Literacy Foundations Mathematics

Curriculum 2010

British Columbia
The Best Place on Earth

Ministry of Education

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Introduction

Literacy Foundations

The development of this curriculum has been guided by the following principles of learning:

- Learning requires the active participation of the student.
- People learn in a variety of ways and at different rates.
- Learning is both an individual and a group process.

This document also recognizes that British Columbia's schools include individuals of varied backgrounds, interests, abilities, and needs. Wherever appropriate for this curriculum, ways to meet these needs and to ensure equity and access for all learners have been integrated as much as possible into the learning outcomes. In addition, the following First Peoples principles of learning have been affirmed within First Peoples societies to guide the teaching and learning of provincial curricula:

- Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors.
- Learning is holistic, reflexive, reflective, experiential, and relational (focussed on connectedness, on reciprocal relationships, and a sense of place.
- Learning involves recognizing the consequences of one's actions.
- Learning involves generational roles and responsibilities.
- Learning recognizes the role of indigenous knowledge.
- Learning is embedded in memory, history, and story.
- Learning involves patience and time.
- Learning requires exploration of one's identity.
- Learning involves recognizing that some knowledge is sacred and only shared with permission and/or in certain situations.

Because these principles of learning represent an attempt to identify common elements in the varied teaching and learning approaches that prevail within particular First Peoples societies, it must be recognized that they do not capture the full reality of the approach used in any single First Peoples society.

Rationale

The aim of Literacy Foundations is to enable adults to develop knowledge and skills in five subject areas (English Language Arts, Mathematics, Science, Social Studies, and Information and Communications Technology) in order to be successful in courses required for graduation in either the Adult Graduation Program or the 2004 Graduation Program. The courses within each subject area of Literacy Foundations are bridging courses and provide standardized, competency-based Prescribed Learning Outcomes to address the literacy development needs of two main groups of adult students:

- **non-graduated adult students** who are functioning below the Grade 11 or 12 level in a given subject area and need to upgrade their skills and knowledge in preparation for entry into a graduation program (Adult Graduation Program or 2004 Graduation Program)

- **graduated adult students** who wish to take a Grade 11 or 12 level course to upgrade their graduation diploma but who are functioning below that level in a given subject area and need to upgrade their skills to enable them to successfully complete the course they have chosen to take

There is no requirement that students must take or that schools must offer any or all of the subject areas and courses within each subject area. Students can work with their school to determine which subject area(s) and course(s) within a subject area would best meet their needs.

Although Literacy Foundations addresses the needs of adult students, school-age students who have significant skill and knowledge gaps in any of the five subject areas of Literacy Foundations and need to upgrade their basic skills in order to be successful in coursework at the Grade 10, 11, and 12 levels may also benefit from some or all of the courses in Literacy Foundations.

Requirements and Graduation Credits

The Literacy Foundations courses within each subject area are coded as Grade 10 elective courses but are **not** creditable toward graduation. They are bridging courses that build the foundational skills necessary for students to successfully enter a graduation program.

Literacy Foundations courses cannot be considered equivalent to the Ministry Authorized K-9/10 curriculum as the Prescribed Learning Outcomes in the five Literacy Foundations subject areas do not contain all of the Prescribed Learning Outcomes found within the same subject areas of the Ministry Authorized K-9/10 curriculum. Successful completion of Literacy Foundations courses will not grant students equivalency for Grade 10 level Ministry Authorized courses. However, the Prescribed Learning Outcomes in the Literacy Foundations courses are sufficiently aligned with the Prescribed Learning Outcomes in the Ministry Authorized K-9/10 curriculum or the Ministry of Advanced Education's ABE (Adult Basic Education) Fundamentals curriculum to prepare adult learners to be successful in the courses required to obtain a graduation diploma.

Although the Literacy Foundations courses within each subject area are not creditable toward a graduation credential for either adult or school-age students, they are designated as four-credit courses for Ministry of Education reporting and funding purposes. Student achievement in Literacy Foundations courses must be reported in accordance with provincial policy.

There are no prerequisites for Ministry-Developed courses. Educators use their professional judgment in assessing students' ability to demonstrate the skills and knowledge necessary to achieve the Prescribed Learning Outcomes in a specific Literacy Foundations course/level.

Suggested Timeframe

The Literacy Foundations courses within each subject area typically contain 80 to 120 hours of instructional content. This estimate is provided as a suggestion only; when delivering the Prescribed Learning Outcomes, teachers may adjust the instructional time as necessary to meet local school and student needs.

Subject Areas

Literacy Foundations contains the learning outcomes for the courses within each of the five following subject areas:

- English Language Arts
- Mathematics
- Science
- Social Studies
- Information and Communications Technology

To further clarify options and next steps for students as they move through and beyond the courses within the subject areas, introductory information and a diagram showing sample pathways is included in each of the subject areas. In particular, the sample pathways diagrams illustrate the following:

- suggested options for sequential skill-building as students progressively upgrade their knowledge and skills through the Literacy Foundations course(s) within a subject area (these are indicated by black arrows in the sample pathways diagrams);
- suggested options for moving from Literacy Foundations courses into courses for credit in either the Adult Graduation Program or the 2004 Graduation Program

The sample pathways are not prescriptive and are not intended to indicate that any course is a prerequisite for another.

However, students whose goals include pursuing post-secondary academic or trades education should be fully informed of specific prerequisite courses required for entry into the post-secondary program of their choice prior to selecting the pathway that will best meet their needs. Detailed information on BC post-secondary programs and requirements can be accessed on the British Columbia Council on Admissions and Transfer (BCCAT) website: www.educationplanner.ca.

PRESCRIBED LEARNING OUTCOMES

The Prescribed Learning Outcomes are the legally required content standards for the provincial education system. They define the required skills and knowledge for Literacy Foundations courses. The Prescribed Learning Outcomes are statements of what students are expected to know and be able to do by the end of each course within a subject area.

In comparison to the organization of the Prescribed Learning Outcomes outlined in the grade levels of provincial K-12 curriculum, the Prescribed Learning Outcomes of Literacy Foundations have been structured with the specific needs of the adult learner in mind. The essential question guiding the development of these Prescribed Learning Outcomes was: What does a student need to know and be able to do at each specific level in order to be successful at the next level?

