and non-shaded parts of a region. ■ Compare fractions with the same denominator.

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

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

- Identify the numerator and denominator for a fraction.
- Model and explain the meaning of numerator and denominator.
- Convert improper fractions into mixed numbers.
- Indicate fractions on a number line that is between 0 and 1, and explain why a fraction is larger than or smaller than another fraction.

Learning Experiences

Language Foundation:

- Discuss the meaning of how a fraction represents a portion of a whole divided into equal parts.
- Compare fractions of the same whole with like denominators.
- Explain why fractions with numerators greater than the denominators are greater than one.
- Discuss what the numerator represents in a fraction.
- Discuss what the denominator represents in a fraction.
- Describe the process of comparing fractions

Key Vocabulary:

- Fraction
- Unit fraction (numerator is one)
- Whole (numerator and denominator are the same number)
- Numerator
- Denominator
- Greater than
- Less than
- Equal to
- Divide
- Equivalent

Sentence Frames:

- The fraction $\left(\frac{1}{2}, \frac{1}{3}, \frac{1}{4}\right)$ represents _____ parts out of _____.
- The fraction _____ is greater than/equal to/less than) one because _____.

Learning Supports:

- Coloured counters
- Tens frames
- Cuisenaire rods
- Fraction strips
- Pattern blocks
- Grid paper
- Decks of cards

Mental Math:

- Estimate placement of fractions on a number line.
- Identify numerator and denominator as shaded part of a shape.
- Compare fractions with same denominators.
- Have students identify parts of a set.
- Represent a whole number as a fraction.

Problem Solving:

- Fernandez ate $\frac{3}{4}$ of a chocolate bar and Katy ate $\frac{1}{2}$. Who ate more? Explain how you got your answer.
- Abdi cut a pizza in 10 slices. His friend ate $\frac{1}{2}$ of the slices. How many slices did the friend eat?
- Nancy had 10 friends visiting her. She bought four strawberry and six chocolate ice cream cones. What fraction of the ice cream is strawberry flavoured?
- For a community get-together of 50 families, 20 families brought dessert. What fraction of the community brought dessert?

LAL Numeracy Phase 1A: **Patterns and Relations: Patterning and Algebraic Thinking**

Big Ideas: Patterns can be represented in a variety of ways. Relationships can be described and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways.

	Numeracy	Language
Outcomes **1PR1, 1PR2, 2PR1, 2PR2, 3PR1, 3PR2, 4PR1, 4PR2**	Identify and use patterns: ■ Describe, extend, compare, and create repeating, increasing, and decreasing patterns. ■ Identify and describe patterns found in tables and charts, including a multiplication chart.	■ 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 using short sentences.
Connection to Prior Learning	■ Skip-counting forwards and backwards. ■ Describe order or relative position using ordinal numbers. ■ Demonstrate an understanding of addition and subtraction.	Identify important information and ideas using keywords and short sentences to do the following: ■ Create and describe a variety of numeric and geometric patterns. ■ Record the pattern in a table of values chart that shows the term and the term number. ■ Create a number pattern involving addition, subtraction, multiplication, and division. ■ Describe the pattern rule and make predictions related to repeating geometric patterns.

	Instructional Strategies:
	■ Explore patterns containing two, three, or four elements in their core.
	■ Use manipulatives, counters, and coins to model regular patterns and predict elements of a pattern.
	■ Use number line and graphic organizers to model regular patterns and predict elements of a pattern.
	■ Translate repeating patterns from one representation to another, such as between concrete, number line, and tables.
	■ Identify patterns found in tables and charts (e.g., hundred chart, addition table, calendar, and then multiplication chart). For example:
	  ■ Use blank monthly calendar with one date given on a random day. Use patterns to solve problems such as: "What is the day of the week for the first of the month?" ... the last day of the month?"
	  ■ Use toothpicks to make a pattern. Encourage students to create and determine the number of toothpicks for the next shape (see image).
	 
	  ■ Solve problems by finding missing values within the hundred chart.
		Assessment Criteria:
		Using keywords, short phrases, and short sentences, do the following:
		■ Identify the core of a repeating pattern.
		■ Identify and explain the rule for different patterns using objects or numbers.
		■ Create a concrete, pictorial, or symbolic pattern and describe the rule found in a table or chart.
		■ Identify and explain errors in an increasing or decreasing pattern.
		■ Identify and describe various increasing or decreasing patterns found on a hundred chart and multiplication chart.
		■ Determine the missing element in a pattern.
		■ Translate the information provided in a problem into a table or chart.
		■ Identify and extend the patterns in a table or chart to solve a problem.

LAL Numeracy Phase 1A: **Patterns and Relations: Patterning and Algebraic Thinking** *(continued)*

Learning Experiences

Language Foundation:

- Demonstrate, orally and in writing, an understanding of increasing and decreasing repeating patterns by
  - describing
  - reproducing
  - extending
  - creating
  - using manipulatives, diagrams, sound, and actions
- Identify, describe relationships, and derive expressions for patterns (e.g., elements go up by 2).

Key Vocabulary:

- Core
- Table
- Pattern
- Increasing
- Decreasing
- Element
- Missing
- Before
- After
- In between
- Predict
- Extend
- Create
- Term
- Rule
- Skip-counting

Sentence Frames:

- The next number/shape in this pattern is _____.
- The missing element of this pattern is _____ because _____.
- This pattern is (increasing/decreasing) because _____.
- In this pattern _____, the _____ term would be _____.

Learning Supports:

- Coloured counters
- Tens frames
- Decks of cards
- Number line
- Pattern blocks
- Hundred chart
- Addition table
- Multiplication table

Mental Math:

- Single-digit computations.
- Identify increasing and decreasing patterns.
- Identify missing elements in a pattern.
- Describe a simple pattern using expressions of addition and subtraction.

Problem Solving:

- Lin sells scarves in the market. Each day, she sells one more scarf than the previous day.
  - If she sold two scarves on the first day, how many scarves did she sell on the other days of that week? How much money did she make each day of this week?
  - Describe the pattern of Lin's sales.
  - If she sold 16 scarves on Tuesday, how many scarves did she sell on the previous Saturday?
  - If Lin sells her scarves for $5 each, create a pattern that describes her earnings.

LAL Numeracy Phase 1A: **Shape and Space (2-D Shapes and 3-D Objects): Identifying, Sorting, Comparing, Constructing**

Big Ideas: Two- and three-dimensional objects can be described, classified, and analyzed by their attributes.

	Numeracy	Language

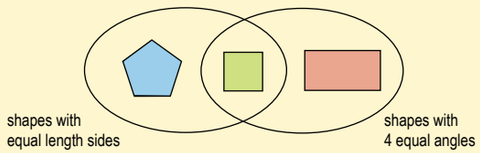
Outcomes
1SS2, 1SS3, 2SS6, 2SS7, 2SS9, 4SS5, 5SS6
	Develop spatial reasoning:
	■ Construct, describe, sort, and compare 2-D shapes, including regular and irregular polygons:
	  ■ triangles
	  ■ squares
	  ■ rectangles
	  ■ cubes
	  ■ spheres
	  ■ cones
	  ■ cylinders
	  ■ prisms
	  ■ pyramids
	  ■ circles
	■ Construct, describe, sort, and compare 3-D objects including:
	  ■ rectangular prisms including cubes
	  ■ triangular prisms.
	  ■ spheres
	  ■ cones
	  ■ cylinders
	  ■ pyramids
		■ Use visuals and realia to begin to add basic knowledge, concepts, and skills related to the core subject areas.
		■ Express ideas using keywords, short phrases, and short sentences in structured, familiar situations, with or without visual aids.
		■ 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	■ Identify simple 2-D shapes such as a circle, square, and triangle and 3-D objects such as a box and a ball.	Recognize and connect concepts and skills by doing the following: ■ Describe—orally, by drawing, and in writing—characteristics of various shapes and objects, including how they are similar and different. ■ Identify 2-D shapes and 3-D objects in the classroom, the school, and the community. ■ Construct, describe, and sort 2-D shapes and 3-D objects.

LAL Numeracy Phase 1A: **Shape and Space (2-D Shapes and 3-D Objects): Identifying, Sorting, Comparing, Constructing** *(continued)*

Instructional Strategies:

- Describe and sort various shapes and objects.
- Compare and contrast attributes of various shapes.
- Draw 2-D shapes.
- Construct 3-D objects.
- Deconstruct 3-D objects into geometric nets or their 2-D components.
- Use graphic organizers such as Venn diagrams to show the relationship between shapes:



Assessment Criteria:

- Sort a set of quadrilaterals and explain the sorting rule.
  - Sort a set of quadrilaterals according to the lengths of the sides.
  - Sort a set of quadrilaterals according to whether or not opposite sides are parallel.
- Identify the characteristics of a set of triangles according to their sides or their interior angles.
  - Sort a set of triangles and explain the sorting rule.
- Identify and name common attributes of prisms.
- Identify and describe regular and irregular polygons in the environment.
- Construct rectangular prisms from their geometric nets.
- Construct triangular prisms from their geometric nets.
- Identify examples of rectangular and triangular prisms found in the environment.

Learning Experiences

Language Foundation:

- Describe characteristics of 2-D shapes:
  - Triangle: A three-sided closed figure
    - — Equilateral triangle: All sides and angles are equal.
    - — Isosceles triangle: Any two sides are equal and their opposite angles are equal.
    - — Scalene triangle: No side or angle is equal.
  - Quadrilaterals: A four-sided closed figure (If all sides and all angles are equal, it is called a regular quadrilateral.)
    - — Square: A figure of four equal sides and four equal right angles (This is a regular quadrilateral.)
    - — Rectangles: A figure with equal opposite sides and four equal right angles (This is an irregular quadrilateral.)
    - — Rhombus: A four-sided irregular quadrilateral
    - — Parallelogram: A four-sided irregular parallelogram (except for a square)
  - Pentagon: A five-sided closed figure (If all sides and all angles are equal, it is called a regular pentagon.)
  - Hexagon: A six-sided closed figure (If all sides and all angles are equal, it is called a regular hexagon.)
  - Circle: A radius determines the size of a circle; diameter is twice the radius.
- Compare and contrast 2-D shapes with 3-D objects.
- Describe the attributes of various 2-D shapes (number of sides, general size) and 3-D objects (size, shape).
- Discuss the process of constructing and deconstructing a 3-D object.
- Identify names of 2-D shapes found on the faces of 3-D objects.

Key Vocabulary:

- Side
- Edge
- Face
- Sort
- Construct
- Rectangles
- Squares
- Parallelogram
- Rhombus
- Pentagon
- Hexagon
- Triangles
- Equilateral
- Isosceles
- Scalene
- Cube
- Circles
- Radius
- Sphere
- Cone
- Prism
- Pyramid

Sentence Frames:

- This shape is called a _____ because _____.
- The _____ has _____ sides.
- The _____ has _____ faces.

LAL Numeracy Phase 1A: **Shape and Space (3-D Shapes and 2-D Objects): Identifying, Sorting, Comparing, Constructing** *(continued)*

Learning Supports:

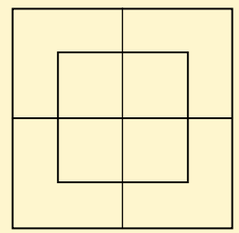
- Geometric nets for 3-D shapes
- Geoboards
- Graph paper
- Linking cubes
- Tangrams
- Pattern blocks

Mental Math:

- Identify number of sides, edges, and corners of various 2-D shapes and 3-D objects.
- Draw 2-D shapes and 3-D objects, given the object's name.

Problem Solving:

- Fern is sorting tiles that have different geometric shapes. Explain how she should sort them.
- Two squares have a side that measures 5 cm. What shape does it become when you put these two squares together? What is the length and the width of this new shape?
- Sam has three cubes. She connects them, touching side by side, on a table. She paints these cubes, but the sides facing the table or each other do not get painted. For each of the cubes, how many sides get painted?
- How many squares are there in this drawing?

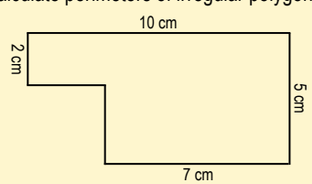


LAL Numeracy Phase 1A: **Shape and Space (Measurement): Length**

Big Ideas: Measurement involves a selected attribute of an object (length, area, mass, volume, capacity) and a comparison of the object being measured against non-standard and standard units. The longer the unit of measurement, the fewer units it takes to measure the object; the use of standard measurement unit simplifies communication about the size of the object.

