Mathematics Essentials 10

Guide

NOVA SCOTIA
NOUVELLE-ÉCOSSE

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Mathematics Essentials 10

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NOVA SCOTIA

Education
English Program Services

Mathematics Essentials 10

CURRICULUM

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Introduction

Background

The Nova Scotia Department of Education has made a commitment to provide a broad-based, quality education in the public school system and to expand the range of programming to better meet the needs of all students. The department is working in collaboration with school boards and other partners in education, business, industry, the community, and government to develop a variety of new courses.

New course options draw from, and contribute to, students' knowledge and skills in more than one discipline. Students synthesize and apply knowledge and skills acquired in other courses, including English language arts, social studies, science, arts, mathematics, and technology.

New course options provide increased opportunities for senior high school students to
- earn the credits they require to attain a high school graduation diploma
- diversify their course options
- prepare for varied post-secondary destinations

Course options are designed to
- appeal to all high school students
- assist students in making connections among school, the community, and the workplace
- enable students to explore a range of career options

Rationale

For some students, the scope and sequence of other mathematics courses currently offered do not meet their needs. These courses may not be relevant to a student's life or future plans, they may not hold the interest of the student, or they may be beyond his or her skill level. The Mathematics Essentials 10 course was developed to meet the needs of these students. Often students taking Mathematics Essentials 10 have had difficulty achieving the outcomes in mathematics throughout their junior high years. What students will learn throughout the Mathematics Essentials 10 will help them in their everyday lives. For example, students will have the opportunity to learn about earning money, paying taxes, and performing mental math techniques for everyday purchasing. The goal of this course is to better prepare students with the mathematics they will need to move into the workforce.

Mathematics Essentials 10 offers students an increased opportunity for success by providing them with more hands-on experiences, real-world applications to mathematics, and skill-building developmental activities. The course will prepare students for the workplace or for post-secondary course options that do not require a mathematics prerequisite.

The typical pathway for students who successfully complete Mathematics Essentials 10 is Mathematics Essentials 11. These two courses will provide successful students with two mathematics credits as required for graduation. However, if a student has successfully completed Mathematics Essentials 10 and has demonstrated outstanding performance in relation to the learning outcomes prescribed for Mathematics Essentials 10, he/she may wish to move on to Mathematics 10 or Mathematics Foundations 10. In such a case, a student may count both credits towards graduation; however, only one grade 10 mathematics course may count towards the two mathematics credits needed for graduation. The other course may be considered an elective.

Topics

Mathematics Essentials 10 topics include the following:

- mental math
- working and earning
- deductions and expenses
- paying taxes
- making purchases
- buying decisions
- probability
- measuring and estimating
- transformations and design
- buying a car

Curriculum Outcomes

Curriculum Outcomes Framework

The mathematics curriculum is based on a framework of outcomes statements articulating what students are expected to know, be able to do, and value as a result of their learning experiences in mathematics. This framework is made up of statements of the essential graduation learnings (EGLs), general curriculum outcomes (GCOs), key-stage curriculum outcomes (KSCOs), and specific curriculum outcomes (SCOs). *Foundation for the Atlantic Canada Mathematics Curriculum* (APEF 1996) articulates GCOs and KSCOs. Curriculum documents provide SCOs for each course, together with elaborations and suggestions for related instructional and assessment strategies and tasks.

Teachers and administrators are expected to refer to the curriculum outcomes framework to design learning environments and experiences that reflect the needs and interests of the students.

Essential Graduation Learnings (EGLs)

EGLs are statements describing the knowledge, skills, and attitudes expected of all students who graduate from high school. EGLs are cross-curricular in nature and comprise different areas of learning: aesthetic expression, citizenship, communication, personal development, problem solving, and technological competence.

Aesthetic Expression

Graduates will be able to respond with critical awareness to various forms of the arts and be able to express themselves through the arts.

Citizenship

Graduates will be able to assess social, cultural, economic, and environmental interdependence in a local and global context.

Communication

Graduates will be able to use the listening, viewing, speaking, reading, and writing modes of language(s) and mathematical and scientific concepts and symbols to think, learn, and communicate effectively.

Personal Development

Graduates will be able to continue to learn and to pursue an active, healthy lifestyle.

Problem Solving

Graduates will be able to use the strategies and processes needed to solve a wide variety of problems, including those requiring language and mathematical and scientific concepts.

Technological Competence

Graduates will be able to use a variety of technologies, demonstrate an understanding of technological applications, and apply appropriate technologies for solving problems.
See *Foundation for the Atlantic Canada Mathematics Curriculum*, (APEF 1996, pp. 4–6).

General Curriculum Outcomes (GCOs)

General Curriculum Outcomes are statements that identify what students are expected to know and be able to do upon completion of study in mathematics. GCOs contribute to the attainment of the EGLs and are connected to KSCOs. The seven GCOs for mathematics are organized in terms of four content strands: number concepts/number and relationship operations; patterns and relations; shape and space; and data management and probability.

Number Concepts/Number and Relationship Operations

GCO A: Students will demonstrate number sense and apply number-theory concepts.
GCO B: Students will demonstrate operation sense and apply operation principles and procedures in both numeric and algebraic situations.

Patterns and Relations

GCO C: Students will explore, recognize, represent, and apply patterns and relationships, both informally and formally.

Shape and Space

GCO D: Students will demonstrate an understanding of and apply concepts and skills associated with measurement.
GCO E: Students will demonstrate spatial sense and apply geometric concepts, properties, and relationships.

Data Management and Probability

GCO F: Students will solve problems involving the collection, display, and analysis of data.
GCO G: Students will represent and solve problems involving uncertainty.

Key-Stage Curriculum Outcomes (KSCOs)

Key-Stage Curriculum Outcomes are statements that identify what students are expected to know and be able to do by the end of grades 3, 6, 9, and 12 as a result of their cumulative learning experiences in mathematics. This curriculum document lists Key-Stage Curriculum Outcomes for the end of grade 12 (beginning on p. 17). Specific Curriculum Outcomes are referenced to Key-Stage Curriculum Outcomes on these same pages.

Specific Curriculum Outcomes (SCOs)

Specific Curriculum Outcomes are statements that specifically identify what students should know and be able to do upon completion of the Mathematics Essentials 10 course. The Specific Curriculum Outcomes are directly related to the seven General Curriculum Outcomes.

In the table that follows, the Specific Curriculum Outcomes for *Mathematics Essentials 10* are listed beside the corresponding KSCOs.

GCO A: Students will demonstrate number sense and apply number-theory concepts.

Elaboration: Number sense includes understanding number meanings, developing multiple relationships among numbers, recognizing the relative magnitudes of numbers, knowing the relative effect of operating on numbers, and developing referents for measurement. Number-theory concepts include such number principles as laws (e.g., commutative and distributive), factors and primes, and number-system characteristics (e.g., density).