It is expected that student achievement will vary in relation to the Prescribed Learning Outcomes. Evaluation, reporting, and student placement with respect to the Prescribed Learning Outcomes are dependent on the professional judgment and experience of teachers, guided by provincial policy.

For ease of reference, Prescribed Learning Outcomes are coded alphanumerically within each subject area; however, this arrangement is not intended to imply a required instructional sequence.

Wording of Prescribed Learning Outcomes

All Prescribed Learning Outcomes complete the stem: "It is expected that students will…."

When used in a Prescribed Learning Outcome, the word "including" indicates that any ensuing item **must be addressed**. Lists of items introduced by the word "including" represent a set of minimum requirements associated with the general requirement set out by the outcome. These lists are not necessarily exhaustive, however; teachers may choose to address additional items that also fall under the general requirement set out by the outcome.

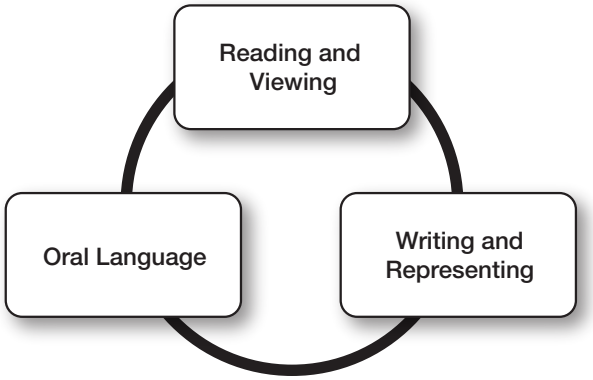
Conversely, the abbreviation "e.g.," (for example) in a Prescribed Learning Outcome indicates that the ensuing items are provided for illustrative purposes or clarification, and are **not required.** Presented in parentheses, the list of items introduced by "e.g.," is neither exhaustive nor prescriptive, nor is it put forward in any special order of importance or priority. Teachers are free to substitute items of their own choosing that they feel best address the intent of the learning outcome.

STRATEGIES FOR SUPPORTING LITERACY LEARNING WITHIN THE SUBJECT AREAS

All teachers, at all grades, teaching all subjects are teachers of literacy. Teachers do not just teach content knowledge but also ways of reading, writing, and oral expression specific to that subject area. Language allows students to make connections across many areas of study.

> What is literacy? Literacy is "the ability to understand and employ printed information in daily activities, at home, at work and in the community – to achieve one's goals and to develop one's knowledge and potential."
>
> *- The International Adult Literacy and Life Skills Survey (IALLS), 2005*

The ability to read is a cornerstone for success in education, work, and life; literacy is the essential skill upon which all other learning depends. It is expected that students enrolled in Literacy Foundations will experience greater success in these courses when there is a focus on reading, writing, and oral language development across all subject areas with the goals of comprehension and understanding.



More time for literacy learning does not mean less time for learning other subjects. In fact, literacy learning provides a way into the increasingly complex ideas and texts that students encounter in all subject areas as they advance through the levels and grades. By integrating literacy learning and adapting instruction to respond to the diverse literacy needs of their students, all subject teachers:

- prepare students to read, write, and comprehend subject area–specific material;
- provide students with opportunities to practise and apply literacy skills and strategies in many different contexts; and
- can better support success for all learners.

British Columbia's education system supports the principles of integration, equity, accessibility, and inclusion for students of all backgrounds, interests, and abilities. Literacy challenges should not be a barrier to students; therefore, the Ministry of Education encourages teachers to consider a variety of instructional and assessment strategies that embed and support literacy learning.

The following are examples of strategies that support literacy learning throughout the Literacy Foundations subject areas. They are not grade-specific but rather suggestions that can be adapted to the particular learning situation.

Ways that teachers can support students to develop oral language skills:

- Assign roles for small group discussion (e.g., leader, recorder, timer, mediator, and presenter).
- Teach, model, and reinforce appropriate listening and speaking behaviours.
- Create a variety of situations where students can use oral language to express ideas, information, and emotions (e.g., speeches, storytelling, debates).
- Teach listening strategies designed to focus attention on identifying the main purpose or theme in informational and literary texts.
- Model how making connections to prior knowledge, making predictions, and evaluating ideas are important listening skills.

Ways that teachers can support students with reading and viewing skills:

- Read and identify features of both informational and literary texts (e.g., illustrations, glossary, and table of contents).
- Identify purpose for reading, model "reading-between-the-lines" to make inferences, and use context to find meaning.
- Demonstrate and teach use of graphic organizers (e.g., in Science, use bar graphs, line graphs, pie charts, tables, and diagrams to extract and convey information; in Math, draw pictures to portray a problem or flow charts to outline the steps to solve a problem; in Social Studies, use timelines to illustrate a sequence of events and charts to compare systems).
- Use a variety of reading strategies, including skimming, scanning, rereading, making predictions, and making connections (e.g., in Science, identify main points that support or refute information and bias in an article; in Math, identify extraneous information in a word problem).
- Identify subject-specific vocabulary (e.g., in Information and Communications Technology, perform internet searches using efficient research skills such as use of keywords/vocabulary; in Science, create a dictionary with plain language definitions of common terminology).

Ways that teachers can support students with writing and representing skills:

- Model the writing process: pre-writing (generate ideas, identify purpose and audience), writing (develop and organize ideas, support the main idea), post-writing (edit and revise)
- Teach subject-specific vocabulary for content, skills, and processes (e.g., in Science, use class time to create subject-specific dictionary and provide simple definitions).
- Teach and model conventions of writing such as grammar, punctuation, spelling, content, style, and form (e.g., in Social Studies, develop criteria for essay writing and have students proof and edit their own work).
- Demonstrate strategies to generate ideas, such as brainstorming, discussion, and visualizing, and mapping and other organizers.

- Explore the features and conventions of various forms of writing (e.g., in English Language Arts, students can write letters, travel journals, résumés, or short stories).

