
Locally Developed Compulsory Credit Courses
Grades 9 and 10

Mathematics

Acknowledgment

Locally Developed Compulsory Credit (LDCC) Courses

These Locally Developed Compulsory Credit courses were developed by the LDCC Project coordinated by the Council of Ontario Directors of Education (CODE) in liaison with the Institute for Catholic Education (ICE), through a Consortium led by the Peel District School Board.

LDCC courses are intended to meet educational and career preparation needs of students that cannot be met by the courses authorized by the provincial curriculum policy documents. Funding for the development of these courses was provided by the Ministry of Education.

Boards who wish to offer these LDCC courses must follow the approval process for locally developed credit courses and submit the necessary approval form to their respective Ministry of Education District Office. These courses have been reviewed by the Ministry of Education for use by school boards and therefore, the processing of the school board approval will be expedited.

For further information on the development of Locally Developed Courses see: *Guide to Locally Developed Courses, Grades 9-12, Development and Approval Procedures, 2004.*

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Introduction

Purpose and Goals of Locally Developed Compulsory Credit (LDCC) Mathematics Courses

The Locally Developed Compulsory Credit courses in mathematics focus on the knowledge and skills that students need to be well prepared for success in the Grade 11 Mathematics Workplace Preparation course. To request approval to offer these courses, school boards should contact their respective Ministry of Education District Office to obtain the necessary form. These courses have already been reviewed by the ministry and, therefore, the processing of the school board approval will be expedited.

Students with widely ranging levels of competency may require these mathematics courses; some of these students may be up to four years behind grade level with significant gaps in knowledge, conceptual understandings, and skills. LDCC mathematics courses support students in developing and enhancing strategies that they need to develop mathematical literacy skills and the confidence to use these skills in their day-to-day lives.

Opportunities to develop, enhance, and practise literacy, and mathematical processes, concepts, skills, and strategies are critical in strengthening students' learning in all subject areas and preparing them for later success. Learning expectations in LDCC mathematics courses interconnect skills in subject-area learning, literacy, and mathematical literacy. In this way, students taking LDCC mathematics courses will be given opportunities to improve their subject-area knowledge and skills and to practise using them in order to strengthen their literacy and mathematical literacy skills.

LDCC mathematics expectations challenge students to examine their conceptual understandings, develop and enhance their critical-thinking skills, and engage in meaningful dialogue.

For students who successfully complete LDCC mathematics courses, opportunities for lateral moves to other types of courses can be provided, as appropriate.

Rationale

The LDCC mathematics courses present a continuum of learning through which students can develop conceptual understanding within six content strands: Developing and Consolidating Money Sense, Developing and Consolidating Concepts in Measurement, Developing Concepts in Proportional Reasoning in Grade 9; and Extending Money Sense, Extending Understanding of Measurement, Extending Understanding of Proportional Reasoning in Grade 10 in preparation for success in the Grade 11 Mathematics Workplace Preparation course and in everyday life. The continuum provides students with opportunities to revisit key content areas through different contexts and experiences so that they have multiple and varied experiences through which to represent and demonstrate their understanding.

Differences between the Grades 9 and 10 courses are reflected in the level of complexity and the depth of understanding that students are asked to demonstrate, and in the contexts that move them from their immediate, personal environment to the larger community.

The learning expectations address both the mathematics content and mathematical processes that are integral to teaching for understanding. Teachers should engage students in learning mathematics by:

- building upon their prior knowledge and everyday experiences;
- supporting conceptual understandings; and
- encouraging them to make connections to their everyday life.

Curriculum Expectations

The expectations identified for these LDCC mathematics courses describe the knowledge and skills that students are expected to develop and demonstrate in the various activities through which their achievement is assessed and evaluated.

For each course, two sets of expectations are listed for each *strand*, or broad curriculum area. The *overall expectations* describe in general terms the knowledge and skills that students are expected to demonstrate by the end of the course. The *specific expectations* describe the expected knowledge and skills in greater detail. The specific expectations are organized under subheadings that reflect particular aspects of the required knowledge and skills and that may serve as a guide for teachers as they plan learning activities for their students. The organization of expectations in strands and sub-groupings is not meant to imply that the expectations in any one strand or groupings are achieved independently of the expectations in the other strands or groupings.

Many of the expectations are accompanied by examples, given in parentheses. These examples are meant to illustrate the kind of skill, the specific area of learning, the depth of learning, and/or the level of complexity that the expectation entails. They are intended as a guide for teachers rather than as an exhaustive or mandatory list.

Strands

Each LDCC mathematics course is divided into three strands.

| Grade 9 LDCC Mathematics | Grade 10 LDCC Mathematics |
|---|--|
| <ul style="list-style-type: none">• Developing and Consolidating Money Sense• Developing and Consolidating Concepts in Measurement• Developing Concepts in Proportional Reasoning | <ul style="list-style-type: none">• Extending Money Sense• Extending Understanding of Measurement• Extending Understanding of Proportional Reasoning |

Teaching Approaches

Teachers use their professional judgement to decide which instructional methods will be most effective in promoting the learning of core knowledge and skills described in the learning expectations. The LDCC mathematics courses should introduce a rich variety of activities that provide students the opportunity to close gaps and build on their knowledge and conceptual understandings. The following strategies should, therefore, be emphasized:

- using before-learning, during-learning and after-learning tasks;
- connecting the students' existing mathematical knowledge to new concepts;
- using manipulatives and technologies (hand-held and ministry-licensed software);
- providing opportunities to organize information; and
- using visual aspects of mathematics, oral communication, reading, and writing to understand problems, organize ideas, and communicate mathematical reasoning.

A solid conceptual foundation is essential for students if they are to learn and apply mathematics. Teachers play a critical role in judging the conceptual understanding of each student and in helping students with gaps in their learning retrace their thinking back to the point where meaning became lost. Establishing a rich environment for students to explore mathematical concepts at the appropriate level and to use oral language to explain their thinking will enable students in LDCC courses to clarify their mathematical conceptual understandings. By stressing conceptual understanding, presenting mathematical ideas in multiple ways, and using relevant problems to apply concepts and promote classroom discussions, teachers are able to target instruction to the needs of the learners.

Building Literacy Skills

In the Preface to *Think Literacy: Cross-Curricular Approaches: Grades 7–12*, it is stated that literacy skills are at the heart of learning. Successful students are able to read for meaning, to write with clarity and purpose, and to participate productively in classroom discussions. But many students may be struggling with these skills, and that makes it more difficult for teachers to get to the content in the various subject areas. Research and classroom experience show that the most effective way to help struggling learners is to incorporate proven instructional strategies in every classroom. Students who are explicitly taught a repertoire of reading, writing, and oral communication skills, and become adept at using them, then apply those skills in other contexts.