Key-Stage Curriculum Outcomes (KSCO)	**Specific Curriculum Outcomes (SCO)**
By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to	*By the end of Mathematics Essentials 10, students will be expected to*
KSCO i: demonstrate an understanding of number meanings with respect to real numbers2,7,9	A2 explain the difference between gross pay and net pay and describe possible payroll deductions A7 recognize and find equivalencies among common fractions and percentages A9 rename common fractions
KSCO ii: order real numbers, represent them in multiple ways (including scientific notation) and apply appropriate representations to solve problems5,8,10	A5 understand transactions such as depositing, transferring and withdrawing money, writing cheques and withdrawing money A8 compare and order common fractions and percentages A10 round rational numbers and percentages in contexts
KSCO iii: demonstrate an understanding of the real number system and its subsystems by applying a variety of number-theory concepts in relevant situations1,4,6	A1 understand purchasing power A4 identify and explain the advantages and disadvantages of various plans to make purchases A6 understand what interest is and how interest is calculated by a bank
KSCO iv: some post-secondary–intending students will be expected to explain and apply relationships among real and complex numbers3,11-14	A3 explain indirect and direct forms of taxation A11 describe the procedures and costs involved in obtaining a driver's licence A12 describe the costs of failing to operate a vehicle responsibly A13 compare the procedures, costs, advantages, and disadvantages involved in buying a new versus a used vehicle A14 explain the factors and costs involved in insuring a vehicle

GCO B: Students will demonstrate operation sense and apply operation principles and procedures in both numeric and algebraic situations.

Elaboration: Operation sense consists of recognizing situations in which a given operation would be useful, building awareness of models and the properties of an operation, seeing relationships among operations, and acquiring insights into the effects of an operation on a pair of numbers. Operation principles and procedures would include such items as the effect of identity elements, computational strategies, and mental mathematics.

Key-Stage Curriculum Outcomes (KSCO)	**Specific Curriculum Outcomes (SCO)**
By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to	***B**y the end of Mathematics Essentials 10, students will be expected to*
KSCO i: explain how algebraic and arithmetic operations are related, use them in problem solving situations, and explain and demonstrate the power of mathematical symbolism	B13 compare the costs involved in buying versus leasing the same new vehicle B14 compare the costs of owning or leasing and maintaining a vehicle with the costs of other forms of transportation B15 complete a project involving the purchase or lease of a new vehicle or the purchase of a used vehicle, including the cost of insurance
KSCO ii: derive, analyse, and apply computational procedures (**algorithms**) in situations involving all representations of real numbers	B16 know the double facts in additions; their extension to two, three, and four digits; and their connections to subtraction, multiplication by 2 and by ½, division by 2, and multiplication by 50 percent B17 know the addition and subtraction facts and extend them to two, three, and four digit Numbers
KSCO iii: derive, analyse, and apply algebraic **procedures** (including those involving algebraic expressions and matrices) in problem situations	B1 determine the renumeration for chosen occupations, including salary and benefits, and evaluate it in terms of purchasing power and living standards B2 solve problems involving various ways that an employee can be paid, using calculators or appropriate software B3 calculate gross pay and net pay for given situations B7 provide the correct change for an amount offered and minimize the number of coins/bills B8 select amounts to offer for a given charge to minimize the number of coins/bills received in the change B9 identify, calculate, and compare the interest costs involved in making purchases under various plans B11 calculate simple and compound interest B12 calculate the fixed and variable costs involved in owning and operating a vehicle

GCO B: Students will demonstrate operation sense and apply operation principles and procedures in both numeric and algebraic situations. (continued)

Elaboration: Operation sense consists of recognizing situations in which a given operation would be useful, building awareness of models and the properties of an operation, seeing relationships among operations, and acquiring insights into the effects of an operation on a pair of numbers. Operation principles and procedures would include such items as the effect of identity elements, computational strategies, and mental mathematics.

Key-Stage Curriculum Outcomes (KSCO)	**Specific Curriculum Outcomes (SCO)**
By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to	*By the end of Mathematics Essentials 10, students will be expected to*
KSCO iv: apply **estimation** techniques to predict, and justify the reasonableness of, results in relevant problem situations involving real numbers	B4 estimate and calculate the unit prices of comparable items to determine the best buy B5 solve problems involving the estimation and calculation of provincial and federal sales taxes B6 estimate and calculate selling price, discounts, mark up, and taxes B10 estimate and calculate the price in Canadian funds of items bought in or ordered from another country B18 estimate appropriate sums, differences, products, and quotients B19 mentally calculate 1%, 10%, 15%, and 50% of quantities that are compatible with these percentage B20 estimate and calculate percentage of quantities, performing operations with decimals, fractions and percents
KSCO v: some post-secondary–intending students will be expected to **apply operations** on complex numbers to solve problems	

GCO C: Students will explore, recognize, represent, and apply patterns and relationships, both informally and formally.

Elaboration: Patterns and relationships run the gamut from number patterns and those made from concrete materials to polynomial and exponential functions. The representation of patterns and relationships will take on multiple forms, including sequences, tables, graphs, and equations, and these representations will be applied, as appropriate, in a wide variety of relevant situations.

Key-Stage Curriculum Outcomes (KSCO)	**Specific Curriculum Outcomes (SCO)**
By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to	*By the end of Mathematics Essentials 10, students will be expected to*
KSCO i: model real-world problems using functions, equations, inequalities and discrete structures	
KSCO ii: represent functional relationships in multiple ways (e.g., written descriptions, tables, equations, and graphs) and describe connections among those representations	C1 recognize patterns in tables where simple and compound interest has been calculated C2 recognize and apply the patterns in the metric system
KSCO iii: interpret algebraic equations and inequalities geometrically and geometric relationships algebraically	C3 recognize and apply the common fraction patterns found on an imperial ruler
KSCO iv: solve problems involving relationships, using graphing technology as well as pencil-and-paper techniques	

GCO D: Students will demonstrate an understanding of, and apply concepts and skills associated with, measurement.

Elaboration: Concepts and skills associated with measurement include making direct measurements, using appropriate measurement units, and using formulas (e.g., surface area, Pythagorean Theorem) and/or procedures (e.g., proportions) to determine measurements indirectly.

Key-Stage Curriculum Outcomes (KSCO)	***Specific Curriculum Outcomes (SCO)***
By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to	*By the end of Mathematics Essentials 10, students will be expected to*
KSCO i: measure quantities indirectly, using techniques of algebra, geometry, and trigonometry	
KSCO ii: determine measurements in a wide variety of problem situations and determine specified degrees of precision, accuracy, and error of measurements	D1 demonstrate a working knowledge of the metric system and imperial system D2 measure lengths accurately, using the metric system and the imperial system
KSCO iii: apply measurement formulas and procedures in a wide variety of contexts	D3 estimate distances in metric units and in imperial units by applying personal referents D4 estimate capacities in metric units by applying personal referents D5 estimate, with reasonable accuracy, large numbers that are illustrated visually and explain the strategies used
KSCO iv: some post-secondary–intending students will be expected to demonstrate an understanding of the meaning of area under a curve	

GCO E: Students will demonstrate spatial sense and apply geometric concepts, properties, and relationships.

Elaboration: Spatial sense is an intuitive feel for one's surroundings and the objects in them and is characterized by such geometric relationships as (i) the direction, orientation, and perspectives of objects in space, (ii) the relative shapes and sizes of figures and objects, and (iii) how a change in shape relates to a change in size. Geometric concepts, properties, and relationships are illustrated by such examples as the concept of area, the property that a square maximizes area for rectangles of a given perimeter, and the relationships among angles formed by transversal intersecting parallel lines.