Ways that teachers can support students to demonstrate evidence of thinking:

- Model how to ask questions (e.g., in Information and Communications Technology, students can develop questions to assess web content for reliability; in Math, students can develop questions to determine steps to solve a word problem).
- Create space for ambiguity and various points of view (e.g., in Social Studies, students can explore "what-if" or alternative historic scenarios; in English Language Arts, students can read a variety of poems or essays on one theme or topic and compare and contrast the ideas presented).
- Encourage students to think independently and to expand thinking (e.g., in Science, students can apply theories to new problems; in Social Studies, students can study current events and propose approaches to social or civic issues; in English Language Arts, students can select reading materials based on their own goals or interests).

Resources:
The following resources are starting points to learn more about literacy strategies and other considerations that can assist teachers designing educational programs for students:

- English Language Arts integrated resource packages and curriculum
- BC Performance Standards (reading, writing)
- Secondary literacy strategies:
  - *Teaching Students with Learning and Behavioural Differences: A Resource Guide for Teachers*
  - *Students with Intellectual Disabilities: A Resource Guide for Teachers*
  - *Students from Refugee Backgrounds: A Guide for Teachers and Schools*
- Literacy specialist and English Language Arts teachers in your school or district
- *Shared Learnings: Integrating BC Aboriginal Content K-10* (2006)

Inclusion, Equity, and Accessibility for All Learners

British Columbia's schools include people of varied backgrounds, interests, and abilities. When selecting specific topics, activities, and resources to support the implementation of Literacy Foundations, teachers are encouraged to ensure that these choices support inclusion, equity, and accessibility for all students. In particular, teachers should ensure that classroom instruction, assessment, and resources reflect sensitivity to diversity and incorporate positive role portrayals, relevant issues, and themes such as inclusion, respect, and acceptance.

Government policy supports the principles of integration and inclusion of students taking English as a Second Language (ESL) and of students with special needs. Some strategies may require adaptations to ensure that those with special and/or ESL needs can successfully achieve the Prescribed Learning Outcomes.

Some students with special needs may require program adaptation or modification to facilitate their achievement of the learning outcomes identified in Literacy Foundations.

Infusing Aboriginal Content

The Ministry of Education is dedicated to ensuring that the cultures and contributions of Aboriginal peoples in BC are reflected in all provincial curricula.

Authentic Texts and Resources

In order to present authentic First Peoples content and worldviews, it is important to draw from Aboriginal learning and teaching resources. Authentic First Peoples texts are those that:

- present authentic First Peoples voices, i.e., historical or contemporary texts created by First Peoples (or through the substantial contributions of First Peoples)
- depict themes and issues important to First Peoples cultures (e.g., loss of identity and affirmation of identity, tradition, healing, role of family, importance of Elders, connection to the land, the nature and place of spirituality as

an aspect of wisdom, the relationships between individual and community, the importance of oral tradition, the experience of colonization and decolonization)
- incorporate First Peoples story-telling techniques and features as applicable (e.g., circular structure, repetition, weaving in of spirituality, humour).

Due to the diversity of Aboriginal communities in BC, Canada and the world, and the need to provide a relevant context to classroom instruction and assessment, it is suggested that resource selection focuses primarily on First Peoples texts and resources from the local community wherever possible.

Working with the Aboriginal Community

To address Aboriginal content and perspectives in the classroom in a way that is accurate and that respectfully reflects Aboriginal concepts of teaching and learning, teachers are strongly encouraged to seek the advice and support of local Aboriginal communities. As Aboriginal communities are diverse in terms of language, culture, and available resources, each community will have its own unique protocol to gain support for integration of local knowledge and expertise. To begin discussion of possible instructional and assessment activities, teachers should first contact Aboriginal education co-ordinators, teachers, support workers, and counsellors in their district who will be able to facilitate the identification of local resources and contacts such as Elders, chiefs, First Nations tribal or band councils, Aboriginal cultural centres, Aboriginal Friendship Centres, and Métis or Inuit organizations. In addition, teachers may wish to consult the various Ministry of Education publications available, including the "Planning Your Program" section of the resource *Shared Learnings*. This resource was developed to help all teachers provide students with knowledge of, and opportunities to share experiences with, Aboriginal peoples in BC.

For more information about these documents, consult the Aboriginal Education web site:

www.bced.gov.bc.ca/abed/welcome.htm

LITERACY FOUNDATIONS: AT A GLANCE

The aim of Literacy Foundations is to enable adults to upgrade their knowledge and skills in five subject areas in order to be successful in courses required for graduation in either the Adult Graduation Program or the 2004 Graduation Program. Students can work with their school to determine which courses within the five subject areas outlined below would best meet their needs. There is no requirement that students must take or that schools must offer any or all of the courses within each subject area.

Literacy Foundations English Language Arts

CORE COURSES

- Literacy Foundations English Language Arts Level 1: Core
- Literacy Foundations English Language Arts Level 2: Core
- Literacy Foundations English Language Arts Level 3: Core
- Literacy Foundations English Language Arts Level 4: Core
- Literacy Foundations English Language Arts Level 5: Core
- Literacy Foundations English Language Arts Level 6: Core
- Literacy Foundations English Language Arts Level 7: Core

*COMPANION COURSES

- Literacy Foundations English Language Arts Level 1/2: Companion - Speaking and Listening
- Literacy Foundations English Language Arts Level 1/2: Companion - Reading
- Literacy Foundations English Language Arts Level 3/4: Companion - Reading
- Literacy Foundations English Language Arts Level 3/4: Companion - Writing
- Literacy Foundations English Language Arts Level 5/6/7: Companion - Writing

**Companion courses are designed to supplement the Prescribed Learning Outcomes of the Literacy Foundations English Language Arts core courses.*

Literacy Foundations Mathematics

COURSES

- Literacy Foundations Mathematics Level 1
- Literacy Foundations Mathematics Level 2
- Literacy Foundations Mathematics Level 3
- Literacy Foundations Mathematics Level 4
- Literacy Foundations Mathematics Level 5
- Literacy Foundations Mathematics Level 6: Apprenticeship and Workplace
- Literacy Foundations Mathematics Level 6: Math Foundations
- Literacy Foundations Mathematics Level 7: Apprenticeship and Workplace
- Literacy Foundations Mathematics Level 7: Math Foundations