The solution offered is teamwork – a whole-school, cross-curricular approach to literacy learning. When teachers of all subjects use the same proven strategies to help their students read and write in the language of their subject discipline, they build on their students’ prior knowledge and equip them to make connections that are essential for continued learning. This teaching doesn’t require “time out” from content-area instruction. It happens side-by-side with content acquisition.* When math teachers demonstrate how to help students solve complex math problems, these skills also prepare them to read any subject text more effectively. When science teachers use a *web* or *concept map* to hypothesize about an ecosystem, student literacy strategies are reinforced.

For students in LDCC courses, the more reinforcement they receive the better – students learn that reading, writing, and oral communication strategies work in all classrooms and that there is some common terminology as well as subject-specific vocabulary.

**Think Literacy Success Grades 7–12: The Report of the Expert Panel on Students at Risk in Ontario, 2003.*

Building on Oral Language Skills

Oral skills – both talking and listening – are at the very foundation of literacy. Large- and small-group discussions help students to learn, to reflect on what they are learning, and to communicate their knowledge and understandings with others – to make visible the often invisible strategies they use to understand mathematical concepts and solve problems. This can also help teachers to provide better feedback and guidance to support student learning. Teachers can help students strengthen their communication skills and conceptual understandings by presenting problems in multiple formats and by encouraging group discussion about the problem before students begin work on a solution.

Limited vocabulary and language structure may be evident among many of the LDCC learners. They may need help with key words required to communicate mathematical ideas and ample opportunities to use mathematical vocabulary in conversation. Group conversations using mathematical language enable students to expand their understanding of mathematical terms and definitions. As they strengthen their understanding of mathematical terms and definitions, they gain confidence in reading mathematical text.

Developing Reading and Viewing Skills

As students progress through school, they are asked to read and view increasingly complex information and graphical texts in their courses. The ability to understand and use the information in these texts is key to a student's success in learning. Successful students have a repertoire of reading and viewing strategies to draw upon and know how to use them in different contexts.

Students in LDCC mathematics courses may not have a wide range of strategies for reading and viewing mathematical text. Because they might not see themselves as able to read very well they often lack the confidence to try to interpret data or to understand word problems prior to attempting to solve them. Providing opportunities for the use of pre-reading, pre-viewing, or pre-problem solving strategies enables students to strengthen their ability to read mathematical text. Students gain confidence in their mathematical skills when:

- they work with problems that are connected to their experiences and lives;
- they go through the process of generating and organizing problems and information and conferring with others about strategies; and
- they become accustomed to the use of before-learning, during-learning and after-learning strategies (e.g., defining mathematical terms, explaining their thinking).

All of these strategies, when used regularly, will help to strengthen students' comprehension skills.

Developing Writing Skills

Students are sometimes confused by differences in writing requirements from subject to subject. Although different subjects require different types of writing assignments, all writing can follow the same process. By adopting a consistent writing process across all subject areas, teachers ease some of the stress associated with writing and help students build confidence and skill as writers.

Integrating Reading, Viewing, and Writing Skills

Reading, viewing, and writing skills are complementary and mutually reinforcing. For this reason, some of the expectations require students to demonstrate their learning through activities that involve reading, viewing, and writing (e.g., mathematics journals).

Teachers need to support and enhance these connections by introducing a rich variety of mathematical literacy activities that integrate reading, viewing, and writing and that provide opportunities for students to develop and practise these skills in conjunction with one another.

Building Mathematical Literacy Skills

Mathematics is a fundamental human endeavour that empowers individuals to describe, analyse, and understand the world we live in.* Mathematical literacy involves more than executing procedures. It implies a knowledge base and the competence and confidence to apply this knowledge in the practical world. A mathematically literate person can estimate; interpret data; solve day-to-day problems; reason in numerical, graphical, and geometric situations; and communicate using mathematics. Opportunities to practise these skills occur naturally in all subjects.

Mathematical literacy is as important as proficiency in reading and writing. Mathematics is so entwined with today's way of life that we cannot fully comprehend the information that surrounds us without a basic understanding of mathematical ideas. Confidence and competence in mathematics lead to productive participation in today's complex information society and open the door to opportunity. Teachers in many other disciplines can create opportunities to help students appreciate the part that mathematics plays in their lives. Teachers should support mathematical literacy by conveying the belief that all students can and should do mathematics.

* *Leading Math Success – Mathematical Literacy Grades 7–12: The Report of the Expert Panel on Student Success in Ontario*

Building Essential Skills

Essential Skills are generic skills used in the workplace, in everyday life, and for lifelong learning. The Ontario Skills Passport provides clear descriptions of skills used in virtually all occupations, as well as a list of important work habits.

Teachers can help students to develop these Essential Skills – reading, writing, use of documents, use of computers, money math, data analysis, problem solving, finding information, job task planning, measurement and calculation, numerical estimation, oral communication, decision making, scheduling and budgeting, and accounting.

The ministry has developed two new courses under the Guidance and Career Education curriculum – *Discovering the Workplace*, Grade 10, Open, and *Navigating the Workplace*, Grade 12, Open. These courses will provide students with the opportunity to learn about and demonstrate workplace Essential Skills and work habits.

Building Confidence

Students taking these courses may be doubtful that they can acquire the mathematical skills they need to function effectively at school, at work, and in other everyday contexts. In seeking to meet the needs of these students, teachers should create a positive classroom environment and community of learners that give students the confidence to take risks as they learn and that continually encourage them to persist and improve. Students should engage in active inquiry to develop and/or enhance metacognitive skills that facilitate independence in learning.

To help students build confidence and to promote learning, teachers should use a variety of materials, manipulatives, and learning tasks that address the varying skill levels of the students. When grouping students for purposes of instruction and support, groupings should be flexible and should change as learning goals change. Students may be grouped in a variety of ways, including:

- by instructional need (e.g., group students who need to develop the same concept or skill);
- by shared interest in particular topics or issues (e.g., group students to generate ideas as a team before they investigate a topic of shared interest);
- for purposes of effective collaboration (e.g., group students who can provide support for one another as they learn);
- by type of mathematical model used to solve a problem (e.g., scale drawing, dynamic geometry model, table of values); and
- by strategy used to solve a problem.

Assessment and Evaluation of Student Achievement

Basic Considerations

The primary purpose of assessment and evaluation is to improve student learning. Information gathered through assessment helps teachers to determine students' strengths and weaknesses in their achievement of the curriculum expectations in each subject in each grade. This information also serves to guide teachers in adapting curriculum and instructional approaches to students' needs and in assessing the overall effectiveness of programs and classroom practices. Students need multiple opportunities and a variety of ways to demonstrate their understanding for assessment and evaluation purposes.