	Numeracy	Language

Outcomes
1SS1, 2SS2, 2SS3, 2SS4, 3SS3
	Demonstrate an understanding of measuring length (cm, m) by
	■ selecting and justifying referents for the units cm and m
	■ modelling and describing the relationship between the units cm and m
	■ estimating length using referents
	■ measuring and recording length, width, and height
		Organize, structure, and sequence text and ideas to do the following:
		■ Differentiate between measuring different attributes such as length (height), mass (weight), and volume (capacity).
		■ Demonstrate that changing the orientation of an object does not alter the measurements of its attributes.
		■ Demonstrate an understanding of perimeter of regular and irregular shapes by
		  ■ estimating perimeter using referents for cm or m
		  ■ measuring and recording perimeter (cm, m)
		  ■ constructing different shapes for a given perimeter to demonstrate that many shapes are possible for a perimeter

Connection to Prior Learning	■ Demonstrate an understanding of place value. ■ Demonstrate an understanding of whole numbers using a number line. ■ Describe characteristics of 2-D shapes. ■ Demonstrate an understanding of addition.	Express and write keywords and simple sentences to do the following: ■ Identify and describe various 2-D shapes (rectangle, square, triangle, pentagon, hexagon, polygon). ■ Identify and name the length of objects with those measurements (cm and m). ■ Describe the measurement process. ■ Represent the lengths of an attribute of two objects and explain how much longer one object is over the other, using the same unit of measure. ■ Represent perimeter of regular shapes and irregular shapes, and explain the process used in the calculation.
	Instructional Strategies: ■ Compare and order objects by length, height, and distance around using non-standard units, and make statements of comparison. ■ Measure length (cm, m) of an object to the nearest unit. ■ Calculate the perimeter of a regular and an irregular shape. ■ Calculate perimeters of irregular polygons:  ■ Compare lengths of an attribute of two objects, and determine how much longer one object is than another, using standard and non-standard units of measure.	**Assessment Criteria:** Use keywords, short phrases, and short sentences to do the following: ■ Provide a personal referent for one centimetre and explain the choice. ■ Provide a personal referent for one metre and explain the choice. ■ Match a standard unit to a referent. ■ Estimate the length of an object using personal referents. ■ Determine and record the length or width of a 2-D shape. ■ Draw a line segment of a given length using a ruler. ■ Sketch a line segment of a given length without using a ruler. ■ Explain that changing the orientation of an object does not change the dimensions of the object. ■ Sort objects by a given attribute. ■ Determine which units are most effective for measuring the length of an object (cm or m).

LAL Numeracy Phase 1A: **Shape and Space (Measurement): Length** *(continued)*

Learning Experiences

Language Foundation:

- Explain the process of using a non-standard and standard unit of measurement.
- Describe the reasons for choosing a standard unit of measurement.
- Identify the steps required for using measurement tools.
- Discuss how to determine the perimeter of a given object.
- Describe how the perimeter of a rectangle changes when it is turned on its side.

Key Vocabulary:

- Length
- Width
- Perimeter
- Unit
- Regular shape
- Irregular shape
- Measure
- Centimetres (cm)
- Metres (m)
- Compare
- Longer
- Shorter
- Height
- Side
- Triangle
- Rectangle
- Square
- Pentagon
- Hexagon
- Polygon
- Ruler
- Base

Sentence Frames:

- The desk measures _____ hand-widths wide and _____ hand-widths long. The perimeter of the desk is _____ hand-widths.
- The perimeter of this classroom is best measured with _____(units) because _____.

Learning Supports:

- Rulers
- Geoboards
- Grid paper
- Pattern blocks
- Anchor chart of 3-D shapes

Mental Math:

- Determine perimeters of regular and irregular polygons.
- Addition of one- and two-digit whole numbers.
- Given a shape, estimate the perimeter.
- Given a shape and whole-number dimensions, calculate the perimeter.

Problem Solving:

- A giraffe is five metres tall and a tree is two metres shorter. How tall is the tree?
- A triangle has a base of 8 cm. Another triangle has a base of 11 cm. How much longer is the base of the second triangle?
- How much fencing would be needed if a rectangular field, measuring 18 metres by 21 metres, needs to be fenced on all four sides?
- Construct several rectangles with a perimeter of 32 cm.

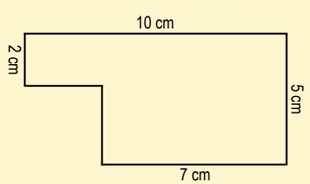
LAL Numeracy Phase 1A: **Shape and Space (Measurement): Area**

Big Ideas: Measurement involves a selected attribute of an object (length, area, mass, volume, capacity) and a comparison of the object being measured against non-standard and standard units. The longer the unit of measurement, the fewer units it takes to measure the object; the use of standard measurement unit simplifies communication about the size of the object.

	Numeracy	Language

Outcomes
2SS3, 2SS5, 4SS3
	■ Demonstrate an understanding of area of regular and irregular 2-D shapes made from rectangles and squares 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 cm^2 or m^2
	  ■ determining and recording area (cm^2 or m^2)
	  ■ recognizing that changing orientation of an object does not change the measurements of its attributes.
	  ■ 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 basic English discourse features to do the following:
		■ Demonstrate that changing the orientation of an object does not alter the measurements of its attributes.
		■ Demonstrate an understanding of area of regular and irregular shapes by
		  ■ estimating area using referents for cm^2 or m^2
		  ■ measuring lengths and calculating area (cm^2 or m^2)
		  ■ constructing different shapes for a given area to demonstrate that many shapes are possible for a perimeter

Connection to Prior Learning	■ Understand the intrinsic relationship of the four operations.
	■ Demonstrate an understanding of the meanings of multiplication as
	  ■ repeated addition
	  ■ equal groups or sets
	  ■ an array
		Using emergent vocabulary, orally and in writing, organize and sequence the steps needed to do the following:
		  ■ Demonstrate how to estimate and calculate area of a regular shape.
		  ■ Divide irregular shapes into regular figures to enable calculation of areas of each individual part.

	Instructional Strategies:
	■ Cut out regular and irregular polygons, overlay on grid paper, and count the number of squares the shape covers.
	  ■ Flip or turn this shape, count the number of squares the shape covers, and compare results.
	■ Using grid paper, draw all possible shapes of given areas.
	  ■ How many different rectangles can be drawn that cover 1 square? ... 2 squares? ... 3 squares? ... 4 squares? … 24 squares?
	■ Measure appropriate sides to gather information to calculate area.
	■ Calculate area of irregular polygons, such as the following, by decomposing this shape into smaller rectangles:
	 
	
		Assessment Criteria:
		■ Describe area as the measure of a surface recorded in square units.
		■ Provide a referent for a square centimetre and explain the choice.
		■ Provide a referent for a square metre and explain the choice.
		■ Determine which standard square unit is represented by a referent.
		■ Estimate the area of a 2-D shape using personal referents.
		■ Determine the area of a regular 2-D shape and explain the strategy.
		■ Determine the area of an irregular 2-D shape and explain the strategy.
		■ Construct a rectangle for a given area.
		■ Demonstrate that many rectangles are possible for an area by drawing at least two different rectangles for the same area.

Learning Experiences

Language Foundation:

- Discuss which standard square unit will be most appropriate for a specific area.
- Explain and represent the process of finding the area of a shape.
- Describe the following:
  - how an irregular shape can be broken up into smaller rectangles and squares
  - how an area of an irregular shape can be calculated

Key Vocabulary:

- Area
- cm^2 or m^2
- Length times width
- Decompose
- Square
- Squared

Sentence Frames:

- The length of this (rectangle/square) is _____ (units). The width is _____ (units). The area is _____ ($units^2$).
- Area is found by _____.

Learning Supports:

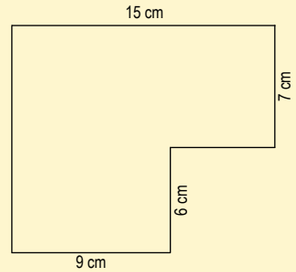
- Grid paper
- Geoboards
- Ruler
- Games (*Race to 100*, *Shikaku*)

Mental Math:

- Compare areas of objects with different dimensions.
- Determine area of regular and irregular shapes with single-digit dimensions.
- If the area of a rectangle is 20 cm^2 and its width is 4 cm, what is its length?

Problem Solving:

- What is the area of your desk? Explain your choice of units.
- How can we find the area of this classroom? What is the area of this classroom?
- Determine the area of the following irregular shape:



- Determine possible dimensions of several rectangles that have an area of 200 m^2.

LAL Numeracy Phase 1A: **Shape and Space: Volume**

Big Ideas: Two- and three-dimensional objects can be described, classified, and analyzed by their attributes. It is necessary to understand the attributes of the object before anything can be measured.

	Numeracy	Language
Outcomes **4SS4. 5SS3**	Demonstrate an understanding of volume by ■ explaining the relationship between area of the base and the height of a rectangular prism to the volume ■ selecting and justifying referents for the units cm^3 or m^3 ■ 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	■ 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 (e.g., learning activities). ■ 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	■ Understand the intrinsic relationship of the four operations.
	■ Demonstrate an understanding of the meanings of multiplication as
	  ■ repeated addition
	  ■ equal groups or sets
	  ■ an array
	  ■ area
		Use keywords and short phrases to do the following:
		■ Describe, orally and in writing, the characteristics of volume.
		■ Determine the units to be used for different dimensions of volume.
		■ Explain how to measure the volumes of rectangular prisms.

	Instructional Strategies:
	■ Measure volume of boxes (rectangular prisms) with non-standard items such as marbles and cubes.
	  ■ Compare and discuss the appropriateness of the units used to measure volume. Recognize the need for a standard unit of measure.
	  ■ Transition from non-standard to standard units.
	■ Use different-sized boxes (rectangular prisms) and centicubes to
	  ■ estimate the volume
	  ■ measure the volume using centicubes to fill or model each box to the nearest whole unit
	  ■ examine the relationship between area of the base and the height of the box to the volume
	  ■ measure the dimensions of the box and calculate the volume
	■ Measure the attributes of a rectangular prism and calculate the volume. Turn this prism on its side and repeat the process. Compare the volumes calculated.
	■ Identify containers and objects in the classroom that would require a larger unit of measure. Discuss units that could be used to measure this volume (m^3).
	■ Make a cubic metre using cardboard.
	■ Estimate whether classroom objects have a volume greater than, less than, or about the same as a cubic metre.
	■ Have students identify items inside and outside of the classroom whose volume could be measured in cubic metres. Have students explain the reasons for their choices.
		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.

LAL Numeracy Phase 1A: **Shape and Space: Volume** *(continued)*

Learning Experiences

Language Foundation:

- Express understanding of volume as a measurement of the amount of space occupied by an object.
- Discuss the relationship between area and volume.
- Describe examples of volume measured in cubic centimetres (cm^3) or cubic metres (m^3).
- Explain what measurements are needed to calculate the volume of a rectangular prism.

Key Vocabulary:

- Length
- Width
- Area
- Height
- Base
- Volume

Sentence Frames:

- _____ has a volume of _____ because _____.
- The volume of the _____ is greater than, less than, or about the same as _____.
- The base of a railway car container has an area of _____ m and a height of _____ m. The volume of this container is _____ m^3.

Learning Supports:

- Centicubes
- Metre sticks
- Rulers
- Cardboard
- Base-10 blocks

Mental Math:

- Multiplication of three whole numbers.
- Calculate volume of objects with single-digit dimensions.
- Estimate volume of objects.
- Given objects of different sizes, determine the most efficient units for volume.

Problem Solving:

- Dmitri has a choice between one big box that measures 25 cm by 12 cm by 20 cm or three smaller boxes with volumes of 200 cm^3, 120 cm^3, and 100 cm^3. What would Dmitri choose? Why?
- How many more centicubes will fit in a cereal box compared to a tissue box?
- A rectangular prism has a volume of 200 cm^3. What are possible dimensions of the prism?

LAL Numeracy Phase 1A: **Shape and Space (Measurement): Mass**

Big Ideas: Measurement involves a selected attribute of an object (length, area, mass, volume, capacity) and a comparison of the object being measured against non-standard and standard units. The use of standard measurement unit simplifies communication about the size of the object.

	Numeracy	Language

Outcomes
2SS2, 2SS3, 3SS4
	■ Demonstrate an understanding of mass in grams (g) and kilograms (kg) by
	  ■ selecting and justifying referents for the use of units *g* and *kg*
	  ■ modelling and describing the relationship between the units *g* and *kg*
	  ■ estimating mass using referents
	■ Describe the relationship between grams and kilograms.
	■ Demonstrate that changing the orientation of an object does not change the mass of the object.
		Use an oral repertoire, phrases, short sentences, and L1 to do the following:
		■ Describe the difference between standard units of grams and kilograms.
		■ Describe the mass of an object.