Key-Stage Curriculum Outcomes (KSCO)	***Specific Curriculum Outcomes (SCO)***
By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to	*By the end of Mathematics Essentials 10, students will be expected to*
KSCO i: extend spatial sense in a variety of mathematical contexts	E1 identify the first five regular polygons and understand basic properties (number of sides, lines of symmetry, and definitions of geometric terms) E3 determine (through investigations using concrete materials and technology) the characteristics of shapes that will tile the plane with a reflecting pattern E4 create designs involving tiling patterns (e.g., Escher-type designs, wallpaper or fabric designs), using technology (e.g., dynamic geometry software, design or drawing software)
KSCO ii: interpret and classify geometric figures, translate between synthetic (Euclidean) and coordinate representations, and apply geometric properties and relationships	
KSCO iii: analyse and apply Euclidean transformations, including representing and applying translations as vectors	
KSCO iv: represent problem situations with geometric models (including the use of trigonometric ratios and coordinate geometry) and apply properties of figures	E2 describe and apply translations, reflections, rotations, and dilatations as they relate to symmetry and design, with the aid of technology
KSCO v: make and test conjectures about, and deduce properties of and relationships between, two- and three-dimensional figures in multiple contexts	E5 analyse the geometric aspects of logos and design E6 create a personal logo, using the mathematics of symmetry, translations, reflections, rotations, or dilatations, with the aid of technology

GCO F: Students will solve problems involving the collection, display, and analysis of data.

Elaboration: The collection, display, and analysis of data involve (i) attention to sampling procedures and issues, (ii) recording and organizing collected data, (iii) choosing and creating appropriate data displays, (iv) analysing data displays in terms of broad principles (e.g., display bias) and via statistical measures (e.g., mean), and (v) formulating and evaluating statistical argument.

Key-Stage Curriculum Outcomes (KSCO)	**Specific Curriculum Outcomes (SCO)**
By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to	*By the end of Mathematics Essentials 10, students will be expected to*
KSCO i: understand sampling issues and their role with respect to statistical claims	F1 read and apply payroll deduction tables F2 identify the information and documents required for filing a personal income tax return and explain why they are required (optional)
KSCO ii: extend construction (both manually and via appropriate technology) of a wide variety of data displays	
KSCO iii: use curve fitting to determine the relationship between, and make predictions from, sets of data and be aware of bias in the interpretation of results	F3 describe the effects on personal spending habits of the frequency of pay period F4 make decisions regarding the purchase of costly items by identifying and ranking criteria for the comparison of possible choices F5 make decisions regarding the payment options for purchases F6 identify various incentives to make purchases
KSCO iv: determine, interpret, and apply as appropriate a wide variety of statistical measures and distributions	
KSCO v: design and conduct relevant statistical experiments (e.g., projects with respect to current issues, career applications, and/or other disciplines) and analyse and communicate the results, using a range of statistical arguments	F7 make personal decisions regarding the best form of transportation
KSCO vi: some post-secondary–intending students will be expected to test hypotheses, using appropriate statistics	

GCO G: Students will represent and solve problems involving uncertainty.

Elaboration: Representing and solving problems involving uncertainty entails (i) determining probabilities by conducting experiments and/or making theoretical calculations, (ii) designing simulations to determine probabilities in situations which do not lend themselves to direct experiment, and (iii) analysing problem situations to decide how best to determine probabilities.

Key-Stage Curriculum Outcomes (KSCO)	**Specific Curriculum Outcomes (SCO)**
By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to	*By the end of Mathematics Essentials 10, students will be expected to*
KSCO i: design and conduct experiments and/or simulations to model and solve a wide variety of relevant probability problems, and interpret and judge the probabilistic arguments of others	G3 predict and describe the results obtained in carrying out probability experiments related to familiar situations involving chance G5 simulate familiar situations involving chance and explain the choice of simulation
KSCO ii: build and apply formal concepts and techniques of theoretical probability (including the use of permutations and combinations as counting techniques)	G1 express probabilities of simple events as the number of favourable outcomes divided by the total number of outcomes
KSCO iii: understand the differences among, and relative merits of, theoretical, experimental, and simulation techniques	G4 compare predicted and experimental results for familiar situations involving chance, using technology to extend the number of experimental trials
KSCO iv: relate probability and statistical situations	G2 express probabilities as fractions, decimals, and percentages and interpret probabilities expressed in each of these forms
KSCO v: Some post-secondary intending students will be expected to create and interpret discrete and continuous probability distributions and apply them in real-world situations	G6 interpret information about probabilities to assist in making informed decisions in a variety of situations G7 interpret and assess probabilistic information used in the media and in common conversation

Program Design and Components

Program Organization

The Mathematics Essentials 10 curriculum is designed to make a significant contribution toward students' meeting each of the EGLs, with the communication and problem-solving EGLs relating particularly well to the curriculums unifying ideas.

Content Organization

Instructional Units

Mathematics Essentials 10 is organized into six instructional units. Mental Math is a skill that you should embed into your teaching of students throughout each of these units. The six instruction units include the following.

- Unit 1: Earning and Purchasing
- Unit 2: Banking
- Unit 3: Measurement
- Unit 4: Geometry
- Unit 5: Transportation and Travel
- Unit 6: Probability

Mental Math

Embedded within each of the above units is the opportunity for you to provide your students with a variety of appropriate mental math activities. You should establish the reasons why mental math and estimation are important skills to possess. While it is true that many computations that require exact answers are done today on calculators, it is important that students have the necessary skills to be able to judge the reasonableness of the answers. This is also true for computations they will do using pencil-and-paper strategies. As well, many computations in their daily lives will not require exact answers (e.g., If three pens each cost $1.90, can I buy them if I have $5.00?). Students will also encounter computations in their daily lives for which they can get exact answers quickly in their heads (e.g., What is the cost of three pens that each cost $3.00?).

Therefore, students develop a repertoire of mental skills to do calculations in their daily lives, whether or not they have a calculator at their disposal. With a good background in mental math, students become more proficient at estimation and develop a better sense of place value, operations, and number sense. In order for mental math skills to develop adequately, there needs to be 5 to 10 minutes daily of mental math skill building.

In general, each strategy for building mental math skills should be practised in isolation until students can give correct solutions in a reasonable time frame. Students must understand the logic of the strategy, recognize when it is appropriate, explain the strategy, and then integrate it with previously learned strategies. The amount of time spent on each strategy should be determined by your students' abilities and previous experiences.

Contexts for Learning and Teaching

Principles of Learning

The public school program is based on principles of learning that teachers and administrators should use as the basis for the experiences they plan for their students. These principles include the following.