Assessment is the process of gathering information from a variety of sources (including assignments, demonstrations, projects, performances, and tests) that accurately reflects how well a student is achieving the curriculum expectations in a subject. As part of assessment, teachers provide students with descriptive feedback that guides their efforts towards improvement. Evaluation refers to the process of judging the quality of student work on the basis of established criteria and assigning a value to represent that quality. In Ontario secondary schools, the value assigned will be a percentage grade.

Assessment and evaluation is based on the learning expectations in the LDCC course and the achievement levels. See <http://www.edu.gov.on.ca/eng/document/policy/achievement/charts1to12.pdf>

In order to ensure that assessment and evaluation are valid and reliable, and that they lead to the improvement of student learning, teachers must use assessment and evaluation strategies that:

- address both what students learn and how well they learn;
- are based both on the categories of knowledge and skills and on the achievement level descriptions given in the Achievement Chart for mathematics;
- are varied in nature, administered over a period of time, and designed to provide opportunities for students to demonstrate the full range of their learning;
- are appropriate for the learning activities used, the purposes of instruction, and the needs and experiences of the students;
- are fair to all students;
- accommodate the needs of exceptional students, consistent with the strategies outlined in their Individual Education Plan;
- accommodate the needs of students who are learning the language of instruction (English or French);
- ensure that each student is given clear directions for improvement;
- promote students' ability to assess their own learning and to set specific goals;
- include the use of samples of students' work that provide evidence of their achievement;
- are communicated clearly to students and parents/guardians at the beginning of the school year and at other appropriate points throughout the year.

All curriculum expectations must be accounted for in instruction, but evaluation focuses on students' achievement of the overall expectations. The overall expectations are broad in nature, and the specific expectations define the particular content or scope of the knowledge and skills referred to in the overall expectations. A student's achievement of the overall expectations, as represented by his or her achievement of related specific expectations, must be evaluated. Teachers will use their professional judgement to determine which specific expectations should be used to evaluate achievement of the overall expectations, and which ones will be covered in instruction and assessment (e.g., through direct observation) but not necessarily evaluated.

The characteristics given in the Achievement Chart for level 3, which is the “provincial standard” for the grade, identify a high level of achievement of the overall expectations. Students achieving at level 3 in a particular grade can be confident that they will be prepared for work at the next grade. Level 1 identifies achievement that falls much below the provincial standard, while still reflecting a passing grade. Level 2 identifies achievement that approaches the standard. Level 4 identifies achievement that surpasses the standard. It should be noted that achievement at level 4 does not mean that the student has achieved expectations beyond those specified for a particular grade. It indicates that the student has achieved all or almost all of the expectations for that grade, and that he or she demonstrates the ability to use the knowledge and skills specified for that grade in more sophisticated ways than a student achieving at level 3.

Categories of Knowledge and Skills

The categories, defined by clear criteria, represent four broad areas of knowledge and skills within which the subject expectations for any given grade are organized. The four categories should be considered as interrelated, reflecting the wholeness and interconnectedness of learning.

See <http://www.edu.gov.on.ca/eng/document/policy/achievement/charts1to12.pdf>.

The Achievement Chart for Mathematics

The Achievement Chart for mathematics identifies four categories of knowledge and skills in mathematics. The Achievement Chart is a standard province-wide guide to be used by teachers. It enables teachers to make judgements about student work that are based on clear performance standards and on a body of evidence collected over time. See <http://www.edu.gov.on.ca/eng/document/policy/achievement/charts1to12.pdf>.

The Achievement Chart is designed to:

- provide a framework that encompasses all curriculum expectations for the subject represented in this document;
- guide the development of assessment tasks and tools (including rubrics);
- help teachers to plan instruction for learning;
- assist teachers in providing meaningful feedback to students;
- provide various categories and criteria with which to assess and evaluate student learning.

The Achievement Charts for all disciplines, Grades 1–12, have been reviewed as part of the Sustaining Quality Curriculum (SQC) process and have been revised to improve consistency across grades and disciplines. Draft Achievement Charts for all disciplines are currently posted on the ministry website.

The draft Achievement Charts were used in the development of the Mathematics Locally Developed Compulsory Credit courses. Teachers may access the draft Achievement Charts on the ministry website. See <http://www.edu.gov.on.ca/eng/document/policy/achievement/charts1to12.pdf>.

Some Considerations for Program Planning in LDCC Mathematics Courses

Teachers who are planning a program for LDCC Mathematics must take into account considerations in a number of important areas. Essential information that pertains to all disciplines is provided in *The Ontario Curriculum, Grades 9 to 12: Program Planning and Assessment*, 2000. Information that pertains to the development of essential literacy skills is provided in *Think Literacy Success, Grades 7–12: The Report of the Expert Panel on Students at Risk in Ontario*, 2003. Information that pertains to the development of essential mathematical literacy skills is provided in *Leading Math Success – Mathematical Literacy, Grades 7–12: The Report of the Expert Panel on Student Success in Ontario*, 2004. All of these resources can be found on the ministry website at www.edu.gov.on.ca. Considerations relating to program planning in LDCC Mathematics are noted here.

Education for Exceptional Students

In planning locally developed compulsory credit courses for exceptional students, teachers should begin by examining both the curriculum expectations for the course and the needs of the individual student to determine which of the following options is appropriate for the student:

- no accommodations* or modifications; or
- accommodations only; or
- modified learning expectations, with the possibility of accommodations.

If the student requires either accommodations or modified expectations, or both, the relevant information, as described in the following paragraphs, must be recorded in his or her Individual Education Plan (IEP). For a detailed discussion of the ministry’s requirement for IEPs, see *Individual Education Plans: Standards for Development, Program Planning, and Implementation*, 2000 (referred to hereafter as *IEP Standards*, 2000). More detailed information about planning courses for exceptional students can be found in Part E of *Special Education: A Guide for Educators*, 2001. Both documents are available at www.edu.gov.on.ca.

* “Accommodations” refers to individualized teaching and assessment strategies, human supports, and/or individualized equipment.

Students Requiring Accommodations Only

With the aid of accommodations alone, some exceptional students are able to participate in the regular course curriculum and to demonstrate learning independently. (Accommodations do not alter the provincial curriculum expectations for the course.) The accommodations required to facilitate the student’s learning must be identified in his or her IEP (see *IEP Standards*, 2000, page 11). A student’s IEP is likely to reflect the same accommodations for many, or all, courses.