Connection to Prior Learning	■ Demonstrate an understanding of place value. ■ Represent and order whole numbers.	Use essential information and short sentences to do the following: ■ Explain when to use grams and when to use kilograms. ■ Compare two objects and explain, orally and in writing, which one is heavier or lighter and by how much.
	Instructional Strategies: ■ Compare referents of 3-D objects that have a mass of approximately 1g, 100 g, and 1 kg. ■ Compare household purchases using grams and kilograms (e.g., comparing a bag of candy with a bag of potatoes).	**Assessment Criteria:** ■ Provide a personal referent for one gram and explain the choice. ■ Provide a personal referent for one kilogram and explain the choice. ■ Match a standard unit to a referent. ■ Explain the relationship between 1000 grams and 1 kilogram using a model. ■ Estimate the mass of an object using personal referents. ■ Provide examples of 3-D objects that have a mass of approximately 1g, 100g, and 1kg.

LAL Numeracy Phase 1A: **Shape and Space (Measurement): Mass** *(continued)*

Learning Experiences

Language Foundation:

- Describe the difference between grams and kilograms.
- Compare and contrast different household items with standard referents.
- Discuss choice of units when representing the mass of an object.

Key Vocabulary:

- Mass
- Weight
- Heavy
- Grams
- Kilograms
- Heavier
- Lighter

Sentence Frames:

- _____ is heavier than _____ because _____.
- _____ has an estimated mass of _____ (g/kg).
- The mass of _____ is best represented with the units _____ (grams/kilograms).

Learning Supports:

- Number line
- Mass scale
- Pan balance
- Metric weights
- Hundred chart
- Thousand chart

Mental Math:

- Compare mass of various objects using standard referents, and determine which is heavier or lighter and by how much.

Problem Solving:

- An apple has a mass of 250 grams. What will be the mass of four apples?
- The mass of a dictionary is 1540 grams. A basketball is 350 grams lighter. What is the mass of the basketball?
- Jon weighs 140 kg. He is four times heavier than his sister. What is the weight of his sister?
- What is heavier: 1 kg of feathers or 1 kg of marbles?

LAL Numeracy Phase 1A: **Shape and Space (Measurement): Time**

Big Ideas: The longer the unit of measurement, the fewer units it takes to measure the object; the use of a standard measurement unit simplifies communication about the size of the object.

	Numeracy	Language

Outcomes
2SS1, 3SS1, 3SS2, 4SS1, 4SS2
	■ Demonstrate an understanding of the relations between various units of time.
	■ Read and record
	  ■ time using digital and analog clocks, including 24-hour clocks
	  ■ calendar dates in a variety of formats
		■ 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 (e.g., learning activities).
		■ 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	■ Using concrete, pictorial, and symbolic representations, demonstrate an understanding of the following:
	  ■ ordering and comparing whole numbers
	  ■ skip-counting
	  ■ addition
	  ■ place value
	  ■ comparing fractions to benchmarks
		Know and use emergent repertoires of words and phrases to do the following:
		■ Demonstrate the relationship between seconds, minutes, hours, days, weeks, months, and years.
		■ Explain orally and represent the passage of time for an activity (such as how long it takes to get to school, etc.).
		■ Describe different formats in which calendar dates are written.

	Instructional Strategies: ■ Select and use a non-standard unit of measure, such as television shows or pendulum swings, to measure the passage of time. ■ Identify activities that can and cannot be accomplished in minutes, hours, days, months, and years. ■ Provide personal referents for seconds, minutes, and hours. ■ Read and record time using digital and analog clocks, including stopwatches and 24-hour clocks. ■ Compare 12-hour clocks and 24-hour clocks using double number lines. ■ Determine the number of days in any month, using a calendar. ■ Solve problems using the number of minutes in an hour or number of days in a given month. ■ Create a personal day planner with benchmark time displayed on a vertical or a horizontal number line. ■ Write dates in a variety of formats such as yyyy/mm/dd, dd/mm/yyyy, March 21, 2019, dd/mm/yy. ■ Read and record calendar dates in a variety of formats. ■ Relate dates written in a variety of formats (e.g., yyyy/mm/dd, dd/mm/yyyy, March 21, 2006, dd/mm/yy) to dates on a calendar. ■ Explore the functions of the time and calendar apps on a mobile phone or a tablet.	**Assessment Criteria:** Use keywords, short phrases, and short sentences to do the following: ■ State the number of hours in a day. ■ Represent the relationship between seconds, minutes, hours, days, weeks, months, and years. ■ Express the time orally and numerically from 12-hour analog and digital clocks. ■ Express the time orally and numerically from 24-hour analog and digital clocks. ■ Describe time orally as “minutes to” or “minutes after” the hour. ■ Explain the meaning of a.m. and p.m., and provide an example. ■ Explain and represent the passage of time to do an activity (e.g., walking to the store may be minutes but going on vacation may be days). ■ Write dates in a variety of formats (e.g., yyyy/mm/dd, dd/mm/yyyy, March 21, 2006, dd/mm/yy). ■ Identify possible interpretations of a given date (e.g., 06/03/04).

LAL Numeracy Phase 1A: **Shape and Space (Measurement): Time** *(continued)*

Learning Experiences

Language Foundation:

- Compare and explain the relationship of the number of seconds to a minute, the number of minutes to an hour, the number of hours to a day, the number of days to a week, and the number of months to a year.
- Describe the passage of time to common activities using non-standard and standard units (e.g., seconds, minutes, hours, days, weeks, months, years).
- Discuss the relationship between the day of the week and the monthly calendar.

Key Vocabulary:

- Time
- Dates
- Calendar
- Seconds
- Minutes
- Hours
- Days
- Week
- Months
- Year
- a.m./p.m.
- O'clock
- Digital
- Analog

Sentence Frames:

- Right now, the time is _____ (a.m./p.m.).
- There are _____ in a(n) _____.
- It will take _____ (units) to _____.

Learning Supports:

- Various games that involve keeping track of time
- Number line
- Hour glass
- Stopwatch
- Analog clocks
- Digital clocks
- Calendars of various formats

Mental Math:

- Skip-counting by 5 up to 60.
- Tell time on an analog clock.
- Translate time from a digital clock to an analog clock.
- Read a calendar.
- Use blank monthly calendar with one date given on a random day. Use patterns to solve problems such as "What is the day of the week for the first of the month? ... the last day of the month?"
- Determine how long an activity will take.

Problem Solving:

- Yesterday, Eva played soccer at 11:30 a.m. She played for an hour and twenty minutes. What time did she finish?
- Today, Eva played soccer at 11:10 a.m. She came back home at 1:30 p.m. How long did she play soccer?
- My dog slept for 2,880 minutes. How many hours did he sleep?
- Carlos is reading a 120-page storybook. It takes him 240 minutes to read the entire book. If Carlos starts to read the book at 9:15 a.m., at what time will he finish reading his book if it is so good that he doesn't take any breaks?
- How many days old are you?

LAL Numeracy Phase 1A: **Shape and Space: Lines**

Big Ideas: Two- and three-dimensional objects can be described, classified, and analyzed by their attributes.

	Numeracy	Language

Outcomes
5SS5, 7SS3
	■ Construct, describe, and provide examples of lines that are
	  ■ parallel
	  ■ intersecting
	  ■ perpendicular
	  ■ vertical
	  ■ horizontal
		■ 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 (e.g., learning activities).
		■ 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	■ Identify various 2-D shapes and 3-D objects.
	■ Draw 2-D shapes.
	■ Construct 3-D objects.
	■ Deconstruct 3-D objects into geometric nets or their 2-D components.
		■ Using keywords and short phrases, describe
		  ■ lines and line segments
		  ■ parallel lines
		  ■ perpendicular lines
		  ■ intersecting lines

	Instructional Strategies: ■ Model and construct line segments using TPR (total physical response) strategies and manipulatives. ■ Identify examples of parallel, intersecting, and perpendicular lines inside and outside of the classroom. ■ Discuss types of lines found in artwork. ■ Sort, categorize, and label each set of lines. ■ Make comparisons and discuss features and characteristics that make each set of line segments—intersecting lines have one common point, perpendicular lines form a “square corner” at the point of intersection, parallel lines have no common intersecting point.	**Assessment Criteria:** Using keywords, short phrases, and short sentences, do the following: ■ Construct pairs of line segments that are parallel, perpendicular, and intersecting. ■ Identify line segments that are not parallel, perpendicular, or intersecting. ■ Identify real-world examples of parallel, perpendicular, and intersecting line segments. ■ Identify parallel, intersecting, perpendicular, vertical, and horizontal edges and faces on 2-D shapes and 3-D objects. ■ Draw 2-D shapes or 3-D objects that have edges, faces, and sides that are parallel, intersecting, perpendicular, vertical, or horizontal.

LAL Numeracy Phase 1A: **Shape and Space: Lines** *(continued)*

Learning Experiences

Language Foundation:

- Describe lines through kinesthetic movement, gestures, realia visuals, and graphic organizers.
- Describe the faces and edges of a 3-D object using terms such as parallel, intersecting, perpendicular, vertical, or horizontal.
- Compare and contrast intersecting and perpendicular lines.

Key Vocabulary:

- Line
- Plane
- Parallel
- Distance
- Perpendicular
- Intersect
- Square corners
- Right angles
- Point
- Vertical
- Horizontal

Sentence Frames:

- _____ lines are two lines that _____.
- Horizontal lines are drawn _____.
- Vertical lines are drawn _____.

Learning Supports:

- TPR (total physical response)
- Manipulatives (string, straws, stir sticks, toothpicks)
- Geoboards
- Grid paper
- Ruler
- Geometric nets

Mental Math:

- Draw/identify parallel, perpendicular, and intersecting lines.
- Name letters of the alphabet that contain horizontal, perpendicular, and/or parallel lines.
- Find intersecting, perpendicular, and/or parallel lines in any artwork and in the environment.

Problem Solving:

Provide a street map.

- Find streets that run parallel, run perpendicular, and intersect.
- Give directions from one location to another using vocabulary such as intersecting, perpendicular, and parallel.

LAL Numeracy Phase 1A: **Statistics and Probability: Methods of Data Collection, Organization, and Analysis**

Big Ideas: Data is gathered and organized in order to answer questions. Visual displays quickly reveal information about the data.

	Numeracy	Language
Outcomes **2SP1, 2SP2, 3SP1, 3SP2, 4SP2, 5SP1, 5SP2, 6SP1**	■ Collect, organize, display, and analyze data to solve problems. ■ Represent, organize, construct, label, and interpret bar graphs and line graphs to draw conclusions. ■ Differentiate between first- and second-hand data.	■ Listen to and understand simple words, phrases, or simple sentences, with or without visual aids such as physical movement, gestures, realia, and pictures. ■ 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 begin 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 basic cognitive strategies, with guidance and support, to enhance language learning (e.g., memorize new words, etc.).
Connection to Prior Learning	■ Demonstrate an understanding of one-to-one correspondence. ■ Represent, order, and compare whole numbers using a number line.	Use cognitive and interpersonal strategies to do the following: ■ Choose appropriate method of collecting data (such as questionnaire, measurement, experiments, databases, etc.). ■ Gather data by measuring aspects or asking questions of different people. ■ Represent data in a table or a chart and as a line or a bar graph.
	Instructional Strategies: ■ Collect first-hand data using a survey or checklist. ■ Justify appropriate methods of collecting data (e.g., surveys, experiments, databases, etc.). ■ Organize and represent the data in various ways (e.g., tally marks, line plots, charts, and lists). ■ Represent data collected using both a bar graph and a line graph, and compare to determine which representation is the most effective. ■ Construct, label, and interpret line and bar graphs to solve problems.	**Assessment Criteria:** Use keywords, short phrases, and short sentences to do the following: ■ Explain the difference between first-hand and second-hand data. ■ Find examples of second-hand data in print and electronic media, such as newspapers, magazines, and the Internet. ■ Identify and label title, axes, and intervals of bar and line graphs. ■ Create a bar or a line graph from a table of values or set of data. ■ Interpret a bar or a line graph to draw conclusions.

Learning Experiences

Language Foundation:

- Discuss the difference between first-hand and second-hand data.
- Formulate a question that can best be answered using first-hand data and second-hand data, and explain why.
- Explain the process of drawing a bar graph and a line graph.
- Describe how a graph represents data collected.

Key Vocabulary:

- Data
- Sort
- Order
- Bar graph
- Tally marks
- Line graph
- Charts
- Lists
- Table

Sentence Frames:

- The intervals of data on the graph will be _____ because _____.
- _____-hand data is (more/less) reliable because _____.

Learning Supports:

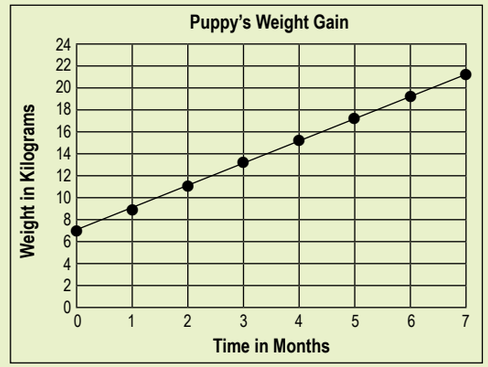
- Vertical and horizontal number lines
- Grid paper

Mental Math:

- Estimate placement of whole numbers on number lines with benchmarks.
- Skip-counting from a given number.
- Read data from line and bar graphs.
- Create a graph from a given data.