1. **Learning is a process of actively constructing knowledge.**
   Therefore, teachers and administrators have a responsibility to
   - create environments and plan experiences that foster inquiry, questioning, predicting, exploring, collecting, educational play, and communicating
   - engage learners in experiences that encourage their personal construction of knowledge, for example, hands-on, minds-on science and math; drama; creative movement; artistic representation; writing; and talking to learn
   - provide learners with experiences that actively involve them and are personally meaningful

2. **Students construct knowledge and make it meaningful in terms of their prior knowledge and experiences.**
   Therefore, teachers and administrators have a responsibility to
   - find out what students already know and can do
   - create learning environments and plan experiences that build on learners prior knowledge
   - ensure that learners are able to see themselves reflected in the learning materials used in the school
   - recognize, value, and use the great diversity of experiences and information students bring to school
   - provide learning opportunities that respect and support students racial, cultural, and social identities
   - ensure that students are invited or challenged to build on prior knowledge, integrating new understandings with existing understandings

3. **Learning is enhanced when it takes place in a social and collaborative environment.**
   Therefore, teachers and administrators have a responsibility to
   - ensure that talk, group work, and collaborative ventures are central to class activities
   - see that learners have frequent opportunities to learn from and with others
   - structure opportunities for learners to engage in diverse social interactions with peers and adults
   - help students to see themselves as members of a community of learners

4. **Students need to continue to view learning as an integrated whole.**
   Therefore, teachers and administrators have a responsibility to
   - plan opportunities to help students make connections across the curriculum and with the world outside and structure activities that require students to reflect on those connections
   - invite students to apply strategies from across the curriculum to solve problems in real situations

5. **Learners must see themselves as capable and successful.**
   Therefore, teachers and administrators have a responsibility to
   - provide activities, resources, and challenges that are developmentally appropriate to the learners
   - communicate high expectations for achievement to all students
   - encourage risk taking in learning
   - ensure that all students experience genuine success on a regular basis
   - value experimentation and treat approximation as signs of growth
   - provide frequent opportunities for students to reflect on and describe what they know and can do
   - provide learning experiences and resources that reflect the diversity of the local and global community
   - provide learning opportunities that develop self-esteem

6. **Learners have different ways of knowing and representing knowledge.**
   Therefore, teachers and administrators have a responsibility to
   - recognize each learner's preferred ways of constructing meaning and provide opportunities for exploring alternative ways
   - plan a wide variety of open-ended experiences and assessment strategies
   - recognize, acknowledge, and build on students diverse ways of knowing and representing their knowledge
   - structure frequent opportunities for students to use various art forms–music, drama, visual arts, dance, movement, crafts–as a means of exploring, formulating, and expressing ideas

7. **Reflection is an integral part of learning.**
   Therefore, teachers and administrators have a responsibility to
   - challenge their beliefs and practices based on continuous reflection
   - reflect on their own learning processes and experiences
   - encourage students to reflect on their learning processes and experiences
   - encourage students to acknowledge and articulate their learnings
   - help students use their reflections to understand themselves as learners, make connections with other learnings, and proceed with learning

A Variety of Learning Styles and Needs

Learners have many ways of learning, knowing, understanding, and creating meaning. Research into links between learning styles and preferences and the physiology and function of the brain has provided educators with a number of helpful concepts of and models for learning. Howard Gardner, for example, identifies eight broad frames of mind or intelligences: linguistic, logical/mathematical, visual/spatial, bodily/kinesthetic, musical, interpersonal, intrapersonal, and naturalistic. Gardner believes that each learner has a unique combination of strengths and weaknesses in these eight areas, but that the intelligences can be more fully developed through diverse learning experiences. Other researchers and education psychologists use different models to describe and organize learning preferences.

Students ability to learn is also influenced by individual preferences and needs within a range of environmental factors, including light, temperature, sound levels, nutrition, proximity to others, opportunities to move around, and time of day. How students receive and process information and the ways they interact with peers and their environment, in specific contexts, are both indicators and shapers of their preferred learning styles. Most learners have a preferred learning style, depending on the situation and the type and form of information the student is dealing with, just as most teachers have a preferred teaching style, depending on the context. By reflecting on their own styles and preferences as learners and as teachers in various contexts, teachers can

- build on their own teaching-style strengths
- develop awareness of and expertise in a number of learning and teaching styles and preferences
- identify differences in student learning styles and preferences
- organize learning experiences to accommodate the range of ways in which students learn, especially students for whom the range of ways of learning is limited

Learning experiences and resources that engage students multiple ways of understanding allow them to become aware of and reflect on their learning processes and preferences. To enhance their opportunities for success, students need some of the following.

- a variety of learning experiences to accommodate their diverse learning styles and preferences
- opportunities to reflect on their preferences and the preferences of others to understand how they learn best and that others may learn differently

- opportunities to explore, apply, and experiment with learning styles other than those they prefer, in learning contexts that encourage risk taking
- opportunities to return to preferred learning styles at critical stages in their learning
- opportunities to reflect on other factors that affect their learning, for example, environmental, emotional, sociological, cultural, and physical factors
- a time line appropriate for their individual learning needs within which to complete their work

The Senior High School Learning Environment

Creating Community

To establish the supportive environment that characterizes a community of learners, teachers need to demonstrate that they value all learners, illustrating how diversity enhances the learning experiences of all students for example, by emphasizing courtesy in the classroom through greeting others by name, thanking them for answers, and inviting, rather than demanding, participation. Students could also be encouraged to share interests, experiences, and expertise with one another. Students must know one another in order to take learning risks, make good decisions about their learning, and build the base for peer partnerships for tutoring, sharing, co-operative learning, and other collaborative learning experiences. Through mini-lessons, workshops, and small-group dynamic activities during initial classes, knowledge is shared about individual learning styles, interpersonal skills, and team building. The teacher should act as a facilitator, attending to both active and passive students during group activities, modelling ways of drawing everyone into the activity, as well as ways of respecting and valuing each persons contribution, and identifying strengths and needs for future conferences on an individual basis. Having established community within the classroom, the teacher and students together can make decisions about learning activities. Whether students are working as a whole class, in small groups, in pairs, in triads, or individually, teachers should

- encourage comments from all students during whole-class discussion, demonstrating confidence in and respect for their ideas
- guide students to direct questions evenly to members of the group
- encourage students to discover and work from the prior knowledge in their own social, racial, or cultural experiences
- encourage questions, never assuming prior knowledge
- select partners or encourage students to select different partners for specific purposes
- help students establish a comfort zone in small groups where they will be willing to contribute to the learning experience
- observe students during group work, identifying strengths and needs, and conference with individuals to help them develop new roles and strategies
- include options for students to work alone for specific and clearly defined purposes

Engaging All Students

A supportive environment is important for all learners and is especially important in encouraging disengaged or underachieving learners.

Mathematics Essentials 10 provides opportunities to engage students who lack confidence in themselves as mathematics learners or who have a potential that has not been realized. These students may need substantial support in gaining essential knowledge and skills and in interacting with others.

Students need to engage fully in learning experiences that

- are perceived as authentic and worthwhile
- build on their prior knowledge
- allow them to construct meaning in their own ways
- link learning to understanding and affirming their own experiences
- encourage them to experience ownership and control of their learning
- feature frequent feedback and encouragement
- include opportunities to provide individuals with clarification and elaboration

- are not threatening or intimidating
- focus on successes rather than failures
- are organized into clear, structured segments

It is important that teachers design learning experiences that provide a balance between challenge and success and between support and autonomy. All students benefit from a variety of grouping arrangements that allow optimum opportunities for meaningful teacher-student and student-student interaction. An effective instructional design provides a balance of the following grouping strategies:

- large-group or whole-class learning
- teacher-directed small-group learning
- small-group-directed learning
- co-operative learning groups
- one-to-one teacher-student learning
- independent learning
- partnered learning
- peer or cross-age tutoring
- mentoring

Meeting the Needs of All Learners

An important emphasis in this curriculum is the need to deal successfully with a wide variety of equity and diversity issues. Not only must teachers be aware of, and adapt instruction to account for, differences in student readiness as students begin this course and as they progress, they must also remain aware of the importance of avoiding gender and cultural biases in their teaching. Ideally, every student should find his or her learning opportunities maximized in the mathematics classroom. The reality of individual student differences must be recognized as teachers make instructional decisions. While Mathematics Essentials 10 presents SCOs for the course, it must be acknowledged that not all students will progress at the same pace or be equally positioned with respect to attaining a given outcome at any given time. The SCOs represent, at best, a reasonable framework for helping students to ultimately achieve the KSCOs and GCOs.