There are three types of accommodations. *Instructional accommodations* are changes in teaching strategies, including styles of presentation, methods of organization, or use of technology and multimedia. *Environmental accommodations* are changes that the student may require in the classroom and/or school environment, such as preferential seating or special lighting. *Assessment accommodations* are changes in assessment procedures that enable the student to demonstrate his or her learning, such as allowing additional time to complete tests or assignments or permitting oral responses to test questions (see page 14 of *IEP Standards*, 2000, for more examples).

If a student requires “accommodations only” in the locally developed compulsory credit course, assessment and evaluation of his or her achievement will be based on the appropriate course curriculum expectations and the achievement levels outlined in this document.

Students Requiring Modified Expectations

Some exceptional students will require modified expectations, which differ from the regular LDCC course expectations. For most secondary school courses, modified expectations will be based on the regular curriculum expectations for the course but will reflect changes to the number and/or complexity of the expectations.

Modified expectations must indicate the knowledge and/or skills the student is expected to demonstrate and have assessed in each reporting period (*IEP Standards*, 2000, pages 10 and 11). For secondary school courses, it is important to monitor, and to reflect clearly in the IEP, the *extent* to which expectations have been modified. As noted in Section 7.12 of the ministry’s policy document *Ontario Secondary Schools, Grades 9 to 12: Program and Diploma Requirements*, 1999, the principal will determine whether achievement of the modified expectations constitutes successful completion of the course, and will decide whether the student is eligible to receive a credit for the course. This decision must be communicated to the parents/guardians and the student.

When a student is expected to achieve most of the curriculum expectations for the course, the IEP should identify which expectations will not be assessed and evaluated. When modifications are so extensive that achievement of the learning expectations is not likely to result in a credit, the expectations should specify the precise requirements or tasks on which the student’s performance will be evaluated and which will be used to generate the course mark recorded on the Provincial Report Card. The student’s learning expectations must be reviewed in relation to the student’s progress at least once every reporting period, and must be updated as necessary (*IEP Standards*, 2000, page 11).

If a student requires modified expectations for the locally developed compulsory credit course, assessment and evaluation of his or her achievement will be based on the learning expectations identified in the IEP and on the achievement levels outlined in this document. If some of the student’s learning expectations for a course are modified but the student is working towards a credit for the course, it is sufficient simply to check the IEP box on the Provincial Report Card. If, however, the student’s learning expectations are modified to such an extent that the principal deems that a credit will not be granted for the course, the IEP box must be checked and the appropriate statement from the *Guide to the Provincial Report Card, Grade 9-12* must be inserted. The teacher’s comments should include relevant information on the student’s demonstrated learning of the modified expectations, as well as about next steps for the student learning in the course.

The Role of Technology in the Curriculum

Technology helps to make students more powerful learners by giving them the means to explore mathematical concepts more easily and quickly. In the time gained by using technology, students can study fundamental ideas in greater depth, and can concentrate their effort in the areas of data collection, data analysis, simulations, and complex problem solving. Whereas student investigators once relied solely on their creativity and their sophistication in the use of largely paper-and-pencil methods to guide them in the solution of problems, they can now turn to technology, which provides capabilities that alter both the form and the means of solution.

The presence of technology as part of learning mathematics makes many new things possible, but it also places an increasing importance on the ability of students to make mental judgements about expected results. For example, the student who uses a calculator to perform an arithmetic calculation should have the habit of using estimation to judge the reasonableness of the answer produced. Similarly, the student who produces a graph using technology should be capable of creating a mental approximation of the graph as a verification of the image on the screen.

Using a Rich Array of Manipulatives

Manipulatives are necessary tools for supporting the effective learning of mathematics by all students. Manipulatives allow students to concretely explore mathematical relationships that will later be translated into symbolic form. The key to the successful use of manipulatives lies in the bridge – which must be built by the teacher – between the artifact and the underlying mathematical concepts (D’Ambrosio et al., 1993); the mathematics is in the connections, not the objects (Kilpatrick & Swafford, 2002).* Teachers should begin by selecting one major mathematical idea (e.g., fractions) and exploring that idea with students from many different perspectives, employing a variety of manipulatives. Lesson planning will include planning for how the mathematics concept will be developed from the experience with manipulatives. The assessment of students’ knowledge of mathematics should be done both with and without manipulatives.

**Leading Math Success – Mathematical Literacy Grades 7–12: The Report of the Expert Panel on Student Success in Ontario, 2004, p. 32.*

English as a Second Language and English Literacy Development (ESL/ELD)

Young people whose first language is not English enter Ontario secondary schools with diverse linguistic and cultural backgrounds. Some may have the experience of highly sophisticated educational systems while others may have had limited formal schooling. All of these students bring a rich array of background knowledge and experience to the classroom, and all teachers must share in the responsibility for their English-language development.

Teachers of mathematics must incorporate appropriate strategies for instruction and assessment to support the success of the ESL and ELD students in their classrooms. Teachers can:

- make modifications to expectations (e.g., modification of some or all of the course expectations based on the student’s level of English proficiency);
- use a variety of instructional strategies (e.g., extensive use of visual cues, graphic organizers, scaffolding, previewing textbooks, pre-teaching key vocabulary, peer tutoring, strategic use of students’ first languages);
- provide a variety of learning resources (e.g., visual material, simplified text, bilingual dictionaries, and culturally diverse materials);
- make accommodations for assessment (e.g., granting extra time, use of oral interviews and tasks requiring completion of graphic organizers and cloze sentences instead of essay questions and other assessment tasks that depend heavily on proficiency in English).

Students who are no longer taking ESL or ELD courses may still require program adaptations to be successful. When learning expectations in a course other than ESL and ELD are modified, or accommodations to the learning environment are made, this must be clearly indicated on the student’s report card by checking the ESL or ELD box. (See *Guide to the Provincial Report Card, Grades 9–12, 1999.*)

For further information on supporting ESL and ELD students, refer to *The Ontario Curriculum, Grades 9 to 12, English As a Second Language and English Literacy Development, 1999.*

Career Education

Teachers should promote students' understanding of the role of mathematics in daily life and its relation to career opportunities by exploring applications of concepts, providing opportunities for career-related project work, and promoting independent investigations.

Expectations in the LDCC mathematics courses include many opportunities for students to apply their mathematical skills to work-related situations, to explore educational and career options, and to become self-directed learners. Literacy skills, mathematical literacy skills, and interpersonal skills are essential skills for the workplace and will equip students to manage information technologies, communicate effectively and correctly in a variety of situations, and perform a variety of tasks. Small-group work and oral presentations help students to express themselves confidently and to work cooperatively with others.