Problem Solving:

- A boy named Leo got a puppy for his birthday. He measured its weight over a few months and plotted the following graph from the data.



- Why was an interval of 2 used to represent the weight of the puppy?
- How long did it take the puppy to be 14 kg?
- Describe the pattern indicated in this graph.

Problem Solving: ***(continued)***

- Heights of a few students in your class were measured:

Student	Height (cm)
Heidi	152
Cam	149
Jodene	135
Luigi	154
Kai	167

  - Will this data be best represented with a line graph or a bar graph?
  - Identify if the height will be represented on a horizontal or a vertical number line.
  - What interval for the height can be used when creating a graph?
- Create a project to gather first-hand data and analyze it.

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

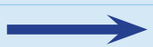
- Represent and describe whole numbers.
- Compare and order whole numbers.

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:

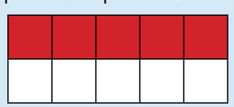
- _____ written as a decimal is _____.
- _____ written as a fraction is _____.
- _____ is equivalent to _____.

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.

LAL Numeracy Phase 1B: **Number: Ratios and Percents** *(continued)*

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 _____.

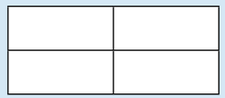
Learning Supports:

- 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:

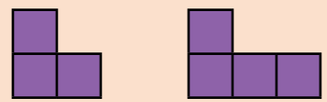
- Grid paper
- Graphic organizers
- L1 text
- Colour counters
- Linking cubes

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**

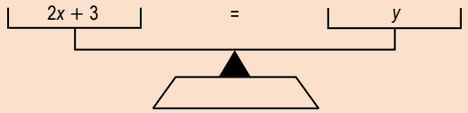
Big Ideas: Relationships between quantities can be described using rules involving variables. The equals sign describes the balance that exists between the quantities on either side of the equals sign. Relationships can be described and generalizations made for mathematical situations that have numbers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

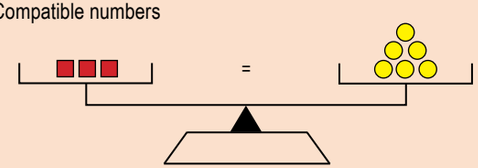
- In an equation, the value of the left side is _____ the value of the right side.
- The opposite of _____ is _____.
- The reciprocal of _____ is _____.
- To solve for *x* in the equation $3x - 1 = 2$, the first step is _____.

Learning Supports:

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

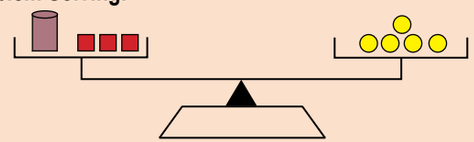
Mental Math:

- Basic math facts
- Compatible numbers

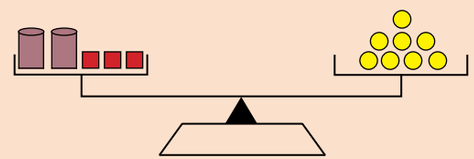


- How many circles balance one square?
- How many circles balance six squares?

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:

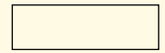
- Categorize and label polygons.
- Review key vocabulary.
- Use age-appropriate vocabulary and examples.
- Identify and describe the rectangle as a 2-D shape.
- Identify and name the length and width with these measurements (cm and m).
- Describe the measurement process in L1.
- Represent the perimeter 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

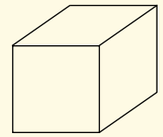
Sentence Frames:

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:

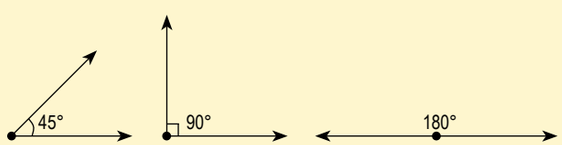
- Comparing/ordering values of volume or capacity
- One-step word problems
- Determining which unit of measurement would be most appropriate for finding a particular volume/capacity

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.

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:

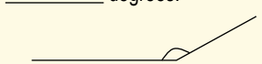
- Discuss the meaning of *angle* and *rotation*.
- Discuss the meaning of *degrees* in terms of rotation rather than temperature.
- Review key vocabulary.

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.

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

Phase 2A—Half-Course Credit

LAL Numeracy Phase 2A: **Number: Repeating Decimals**

Big Ideas: There are different but equivalent representations of numbers; our number system is based on patterns; benchmark numbers are useful for comparing and estimating numbers.

	Numeracy	Language

Outcomes
7N4, 7N7
	■ Demonstrate an understanding of repeating decimals and their relationships to fractions.
	■ Compare and order fractions, decimals, and integers by using
	  ■ benchmarks
	  ■ place value
	  ■ equivalent fractions and/or decimals
		■ Know and use with some consistency a range of simple 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.

Connections to Prior Learning	■ Compare and order terminating decimals (tenths, hundredths, thousandths) and equivalent fractions. ■ Demonstrate an understanding of place value in terms of decimal numbers.	Use cognitive and interpersonal strategies to do the following: ■ Convert decimals to fractions and fractions to decimals. ■ Explain why a decimal is repeating and how they relate to their equivalent fractions. ■ Order fractions, decimals, and integers.
	Instructional Strategies: ■ Use manipulatives to represent and explore parts of a whole. Record the parts as a decimal and its related fraction. ■ Change a set of fractions to decimals. Sort in numerical order. ■ Lead a class demonstration and discussion about representing a fraction quantity using base-10 blocks. Use a "flat" to represent a candy bar to be shared among various numbers of people. Sharing between 2 people—each person receives 5 tenths ("longs") or $\frac{1}{2}$ the candy bar. In the base-10 number system, the share is represented by 0.5 of the whole candy bar. Sharing between 3 people—each person receives 3 tenths ("longs") and they need to further divide the extra tenth among the 3 people. The extra tenth ("long") can be further divided using unit blocks. Each person will receive 3 more hundredths ("units"), further divide the extra hundredth ("unit") among the 3 people. This process needs to be repeated indefinitely. In the base-10 number system this share is represented by $0.3 + 0.03 + \ldots = 0.33333\ldots$. ■ Repeat this process sharing the candy bar represented by a "flat" with 4, 5, 6, 7, 8, 9, and 10 people. Determine which fractions result in a repeating decimal and which fractions result in a terminating decimal. See Grade 7 Support Document (pp. 72–74) (https://www.edu.gov.mb.ca/k12/cur/math/support_gr7/index.html)	**Assessment Criteria:** ■ Match a set of fractions to their decimal representations. ■ Sort a set of fractions as repeating or terminating decimals. ■ Express a fraction as a terminating or repeating decimal. ■ Express a repeating decimal as a fraction. ■ Express a terminating decimal as a fraction. ■ Order the numbers of a set that includes fractions, decimals, or integers in ascending or descending order, and verify the result using a variety of strategies. ■ Identify a number that would be between two numbers in an ordered sequence or on a horizontal or vertical number line. ■ Identify incorrectly placed numbers in an ordered sequence or on a horizontal or vertical number line. ■ Position fractions with like and unlike denominators from a set on a horizontal or vertical number line, and explain strategies used to determine order. ■ Order the numbers of a set by placing them on a horizontal or vertical number line that contains benchmarks, such as 0 and 1 or 0 and 5. ■ Position a set of fractions, including mixed numbers and improper fractions, on a horizontal or vertical number line, and explain strategies used to determine order.

Connections to Prior Learning

Instructional Strategies: *(continued)*

- Show students how to use a calculator to convert a fraction into a decimal, and record using the appropriate notation to indicate if the decimal is terminating or repeating. (Note: Students cannot rely on the calculator to verify whether a fraction is represented as a terminating or repeating decimal—e.g., $\frac{1}{7}$ = 0.14285714, which is a repeating decimal.)
- Order decimal and fractions on a number line (e.g., use a clothesline with fraction/decimal cards as a physical number line).

Learning Experiences

Language Foundation:

- Use age-appropriate examples and resources.
- Describe how to order fractions.
- Discuss how to identify a repeating decimal.
- Describe the repeating decimals, terminating decimals, and fractions.
- Discuss how to order decimal numbers by comparing decimal places.

Key Vocabulary:

- Decimal equivalent
- Decimal number
- Denominator
- Fraction
- Multiple
- Numerator
- Repeating decimal
- Terminating decimal
- Ascending
- Denominators
  - like and unlike
- Descending
- Equivalent fractions
- Horizontal
- Improper fractions
- Mixed numbers
- Proper fractions
- Unlike denominators
- Verify
- Vertical
- Tenths, hundredths, thousandths

Sentence Frames:

- _____ is greater than/less than _____.
- _____ is a terminating/repeating decimal because _____.
- _____ is between _____ and _____.

Learning Supports:

- Counters
- Number lines (vertical and horizontal)
- Base-10 blocks
- Calculators
- *National Library of Virtual Manipulatives* (http://nlvm.usu.edu/en/nav/category_g_2_t_1.html)
- Cuisinaire rods

Mental Math:

- Apply mental mathematics strategies for multiplication and division, such as
  - annexing, then adding zeros
  - halving and doubling using the distributive property
  - multiples of 10

Problem Solving:

- Organize a collection of library books according to the decimal numbers on the spine.
- Give two decimal numbers (i.e., 4.56, 4.55) and have the students find a number between them.
- Determine how to evenly divide $20 among
  a) two people
  b) three people
  c) five people
  d) six people
  e) ten people

LAL Numeracy Phase 2A: **Number: Operations with Integer Numbers**

Big Ideas: When a mathematics question is composed of more than one operation, the solution depends on the order in which the operations are done. It is important to follow a standardized order of operations so that everyone solving the identical problem will obtain the same answer.

	Numeracy	Language
Outcomes **7N6, 8N7**	■ Demonstrate—concretely, pictorially, and symbolically—an understanding of addition, subtraction, multiplication, and division of integers. ■ Explain generalization about integers (e.g., the Zero Principle—the sum of opposite integers is equal to zero).	■ Know and use with some consistency a range of simple grammatical features required of 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 mathematical tasks related to the outcomes. ■ Use a variety of simple cognitive and metacognitive strategies, with guidance, to enhance learning.

Connections to Prior Learning	■ Represent integer operations with models
	  ■ coloured counters
	  ■ horizontal and vertical number lines
	  ■ algebra tiles
	■ Demonstrate—concretely, pictorially, and symbolically—an understanding of operations with whole numbers.
	■ Explain the properties of
	  ■ 0 and 1 for multiplication
	  ■ 1 for division
		Recognize and connect concepts and skills to do the following:
		■ Write solutions to addition, subtraction, multiplication, and division of integers using symbols and an equals sign.
		■ Demonstrate the result when zero is added or taken away from a number.
		■ Derive and explain an estimate of an integer computation.

	Instructional Strategies: ■ Use concrete materials to explore the sum of opposite integers. ■ Using a horizontal or vertical number line, show the results of adding or subtracting negative and positive integers (e.g., a move in one direction followed by an equivalent move in the opposite direction results in no net change in position). ■ Use total physical response (TPR) and manipulatives to determine a pattern and rule for adding and subtracting two integers. Record symbolically. ■ Apply the rule/algorithm for adding and subtracting integers in problem-solving situations. ■ Model the process of multiplying two integers using concrete materials. ■ Generalize and apply a rule for determining the sign of the product or quotient of integers. ■ Model the process of dividing an integer by an integer using concrete materials or pictorial representations, and record the process.	**Assessment Criteria:** ■ Illustrate, using a horizontal or vertical number line, the results of adding or subtracting negative and positive integers. ■ Add, subtract, multiply, or divide two integers using concrete materials or pictorial representations, and record the process symbolically. ■ Identify the operation(s) required to solve a problem involving integers. ■ Solve a problem involving integers, taking into consideration order of operations.

LAL Numeracy Phase 2A: **Number: Operations with Integer Numbers** *(continued)*

Learning Experiences

Language Foundation:

- Use age-appropriate examples and resources.
- Describe the process of ordering integers on a horizontal or vertical number line (e.g., negative is left or down, positive is right or up).
- Discuss examples of opposites, multiplying by 0 and 1, and dividing by 1

Key Vocabulary:

- Integer
- Negative integer
- Opposite integer
- Positive integer
- Order of operation
- Sign

Sentence Frames:

- (negative/positive) (multiplied by/divided by) (negative/positive) gives a (negative/positive) answer. This is (choose one):
  a) Always true
  b) Sometimes true
  c) Never true
- (negative/positive) (added to/minus) (negative/positive) gives a (negative/positive) answer. This is (choose one):
  a) Always true
  b) Sometimes true
  c) Never true
- _____ + (−8) = _____
- −2 − (−5) = _____

Learning Supports:

- Coloured counters
- Number line
- Deck of cards
- 10-sided number cube
- Algebra tiles
- Math journal
- *National Library of Virtual Manipulatives*, 1999–2010 (http://nlvm.usu.edu/en/nav/category_g_2_t_1.html)

Mental Math:

- Demonstrate the integer computations of one- and two-digit numbers.