Mathematics teachers can reach a variety of learners by using a multi-representational approach. If students experience many ways of connecting with a mathematical concept, they will obtain a deeper understanding of that concept; and students with different learning styles can access the concept with the representation that has the most meaning for them. A classroom environment that balances individual, small-group, and whole-class approaches to activities is recommended when trying to meet the needs of all learners.

Meeting the Needs of All Students

Learners require inclusive classrooms, where a wide variety of learning experiences ensures that all students have equitable opportunities to reach their potential. In designing learning experiences, teachers must accommodate the learning needs of individuals and consider the abilities, experiences, interests, and values that they bring to the classroom. In recognizing and valuing the diversity of students, teachers should consider ways to

- create a climate and design learning experiences to affirm the dignity and worth of all learners in the classroom community
- give consideration to the social and economic situations of all learners
- model the use of inclusive language, attitudes, and actions supportive of all learners
- acknowledge racial and cultural uniqueness
- adapt classroom organization, teaching strategies, assessment practices, time, and learning resources to address learners needs and build on their strengths
- provide opportunities for learners to work in a variety of contexts, including mixed-ability groupings

- identify and utilize strategies and resources that respond to the range of students learning styles and preferences
- build on students individual levels of knowledge, skills, and attitudes
- design learning and assessment tasks that draw on learners strengths
- use students strengths and abilities to motivate and support their learning
- provide opportunities for students to make choices that will broaden their access to a range of learning experiences
- acknowledge the accomplishment of learning tasks, especially those that learners believed were too challenging for them

In a supportive learning environment, all students receive equitable access to resources, including the teachers time and attention, technology, learning assistance, a range of roles in group activities, and choices of learning experiences when options are available. All students are disadvantaged when oral, written, and visual language creates, reflects, and reinforces stereotyping. Teachers promote social, cultural, racial, and gender equity when they provide opportunities for students to critically examine the ideas, concepts, and environments associated with Mathematics Essentials 10 in the classroom, in the community, and in the media. Teachers should look for opportunities to

- promote critical thinking
- recognize knowledge as socially constructed
- model gender-fair language and respectful listening in all their interactions with students
- articulate high expectations for all students
- provide equal opportunity for input and response from all students
- encourage all students to assume leadership roles
- ensure that all students have a broad range of choice in learning and assessment tasks
- encourage students to avoid making decisions about roles and language choices based on stereotyping
- include the experiences and perceptions of all students in all aspects of their learning
- recognize the contributions of men and women of all social, cultural, linguistic, and racial backgrounds to all disciplines throughout history

Social and cultural diversity in student populations expands and enriches the learning experiences of all students. Students can learn much from the backgrounds, experiences, and perspectives of their classmates. In a community of learners, participants explore the diversity of their own and others customs, histories, values, beliefs, languages, and ways of seeing and making sense of the world.

When learning experiences are structured to allow for a range of perspectives, students from varied social and cultural backgrounds realize that their ways of seeing and knowing are not the only ones possible. They can come to examine more carefully the complexity of ideas and issues arising from the differences in their perspectives and to understand how cultural and social diversity enrich their lives and their culture.

The curriculum outcomes designed for Mathematics Essentials 10 provide a framework for a range of learning experiences for all students. Teachers must adapt learning contexts, including environment, strategies for learning, and strategies for assessment, to provide support and challenge for all students, using learning outcomes to plan learning experiences appropriate to students individual learning needs. When these changes are not sufficient for a student to meet designated outcomes, an individual program plan (IPP) is developed. For more detailed information, see *Special Education Policy Manual* (1996), Policy 2.6.

A range of learning experiences, teaching and learning strategies, resources, and environments provides expanded opportunities for all learners to experience success as they work toward the achievement of designated outcomes. Many of the learning experiences suggested in this guide provide access for a wide range of learners, simultaneously emphasizing both group support and individual activity. Similarly, the suggestions for a variety of assessment practices provide multiple ways for students to demonstrate their achievements.

In order to provide a range of learning experiences to challenge all students, teachers may adapt learning contexts to stimulate and extend learning. Teachers should consider ways in which students can extend their knowledge base, thinking processes, learning strategies, self-awareness, and insights. Some learners can benefit from opportunities to negotiate their own challenges, design their own learning experiences, set their own schedules, and work individually or with learning partners.

Some students learning needs may be met by providing opportunities for them to focus on learning contexts that emphasize experimentation, inquiry, and critical and personal perspectives; in these contexts, teachers should work with students to identify and obtain access to appropriate resources.

The Role of Technology

Vision for the Integration of Information Technologies

Within the learning outcomes framework the Nova Scotia Department of Education has articulated five components for the integration of information technology (IT) within curriculum programs

1. *Basic Operations and Concepts*
   Concepts and skills associated with the safe, efficient operation of a range of information technologies

2. *Productivity Tools and Software*
   The efficient selection and use of IT to perform tasks such as
   - the exploration of ideas
   - data collection
   - data manipulation, including the discovery of patterns and relationships
   - problem solving
   - the representation of learning

3. *Communications Technology*
   The use of specific, interactive technologies that support collaboration and sharing through communication

4. *Research, Problem Solving, and Decision Making*
   The organization, reasoning, and evaluation by which students rationalize their use of IT

5. *Social, Ethical, and Human Issues*
   The understanding associated with the use of IT that encourages in students a commitment to pursue personal and social good, particularly to build and improve their learning environments and to foster stronger relationships with their peers and others who support their learning.

Integrating Information and Communication Technologies within the Classroom

As information technologies shift the ways in which society accesses, communicates, and transfers information and ideas, they inevitably change the ways in which students learn. Students must be prepared to deal with an information and communications environment characterized by continuous, rapid change, an exponential growth of information, and expanding opportunities to interact and interconnect with others in a global context. Because technologies are constantly and rapidly evolving, it is important that teachers make careful decisions about applications, always in relation to the extent to which technology applications help students to achieve the curriculum outcomes. Technology can support learning for the following specific purposes.

Inquiry

Theory Building: Students can develop ideas, plan projects, track the results of growth in their understanding, develop dynamic, detailed outlines, and develop models to test their understanding, using software and hardware for modelling, simulation, representation, integration, and planning.
Data Access: Students can search for and access documents, multimedia events, simulations, and conversations through hypertext/hypermedia software, digital media, CD-ROM, Internet libraries, and databases.

Data Collection: Students can create, obtain, and organize information in a range of forms, using sensing, scanning, image and sound recording and editing technology, databases, spreadsheets, survey software, and Internet search software.