Cooperative Education and Other Workplace Experiences

Experiential, community-based activities, such as job shadowing, work experience, and cooperative education help students develop learning and interpersonal skills as well as identify their educational and career interests. Students develop the knowledge and skills that are necessary for success in today's workplace. Through these activities, students have the opportunity to practise, in an authentic environment, workplace skills such as literacy and numeracy, and interpersonal and personal management skills. The Ontario Curriculum, Guidance and Career Education, Grade 10 course, *Discovering the Workplace*, will help students identify early in their secondary school career the Essential Skills and work habits that are required for success in the workplace, and will prepare them for work experiences in the community.

Antidiscrimination Education

The LDCC curriculum is designed to help students acquire the “habits of mind” essential in a complex democratic society characterized by rapid technological, economic, political, and social change. Students are expected to demonstrate a willingness to show respect, tolerance, and understanding towards individuals, groups, and cultures in the global community, as well as respect and responsibility for the environment. These attitudes, including understanding the importance of protecting the rights of others, and taking a stand against racism and other expressions of hatred and discrimination, are modelled in the classroom and prepare students for their future roles at home, at work, and in the community.

The learning activities and materials used to teach the curriculum should be inclusive in nature, and should reflect various points of view and experiences, including Aboriginal perspectives. This will enable all students to become more sensitive to the experiences and perceptions of others. Curriculum activities should also strengthen students' abilities to recognize bias and stereotypes in contemporary as well as in historical portrayals, viewpoints, representations, and images.

Course Description

This course emphasizes further development of mathematical knowledge and skills to prepare students for success in their everyday lives, in the workplace, and in the Grade 10 LDCC course.

The course is organized in three strands related to money sense, measurement, and proportional reasoning. In all strands, the focus is on developing and consolidating key foundational mathematical concepts and skills by solving authentic, everyday problems.

Students have opportunities to further develop their mathematical literacy and problem-solving skills and to continue developing their skills in reading, writing, and oral language through relevant and practical math activities.

Prerequisite: None

Developing and Consolidating Money Sense

Overall Expectations

By the end of this course, students will:

DMSV.01 • interpret, write, and round decimal numbers with understanding in everyday money situations;

DMSV.02 • solve problems involving money, drawn from everyday situations;

DMSV.03 • communicate information about money concepts;

DMSV.04 • use literacy skills (reading, writing, listening, and speaking) to obtain and communicate information about money sense.

Specific Expectations

Understanding and Using Decimals

By the end of this course, students will:

DMS1.01 – read and interpret money values given in words and symbols, using the correct place value (e.g., \$25 million is \$25 000 000; \$43K is \$43 000), found in everyday contexts;

DMS1.02 – write money values, using correct units (e.g., 79 cents may be written as 79¢ or \$0.79);

DMS1.03 – round money values to stated accuracies (e.g., the nearest cent, the nearest dollar, the nearest ten dollars, the nearest hundred dollars, the nearest thousand dollars, and the nearest million dollars), in applications drawn from everyday situations;

DMS1.04 – use estimation strategies involving addition, subtraction, multiplication, and division to round money values appropriately within a given context (e.g., I am shopping and have \$40 with me. I will round prices up when estimating, to make sure that my total is less than \$40.);

DMS1.05 – interpret numerical information drawn from the media or through conversation and explain its significance, using familiar references (e.g., I read in the newspaper that an athlete earned \$250 000 last year. How many hours would you need to work to earn that much money?);

DMS1.06 – enter decimal numbers correctly on a numerical key pad (e.g., calculator, computer, ATM, cash register) and read and interpret decimal numbers correctly from a display (e.g., 16.5 means \$16.50, not \$16.05);

DMS1.07 – demonstrate the effective use of a calculator in operations with decimals;

DMS1.08 – estimate the change for a transaction (e.g., for a transaction of \$13.72, the change from a \$20 bill should be a little more than \$6.00);

DMS1.09 – represent a given coin or bill as a combination of other coins or bills (e.g., \$5 could be given as one \$5 bill, as five loonies, or as two toonies and one loonie);

DMS1.10 – identify different combinations of coins and bills that would result in a given amount of money (e.g., What are possible ways to make \$27.48, using coins and bills?);

DMS1.11 – judge the reasonableness of calculations involving decimals, through estimation using mental mathematics, where appropriate.

Solving Problems Involving Money

By the end of this course, students will:

DMS2.01 – make the correct change for an offered amount with and without concrete materials (e.g., change from a \$5 bill for an item costing \$4.77);

DMS2.02 – solve problems involving estimating the totals of money values found in real contexts (e.g., the total of a transaction, the total cost of several items on a restaurant menu, the total cost of several items in a newspaper advertisement);

DMS2.03 – solve problems requiring estimating and calculating the cost of projects that require the purchase of multiples of the same item (e.g., 18 sheets of Bristol board and 9 glue sticks);

DMS2.04 – solve problems by exploring the cost of several items (e.g., collect data through reading newspapers, catalogues, and online sources) and produce an organized list, using technology as appropriate;

DMS2.05 – identify, record, and monitor daily purchases to determine personal weekly expenditures.

Communicating Information about Money

By the end of this course, students will:

- DMS3.01** – verbalize their observations and reflections regarding money sense and ask questions to clarify their understanding (e.g., talk about their own and other students’ solutions to problems);
- DMS3.02** – explain their reasoning used in problem solving and in judging reasonableness;
- DMS3.03** – communicate, orally and in writing, the solutions to money problems and the results of investigations, using appropriate terminology, symbols, and form.

Developing and Consolidating Concepts in Measurement

Overall Expectations

By the end of this course, students will:

- DCMV.01** • estimate and measure length, capacity, and mass, in order to consolidate understanding of the metric system;
- DCMV.02** • estimate and measure length, using the Imperial system;
- DCMV.03** • solve problems, carry out investigations, estimate, and measure, using metric units, to consolidate understanding of perimeter, area, and volume;
- DCMV.04** • communicate information about measurement concepts;
- DCMV.05** • use literacy skills (reading, writing, listening, and speaking) to obtain and communicate information about measurement concepts.