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Literacy Foundations Science

COURSES

- Literacy Foundations Science: Biology
- Literacy Foundations Science: Chemistry
- Literacy Foundations Science: Physics

Literacy Foundations Social Studies

COURSE

- Literacy Foundations Social Studies

Literacy Foundations Information and Communications Technology

COURSE

- Literacy Foundations Information and Communications Technology

Literacy Foundations

Mathematics

INTRODUCTION

Literacy Foundations (LF) Mathematics comprises nine courses within seven levels. The Prescribed Learning Outcomes in these courses define the specific knowledge, skills, and attitudes that students are expected to achieve. Curriculum organizers include

- Number
- Patterns and Relations
- Shape and Space
- Statistics and Probability
- Measurement
- Geometry
- Algebra
- Relations and Functions

Interrelated with the specific Prescribed Learning Outcomes of these courses are the following seven overarching mathematical processes that students are expected to develop in their mathematics education program to foster lifelong learning in mathematics. These processes are intended to permeate the teaching of Literacy Foundations Mathematics.

It is expected that students will:

1. communicate in order to learn and express their understanding
2. connect mathematical ideas to other concepts in mathematics, to everyday experiences, and to other disciplines
3. demonstrate fluency with mental mathematics and estimation
4. develop and apply new mathematical knowledge through problem solving
5. develop mathematical reasoning
6. select and use technologies as tools for learning and solving problems
7. develop visualization skills to assist in processing information, making connections, and solving problems

The aim of the Literacy Foundations Mathematics courses is to help students develop the knowledge and skills that they need to be successful in mathematics courses at the Grade 11 level or to be sufficiently prepared to successfully write the mathematics section of the GED examination.

The sample pathways diagram on the following page illustrates the various course options that students may select in order to move toward their particular goal. Typically, adult learners have set their work or career goals prior to beginning their studies and want to complete coursework that meets their specific needs. **Students whose goals include pursuing post-secondary academic or trades education should be fully informed of specific prerequisite mathematics courses required for entry into the program of their choice prior to selecting the pathway that will best meet their needs.**

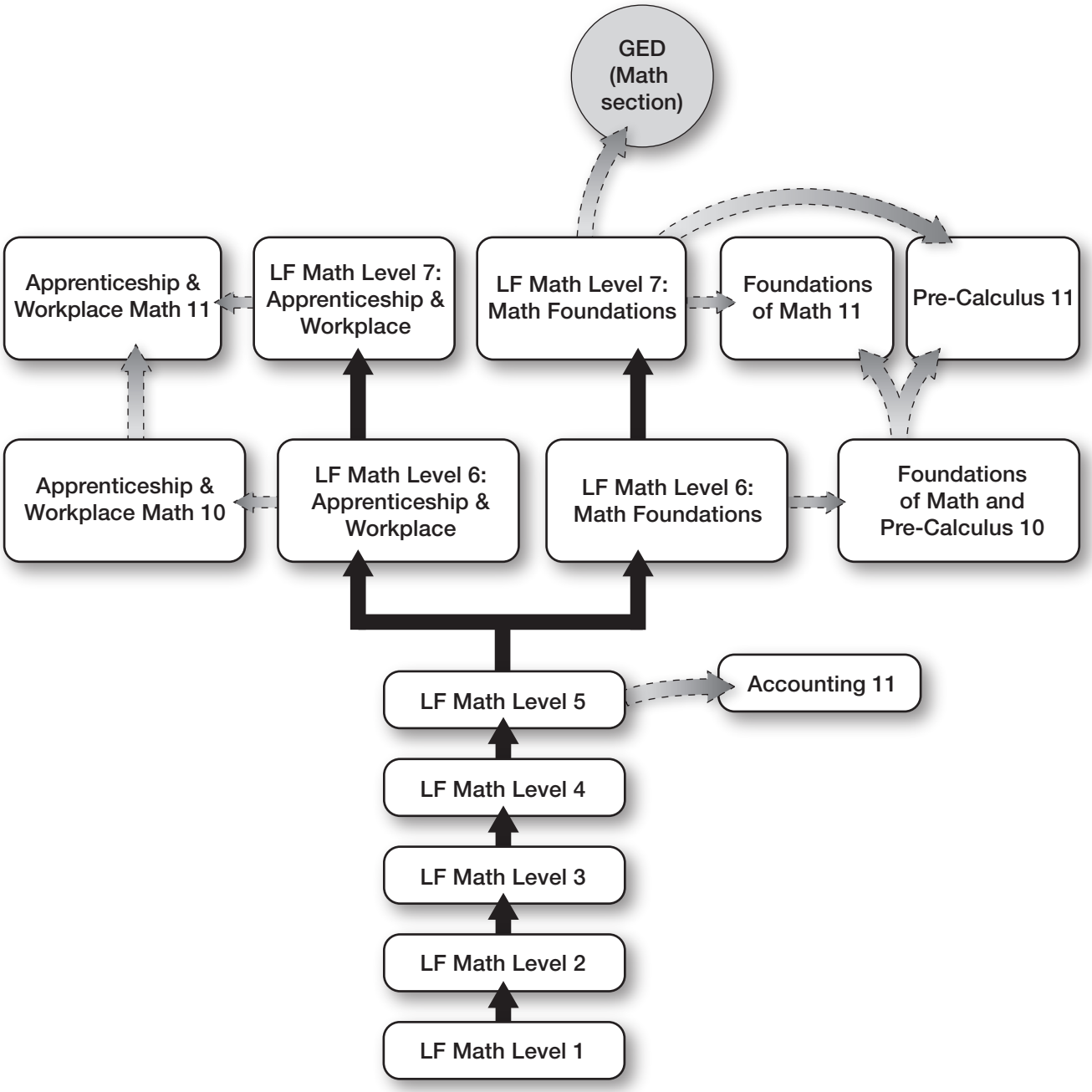
Students intending to graduate with the Adult Graduation Diploma (Adult Dogwood) have a choice of pathways to meet the Mathematics 11 course requirement for graduation. At the end of Literacy Foundations (LF) Mathematics Level 5 they may move to Accounting 11 **or** to one of the two LF Mathematics pathways – LF Mathematics Levels 6 and 7: Apprenticeship and Workplace **or** LF Mathematics Levels 6 and 7: Math Foundations.