Problem Solving:

- It was a dry summer in Winnipeg. The Red River was 2 m below its normal level. During August, there was no rain, and the water level went down another metre. How far is the river below the normal level now?
- Maria owed her dad $12. Her dad cancelled $5 of the debt. How much does she still owe?
- Andrea had a collection of bracelets. She sold four bracelets to friends at school and used the money to purchase a new bracelet. What is the resulting change in the number of bracelets in her collection?
- The temperature is −8°C and it goes down 4°C. What is the new temperature?
- You owe your brother $25 and you earn $20. If you give all the money to your brother, how much money do you have? How much do you still owe your brother?

LAL Numeracy Phase 2A: **Number: Problem Solving Using Percent**

Big Ideas: Personal strategies and algorithms provide flexible and efficient methods of calculating that vary depending on the context and the numbers involved. There are a variety of ways to estimate sums, differences, products, and quotients.

	Numeracy	Language
Outcomes **7N3**	■ Demonstrate an understanding of whole number percents from 1% to 100%. ■ Solve problems involving percents from 1% to 100%.	■ Know and use with some consistency a range of simple grammatical features required of 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 mathematical tasks related to the outcomes. ■ Use a variety of simple cognitive and metacognitive strategies, with guidance, to enhance learning.
Connections to Prior Learning	■ Demonstrate—concretely, pictorially, and symbolically—conceptual understanding of representing fractions and decimals. ■ Compare and order fractions and decimals using benchmarks and equivalent values. ■ When translating standard notation to percent, demonstrate an understanding of how the decimal point indicates where to read the hundredths in a number.	Know and use emergent repertoires of words and phrases to ■ convert decimals to % ■ convert fractions to % ■ solve problems using percent from 1% to 100%
	Instructional Strategies: ■ Provide visual representations of equivalent fractions. Students record the representation as a fraction, decimal, and percent, using a calculator if needed. The word *percent* means "per hundred" and may be substituted for the word *hundredths* when reading a number. Therefore, $\frac{7}{100}$ or 0.07 may be read as 7 hundredths and also as 7 percent. ■ Create a set of cards with equivalent percent, fraction, and decimal cards (numeric and pictorial). Play a game with the objective to create sets of four matching cards (percent, fraction, decimal, illustration) as in *Rummy* (see Grade 7 Support Document, BLM 7.N.2.3 at https://www.edu.gov.mb.ca/k12/cur/math/support_gr7/index.html).	**Assessment Criteria:** ■ Express a percent as a decimal or fraction. ■ Solve a problem that involves finding a percent. ■ Determine the answer to a percent problem where the answer requires rounding, and explain why an approximate answer is needed.

LAL Numeracy Phase 2A: **Number: Problem Solving Using Percent** *(continued)*

Learning Experiences

Language Foundation:

- Use age-appropriate examples and resources.
- Describe procedures to convert percents to decimals and fractions.
- Discuss the purpose of solving problems using percents, connecting to real-life situations.

Key Vocabulary:

- Decimal
- Equivalent
- Factor
- Fraction
- Multiple
- Percent
- Proportion

Sentence Frames:

- _____ % expressed as a fraction is _____.
- The fraction _____ expressed as a percent is _____.
- _____ % of _____ is _____.
- Adding _____ % to _____ results in _____.

Learning Supports:

- Grid paper
- Base-10 blocks
- Calculator
- Math journal
- Fraction bars
- *National Library of Virtual Manipulatives* (http://nlvm.usu.edu/en/nav/category_g_2_t_1.html)

Mental Math:

- Use multiplication and division facts.
- Convert benchmark fractions to percents (e.g., $\frac{1}{4}$ = 25%, $\frac{1}{2}$ = 50%).

Problem Solving:

- Beckett bought a sweater for $24.99 before tax. Sales tax is 13%. What is the total amount she will pay for the sweater?
- In a collection of 25 marbles, Joe lost 4 marbles. What percent of marbles did he have remaining? What percent of marbles did he lose?
- Phones are on sale for 30% off. The regular price of the phone you want is $249.99.
  a) How much is the discount?
  b) What is the sale price?

LAL Numeracy Phase 2A: **Number: Adding and Subtracting Positive Fractions**

Big Ideas: The four operations are intrinsically related; flexible methods of calculation require a strong understanding of operations and properties of the operation; there are a variety of ways to estimate sums, differences, products, and quotients.

	Numeracy	Language
Outcomes 7N5	■ Demonstrate—concretely, pictorially, and symbolically—an understanding of adding and subtracting positive fractions and mixed numbers, with like and unlike denominators (limited to positive sums and differences).	■ Know and use with some consistency a range of simple 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 mathematical tasks related to the outcomes. ■ Use a variety of simple cognitive and metacognitive strategies, with guidance, to enhance learning.

Connections to Prior Learning	■ Demonstrate an understanding of fractions less than or equal to one by using concrete and pictorial representations to
	  ■ name and record fractions for the parts of a whole or a set
	  ■ compare and order fractions
	  ■ model and explain that for different wholes, two identical fractions may not represent the same quantity
	  ■ provide examples of where fractions are used
	■ Demonstrate—concretely, pictorially, and symbolically—an understanding of addition and subtraction with whole numbers.
	■ Represent values with equivalent fractions.
	■ Determine common multiples of two numbers..
		Use emergent repertoires of words and phrases to do the following:
		■ State equivalent fraction with the same denominator as the other fraction.
		■ Write solutions to addition and subtraction of fractions using symbols and an equals sign.
		■ Demonstrate the result when zero is added or taken away from a number.
		■ Derive and explain an estimate of an addition and a subtraction computation.

	Instructional Strategies: ■ Use fraction strips, Cuisenaire rods, or pattern blocks to compare fractions with like and unlike denominators. ■ Use manipulatives to represent addition and subtraction of fractions with like and unlike denominators. ■ Determine common denominator using arrays (e.g., determine $\frac{2}{3}+\frac{1}{4}$, using a 4×3 array of 12).	**Assessment Criteria:** ■ Model addition and subtraction of positive fractions or mixed numbers using concrete representations, and record symbolically. ■ Determine the sum or difference of two positive fractions or mixed numbers with like denominators. ■ Determine a common denominator for a set of positive fractions or mixed numbers. ■ Determine the sum or difference of two positive fractions or mixed numbers with unlike denominators. ■ Simplify a positive fraction or mixed number by identifying the common factor between the numerator and denominator. ■ Solve a problem involving the addition or subtraction of positive fractions or mixed numbers, and determine whether the solution is reasonable.

LAL Numeracy Phase 2A: **Number: Adding and Subtracting Positive Fractions** *(continued)*

Learning Experiences

Language Foundation:

- Discuss the conceptual understanding of fractions (i.e., parts of a whole).
- Describe the process for adding and subtracting fractions using personal strategies, standard algorithms, estimating, and problem solving.

Key Vocabulary:

- Denominator
- Sum
- Difference
- Equivalent fractions
- Fraction
- Mixed number
- Multiple
- Lowest common multiple
- Numerator
- Simplify

Sentence Frames:

- _____ and _____ have like/unlike denominators.
- _____ and _____ have common denominators.
- _____ and _____ are/are not equivalent fractions.
- _____ is an improper fraction.
- _____ is a mixed number.
- The greatest common factor of _____ and _____ is _____.
- A common denominator for _____ and _____ is _____.

Learning Supports:

- Fraction strips
- Grid paper
- Coloured counters
- Number lines
- Cuisenaire rods
- Pattern blocks
- Clocks
- Money

Mental Math:

- Demonstrate the ability to use the following:
  - Addition facts
  - Subtraction facts
  - Multiplication facts
  - Division facts
  - Multiples

Problem Solving:

- Chris is allowed to play video games for $\frac{5}{3}$ hours each day. He has already played for a $\frac{1}{2}$ hour. What fraction of time does he have left to play video games?
- Mark ate 1 slice of cake. Nova ate 2 slices. If there were initially 5 slices and all the slices are the same size, what fraction of the cake is remaining?
- Emma and Daniel need 1 can of orange paint for a project. Emma has $\frac{2}{5}$ of a can. Daniel has $\frac{1}{2}$ of a can. If they mix their paints together, will they have a full can?

LAL Numeracy Phase 2A: **Patterns and Relations: Patterning and Table of Values**

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

	Numeracy	Language

Outcomes
7PR1, 7PR2
	■ 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.
		■ Demonstrate, orally and in writing and by using manipulatives, diagrams, sound, and actions, an understanding of increasing and decreasing repeating patterns by
		  ■ describing
		  ■ reproducing
		  ■ extending
		  ■ creating
		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	■ Describe, translate, repeat, and extend patterns.
	■ Progress from repeating patterns (ABABAB or AABAABAAB) to growing patterns (1, 3, 5, 7, … and 2, 4, 8, 16, …).
	■ Identify, represent, and describe patterns and relationships using graphs and tables.
	■ Use a table of values to record relations.
		■ Recognize and produce a limited range of simple text forms, such as reports, graphs, and charts, to describe, translate, and extend patterns.
		■ Know and use a developing repertoire of words and phrases to
		  ■ construct a table of values
		  ■ create a graph
		  ■ draw conclusions from the data

	Instructional Strategies: ■ Use manipulatives to create, repeat, and extend patterns. ■ Ask students to describe and compare a sample of patterns or patterns they have seen. ■ Use a student example, including three or four terms of a basic growing pattern. Students may build the pattern and record it in their math journals or notebooks. ■ Students can describe the pattern rule using words and a mathematical expression. ■ Have students translate a pattern into a table of values, with one column being the term number x and the other being the term value (the relation to x) or y. ■ Graph the table of values on a grid. Include term number and term value in the labels of the x-axis and y-axis. ■ Connect the x- and y-variables to the term number and the term values and to the coordinate points. Write an equation to represent y in terms of x.	**Assessment Criteria:** ■ Formulate a relation to represent the relationship in an oral or written pattern. ■ Provide a context for a relation that represents a pattern. ■ Represent a pattern in the environment using a relation. ■ Create a table of values for a relation by substituting values for the variable. ■ Sketch the graph from a table of values created for a relation, and describe the patterns found in the graph to draw conclusions (e.g., graph the relationships between n and $2n + 3$). ■ Describe the relationship shown on a graph using everyday language in spoken or written form to solve problems. ■ Match a set of relations to a graph and a graph to a set of relations.

Learning Experiences

Language Foundation:

- Use concrete materials to represent, extend, and explain patterns.
- Explain mathematical relationships using charts and diagrams.
- Use symbols (*x*, *y*, etc.) to represent an unknown.
- Use (*x*, *y*) coordinates to represent points on a grid.
- Appropriately label the *x*-axis and *y*-axis on a graph.

Key Vocabulary:

- Expression
- Coordinates
- Graph
- Grid
- Linear relation
- Next
- Pattern
- Previous
- Relation
- Represent
- Substitution
- Table of values
- Term
- Unknown
- Value
- Variable

Sentence Frames:

- The coordinates (_____, _____) represent a point. _____ represents the horizontal value and _____ represents the vertical value.
- Given this table of values:

Number of Students	Total cost of Going to a Movie
5	$40
10	$80
15	
20	$160
25	

The total cost of going to a movie for _____ number of students will be $_____.

Learning Supports:

- Linking cubes
- Patterns blocks
- Graph paper
- Notebook for math journal

Mental Math:

- What is the next term in the pattern 11, 16, 21, 26, …?
- What is the next term in the pattern 32, 28, 24, …?
- Extend the pattern to determine the next value in the table.

Term	1	2	3	
Value	3	6	9	

Problem Solving:

- Amanda puts a 3 into the function machine and gets out a 7. Use symbols or words to show three different rules the function machine could be following.
- The cost of a taxi ride is $3.00 plus $1.20 per kilometre. Make a table of values showing the relationship between the kilometres travelled and the cost.

LAL Numeracy Phase 2A: **Patterns and Relations: Algebraic Representations with Expressions**

Big Ideas: Algebra, with the use of symbols or variables, is a tool for generalizing arithmetic expressions and representing mathematical situations and patterns in our world.