Specific Expectations

Understanding and Using the Metric System

By the end of this course, students will:

- DCM1.01** – investigate, discuss, and describe applications from everyday life and the workplace that would involve the measurement of length in commonly used metric units (millimetre, centimetre, metre, and kilometre);
- DCM1.02** – investigate, discuss, and describe applications from everyday life and the workplace that would involve the measurement of mass in commonly used metric units (milligram, gram, and kilogram);
- DCM1.03** – investigate, discuss, and describe applications from everyday life and the workplace that would involve the measurement of capacity in commonly used metric units (millilitre, litre, and kilolitre);
- DCM1.04** – explain and use correctly prefixes in the metric system;
- DCM1.05** – convert between metric units commonly used in everyday applications (e.g., 260 cm is 2.6 m or 2 m 60 cm);
- DCM1.06** – demonstrate accuracy in measuring length, capacity, and mass in everyday applications, using teacher-selected tools, and record the measurements using the correct abbreviations for metric units;
- DCM1.07** – investigate, identify, and use personal referents to aid in the estimation of length, capacity, area, and mass in everyday situations (e.g., a small paper clip has a mass of about 1 g; the width of my baby finger is about 1 cm; the area of a room is about 10 square metres; the length of my walking stride is about 60 cm; a can of juice contains about 350 mL);

- DCM1.08** – estimate and use measurements of length, capacity, and mass in everyday applications (e.g., the distance from the school to the skating rink is about 1 km; the cups in the cafeteria hold about 350 mL; one protein bar has a mass of about 85 g).

Understanding and Using the Imperial System

By the end of this course, students will:

- DCM2.01** – investigate, discuss, and describe applications from everyday life and the workplace that would involve the measurement of length in feet and inches;
- DCM2.02** – measure length in feet and inches, to an accuracy of $\frac{1}{4}$ inch, using tape measures and 12-inch rulers;
- DCM2.03** – record measurements, using commonly accepted abbreviations for the chosen units (e.g., 5 inches could be written as 5 in. or 5"; 7 feet could be written as 7 ft. or 7');
- DCM2.04** – investigate, identify, and use personal referents to aid in the estimation of length in feet and inches (e.g., 1" is about the distance from the tip of my thumb to the first knuckle);
- DCM2.05** – estimate and use measurements of lengths in feet and inches in everyday situations (e.g., the length of a car is about 10').

Understanding and Applying Perimeter, Area, and Volume

By the end of this course, students will:

- DCM3.01** – explore and describe situations from everyday life and the workplace that require calculation or measurement of perimeter (e.g., fencing, wall paper borders, the baseboard around a room, the distance around a track or a baseball diamond);
- DCM3.02** – estimate, measure, and calculate perimeters drawn from applications in everyday life and the workplace;
- DCM3.03** – explain and illustrate how to determine the perimeter of any figure bounded by straight line segments;
- DCM3.04** – explore and describe situations from everyday life and the workplace that require calculating and measuring area (e.g., buying wallpaper, floor tiles, sod, patio slabs);
- DCM3.05** – investigate the areas of a variety of rectangles and triangles, using concrete materials (e.g., square tiles, interlocking cubes, rectangular and triangular pattern blocks, triangle models, grid paper);
- DCM3.06** – estimate, measure, and record rectangular areas found in everyday life and the workplace, using uniform non-standard units (e.g., floor tiles, ceiling tiles, square pattern blocks);
- DCM3.07** – predict and explain, from experiences involving concrete materials, that the area of any rectangle can be found by multiplying its length by its width;
- DCM3.08** – estimate and calculate the areas of rectangles and triangles, drawn from applications in everyday life and the workplace;
- DCM3.09** – estimate and calculate the areas of regions that can be broken into rectangles (e.g., L-shaped floor plan, a garden, a roof);
- DCM3.10** – explore and describe situations from everyday life and the workplace that require calculation or measurement of volume (e.g., the size of a package, the amount of soil to purchase, the volume of air in a room, amount of liquid medication);
- DCM3.11** – investigate and calculate the volumes of a variety of prisms whose bases involve rectangular regions (e.g., rectangular, T-shaped, L-shaped), by building the prisms using concrete materials (e.g., interlocking cubes);

- DCM3.12** – predict and explain, from investigations involving the building of prisms, that the volume of a prism is given by multiplying the area of its base by its height;
- DCM3.13** – estimate and calculate the volumes of rectangular prisms drawn from applications in everyday life and the workplace;
- DCM3.14** – select the most appropriate standard unit to measure the perimeter, area, or volume of a figure (e.g., use centimetres squared or cm^2 to measure the area of a book cover, but use metres squared or m^2 to measure the area of a wall);
- DCM3.15** – explain, using examples drawn from their everyday experiences, why length is measured in linear units, why area is measured in square units, and why volume is measured in cubic units;
- DCM3.16** – solve problems involving perimeter, area, and volume in applications drawn from everyday situations.

Communicating Information about Measurement

By the end of this course, students will:

- DCM4.01** – organize measurement information, using a simple framework (e.g., template, form, graphic organizer, chart, electronic spreadsheet), draw conclusions from this data, and make decisions based on it;
- DCM4.02** – verbalize their observations and reflections regarding measurements and ask questions to clarify their understanding (e.g., talk about their own and other students' solutions to problems);
- DCM4.03** – explain their reasoning used in problem solving and in judging reasonableness;
- DCM4.04** – communicate, orally and in writing, the solutions to measurement problems and the results of investigations, using appropriate terminology, symbols, and form.

Developing Concepts in Proportional Reasoning

Overall Expectations

By the end of this course, students will:

- DPRV.01** • determine relationships among fractions, percentages, ratios, and rates by constructing diagrams, building models, and estimating measurements;
- DPRV.02** • solve problems drawn from everyday situations involving percent, ratio, rate, and fractions;
- DPRV.03** • communicate information about proportional reasoning;
- DPRV.04** • use literacy skills (reading, writing, listening, and speaking) to obtain and communicate information about proportional reasoning.

Specific Expectations

Constructing Understanding of Fractions, Percentages, Ratios, and Rates

By the end of this course, students will:

DPR1.01 – represent the magnitudes of the fractions $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$ using manipulatives and by constructing diagrams and models;

DPR1.02 – represent the addition and subtraction of $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1, in the context of fractional parts of an hour, a cup, a dollar, and an inch by constructing diagrams and using models;

DPR1.03 – estimate and add pairs of simple fractions with the support of an appropriate model (e.g., estimate $2\frac{1}{2} + 1\frac{3}{4}$ then add using a 12-inch ruler to model and validate results);

DPR1.04 – interpret simple fractions of a dollar in decimal form (e.g., 25 cents is a quarter, which is $\frac{1}{4}$ of a dollar or \$0.25; 10 cents is a dime, which is $\frac{1}{10}$ of a dollar or \$0.10);

DPR1.05 – explore the relationship between the fractions $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$ and $\frac{3}{4}$ and decimals, using a calculator, concrete materials, and diagrams;

DPR1.06 – round decimal values appropriately within a given context (e.g., calculations with money rounding to 2 decimal places);