LF Mathematics Levels 6 and 7: Apprenticeship and Workplace courses have been designed to prepare students to continue into Apprenticeship and Workplace 11, whereas LF Mathematics Levels 6 and 7: Math Foundations courses prepare students to take Foundations of Mathematics 11 or Pre-Calculus 11.

Students intending to graduate with the 80-credit Dogwood Diploma have a choice of pathways to meet the Mathematics 10 course requirement for graduation. They may move from LF Mathematics Levels 5 and 6: Apprenticeship and Workplace and then to Mathematics 10 Apprenticeship and Workplace **or** move from LF Mathematics Levels 5 and 6: Math Foundations and then to Foundations of Mathematics and Pre-Calculus 10.

All students who complete LF Mathematics Level 7 Math Foundations should be sufficiently prepared to successfully write the mathematics section of the GED examination.

Literacy Foundations Mathematics
Sample Pathways



Note: *Students whose goals include pursuing post-secondary academic or trades education should be fully informed of specific prerequisite mathematics courses required for entry into the program of their choice prior to selecting the pathway that will best meet their needs.*

Literacy Foundations Mathematics Level 1

NUMBER

It is expected that students will:

A1 read and write numerals to 1000
A2 read and write number words to 100
A3 demonstrate an understanding of place value for whole numbers to 1000
A4 apply front-end rounding to determine the value of numbers to nearest 10 and 100
A5 apply mental mathematics strategies, such as
- using doubles
- making 10
- one more, one less
- two more, two less
- addition for subtraction
- to determine basic addition facts to 18 and related subtraction facts

A6 demonstrate and describe the processes of addition and subtraction of whole numbers up to 1000 with and without regrouping
A7 verify solutions to addition and subtraction problems by using the inverse operations
A8 demonstrate and explain the process used for multiplying two numbers concretely, pictorially, and symbolically
A9 demonstrate and explain the process of division as equal sharing and equal grouping concretely, pictorially, and symbolically
A10 demonstrate an understanding of fractions by explaining that a fraction is part of a whole or set, using examples
A11 compare and order fractions with common denominators in ascending or descending order

PATTERNS AND RELATIONS

Patterns

It is expected that students will:

B1 identify, create, and describe numerical and non-numerical repeating, increasing, and decreasing patterns
B2 represent a given pattern using manipulatives, symbols, diagrams, charts, or oral or written terms in another mode
B3 explain the rule used to create a pattern and make predictions about the pattern using models and objects

Literacy Foundations Mathematics Level 1

SHAPE AND SPACE

Measurement

It is expected that students will:

C1 demonstrate an understanding of measurement as a process of comparing by
- identifying attributes that can be compared
- ordering objects
- making statements of comparison
- filling, covering, or matching

C2 relate the number of seconds to a minute, the number of minutes to an hour, and the number of days to a month in a problem-solving context

C3 read and record time to the nearest minute using both digital and analog clocks, using a.m. and p.m.

C4 identify, count, and create equivalent sets for coins and bills up to $100

C5 explain strategies used when making change up to $10

C6 read and record monetary accounts using both cent and dollar notation (e.g., 89¢ and $0.89)

3D Objects and 2-D Shapes

It is expected that students will:

C7 identify and describe the characteristics of specific two-dimensional shapes, including circles, squares, triangles, or rectangles

STATISTICS AND PROBABILITY

Data Analysis

It is expected that students will:

D1 formulate questions that can be answered by collecting first-hand data and creating categories for organizing the data

D2 use a variety of methods to collect and record data, such as tally marks, line plots, charts, and lists

D3 sort and organize a set of data by one or more attributes

D4 construct, label, and interpret concrete graphs and pictographs to display a data set

Literacy Foundations Mathematics Level 2

NUMBER

It is expected that students will:

A1 read and write numerals to 10,000
A2 read and write number words to 1000
A3 demonstrate an understanding of place value for whole numbers up to 10,000
A4 apply front-end rounding to numbers to determine their value to the nearest 10, 100, and 1000
A5 apply mental mathematics strategies and number properties, such as:
- skip counting from a known fact
- using doubling or halving
- using patterns in the 9s facts
- using repeated doubling or halving
- to determine answers for basic multiplication facts to 81 and related division facts

A6 demonstrate and describe processes of addition and subtraction of whole numbers up to 10,000 with and without regrouping
A7 demonstrate a process of multiplication (up to two-digit by three-digit numbers) to solve problems
A8 demonstrate a process of division (up to three-digit by one-digit numbers) to solve problems
A9 verify solutions to multiplication and division problems by using the inverse operations
A10 create equivalent fractions for a given fraction
A11 compare fractions using benchmarks such as 0, 1/2, and 1 using mathematical symbols (e.g., >, <, =) and a number line

PATTERNS AND RELATIONS

Patterns

It is expected that students will:

B1 identify and describe patterns found in tables and charts, including the multiplication chart
B2 predict the next term in a sequence using a pattern rule and justify the answer

Literacy Foundations Mathematics Level 2

SHAPE AND SPACE

Measurement

It is expected that students will:

C1 draw and measure specific lengths using standard metric units of millimetres, centimetres, and metres (mm, cm, m) to solve problems
C2 select and justify standard units of millimetres, centimetres, metres, and kilometres (mm, cm, m, and km) to measure length and identify referents for each
C3 describe the relationships among millimetres, centimetres, metres, and kilometres (mm, cm, m, and km) and convert a given length from one unit to another
C4 describe the relationship between millilitres and litres (mL and L)
C5 perform metric conversions for volume and capacity and identify personal referents for each
C6 describe the relationships between gram and kilogram (g and kg) and convert a given mass from one form to another
C7 solve problems involving metric system measurements for length (mm, cm, m, and km), volume/capacity (mL and L) and mass (g and kg) and identify personal referents for each
C8 determine the perimeter of a given shape to solve problems
C9 read and record temperature to the nearest degree Celsius (C)
C10 explain strategies used when making change up to $100
C11 read and record time to the nearest minute using a 24-hour clock

3-D Objects and 2-D Shapes

It is expected that students will:

C12 identify and describe the characteristics of regular and irregular polygons according to the number of sides
C13 identify, count, and describe the faces, vertices, edges, and sides of shapes and solids
C14 describe and name three-dimensional objects (cubes, spheres, cones, cylinders, pyramids, and prisms) and use corresponding two-dimensional names to describe their faces

STATISTICS AND PROBABILITY

Data Analysis

It is expected that students will:

D1 construct and describe bar graphs and pictographs using one-to-one correspondence

Literacy Foundations Mathematics Level 3

NUMBER

It is expected that students will:

A1 read and write numerals to 1,000,000
A2 demonstrate an understanding of place value for numbers 0 to 100,000 by writing the number in expanded form (e.g., 356 = 300 + 50 + 6) and explaining how the value of a digit depends on its placement in a numeral (e.g., the value of 3 in 356 is 300)
A3 use front-end rounding of numbers to determine the value of a number to the nearest 10, 100, 1000, and 10,000
A4 demonstrate and describe processes of addition and subtraction of whole numbers up to 100,000 with and without regrouping
A5 demonstrate a process of multiplication (up to three-digit by three-digit numbers) to solve problems
A6 demonstrate a process of division (up to three-digit by two-digit number)
A7 explain the properties of 0 and 1 for multiplication and division concretely and pictorially
A8 determine and use the divisibility rules for 2, 3, 4, 5, 6, 8, 9, and 10
A9 represent and describe proper fractions, improper fractions, and mixed numbers pictorially and symbolically
A10 determine common multiples, common factors, least common multiples, greatest common factors, and prime factorization to 36
A11 determine the decimal fraction equivalent for common fractions such as 1/4, 1/2, 1/10, and 1/100 and explain the relationship to currency

PATTERNS AND RELATIONS

Variables and Equations

It is expected that students will:

B1 given one-step addition and subtraction equations, solve problems involving symbols representing an unknown number (e.g., ❐+3=7)

Literacy Foundations Mathematics Level 3

SHAPE AND SPACE

Measurement

It is expected that students will:

C1 describe and explain the relationship between (milli, centi, kilo) and perform metric conversions for capacity, length, mass, and volume
C2 determine the area for a given triangle and explain the process
C3 determine the area for a given quadrilateral and explain the process
C4 determine the volume of right rectangular prisms and justify the reasonableness of the solution
C5 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

C6 demonstrate that the sum of interior angles is
- 180° in a triangle
- 360° in a quadrilateral

3-D Objects and 2-D Shapes

It is expected that students will:

C7 identify and explain the characteristics of lines, line segments, rays, parallel lines, intersecting lines, and perpendicular lines
C8 identify and explain the characteristics of quadrilaterals, including rectangles, squares, trapezoids, parallelograms, and rhombi

Transformations

It is expected that students will:

C9 describe the position of an object on a grid using columns and rows
C10 identify, classify, and create symmetrical and non-symmetrical two-dimensional shapes

STATISTICS AND PROBABILITY

Data Analysis

It is expected that students will:

D1 interpret bar graphs, double bar graphs, and pictographs involving many-to-one correspondence

Chance and Uncertainty

It is expected that students will:

D2 describe the likelihood of a single outcome using words such as "possible," "impossible," and "certain"
D3 explain the differences between the measures of central tendency (mean, median, and mode)
D4 calculate mean, median, and mode for a given data set and state the range

Literacy Foundations Mathematics Level 4

NUMBER

It is expected that students will:

A1 read and write numerals greater than one million
A2 read and write numbers to the thousandths place
A3 demonstrate an understanding of place value for numbers greater than one million
A4 demonstrate an understanding of place value for numbers less than one thousand
A5 explain the pattern resulting from multiplication or division by 10, 100, and 1000
A6 demonstrate an understanding of adding and subtracting fractions and mixed numbers with like and unlike denominators, concretely, pictorially, and symbolically
A7 apply arithmetic operations on decimals to solve problems
A8 compare a given set of decimals expressed in tenths, hundredths, thousandths, and ten-thousandths on a number line and using the symbols for greater than (>), less than (<), and equal to (=).
A9 explain a process for addition, subtraction, multiplication, and division of decimals concretely, pictorially, and symbolically
A10 explain the patterns resulting from multiplication or division of a number by 1/10, 1/100, or 1/1000
A11 solve problems involving the multiplication or division of decimals using technology and determine the reasonableness of the solution
A12 demonstrate an understanding of ratio concretely, pictorially, and symbolically
A13 demonstrate an understanding of proportion concretely, pictorially, and symbolically
A14 determine and justify a proportional statement for a given ratio
A15 demonstrate and explain the meaning of percentage greater than or equal to 0% and less than or equal to 100%
A16 solve problems involving the application of percents and ratios
A17 use proportional reasoning to convert between proper fractions, decimals, and percentages to solve problems
A18 simplify expressions, excluding exponents, using order of operations

PATTERNS AND RELATIONS

Patterns

It is expected that students will:

B1 identify and describe patterns and relationships in graphs and tables

Variables and Equations

It is expected that students will:

B2 express a given problem as an equation in which a symbol is used to represent an unknown number
B3 identify the errors in a given solution to a single variable, one-step equation with whole number coefficients concretely, pictorially, and symbolically

Literacy Foundations Mathematics Level 4

SHAPE AND SPACE

Measurement

It is expected that students will:

C1 calculate the area of triangles, rectangles, trapezoids, and parallelograms using a given formula and justify the reasonableness of the solution
C2 calculate the volume of right rectangular prisms and justify the reasonableness of the solution

3-D Objects and 2-D Shapes

It is expected that students will:

C3 describe, construct, and compare different triangles and angles, including right, acute, obtuse, and vertically opposite
C4 describe, construct, and compare different complementary and supplementary angles
C5 explain the relationship between the radius, diameter, and circumference of a circle

Transformations

It is expected that students will:

C6 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

C7 identify and plot points in the first quadrant of a Cartesian plane using whole number ordered pairs

STATISTICS AND PROBABILITY

Data Analysis

It is expected that students will:

D1 graph and represent data to solve problems
D2 create and interpret circle graphs to solve problems