Communication

Media Communication: Students can create, edit, publish, present, or post documents, presentations, multimedia events, web pages, simulations, models, and interactive learning programs, using word processing, publishing, presentation, webpage development, and hypertext software.

Interaction/collaboration: Students can share information, ideas, interests, concerns, and questions with other through e-mail; Internet audio, video, and print conferences; information servers, Internet news groups, and listservs; and student-created hypertext environments.

Expression

Students can shape the creative expression of their ideas, feelings, insights, and understandings using graphic software; music making, composing, editing, and synthesizing technology; interactive video and hypermedia; animation software; multimedia composing technology; sound and light control systems and software; and video and audio recording and editing technology.

The Role of Technology in Mathematics Essentials 10

Although technology is not essential for the successful completion of the outcomes, the use of graphing calculators, the Excel spreadsheet program, and dynamic geometry software such as Tessellation Exploration is considered to be necessary for the most effective coverage of some of the outcomes and may enhance the development of the concept in others. The table below shows which outcomes from the Mathematics Essentials 10 are enhanced by the use of specific technology and which outcomes require technology for effective curriculum implementation. Whatever technology is implemented into the classroom, it should be noted that the technology be integrated into the lesson rather than an add-on.

Technology Requirements for Mathematics Essentials 10

Examples of Outcomes Requiring or Enhanced by Technology	Scientific Calculator	Tessellation Exploration	Excel
A6			enhanced
B2	necessary		enhanced
B3	necessary		enhanced
B4	necessary		
B5	necessary		enhanced
B6	necessary		enhanced
B9	necessary		
B10	necessary		
B11	necessary		enhanced
B12	necessary		
B13	necessary		enhanced
B14	necessary		enhanced
B15	necessary		enhanced
C1		enhanced	
E2		necessary	
E3		necessary	
E4		necessary	
E5		necessary	
E6		necessary	
F5	necessary		
G2	necessary		
G3	necessary		
G4	necessary		
G5	necessary		
G6	necessary		
G7	necessary		

Learning and Teaching Mathematics

What students learn is fundamentally connected to how they learn it. The view of learning mathematics as an integrated set of intellectual tools for making sense of mathematical situations has created a need for new forms of classroom organization, communication patterns, and instructional strategies. The teacher is no longer the sole dispenser of knowledge but is rather a facilitator and educational conductor whose major roles include

- creating a classroom environment to support the teaching and learning of mathematics
- setting goals and selecting or creating mathematical tasks to help the students reach these goals
- stimulating and managing classroom discourse so that the students have a clearer understanding about what is being taught
- analysing student learning, the mathematical tasks, and the environment in order to make ongoing instructional decisions

Effective mathematics teaching and learning take place in a range of situations. Instructional settings and strategies should create a climate that reflects the constructive, active view of the learning process. This means that learning does not occur by passive absorption and imitation, but rather as students actively assimilate new information and construct their own meanings.

Opportunities to learn mathematics are a function of the setting and the kinds of tasks and discourse in which students participate. What students learn about particular concepts and procedures and their own mathematical thinking depends on the ways in which they engage in mathematical activity in their classrooms. Their dispositions toward mathematics are also shaped by such experiences. Consequently, the goal of developing students mathematical powers requires careful attention to pedagogy as well as to the curriculum.

Mathematics instruction should vary and should include opportunities for group and individual assignments, discussion between teacher and students and among students, appropriate project work, practice with mathematical methods, and exposition by the teacher.

Instructional settings should include varied learning environments that encourage the development of specific co-operative behaviours. Students should be expected to work together to help one another and to complete individual projects. Students develop strategies and skills in asking questions, listening, showing and explaining to others how to do things, finding out what others think, and determining the best way to complete a project.

Summary of Changes in Instructional Practices

Research in the way students learn and the best practices for teaching has caused us to move away from

- teacher and text as exclusive sources of knowledge
- rote memorization of facts and procedures
- extended periods of individual practising of routine tasks
- instruction based almost completely on teacher exposition
- a total emphasis on pencil-and-paper manipulative skill work
- the relegation of testing to an adjunct role with the sole purpose of assigning grades

And move toward more effective instructional practices that include

- the active involvement of students in constructing and applying mathematical ideas
- problem solving as a means, as well as a goal, of instruction
- effective questioning techniques that promote student interaction
- the use of a variety of instructional formats (small groups, explorations, peer instruction, whole class, project work)
- the use of computers and calculators as tools for learning and doing mathematics
- student communication of mathematical ideas orally and in writing
- the establishment and application of the interrelatedness of mathematical topics
- the systematic maintenance of student learnings by embedding review in the context of new topics and problem situations
- assessment of learning as an integral part of instruction

Learning Resources

This curriculum guide is the central resource for mathematics teachers with respect to Mathematics Essentials 10. Other teacher resources are ancillary to it. This curriculum guide should serve as the focal point for all daily, unit, and yearly planning, as well as a reference point to determine the extent to which the curriculum outcomes have been met.

Teachers require access to a variety of professional resources as they seek to broaden their instructional and mathematical skills. Students require access to manipulative materials and technological resources to support their learning in Mathematics Essentials 10, as well as to print resources that support the curriculum. The Authorized Learning Resources list includes a wide range of student and teacher resources for mathematics. Both up-to-date printable catalogues in PDF format and a searchable database are available online at http://w3apps.ednet.ns.ca/nssbb. In addition, the Media Library at Learning Resources and Technology includes a range of resources in video, audio, and photographic formats. The searchable online catalogue is available at http://lrt.ednet.ns.ca.

Assessing and Evaluating Student Learning

In recent years there have been calls for change in the practices used to assess and evaluate students' progress. Many factors have set in motion the demands for change, including the following:

- **Expectations for mathematics education as outlined in *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989) and *Principles and Standards for School Mathematics* (NCTM, 2000)**

  Curriculum and Evaluation Standards provides educators with specific information about what students should be able to do in mathematics. These expectations go far beyond learning a list of mathematical facts; instead, they emphasize such competencies as creative and critical thinking, problem solving, working collaboratively, and the ability to manage one's own learning. Students are expected to be able to communicate mathematically, to solve and create problems, to use concepts to solve real-world applications, to integrate mathematics across disciplines, and to connect strands of mathematics. For the most part, assessments used in the past have not addressed these expectations. New approaches to assessment are needed to address the expectations set out in *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989) and *Principles and Standards for School Mathematics* (NCTM, 2000).

- **Understanding of the bonds linking teaching, learning, and assessment**
  Much of our understanding of learning has been based on a theory that viewed learning as the accumulation of discrete skills. Cognitive views of learning call for an active, constructive approach in which learners gain understanding by building their own knowledge and developing connections between facts and concepts. Problem solving and reasoning, rather than the acquisition of isolated facts, become the emphases.

  Conventional testing, which includes multiple choice or having students answer questions to determine if they can recall the type of question and the procedure to be used, provides a window into only one aspect of what a student has learned. Assessments that require students to solve problems, demonstrate skills, create products, and create portfolios of work reveal more about the students reasoning and understanding of mathematics. Since students are expected to develop reasoning and problem-solving competencies, teaching must reflect such, and in turn, assessment must reflect what is valued in teaching and learning.

  Feedback from assessment directly affects learning. The development of problem-solving and higher-order thinking skills will be realized only if assessment practices are in alignment with these expectations.