	Numeracy	Language

Outcomes
7PR4, 7PR5
	■ Explain the difference between an expression and an equation.
	■ Evaluate an expression given the value of the variable(s).
		■ 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.
		■ 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—concretely, pictorially, and symbolically—and explain the meaning of preservation of equality. ■ Express a problem as an equation in which a symbol is used to represent an unknown number. ■ Solve one-step equations involving a symbol to represent an unknown number. ■ Solve problems involving single-variable (expressed as symbols or letters), one-step equations with whole-number coefficients and whole-number solutions.	Know and use emergent repertoires of words and phrases to do the following: ■ Explain why a term is a constant term. ■ Explain the variable and what it represents in the equation. ■ Describe the process in solving one-step equations.
	Instructional Strategies: ■ Have students use a variety of variables to express contextual relationships or to identify possible contexts for a relation (e.g., $4g = s$. Four students in a group, so $4 \times$ # of groups = the # of students.). ■ Given a relation, establish a process to enable students to describe the relation in words. ■ Use substitution to evaluate an expression. ■ Analyze a relation (such as $x + 1 = y$) by identifying the two expressions, the variables, and their relationship. ■ Create a possible context, situation, or a story to represent a relation. ■ Illustrate how to analyze the description and find the parts to represent x, y, and constants or numerical coefficients by using examples (e.g., a girl owns three horses. She purchases more horses at an auction; consequently, she now has more horses. The equation is $3 + x = y$.).	**Assessment Criteria:** ■ Identify and provide an example of a constant term, a numerical coefficient, and a variable in an expression and an equation. ■ Explain what a variable is and how it is used in an expression. ■ Provide an example of an expression and an equation, and explain how they are similar and different. ■ Substitute a value for each unknown in an expression and evaluate the expression.

LAL Numeracy Phase 2A: **Patterns and Relations: Algebraic Representations with Expressions** *(continued)*

Learning Experiences

Language Foundation:

- Use appropriate mathematics vocabulary to describe an expression and an equation as it relates to a real-life context of a pattern.

Key Vocabulary:

- Constant
- Equation
- Equivalent
- Evaluate
- Expression
- Numerical coefficient
- Relation
- Represent
- Substitution
- Term
- Unknown
- Value
- Variable

Sentence Frames:

- In the relation _____ (e.g., $y = 3x + 2$), the numerical coefficient is _____ and the constant is _____.
- In the equation _____ the variables are _____ and _____.
- Given the relation _____ ($y = x + 5$), the two equal expressions are _____ and _____.
- _____ ($3b + 4$ or $c = 3 - 2$) is an _____ (expression or equation).
- For the expression, $3x + 1$, if $x =$ _____, then the value of the expression is _____.
- For the equation, $3x + 1 = y$, if $x =$ _____, then the value of y is _____.

Learning Supports:

- Algebra tiles
- Coloured counters
- Number lines

Mental Math:

- Find the value of the expression, $x + 3y$, when x is 12 and y is 2.
- Three times a number is 18. What is the number?
- The expression $2x - 1$ has a value of 49. What is the value of x?
- Evaluate the following expressions:
  - $x - 25$, when $x = 89$
  - $3m$, when $m = 17$
  - $\frac{24}{k}$, when $k = 8$
  - $\frac{24}{k}$, when $k = 24$

Problem Solving:

- Write two or three different expressions for the number of loonies and quarters you can use to make $5.00.
- Write two or three different expressions for the number of loonies, quarters, dimes, and/or nickels you can use to make $2.00.

LAL Numeracy Phase 2A: **Patterns and Relations: Representations with Equations**

Big Ideas: The equals sign describes the balance between the quantities on either side of the equals sign; Relationships between quantities can be described using rules involving variables.

	Numeracy	Language

Outcomes
7PR6, 7PR7
	■ Model and solve problems—concretely, pictorially, and symbolically—represented by
	  ■ one-step equations of the form $x + a = b$, where a and b are integers
	  ■ linear equations of the form:
	  — $ax = b$
	  — $ax + b = c$
	  — $\frac{x}{a} = b, a \neq 0$
	  where a, b, and c are integers
		■ Demonstrate—concretely, pictorially, and symbolically—an understanding of linear equations involving whole numbers and one-step equations involving integers.
		■ 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—concretely, pictorially, and symbolically—an understanding of the addition, subtraction, multiplication, and division of integers.
	■ Demonstrate—concretely, pictorially, and symbolically—an understanding of the preservation of equality.
	■ Write an equation in which a symbol is used to represent an unknown number in context.
	■ Create a table of values representing a relation.
		■ Demonstrate orally and in writing an understanding of
		  ■ representing
		  ■ solving
		  equations.

	Instructional Strategies: ■ Use counters and a pan balance—concretely and pictorially—to solve an equation using whole numbers. Describe and connect this strategy to symbolic representation of equation solving. ■ Use coloured tiles and a balance metaphor to solve equations using integers. Describe and connect this strategy to a symbolic representation of equation solving. ■ 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.	**Assessment Criteria:** ■ Represent a problem with a linear equation and solve the equation using concrete models. ■ Solve a problem using a linear equation and record the process. ■ Verify the solution to a linear equation using concrete materials or diagrams. ■ Substitute a possible solution for the variable in a linear equation to verify the equality. ■ Draw a visual representation of the steps used to solve a linear equation. ■ Solve a problem using a linear equation and record the process. ■ Verify the solution to a linear equation using concrete materials or diagrams. ■ Substitute a possible solution for the variable in a linear equation to verify the equality.

LAL Numeracy Phase 2A: **Patterns and Relations: Algebraic Representations with Equations** *(continued)*

Learning Experiences

Language Foundation:

- Use appropriate vocabulary to describe the connections between the concrete and symbolic representations of an equation.
- Apply the knowledge of mathematical vocabulary to solve equations (e.g., doubling, halving).
- Describe the steps involved in solving equations algebraically and graphically.

Key Vocabulary:

- Substitution
- Halving
- Multiplying
- Value
- Variable
- Positive numbers
- Negative numbers

Sentence Frames:

- To solve the equation $3x = 24$, the first step is to _____ on _____ side(s) of the equation.
- In the _____ (equation, expression) $2x + 1 = y$, if $x = 3$, then y equals _____.

Learning Supports:

- Coloured counters
- Pan balance
- Graph paper

Mental Math:

- Solve the equations:
  - $x + 1 = 4$
  - $x + 4 = 1$
  - $2y = 12$
  - $14y = 2$
  - $x - 3 = -5$

Problem Solving:

- In the relation $2x + 3 = y$,
  - find the value of y when x is any number from 1 to 5. Describe patterns you see.
  - find the value of x when y is 21

LAL Numeracy Phase 2A: **Shape and Space: Circles**

Big Ideas: It is necessary to understand the attributes of an object before anything can be measured; measurement involves a selected attribute of an object (length) and a comparison of the object being measured against non-standard and standard units of the same attributes.

	Numeracy	Language
Outcomes **7SS1**	Demonstrate an understanding of circles by ■ describing the relationships among radius, diameter, and circumference of circles ■ relating circumference to pi (π) ■ determining the sum of central angles ■ constructing circles with a given radius or diameter ■ solving problems involving the radii, diameter, and circumference of a circle	■ 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. ■ Ask for and provide information on familiar topics in structured situations. ■ Record essential information into a graphic organizer after receiving guidance (e.g., complete a T-chart, Venn diagram). ■ Recognize and share with others some information concerning similarities and differences concerning their first language, English, and other languages.

Connections to Prior Learning	■ 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 benchmarks
	  ■ determining angle measures in degrees
	  ■ drawing and labelling angles when the measure is specified
	■ Describe, compare, and order fractions, decimals, and percents.
		Use visuals, realia, and/or first language to add a developing range of new knowledge, concepts, and skills to demonstrate an understanding of circle properties, including the following:
		■ size of circle
		■ radius
		■ diameter
		■ concept of pi (π)
		■ circumference
		■ angles

	Instructional Strategies: ■ Discuss where you would find circles in the environment (e.g., clock, compass, oven dial, pizza, etc.). ■ Using large cut-outs of angles (two copies of 45° and 90° angles, one copy of a 180° angle), have students explore central angles. For example, when the vertex of the angles are put together, the sum of the angles is 360° and a circle is formed. ■ Draw circles using the radius and the diameter. ■ Using a string, directly measure the length of the string to determine the circumference, diameter, and radius of that circle; calculate the radius, diameter, and circumference to compare the values and look for patterns. ■ Use measurements of circles to confirm that pi (π) is the ratio of the circumference to the diameter.	**Assessment Criteria:** ■ Illustrate and explain that the diameter is twice the radius in a circle. ■ Illustrate and explain that the circumference is approximately three times the diameter in a circle. ■ Explain that, for all circles, pi (π) is the ratio of the circumference to the diameter (d), and its value is approximately 3.14. ■ Explain, using an illustration, that the sum of the central angles of a circle is 360°. ■ Draw a circle with a given radius or diameter with or without a compass. ■ Solve a contextual problem involving circles.

Learning Experiences

Language Foundation:

- Develop foundational oral language through kinesthetic movement (e.g., students forming circles), realia, and visuals.
- Describe the relationship between the radius, diameter, and circumference of a circle.
- Identify central angles and their relationship to the whole circle.

Key Vocabulary:

- Angle
- Arc
- Central angle
- Circle
- Circumference
- Diameter
- Pi
- Radius
- Right angle
- Estimate
- Approximately

Sentence Frames:

- The total angle of a circle is _____.
- Each degree is _____ of a circle.
- The circumference of a circle can be found by _____ pi by the _____ the circle.
- If you know radius of a circle, the _____ is twice as large.
- If a central angle is _____, then the other central angle must be _____.

Learning Supports:

- Cut-outs for angles of different measures copied on card stock or on bond paper (two copies of 45° and 90° angles, one copy of 180° angle)
- Pictures/illustrations
- Scissors
- Protractors
- Rulers
- String

Mental Math:

- Determine the value of n:
  - $(90)(n) = 360$
  - $(45)(n) = 360$
  - $(30)(n) = 360$
  - $(90 + n) = 360$
  - $(225 + n) = 360$
- Mystery angle: Students work with a partner. One partner gives the central angle of an incomplete circle. The other student must identify the angle of the missing part.

Problem Solving:

- The radius of a clock is 43 cm. What is the clock's diameter?
- A plate has a diameter of 15 cm. Find the circumference.

LAL Numeracy Phase 2A: **Shape and Space: Area**

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

	Numeracy	Language

Outcomes
7SS2
	■ Develop and apply formulas for determining areas of
	  ■ parallelograms
	  ■ triangles
	  ■ circles
		■ 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.
		■ Recognize and share with others some information concerning similarities and differences concerning their first language, English, and other languages.

Connections to Prior Learning	Students build on their prior knowledge of rectangles to generalize rules for determining the area of other shapes. Students should be able to do the following: ■ Describe area as the number of squares required to cover a flat surface. The squares can be any size (e.g., squares on a grid, square inches, square centimetres, etc.). ■ Identify different classifications of triangles and quadrilaterals according to their attributes. ■ Identify parallel, perpendicular, intersecting, horizontal, and vertical lines. ■ Identify the base and height of shapes. ■ Demonstrate that the area covered doesn't change when a shape is cut up into pieces and re-arranged into a different shape. ■ Calculate the area of rectangles.	Use visuals, realia, and/or their first language to add a developing range of new knowledge, concepts, and skills to do the following: ■ Identify different shapes. ■ Describe the process or the formula for calculating the area of different shapes. ■ Calculate the area of a given shape.
	Instructional Strategies: Students will explore the area of a parallelogram: ■ Determine the area of parallelograms on grid paper by counting the number of squares and partial squares. ■ Cut a parallelogram shape with one cut and rearrange the pieces to form a rectangle. Demonstrate that the area of the parallelogram is the same as the corresponding rectangle. Measure the base and height, and then calculate the area of the rectangle and, thus, the parallelogram. ■ Show how the height of a parallelogram relates to the height of a corresponding rectangle and the base of the parallelogram is the same as the base of a corresponding rectangle. ■ Generalize a formula for the area of parallelograms as base × height. ■ Find the area of parallelograms on grid paper by determining their base and height.	**Assessment Criteria:** ■ Illustrate and explain how the area of a rectangle can be used to determine the area of a triangle. ■ Generalize a rule to create a formula for determining the area of triangles. ■ Illustrate and explain how the area of a rectangle can be used to determine the area of a parallelogram. ■ Generalize a rule to create a formula for determining the area of parallelograms. ■ Illustrate and explain how to estimate the area of a circle without the use of a formula. ■ Apply a formula for determining the area of a circle. ■ Solve a problem involving the area of triangles, parallelograms, or circles.

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

Students will explore the area of a triangle:

- Determine the area of triangles on grid paper by counting the number of squares and partial squares.
- Cut a parallelogram shape with one cut along a diagonal to form two identical triangles. Demonstrate that the area of each triangle is half the area of the corresponding parallelogram. Measure the base and height, and then calculate the area of the parallelogram. Determine the area of the triangle.
- Show how the height of a triangle relates to the height of a corresponding parallelogram. The base of the triangle is the same as the base of a corresponding parallelogram (and thus corresponding rectangle).
- Generalize a formula for the area of triangles as $\frac{1}{2}$(base $\times$ height).
- Find the area of triangles on grid paper by determining their base and height.