Literacy Foundations Mathematics Level 5

NUMBER

It is expected that students will:

A1 demonstrate an understanding of multiplication and division of fractions with like and unlike denominators concretely, pictorially, and symbolically
A2 determine the relationship between positive repeating decimals and positive fractions (e.g., 1/3) and positive terminating decimals and positive fractions (e.g., 1/8)
A3 compare and order positive fractions, decimals, and whole numbers using benchmarks (e.g., 0, 1/2, 1)
A4 solve problems involving the application of ratios and proportions
A5 solve problems involving percentages and justify the solution
A6 explain the process for addition, subtraction, multiplication, and division of integers concretely, pictorially, and symbolically
A7 demonstrate an understanding of powers as repeated multiplication and explain the meaning of the base, coefficient, and exponent in a power
A8 write powers as the product of factors and explain their meaning
A9 evaluate expressions involving powers with integral bases
A10 demonstrate an understanding of exponent rules for the multiplication and division powers to solve problems
A11 express a given number using scientific notation
A12 simplify expressions, including exponents, using order of operations

PATTERNS AND RELATIONS

Patterns

It is expected that students will:

B1 represent algebraic expressions and equations in words
B2 represent and describe patterns and relationships using graphs and a table of values

Variables and Equations

It is expected that students will:

B3 apply and explain how preservation of equality is used to solve equations
B4 solve problems involving one- and two-step equations limited to equations of the form $\chi + a = b$, $a\chi = b$, and $a\chi + b = c$
B5 distinguish between expressions and equations and explain the similarities and differences
B6 evaluate an expression given the value of the variable

Literacy Foundations Mathematics Level 5

SHAPE AND SPACE

Measurement

It is expected that students will:

C1 explain the process for determining the circumference and area of a circle

3-D Objects and 2-D Shapes

It is expected that students will:

C2 calculate the volume of triangular prisms, cylinders, cones, and pyramids

Transformations

It is expected that students will:

C3 identify and plot points in the four quadrants of a Cartesian plane using ordered pairs

STATISTICS AND PROBABILITY

Data Analysis

It is expected that students will:

D1 read, interpret, and construct line graphs from a given data set

Chance and Uncertainty

It is expected that students will:

D2 express and interpret probabilities as ratios, fractions, or percents

Literacy Foundations Mathematics Level 6: Apprenticeship and Workplace

NUMBER

It is expected that students will:

A1 demonstrate an understanding of perfect square and square root concretely, pictorially, and symbolically
A2 determine the square root of positive whole and rational numbers that are perfect squares
A3 determine, using technology, the approximate square root of positive rational numbers that are non-perfect squares
A4 demonstrate an understanding of powers with whole number bases (excluding base 0), whole number exponents, and powers with base 10 and integral exponents
A5 use patterns to show that a power with an exponent of zero is equal to one
A6 solve problems involving powers
A7 compare and order rational numbers and justify the reasoning
A8 solve problems that involve arithmetic operations on rational numbers, with or without technology, and determine the reasonableness of the solution
A9 explain and apply the order of operations, including exponents, with or without technology

PATTERNS AND RELATIONS

Patterns

It is expected that students will:

B1 determine if the relationship between two variables is linear and justify the reasoning
B2 generate a pattern from a problem using linear equations and verify by substitution
B3 graph linear relations, analyse the graph, and interpolate or extrapolate from the graph to solve problems

Variables and Equations

It is expected that students will:

B4 model and solve problems using linear equations of the form
- $a\chi = b$
- $\chi / a = b$, $a \neq 0$
- $a\chi + b = c$
- $\chi / a + b = d$, $a \neq 0$
- $a(\chi + b) = c$
- concretely, pictorially, and symbolically where a, b, and c are integers

B5 demonstrate an understanding of polynomials (of degree less than or equal to 2) by
- identifying the variables, degree, number of terms and coefficients, including the constant term of a given simplified polynomial expression
- describing a situation for a given first-degree polynomial expression
- matching equivalent polynomial expressions given in simplified form (e.g., $4\chi - 3\chi 2 + 2$ is equivalent to $-3\chi 2 + 4\chi + 2$)

B6 model, record, and explain the addition and subtraction of polynomial expressions concretely, pictorially, and symbolically (of degree less than or equal to 2)
B7 add and subtract polynomial expressions (of degree less than or equal to 2)
B8 multiply and divide polynomial expressions by monomials (of degree less than or equal to 2)

Literacy Foundations Mathematics Level 6: Apprenticeship and Workplace

SHAPE AND SPACE

Measurement

It is expected that students will:

C1 develop and apply the Pythagorean theorem to solve problems

3-D Objects and 2-D Shapes

It is expected that students will:

C2 draw and construct nets for 3-D objects
C3 draw and interpret top, front, and side views of 3-D objects composed of right rectangular prisms
C4 explain and describe polygons and polyhedra in terms of their edges, faces, and vertices
C5 determine the surface area of
- right rectangular prisms
- right triangular prisms
- right cylinders
- composite 3-D objects

to solve problems

Transformations

It is expected that students will:

C6 draw and interpret scale diagrams of 2-D shapes
C7 demonstrate an understanding of line and rotation symmetry by
- classifying 2-D shapes based on the number of lines of symmetry
- determining if a given 2-D shape has rotation symmetry
- drawing a 2-D shape that has rotation symmetry
- identifying a piece of artwork that has line and/or rotation symmetry

Literacy Foundations Mathematics Level 6: Math Foundations

NUMBER

It is expected that students will:

A1 demonstrate an understanding of perfect square and square root concretely, pictorially, and symbolically
A2 determine the square root of positive whole and rational numbers that are perfect squares
A3 determine, using technology, the approximate square root of positive rational numbers that are non-perfect squares and justify their reasonableness
A4 demonstrate an understanding of powers with integral bases (excluding base 0) and whole number exponents by
- representing repeated multiplication using powers
- using patterns to show that a power with an exponent of zero is equal to one
- solving problems involving powers

A5 demonstrate an understanding of rational numbers by
- comparing and ordering rational numbers
- solving problems that involve arithmetic operations on rational numbers, with or without technology

A6 explain and apply the order of operations, including exponents, with or without technology