- **Limitations of the traditional methods used to determine student achievement**
  Do traditional methods of assessment provide the student with information on how to improve performance? Methods of assessment need to be developed that provide teachers with accurate information about students academic achievement. As well, information is needed to guide teachers in decision making to improve both learning and teaching.

What Is Assessment?

Assessment is the systematic process of gathering information on student learning. Assessment allows teachers to communicate to students what is really valued–what is worth learning, how it should be learned, what elements of quality are considered most important, and how well students are expected to perform. To assess student learning in a mathematics curriculum that emphasizes applications and problem solving, teachers must employ strategies that recognize the reasoning involved in the process as well as in the product. *Assessment Standards for School Mathematics* (NCTM 1995) describes assessment practices that enable teachers to gather evidence about a students knowledge of, ability to use, and disposition toward mathematics and make inferences from that evidence for a variety of purposes.

Assessment can be informal or formal. Informal assessment occurs during instruction. It is a mindset, a daily activity that helps teachers answer the question. Is what is taught being learned? Its primary purpose is to collect information about the instructional needs of students so that teachers can make decisions to improve instructional strategies. For many teachers, the strategy of making annotated comments about a students work is part of informal assessment. Assessment must do more than determine a score for the student. It should do more than portray a level of performance. It should direct teachers communication and actions. Assessment must anticipate subsequent action.

Formal assessment requires the organization of an assessment event. In the past, mathematics teachers may have restricted these events to quizzes, tests, or exams. As the outcomes for mathematics education broaden, it becomes more obvious that these assessment methods become more limited. Some educators would argue that informal assessment provides better-quality information because it is in a context that can be put to immediate use.

Why Should Teachers Assess Student Learning?

Teachers should assess student learning in order to

- improve instruction by identifying successful instructional strategies
- identify and address specific sources of the students misunderstandings
- inform the students about their strengths in skills, knowledge, and learning strategies
- inform parents of their childrens progress so that they can provide more effective support
- determine the level of achievement for each outcome

Effective assessment is integral to instruction and will enable effective intervention and support; therefore, it is essential that teachers develop a repertoire of assessment strategies.

Assessment Strategies

The following are some of the assessment strategies that teachers may employ.

Documenting Classroom Behaviours

In the past, teachers have generally made observations of students persistence, systematic working, organization, accuracy, conjecturing, modelling, creativity, and ability to communicate ideas, but often failed to document them. Recording information signals to the student those behaviours that are truly valued. Teachers should focus on recording only significant events–those that represent a students typical behaviour or a situation in which the student demonstrates new understanding or a lack of understanding. Using a class list, teachers can expect to record comments on approximately four students per class. The use of an annotated class list allows the teacher to recognize where students are having difficulties and to identify students who may be spectators in the classroom. However, for summative purposes, grades should reflect the degree to which students achieve the curriculum outcomes.

Using a Portfolio and Student Journal

Having students assemble responses to various types of tasks on a regular basis is part of an effective assessment scheme. Responding to open-ended questions allows students to explore the bounds and the structure of mathematical categories. For example, asking students to prepare a shopping list that stays within

a budget of $50 would be preferable to asking students to find the total of a given list of articles. It would allow students to explore the problem in many different ways and give them the opportunity to use many different procedures and skills.

Students should use their journals to monitor their own learning by reflecting on and responding to questions such as

- What is the most interesting thing you learned in mathematics class this week?
- What do you find difficult to understand?
- How could the teacher improve mathematics instruction?
- Can you identify how the mathematics we are now studying is connected to the real world?

In students portfolios and journals, teachers can observe the development of their understanding and progress as problem solvers. Students should be solving problems that require varying lengths of time and represent both individual and group effort. What is most important is that teachers discuss with their students what items are to be parts of a meaningful portfolio and that students have responsibility for assembling the portfolio.

Projects and Investigative Reports

Students will have opportunities to do projects at various times through the year. For example, in the Geometry Unit they will be asked to design a logo; they may do a project by creating a business and explain how the logo relates to the business that they created. Students should also be given investigations in which they learn new mathematical concepts on their own. Excellent materials can be obtained from the NCTM including *Student Math Notes* (news bulletins that can be downloaded from the Internet).

Written Tests, Quizzes, and Exams

Written tests have been criticized as being limited to assessing students' abilities to recall and replicate mathematical facts and procedures. Some educators would argue that asking students to solve contrived applications, usually within time limits, provides teachers with little knowledge of their understanding of mathematics.

How might teachers improve the use of written tests?

The challenge is to improve the nature of the questions being asked, so that teachers are gaining information about the students understanding and comprehension. Tests must be designed so that questions being asked reflect the expectations of the outcomes being addressed. One way to do this is to have students construct assessment items for the test. Allowing students to contribute to the test permits them to reflect on what they were learning, and it is a most effective revision strategy.

Teachers should reflect on the quality of the test being given to students. Are students being asked to evaluate, analyse, and synthesize information, or are they simply being asked to recall isolated facts from memory? Teachers should develop a table of specifications when planning their tests. In assessing student learning, teachers have a professional obligation to ensure that the assessment reflects those skills and behaviours that are truly valued. Effective assessment goes hand in hand with effective instruction, and together they promote student achievement.

Course Organization

Course Design

This section of the document presents the mathematics curriculum outcomes that students are expected to achieve during this course. Teachers are encouraged, however, to consider what comes before and what follows to better understand how the students learning at a particular course level are part of a bigger picture of concept and skill development.

Mathematics Essentials 10 is organized into six instructional units: Earning and Purchasing, Banking, Measurement, Geometry, Transportation and Travel, and Probability. Mental Math is an skill that will be incorporated throughout the six units of the Mathematics Essentials 10 course.

The Two-Page Spread

The following pages detail curriculum outcomes. Each two-page spread is dedicated to a small number of SCOs. As much as possible, connections are made through references to other pages of related outcomes or topics.

The unit title is presented at the top of each page, and the appropriate SCO(s) are displayed in the left-hand column. The second column presents the elaboration, which includes instructional strategies and suggestions, as well as some examples that might be used to illustrate achievement of outcomes. The third column includes worthwhile tasks for instruction and/or assessment purposes. While the strategies, suggestions, and examples are not intended to be rigidly applied, they will help to further clarify the SCO(s) and to illustrate ways to work toward the outcome(s), while maintaining an emphasis on problem solving, communication, reasoning, and connections.

The final column is entitled Suggested Resources and will, over time, with your additions, become a collection of useful references to resources that are particularly valuable for addressing the given outcome(s).

Mental Math

Mental Math

Outcomes

By the end of this course, students will be expected to

B16 know the double facts in additions; their extension to two, three, and four digits; their connections to subtraction, multiplication by 2 and by ½, division by 2 and multiplication by 50 percent

B18 estimate appropriate sums, differences, products, and quotients

Elaboration – Instructional Strategies/Suggestions

B 16 The general approach to highlighting a mental math strategy is to give the students an example of a computation for which the strategy would be useful to see if any of the students already know the strategy. If so, the student(s) can explain the strategy to the class with your help. If not, you could share the strategy yourself. The logic of the strategy should be well understood before it is rehearsed. (Often it would also be appropriate to show when the strategy would not be appropriate as well as when it would be appropriate.) Rehearsals should be short with a few examples each time with continual discussion of the strategy. These rehearsals could take different forms; however, they should be structured to insure maximum involvement. The amount of "wait time" might start at 10 seconds and gradually decrease with each rehearsal. Each new strategy should be practised in isolation until it is mastered and then integrated with other previously learned strategies.