DPR1.07 – multiply a fraction by a whole number, using a calculator;

DPR1.08 – represent and explain the meaning of percent as part of 100, by constructing diagrams, using concrete materials (e.g., base ten materials);

DPR1.09 – explore the relationship between fractions, decimals, and percentages, using a calculator, concrete materials, and diagrams;

DPR1.10 – identify and use common equivalences or approximations between fractions and percentages (e.g., $\frac{1}{4} = 25\%$, $\frac{1}{3} \doteq 33\%$, $\frac{1}{2} = 50\%$, $\frac{2}{3} \doteq 67\%$, $\frac{3}{4} = 75\%$ and $1 = 100\%$) in contexts such as sales and discounts (e.g., Which is the better deal, $\frac{1}{3}$ off or 25% off?);

DPR1.11 – identify and use ratios, including equivalent ratios, to express the relationships among quantities represented by models and diagrams;

DPR1.12 – explore and describe the use of ratios from their personal experiences (e.g., ratio of ingredients in a recipe, bicycle gear ratios, the ratio of red cars to blue cars in the school parking lot is 12:10 or 6:5);

DPR1.13 – explore and identify rates drawn from their experiences and the units used in them (e.g., the speed limit for an automobile in the city is 50 km/h);

DPR1.14 – calculate rates in activities drawn from their experiences (e.g., heart rate in various situations, walking speed, rate of pay, cost/linear foot, cost/m²).

Solving Problems

By the end of this course, students will:

DPR2.01 – solve problems involving fractions and percentages in practical situations (e.g., discount, sales tax, nutrition facts, sports data), by converting to decimals and using a calculator, where appropriate;

DPR2.02 – solve simple problems using equivalent ratios (e.g., recipes, scale diagrams);

DPR2.03 – solve problems involving rates (e.g., You make \$7/h. How long will you have to work to make a purchase worth \$150?);

DPR2.04 – calculate and compare the unit costs of items found in everyday situations (e.g., compare the cost of one bottle of water bought from a vending machine versus the cost of one bottle from a case of 24);

DPR2.05 – read, interpret, and explain, orally and in writing, data displayed in simple tables and graphs.

Communicating Information about Proportional Reasoning

By the end of this course, students will:

DPR3.01 – verbalize their observations and reflections regarding proportional reasoning and ask questions to clarify their understanding (e.g., talk about their own and other students’ solutions to problems);

DPR3.02 – explain their reasoning used in problem solving and in judging reasonableness;

DPR3.03 – communicate, orally and in writing, the solutions to proportional reasoning problems and the results of investigations, using appropriate terminology, symbols, and form.

Course Description

This course emphasizes the extension of mathematical knowledge and skills to prepare students for success in their everyday lives, in the workplace, and in the Grade 11 Mathematics Workplace Preparation course.

The course is organized in three strands related to money sense, measurement, and proportional reasoning. In all strands, the focus is on strengthening and extending key foundational mathematical concepts and skills by solving authentic, everyday problems.

Students have opportunities to extend their mathematical literacy and problem-solving skills and to continue developing their skills in reading, writing, and oral language through relevant and practical math activities.

Prerequisite: A Grade 9 Mathematics credit

Extending Money Sense

Overall Expectations

By the end of this course, students will:

EMSV.01 • solve problems drawn from everyday situations involving money, demonstrating skill, and understanding in the use of decimal numbers;

EMSV.02 • communicate information about money sense;

EMSV.03 • use literacy skills (reading, writing, listening, and speaking) to extend their money sense.

Specific Expectations

Understanding and Using Decimal Numbers in Solving Problems

By the end of this course, students will:

EMS1.01 – read and interpret money values given in words, write money values as decimals, and round money values appropriately, in solving problems found in everyday contexts;

EMS1.02 – explain the meaning of negative numbers as they apply to money (e.g., a negative amount may mean that you owe money or that you have spent more than you budgeted for) and use them to solve problems involving money;

EMS1.03 – interpret numerical data drawn from the media and explain its significance, using other number references (e.g., An athlete earned \$850 000 last year. How many people could that much money feed in a developing nation?);

EMS1.04 – demonstrate the effective use of a calculator in operations with decimals;

EMS1.05 – judge the reasonableness of calculations involving decimals through estimation;

EMS1.06 – solve problems involving sales tax, discounts, restaurant tips, and commission earnings (e.g., A skateboard costs \$49.99 before taxes. You have \$60.00. Do you have enough to buy the skateboard? Justify your answer.);

EMS1.07 – investigate and identify possible part-time jobs, determine hourly rates of pay, and calculate possible weekly, monthly, and yearly total incomes;

EMS1.08 – solve problems involving the accomplishment of a particular goal, including investigating, planning, gathering, and organizing data, and making relevant calculations (e.g., plan a special event within a given budget).

Communicating Information about Money

By the end of this course, students will:

EMS2.01 – verbalize their observations and reflections regarding money sense and ask questions to clarify their understanding (e.g., talk about their own and other students' solutions to problems);

EMS2.02 – explain their reasoning used in problem solving and in judging reasonableness;

EMS2.03 – communicate, orally and in writing, the solutions to money problems and the results of investigations, using appropriate terminology, symbols, and form.

Extending Understanding of Measurement

Overall Expectations

By the end of this course, students will:

- EUMV.01** • make estimates and measurements to extend understanding of the metric system;
- EUMV.02** • make estimates and measurements to extend understanding of the Imperial system;
- EUMV.03** • solve problems involving measurements of circles, rectangles, cylinders, and rectangular prisms, using metric units in applications drawn from everyday life and the workplace;
- EUMV.04** • communicate information about measurement concepts;
- EUMV.05** • use literacy skills (reading, writing, listening, and speaking) to extend understanding of measurement.

Specific Expectations

Estimating and Measuring Using the Metric System

By the end of this course, students will:

- EUM1.01** – demonstrate accuracy in measuring length, capacity, and mass in everyday applications, using appropriate tools, and record the measurements using the correct abbreviations for metric units;
- EUM1.02** – solve problems drawn from everyday applications requiring the conversion between commonly used metric units;
- EUM1.03** – estimate, using standard units, measurements of length, capacity, and mass that arise from their everyday experience (e.g., the distance from school to the motor vehicle office is about 15 km; the mass of the refrigerator is about 75 kg; the capacity of a gasoline tank is about 60 L);
- EUM1.04** – read and use schedules to solve problems (e.g., bus, train, or airline schedules);
- EUM1.05** – read, write, and interpret dates, using a specified numerical format (e.g., Oct. 5, 2007 can be written as 5/10/07);
- EUM1.06** – solve problems to determine the elapsed time between two given dates or two given times (e.g., number of days between two given dates, elapsed time in hours between two different time zones);
- EUM1.07** – identify and use personal referents to aid in the estimation of temperature (e.g., an outside temperature of 22°C is comfortable, but 33°C is a very hot day);

- EUM1.08** – describe applications from everyday life and the workplace that involve a combination of perimeter, area, volume, mass, capacity, time, and/or money (e.g., a landscaping project may require the use of perimeter for purchasing fencing, area for purchasing sod, volume for purchasing soil, and require the job to be completed within a specified time).