Students will explore the area of a circle:

- Estimate the area of circles on grid paper by counting the number of squares and partial squares.
- Using various-sized circle-shaped cut-outs, measure the radius and calculate the circumference. Cut the circle shape into eight pie-shaped wedges and arrange them into a parallelogram. Calculate the area of the circle using the formula for a parallelogram and the measurements of radius and circumference.
- Develop a formula for the area of a circle, pi $\times$ r $\times$ r or πr^2.

Learning Experiences

Language Foundation:

- Discuss the relationship between triangles and parallelograms.
- Describe the process for deriving areas of triangles and parallelograms.
- Identify and label parts of a circle, triangle, or parallelogram used in calculating the area of circle.

Key Vocabulary:

- Area
- Rectangle
- Perimeter
- Circumference
- Base
- Square units
- Formula
- Height
- Vertex
- Horizontal
- Vertical
- Intersecting
- Width
- Length
- Parallel
- Parallelogram
- Perpendicular
- Polygon

Sentence Frames:

- The rule to determine the area of triangles is _____.
- The rule to determine the area of parallelograms is _____.
- A circle with a radius of _____ cm has an area of _____ cm^2.

Learning Supports:

- Scissors
- Grid paper
- Protractors
- Rulers
- Calculators
- Geoboard

Mental Math:

- Find the area of a parallelogram that has a base of 3 and a perpendicular height of 2.
- Given a parallelogram, find the area and perimeter.
- Given the radius of a circle, estimate the area and the circumference (for mental math purposes only, it may be helpful to approximate pi as 3).

Problem Solving:

- If the base of the triangle is 6 cm and the height is 3 cm, what is the area?
- If the base of a parallelogram is 6 cm and the height is 3 times its base, what is the area?
- Create a square and triangle with the same area.
- Create a rectangle and a parallelogram with the same area.
- If you have a triangle with a base of 24 and a perpendicular height of 8, create other triangles with the same area.

LAL Numeracy Phase 2A: **Shape and Space: Position and Motion—Plotting Points**

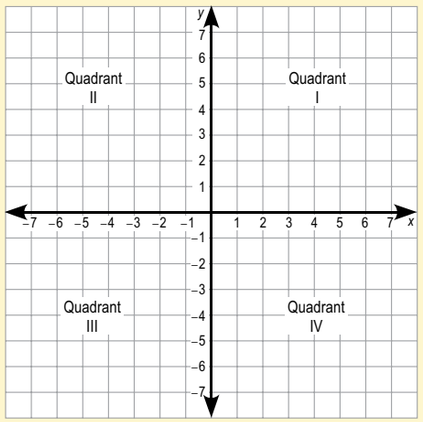
Big Ideas: Shapes can be relocated and reoriented using mathematical procedures; shapes can be described in terms of their location in a plane or in a space.

	Numeracy	Language
Outcomes **6SS8, 7SS4**	■ Demonstrate an understanding of the Cartesian plane (formed by a horizontal [*x*] axis and a vertical [*y*] axis, creating four quadrants). ■ Identify and plot points in the first quadrant of a Cartesian coordinate plane, using whole number ordered pairs. ■ Identify and plot points in the four quadrants of a Cartesian coordinate plane using ordered pairs.	■ 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 demonstrate an understanding of the Cartesian coordinate system and plot points in each of the four quadrants. ■ 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 a short oral presentation or interaction on a familiar topic and some supported unfamiliar routines and contexts in a structured situation.
Connections to Prior Learning	■ Demonstrate an understanding of integers—concretely, pictorially, and symbolically. ■ Place a set of numbers on a horizontal or vertical number line. ■ Create, label, and interpret line graphs. ■ Construct a table of values from a relation, graph the table of values, and analyze the graph to draw conclusions and solve problems. ■ Graph collected data and analyze the graph to solve problems. ■ Use total physical responses (TPR) strategies without and then with a large Cartesian plane on the floor of the classroom to describe locations or describe movement of students/objects.	■ Demonstrate—orally, graphically, and in writing—an understanding of plotting points in any of the four quadrants of the Cartesian coordinate system.

Connections to Prior Learning

Instructional Strategies:

- Discuss the features of the Cartesian plane:
  - The horizontal number line in the Cartesian number line is termed the *x*-axis, and the vertical number line the *y*-axis.
  - The point found at (0, 0) is called the origin.
- Develop the concept of ordered pairs (i.e., horizontal direction first, vertical direction second) and how to plot coordinates on a Cartesian plane.
- Plot and connect a list of ordered pairs (given by the teacher) to form a simple shape or a picture.
- Create a simple shape, such as a polygon, and generate a list of ordered pairs for the vertices of the shape.
- Students verify each other's work.
- Play a version of games such as *Battleship*, *Private Detective*, hide-and-seek, etc., with a focus on quadrant 1.
- Have students create a math story. The story will require a main character who is able to move about freely (e.g., a dog in a field, a person on a bus, a soccer player on a field).



Assessment Criteria:

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

- Label the axes of a Cartesian plane and identify the origin.
- Plot a point in a Cartesian plane given its ordered pair.
- Match points in a Cartesian plane with their corresponding ordered pair.
- Label the axes of a Cartesian plane and identify the origin.
- Identify the location of a point in any quadrant of a Cartesian plane using an ordered pair.
- Plot the point corresponding to an ordered pair on a Cartesian plane with units of 1, 2, 5, or 10 on its axes.
- Draw shapes and designs, using ordered pairs, on a Cartesian plane.
- Create shapes and designs on a Cartesian plane and identify the points used.

Learning Experiences

Language Foundation:

- Develop foundational oral language through realia and visuals.
- Discuss the use of horizontal and vertical number lines.
- Describe movement on a Cartesian coordinate plane.

Key Vocabulary:

- Cartesian plane
- Horizontal
- Vertical
- Ordered pairs
- Origin
- Point
- Quadrant
- Coordinates
- Axes (plural)
- *x*-axis
- *y*-axis
- Negative
- Positive

Sentence Frames:

- The _____ (horizontal, vertical) axis is the _____ (*x*-axis, *y*-axis).
- Quadrant _____ (1, 2, 3, 4) is in the _____ _____ (top, right, left, bottom) of the Cartesian plane.
- The point (0, 0) is called the _____.
- The ordered pair (4, 3) is repositioned three spaces to the left. What are the new coordinates?

Learning Supports:

- Grid paper
- Geoboards
- Stickers

Mental Math:

- In which quadrant is the point (3, −4)?
- In which quadrant is the point (−5, −1)?
- Write the coordinate pairs of a point that is in quadrant IV.
- What are four ordered pairs that are 5 spaces away in all four directions from the point (3, 1)

Problem Solving:

- If you start at a point (1, 4) and move up 2 units, left 5 units, and down 3 units, determine your end point.
- Determine four coordinate pairs that, when joined, form a square.

LAL Numeracy Phase 2A: **Shape and Space: Position and Motion—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 **7SS5**	Perform transformations of 2-D shapes through ■ translations ■ rotations ■ reflections in all four quadrants of a Cartesian coordinate plane, limited to integral vertices.	■ 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 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. ■ 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; social invitations; buying a drink at the convenience store). ■ 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	■ Identify polygons. ■ Identify transformations without coordinates. ■ Identify and plot points in all quadrants of a Cartesian plane using integer ordered pairs. ■ Perform and identify a single transformation (e.g., translation, rotation, or reflection) of a 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.	Using emergent vocabulary, express the following with keywords and simple sentences: ■ Demonstrate the process for translations, rotations, and reflections of 2-D shapes in all four quadrants of the Cartesian coordinate plane.
	Instructional Strategies: ■ Using TPR, students work in groups to demonstrate and discuss transformations concretely, using strings, mirrors, etc. ■ Using grid paper with a Cartesian plane and polygon cutouts, place a polygon on grid paper and demonstrate translations, reflections, and rotations with coordinate points.	**Assessment Criteria:** Use keywords, short phrases, and short sentences to do the following: ■ Identify the coordinates of the vertices of a 2-D shape on a Cartesian plane. ■ Describe the horizontal and vertical movement required to move from a given point to another point on a Cartesian plane.

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

- On a grid paper with polygons sketched, perform a specific transformation and label the image with coordinate points.
- Model recording various transformations and review correct labelling of the following:
  - vertices (ABC)—corresponding vertices (A′, B′, C′—A prime, B prime, C prime)
  - slide arrows
  - lines of reflection
  - centre of rotation
  - direction and amount of degrees of rotation

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

- Describe the positional change of the vertices of a 2-D shape to the corresponding vertices of its image as a result of a transformation or successive transformations on a Cartesian plane.
- Perform a transformation or consecutive transformations on a 2-D shape, and identify the coordinates of the vertices of the image.
- Describe the image resulting from the transformation of a 2-D shape on a Cartesian plane by comparing the coordinates of the vertices of the image.

Learning Experiences

Language Foundation:

- Develop foundational oral language through TPR.
- Describe the transformations orally and in writing.

Key Vocabulary:

- Cartesian plane
- Centre of rotation
- Clockwise
- Counter-clockwise
- Congruent
- Coordinates
- Original
- Image
- Line of reflection
- Prime
- Quadrant
- Reflection
- Rotation
- Transformation
- Translation
- Vertex
- Vertices

Sentence Frames:

- To _____ (translate, rotate, and reflect) a shape means to _____ it.
- The shape or figure before the transformation is called the _____.
- A vertex labelled A in the original shape will now be labelled _____ in the image shape

Learning Supports:

- Polygon cut-outs
- String
- Mira
- Mirror
- Grid paper with Cartesian plane
- Linking cubes

Mental Math:

- Point A (3, −2) is translated 5 left. Where is A′?
- Point A (−1, −2) is translated 5 left, 4 down. Where is A′?
- Point B (−4, 3) is reflected over the *x*-axis. Where is B′?
- Point C (−5, 3) is rotated 180° clockwise about the origin. Where is C?
- Point D (−9, −3) is reflected over the *y*-axis. Where is D?
- Point E (3, −5) is rotated 90° clockwise about the origin. Where is E?

Problem Solving:

- The image of a point is at (5, 3) after being translated 4 down and 1 up. Where was the original point?
- A point is at (3, −2) and is reflected over the *x*-axis and then over the *y*-axis. What are the new coordinates?
- Starting at (−1, 3), describe the horizontal and vertical movements to end at (2, −3).

LAL Numeracy Phase 2A: **Statistics and Probability: Circle Graphs**

Big Ideas: Data is gathered and organized in order to answer questions; visual displays quickly reveal information about the data.

Outcomes 7SP3

Numeracy

- Construct, label, and interpret a circle graph to solve problems.
- Recognize that the circle graph displays the distribution of data, not the actual data values.
- Group data by categories expressed as a percent of the whole.
- Represent each sector of the graph as a part-to-whole ratio.

Language

- Know and use with some consistency a range of simple grammatical features required of 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 mathematical tasks related to the outcomes.
- Use a variety of simple cognitive and metacognitive strategies, with guidance, to enhance learning.

Connections to Prior Learning

- Demonstrate an understanding of angles by
  - estimating the measure of angles using 45°, 90°, and 180° as reference angles
  - determining angle measures in degrees
- Compare, order, and demonstrate an understanding of operations involving fractions, decimals, and percents.
- Demonstrate an understanding of circles by determining the sum of the central angles as 360°.

- Using cognitive and interpersonal strategies, construct a labelled circle graph and describe each sector compared to the whole circle.

Instructional Strategies:

Make a connection to prior learning on fractions:

- Choose a fraction circle that matches the number of pieces of data. For example, if there are 10 marbles in a set, choose a circle divided into tenths. Each tenth represents one marble. If six of the marbles are blue, colour $\frac{6}{10}$ of the circle blue; if three of the marbles are yellow, colour $\frac{3}{10}$ of the circle yellow; and if the remaining marble is red, colour $\frac{1}{10}$ of the circle red.
- Use age-appropriate examples and resources to collect real-life data.

Construct and label circle graphs:

- Express the number in each category as a fraction of the whole set.
- Convert each fraction to a decimal number and then to a percent.
- Create sectors to represent the percent of each category.
- Create and complete a chart such as the one below:

Category	Quantity	Fraction of the Whole	Percent of the Whole	Percent Times 360° in the Circle	Size of the Central Angle

Assessment Criteria:

- Identify common attributes of circle graphs, such as the following:
  - title, label, or legend
  - the sum of the central angles is 360°
  - the data is reported as a percent of the total
  - the sum of the percents is equal to 100%
- Create and label a circle graph, with or without technology, to display a set of data.
- Find and compare circle graphs in a variety of print and electronic media, such as newspapers, magazines, and the Internet.
- Translate percents displayed in a circle graph into quantities to solve a problem.
- Interpret a circle graph to answer questions.

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

- Draw a circle with a radius.
- Use the radius as a reference point to draw one of the central angles.
- Create successive central angles.