PATTERNS AND RELATIONS

Patterns

It is expected that students will:

B1 determine if the relationship between two variables is linear and justify the reasoning
B2 generate a pattern from a problem using linear equations and verify by substitution
B3 graph linear relations, analyse the graph, and interpolate or extrapolate from the graph to solve problems

Variables and Equations

It is expected that students will:

B4 model and solve problems using linear equations of the form
- $a\chi = b$
- $\chi / a = b$, $a \neq 0$
- $a\chi + b = c$
- $\chi / a + b = d$, $a \neq 0$
- $a(\chi + b) = c$
- $a\chi + b = c\chi + d$
- $a(b\chi + c) = d(e\chi + f)$
- $a / \chi = b$, $\chi \neq 0$

where a, b, c, d, e, and f are rational numbers

B5 solve single variable linear inequalities with rational coefficients
B6 demonstrate an understanding of polynomials (of degree less than or equal to 2) by
- identifying the variables, degree, number of terms and coefficients, including the constant term of a given simplified polynomial expression
- describing a situation for a given first-degree polynomial expression
- matching equivalent polynomial expressions given in simplified form (e.g., $4\chi - 3\chi 2 + 2$ is equivalent to $-3\chi 2 + 4\chi + 2$)

B7 add and subtract polynomial expressions (of degree less than or equal to 2)
B8 multiply and divide polynomial expressions by monomials (of degree less than or equal to 2)

Literacy Foundations Mathematics Level 6: Math Foundations

SHAPE AND SPACE

Measurement

It is expected that students will:

C1 develop and apply the Pythagorean theorem to solve problems

3-D Objects and 2-D Shapes

It is expected that students will:

C2 explain and describe polygons and polyhedra in terms of their edges, faces, and vertices
C3 determine the surface area of:
- right rectangular prisms
- right triangular prisms
- right cylinders
- composite 3-D objects

to solve problems

Literacy Foundations Mathematics Level 7: Apprenticeship and Workplace

MEASUREMENT

It is expected that students will:

A1 demonstrate an understanding of the Systeme International (SI) by
- describing the relationships of the units for length, area, volume, capacity, mass, and temperature (for the prefixes milli, centi, deci, hecto, kilo)
- apply strategies to convert SI units to imperial units

A2 demonstrate an understanding of the imperial system by
- describing the relationships of the units for length, area, volume, capacity, mass, and temperature
- comparing American and British imperial units for capacity
- applying strategies to convert imperial units to SI units

A3 solve problems that involve SI and imperial linear measurements, including decimal and fraction measurements

A4 solve problems that involve SI and imperial measurements of regular, composite, and irregular 2-D shapes and 3-D objects, including decimal and fractional measurements, and verify the solutions

GEOMETRY

It is expected that students will:

B1 demonstrate an understanding of similarity of convex polygons, including regular and irregular polygons, by defining edges, faces, and vertices

B2 demonstrate an understanding of primary trigonometric ratios (sine, cosine, tangent) by
- applying similarity to right triangles
- generalizing patterns from similar right triangles
- applying the primary trigonometric ratios
- solving problems

B3 solve problems that involve parallel, perpendicular, and transversal lines, and pairs of angles formed between them

B4 demonstrate an understanding of angles, including acute, right, obtuse, straight, and reflex, by
- drawing
- replicating and constructing
- bisecting
- solving problems

B5 demonstrate an understanding of the Pythagorean theorem by
- identifying situations that involve right triangles
- verifying the formula
- applying the formula
- solving problems

Literacy Foundations Mathematics Level 7: Apprenticeship and Workplace

NUMBER

It is expected that students will:

C1 solve problems that involve unit pricing and currency exchange using proportional reasoning

C2 demonstrate an understanding of income, including:
- wages
- salary
- contracts
- commissions
- piecework

to calculate gross pay and net pay

ALGEBRA

It is expected that students will:

D1 solve problems that require the manipulation and application of formulas related to
- perimeter
- area
- the Pythagorean theorem
- primary trigonometric ratios
- income

Literacy Foundations Mathematics Level 7: Math Foundations

MEASUREMENT

It is expected that students will:

A1 solve problems related to
- perimeter
- area
- the Pythagorean theorem
- primary trigonometric ratios
- income

A2 apply proportional reasoning to problems that involve conversions between SI and imperial units of measure

A3 solve problems, using SI and imperial units, that involve the surface area and volume of 3-D objects, including:
- right cones
- right cylinders
- right prisms
- right pyramids
- spheres

A4 apply the primary trigonometric ratios (sine, cosine, tangent) to solve problems that involve right triangles

ALGEBRA AND NUMBER

It is expected that students will:

B1 demonstrate an understanding of factors of whole numbers by determining
- prime factors
- greatest common factor
- least common multiple
- square root
- cube root

B2 demonstrate an understanding of irrational numbers by
- representing, identifying, and simplifying irrational numbers
- ordering irrational numbers

B3 demonstrate an understanding of powers with integral and rational exponents

B4 multiply polynomial expressions (limited to monomials, binomials, and trinomials)

B5 demonstrate an understanding of common factors and trinomial factoring

Literacy Foundations Mathematics Level 7: Math Foundations

RELATIONS AND FUNCTIONS

It is expected that students will:

C1 interpret and explain the relationships among data, graphs, and situations
C2 demonstrate an understanding of relations and functions
C3 demonstrate an understanding of slope with respect to
- rise and run
- line segments and lines
- rate of change
- parallel lines
- perpendicular lines

C4 describe and represent linear relations, using
- words
- ordered pairs
- tables of values
- graphs
- equations

C5 determine the characteristics of the graphs of linear relations, including
- intercepts
- slope
- domain
- range

C6 relate linear relations, expressed in the following forms, to their graphs:
- slope-intercept form ($y = m\chi + b$)
- general form ($a\chi + by + c = 0$)
- point-slope form ($y - y_1 = m(\chi - \chi_1)$)

C7 determine the equation of a linear relation to solve problems, given
- a graph
- a point and the slope
- two points
- a point and the equation of a parallel or perpendicular line

C8 represent a linear function using function notation
C9 solve problems that involve systems of linear equations in two variables, graphically and algebraically