Estimating and Measuring Using the Imperial System

By the end of this course, students will:

- EUM2.01** – measure length in feet and inches, to accuracies of $\frac{1}{8}$ inch and $\frac{1}{16}$ inch, using tape measures and 12-inch rulers;
- EUM2.02** – record linear measurements, using commonly accepted abbreviations for the chosen units (e.g., 3 yards could be written as 3 yd.; 11 miles could be written as 11 mi.);
- EUM2.03** – make estimates and accurate measurements of length in the Imperial system to construct a model (e.g., a rectangular prism constructed from cardboard to given dimensions; a scale model of a room);
- EUM2.04** – explore and identify approximate relationships between non-linear units of measure in the metric and Imperial systems (e.g., gallons and litres, kilograms and pounds, litres and cups).

Solving Problems Involving Circumference, Perimeter, Area, and Volume

By the end of this course, students will:

- EUM3.01** – identify the parts of a circle, using the correct terminology (e.g., centre, radius, diameter, circumference);
- EUM3.02** – determine an approximate value for π (π) by investigating the relationship between the circumference and the diameter of a circle, using concrete materials to obtain measurements;
- EUM3.03** – validate the formula for the circumference of a circle by comparing measurements of the circumference to the calculations, using the formula $C = \pi d$;
- EUM3.04** – solve authentic problems requiring the calculation of the circumference of a circle;
- EUM3.05** – solve authentic problems requiring the calculation of the perimeter of composite figures made up of straight line segments and half- and quarter-circles;
- EUM3.06** – estimate the size of a given angle by comparing it to angles of 30° , 45° , 60° , 90° , 180° , or 360° ;
- EUM3.07** – estimate and calculate the areas of circles and fractions of circles drawn from applications in the environment;
- EUM3.08** – validate the formula for the area of a circle by comparing approximate measurements of the area to the calculations, using the formula $A = \pi r^2$ (e.g., measure the area and radius of several circles, using concrete materials);
- EUM3.09** – construct reasonably accurate diagrams of the angles 180° , 90° , 45° , 30° , and 60° , by dividing a given circle into the appropriate number of parts (e.g., to construct an angle of 45° , divide a given circle into eight equal parts);
- EUM3.10** – solve authentic problems requiring the calculation of the areas of composite figures made up of rectangles and half- or quarter-circles;

EUM3.11 – establish that the volume of a cylinder is found by multiplying the area of its base by its height by comparing the structure of a prism to that of a cylinder (e.g., the top and bottom are identical and the sides are perpendicular to the top and bottom);

EUM3.12 – solve problems drawn from everyday situations involving the perimeters and the areas of circles and rectangles, and the volumes of cylinders and rectangular prisms.

Communicating Information about Measurement

By the end of this course, students will:

- EUM4.01** – organize measurement information, using a simple framework (e.g., template, form, graphic organizer, chart, electronic spreadsheet), draw conclusions from this data, and make decisions based on it;
- EUM4.02** – verbalize their observations and reflections regarding measurements and ask questions to clarify their understanding (e.g., talk about their own and other students' solutions to problems);
- EUM4.03** – explain their reasoning used in problem solving and in judging reasonableness;
- EUM4.04** – communicate, orally and in writing, the solutions to measurement problems and the results of investigations, using appropriate terminology, symbols, and form.

Extending Understanding of Proportional Reasoning

Overall Expectations

By the end of this course, students will:

- EPRV.01** • solve problems drawn from everyday situations, demonstrating skill and understanding in the use of fractions, percentages, ratios, and rates;
- EPRV.02** • communicate information drawn from a variety of sources;
- EPRV.03** • use literacy skills (reading, writing, listening, and speaking) to extend understanding of proportional reasoning.

Specific Expectations

Applying Fractions, Percent, Ratio, and Rate in Solving Problems

By the end of this course, students will:

- EPR1.01** – determine the relationships among fractions, decimals, and percentages by constructing diagrams and building models;
- EPR1.02** – recall from memory the most commonly used equivalences or approximations between fractions and percentages (e.g., $\frac{1}{4} = 25\%$, $\frac{1}{3} \doteq 33\%$, $\frac{1}{2} = 50\%$, $\frac{2}{3} \doteq 67\%$, $\frac{3}{4} = 75\%$, and $1 = 100\%$);
- EPR1.03** – solve problems involving the most commonly used equivalences between fractions and percentages (e.g., An item selling for \$43.99 is 25% off. That’s about $\frac{1}{4}$ off \$40. So I should save about $40 \div 4 = \$10$, or a little more than \$10.);
- EPR1.04** – round decimal values appropriately in solving problems drawn from everyday situations;
- EPR1.05** – solve problems involving fractions and percentages in practical situations (e.g., sales tax, discounts, restaurant tips, and commission earnings), by converting to decimals and using a calculator, where appropriate;
- EPR1.06** – measure areas of personal interest, using metric or Imperial units, and construct scale diagrams, using grid paper;
- EPR1.07** – write ratios describing relationships in the school environment (e.g., the ratio of silver cars to white cars in the parking lot today is 7:15);

EPR1.08 – describe the effects of changing the parts of a given ratio proportionately and disproportionately in activities in which the results are observable (e.g., mixing paint, drywall compound, cement, punch, distorting a picture on a computer by enlarging or reducing in one direction only);

EPR1.09 – solve problems using proportions (e.g., In making punch, the ratio of fruit juice to water is 1:3. How much water should be added if you have 3 litres of fruit juice?);

EPR1.10 – solve problems involving the calculation of rates drawn from a variety of everyday contexts and from familiar social issues (e.g., the mass of garbage produced per person in a month, the number of plastic bags consumed by a family in a year).

Communicating Information

By the end of this course, students will:

- EPR2.01** – read, interpret, and explain, orally and in writing, data displayed in tables and graphs;
- EPR2.02** – construct a variety of graphs (straight line, bar, circle), with and without the use of technology, to assist in identifying patterns in data or drawing conclusions from data;
- EPR2.03** – identify graphs that misrepresent data and explain why the graphs are misleading.