Interpret data in circle graphs:

- Provide examples of circle graphs for interpretation.

Learning Experiences

Language Foundation:

- Discuss attributes of a circle (e.g., circumference, diameter, radius, area, pi).
- Describe the interpretation of the circle graph.

Key Vocabulary:

- Angle
- Circle
- Graph
- Legend
- Percent
- Pie chart
- Sum
- Sum of the central angles
- Attributes

Sentence Frames:

- _____ % of the circle is _____ (content).
- _____ (fraction) of the circle is equal to _____ % of the circle graph.
- The sum of central angles is equal to _____ degrees.
- The angle measure for _____ % of the circle is _____.

Learning Supports:

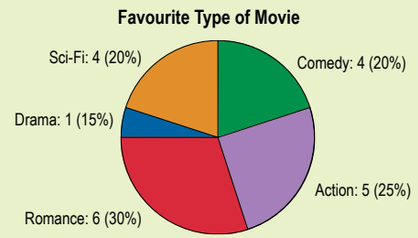
- Protractors
- Compass
- Calculators
- Fraction Circles
- Rulers
- Grid paper

Mental Math:

- Demonstrate the ability to use the following:
  - Fractions to percents
  - Percents to fractions
  - Addition
  - Subtraction
  - Sum of central angles in a circle
- Estimate percent of a number using benchmarks.

Problem Solving:

- Steve sold 50 guitar picks. 25 were made of thin plastic, 10 were made from medium plastic, and 15 were made from thick plastic. Create a circle graph to represent Steve's sales.
- In the circle graph below, which two movie selections represent more than 50% of the choices?



LAL Numeracy Phase 2A: **Statistics and Probability: Measures of Central Tendencies**

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 **7SP1, 7SP2**	Demonstrate an understanding of central tendency and range by doing the following: ■ Determine the central tendencies and the range. ■ Determine the most appropriate measure of central tendency to describe a data set. ■ Determine the effect on mean, median, and mode when an outlier is included in a data set.	■ Know and use with some consistency a range of simple grammatical features required of 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 mathematical tasks related to the outcomes. ■ Use a variety of simple cognitive and metacognitive strategies, with guidance, to enhance learning.
Connections to Prior Learning	■ Compare, order, and demonstrate an understanding of operations involving fractions, decimals, and percents. ■ Graph collected data and analyze the graph to solve problems.	Use emergent repertoire of words and phrases to do the following: ■ Describe the difference between the central tendencies. ■ Calculate the central tendencies and determine which measure of central tendency is most appropriate.
	Instructional Strategies: ■ Demonstrate how to calculate mean, median, mode, and range of a set of data where each measure of central tendency will have a unique value (i.e., 10, 20, 20, 30, 40, 50 has a mean of 28.3, median of 30, a mode of 20, and a range of 40). ■ Use age-appropriate examples and resources to collect real-life data and determine the most appropriate measure of central tendency to describe this data. ■ Calculate mean, median, and mode using a given set of data, including an outlier. Identify and remove the outlier from the set of data and recalculate the mean, median, and mode. Which measure of central tendency was most affected and least affected?	**Assessment Criteria:** ■ Determine the mean, median, and mode for a set of data, and explain why these values may be the same or different. ■ Determine the range of a set of data. ■ Provide a context in which the mean, median, or mode is the most appropriate measure of central tendency to use when reporting findings. ■ Solve a problem involving the measures of central tendency. ■ Analyze a set of data to identify any outliers. ■ Explain the effect of outliers on the measures of central tendency for a data set. ■ Identify outliers in a set of data and justify whether or not they are to be included in the reporting of the measures of central tendency. ■ Provide examples of situations in which outliers would or would not be used in determining the measures of central tendency.

LAL Numeracy Phase 2A: **Statistics and Probability: Measures of Central Tendencies** *(continued)*

Learning Experiences

Language Foundation:

- Use age-appropriate examples and resources.
- Discuss whether or not a particular measure of central tendency represents the data better than the others.
- Discuss why a set of data may have an identical mean, median, and mode.
- Describe how an outlier may affect measures of central tendencies.

Key Vocabulary:

- Average
- Data
- Mean
- Measure of central tendency
- Median
- Mode
- Range
- Statistics

Sentence Frames:

- The mean of this set of data is _____.
- The mode of this set of data is _____ because _____.
- The median of this set is _____ because _____.
- _____ (mean, median, mode) is the best description of this data because _____.
- The range of a set of data is found by _____.
- _____ is an outlier because _____.

Learning Supports:

- Calculator
- Measurement tools to collect data
- Dice and spinners to generate data

Mental Math:

- Demonstrate the ability to use the following:
  - Order a set of numbers
  - Addition facts
  - Subtraction facts
  - Division facts

Problem Solving:

- Given: Set A: 10, 11, 12
  Set B: 1, 11, 21
  What is the mean of each set? For which set is the mean a better representation of the data?
- Which measure of central tendency would best describe the age or height of our class?
- A class of 18 students has one student with a green pencil and the rest with a yellow pencil. What is the mean, median, and mode for this data? Which measure of central tendency would be the most appropriate description of the data set? Why?

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.

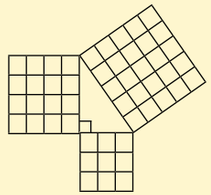
Connections to Prior Learning	■ Demonstrate an understanding of angles using 90˚ as a benchmark.
	■ Construct and compare triangles, including
	  ■ isosceles
	  ■ equilateral
	  ■ right
	  ■ acute
	in different orientations.
	■ Demonstrate an understanding
	  ■ that area is measured in square units
	  ■ 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).

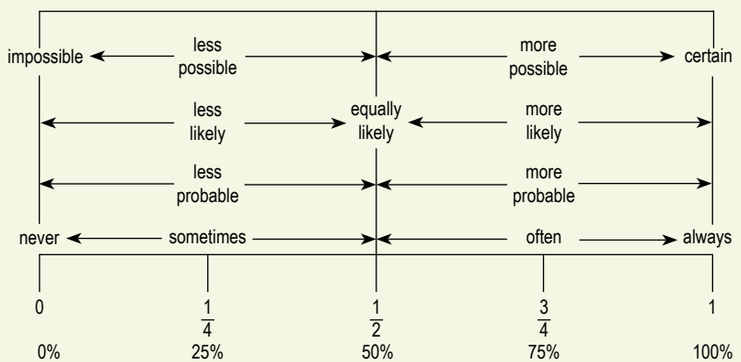
LAL Numeracy Phase 2B: **Statistics and Probability: Sample Space, Theoretical, and Experimental Probabilities** *(continued)*

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.

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

Bibliography

Manitoba Education and Training Resources

Manitoba Mathematics Website

This site provides a portal to all of the Manitoba curriculum and teacher support documents for teaching and assessing mathematics, including the series of support documents for teachers of mathematics for Grades 1 through 8 and the Mental Math series for Grades 8 through 12.

www.edu.gov.mb.ca/k12/cur/math/index.html

Manitoba EAL Website

This site provides a portal to all of the Manitoba curriculum and teacher support documents for teaching English as an additional language. It includes information on funding, additional learning resources, and related links for teachers.

www.edu.gov.mb.ca/k12/cur/eal/index.html

Manitoba Glance Across the Grades

This resource is a compilation of the outcomes into suggested categories or learning targets. These learning targets sort the outcomes and allow teachers to preview the outcomes across grade levels. This can enable teachers to differentiate teaching within each strand of the curriculum.

The document contains big ideas, which are located under each learning target. These big ideas are statements of an idea that is central to the learning of mathematics and makes instruction purposeful. Using the big ideas within the Glance Across the Grades document can be a central focus for professional discussion and action related to classroom practice.

It is available online and in print through the Manitoba Learning Resource Centre (stock #80726).

www.edu.gov.mb.ca/k12/cur/math/glance_k-9/index.html

My Child in School: A Resource for Parents

Children are more likely to succeed in school when parents or guardians are informed and involved in their education. This resource facilitates parental involvement and provides them with the information they need:

www.edu.gov.mb.ca/k12/mychild/

Resources

Benchmarks, Strategies, and Resources for Teachers of English Language Learners

This Alberta Department of Education website allows educators access to Alberta's **K–12 proficiency benchmarks**, student **writing samples** with benchmark analysis, **videos** of students engaging in content learning with teacher commentary on proficiency levels and benchmark analysis, programming information on **organizing for instruction, assessment tools and strategies** for English language learners, and research and resources on a variety of topics related to EAL.

www.learnalberta.ca/content/eslapb/

Digital Learning Tools

Interactive virtual environments to visualize and explore patterns, test conjectures and compare mathematical representations.

https://nzmaths.co.nz/digital-learning-objects

Designed by the National Council of Teachers of Mathematics (NCTM), these resources for teaching and learning mathematics include interactive tools for students and instructional support for teachers

https://illuminations.nctm.org/

Free Math Worksheets

K5 Learning offers reading and math worksheets, workbooks, and an online reading and math program for Kindergarten to Grade 5 students.

www.k5learning.com/free-math-worksheets

Grade 7 Mathematics ELL Scaffolding

This State of New Jersey Department of Education website provides useful scaffolding resources for English language learners in Grade 7 Mathematics.

www.state.nj.us/education/modelcurriculum/math/ellscaffolding/7u4.pdf

How to Teach Math to English Language Learners

This TeachHub.com resource by Tracie Heskett, M.Ed., provides strategies for teaching mathematics to ELLs.

www.teachhub.com/teaching-math-to-english-language-learners

Instructional Supports by Level of English Language Proficiency

"When organizing for instruction, the goal is to match each English language learner to the most appropriate program or class and ensure teachers have access to the support and resources they need to meet the student's learning needs. Instructional supports need to be responsive to the student's academic and language learning abilities, needs and interests and these supports should be revisited and adjustments made, as necessary, as student needs change." This Alberta Department of Education resource helps teachers organize for instruction of English language learners.

www.learnalberta.ca/content/eslapb/organizing_for_instruction_instructional_supports.html

Integers

This resource, part of the Continuum and Connections series by Targeted Implementation and Planning Supports for Revised Mathematics (TIPS4RM), is useful in planning for teaching integers to English language learners.

www.edugains.ca/resources/LearningMaterials/ContinuumConnection/Integers.pdf

Manitoba Rural Learning Consortium

The Manitoba Rural Learning Consortium (mRLC) is a cooperative that serves rural educators through collaborative professional learning networks and research projects and resources. The Tools and Resources section of the mRLC website includes useful Essential Learning resources and Backward Design Unit Samples.

www.mrlc.ca/tools.html

Math in English

This site provides useful primary math worksheets and word problems for English language learners.

www.mathinenglish.com/menuWorksheets.php
www.mathinenglish.com/menuWordProblems.php

Math Word Problems for English Learners

This site provides strategies for EAL students to achieve success with mathematics word problems.

http://study.com/academy/lesson/math-word-problems-for-esl-students.html

Methods for Single-Digit Addition and Subtraction

This video by UnboundEd provides a description of the three levels for single-digit addition and subtraction: counting all, counting on, and converting to an easier problem.

www.unbounded.org/media/7248

Problem-Solving Activities

The problem-solving activities are grouped by strand and age level. They are designed for able students to attempt by themselves. Solutions and extensions are provided.

https://nzmaths.co.nz/problem-solving

Suggested Anti-Bias Strategies for Use with ELL Students

This list from Teaching Tolerance provides sample ELL-friendly strategies to spark creativity that can be implemented alone, combined, or integrated into previously created lessons.

www.tolerance.org/ELL-appendix-a

Teaching Strategies for English Language Learners

SupportREALteachers.org is an initiative of the Center for Advancement of Standards-Based Physical Education Reform (CASPER), a non-profit organization that consists of teachers, parents, school administrators, and other stakeholders who are concerned about quality physical education.

www.supportrealteachers.org/strategies-for-english-language-learners.html

Translating Word Problems: Keywords

This site by Purplemath provides hints and tips for English language learners to find the equation they are looking for when doing word problems.

www.purplemath.com/modules/translat.htm

Youcubed

Youcubed is an initiative intended to inspire, educate, and empower math teachers by making current math education research more accessible and practical.

www.youcubed.org/

What is Numeracy?/The Essentials of Numeracy

"National Numeracy is an independent charity established in 2012 to help raise low levels of numeracy among both adults and children and to promote the importance of everyday maths skills."

www.nationalnumeracy.org.uk/what-numeracy
www.nationalnumeracy.org.uk/essentials-numeracy

What is Subitizing?

This resource by Pre-K Pages is useful for pre-K and Kindergarten teachers.

www.pre-kpages.com/subitizing/

Which One Doesn't Belong

A website created by Mary Bourassa for comparing and contrasting shapes, numbers and graphs. These puzzles do not have any words and facilitate discussions of "Which one doesn't belong?"

http://wodb.ca/index.html

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