You should help students appreciate the value of knowing the basic facts involving single digits by making the connections to larger numbers and other concepts. For example, you could start by working with the double addition facts (1 + 1, 2 + 2, 3 + 3, … , 9 + 9), and their extensions:

- 10 + 10, 20 + 20, 30 + 30, … , 90 + 90; 100 + 100, 200 + 200, 300 + 300, … , 900 + 900; 1000 + 1000, 2000 + 2000, 3000 + 3000, … , 9000 + 9000
- 2 – 1, 4 – 2, 6 – 3, … , 18 – 9; 20 – 10, 40 – 20, 60 – 30, … , 180 – 90; 200 – 100, 400 – 200, 600 – 300, … , 1800 – 900; 2000 – 100, 4000 – 2000, 6000 – 3000, … , 18 000 – 9000
- 2 × 1, 2 × 2, 2 × 3, … , 2 × 9; 2 × 10, 2 × 20, 2 × 30, … , 2 × 90; 2 × 100, 2 × 200, 2 × 300, … , 2 × 900; 2 × 1000, 2 × 2000, 2 × 3000, … , 2 × 9000
- 2 ÷ 2, 4 ÷ 2, 6 ÷ 2, … , 18 ÷ 2; 20 ÷ 2, 40 ÷ 2, 60 ÷ 2, … , 180 ÷ 2; 200 ÷ 2, 400 ÷ 2, 600 ÷ 2, … , 1800 ÷ 2; 2000 ÷ 2, 4000 ÷ 2; 6000 ÷ 2, … , 18 000 ÷ 2
- 50% × 2, 50% × 4, 50% × 6, … , 50% × 18; 50% × 20, 50% × 40, 50% × 60, … , 50% × 180; 50% × 200, 50% × 400, 50% × 600, … , 50% × 1800; 50% × 2000, 50% × 4000, 50% × 6000, … , 50% × 18 000

B18 You should apply the mental math strategies in B16 to corresponding estimations. For example, if students are asked to estimate the sum of $398 + $392, they would round both to $400 and use the double strategy to get an estimate of $800. If students are asked to estimate 50% of $58, they would find 50% of 60 to get an estimate of $30. (See Appendix A)

Mental Math

Worthwhile Tasks for Instruction and/or Assessment
Performance

B16.1 Mentally calculate each of the following:
(a) 60 + 60 (b) 8 000 + 8 000 (c) 300 + 300 (d) 9 + 9

B16.2 Explain how you can mentally calculate 2 × 700.

B16.3 Mentally calculate each of the following:
(a) 40 × 2 (b) 2 × 6 000 (c) 900 × 2 (d) 16 ÷ 2

B16.4 Explain how you can mentally calculate 50% of 800.

B16.5 Explain how 1/2 × 400 and 50% × 400 are equivalent.

B16.6 Mentally calculate each of the following:
(a) 140 ÷ 2 (b) 6 000 ÷ 2 (c) 1600 ÷ 2 (d) 1200 ÷ 2

B18.1 Estimate each of the following:
(a) 6.8 + 6.9 (b) 9.2 + 8.9 (c) 68 + 71 (d) 199 + 197

B18.2 Estimate each of the following:
(a) 2 × 9.2 (b) 2 × 597 (c) 2 × 6 998 (d) 2 × 49

B18.3 Estimate each of the following:
(a) 50% × 798 (b) 50% × 81 (c) 50% × 1797 (d) 50% × 1196

B18.4 Explain how you estimate 49% of 17.9.

B16.7 Mary bought two toys for her niece for Christmas. They cost $30 each. How much did she pay for the two toys?

B18.5 Joe bought a VCR for $199 and a monitor for $210. Approximately how much did Joe spend?

Suggested Resources

Mental Math, worksheet. (Appendix A)

Mental Math

Outcomes

By the end of this course, students will be expected to

B17 know the addition and subtraction facts and extend them to two, three, and four digit numbers

B18 estimate appropriate sums, differences, products, and quotients

Elaboration – Instructional Strategies/Suggestions

B 17 There are 100 addition facts involving 0 to 9. The doubles for 1 to 9 constitute 9 of these 100 facts. Other addition fact strategies should be developed for single digits and then applied to tens, hundreds, and thousands. These would include

- Add 1 by thinking "next number" will apply to 16 new facts.
- 1-parts, such as 2 + 3, 3 + 4, and 8 + 9, by thinking "double and add 1" or "double and subtract 1", will apply to 14 new facts. (1 + 2 and 2 + 1 were dealt with by "next number" strategy.)
- Adding zero by thinking "no change" will apply to 19 new facts.
- Make 10 with a 9 by thinking "change the 9 to a 10 by taking 1 from the other number and then add 10 and what's left of the other number" will apply to 12 new facts as well as to ones already done by other strategies, such as 9 + 1, 1 + 9, 9 + 8, and 8 + 9.
- Make 10 with an 8 by thinking "change the 8 to 10 by taking 2 from the other number and then add 10 and what's left of the other number" will apply to 10 new facts as well as ones already done by other strategies, such as 8 + 7, 7 + 8, 8 + 9, and 9 + 8.
- Add 2 by thinking "next even/odd number" will apply to 8 new facts as well as ones already done by other strategies, such as 1 + 2, 2 + 1, 2 + 2, 2 + 3, 3 + 2, … , 8 + 2, 2 + 8, 9 + 2, and 2 + 9.
- The Last 6 Facts and Their Commutative Pairs: (5 + 3, 6 + 3,
- 6 + 4, 7 + 3, 7 + 4, and 7 + 5). Ask students for suggestions of strategies for these. Some students might suggest a make-10 strategy for the "7 + " facts; others might visualize the ten-frames for all of these; others might suggest two skips of 2 for 6 + 4 and 7 + 4; others might suggest adding 2 and then 1 for the addition of 3; others might suggest that 7 + 5 is (5 + 5) + 2.
- Another interesting strategy that uses doubles applies to sums of numbers that are 2-apart, such as 3 + 5, 4 + 6, 5 + 7, 6 + 8, and 7 + 9. In all cases, the sums are the double of the number in between; for example, 3 + 5 = 4 + 4.

Each of these strategies can be applied to corresponding tens, hundreds, and thousands. For example, 600 + 700 could be thought of as (600 + 600) + 100 using a strategy for *100-aparts*. Teachers could extend each strategy for the single-digit sums to tens, hundreds, and thousands after the strategy is learned, or they could wait until all single-digit strategies are learned before extending them.

B18 You should apply the mental math strategies in B17 to corresponding estimations. For example, if students are asked to estimate $3.99 + $4.97, they would add $4 and $5 by "doubling $4 and adding 1" to get an estimate of $9; if asked to estimate $8.90 + $5.12, they would add $9 and $5 using the "make 10" strategy to get an estimate of $14.

Mental Math

Worthwhile Tasks for Instruction and/or Assessment
Performance

B17.1 Mentally calculate each of the following:
(a) 7 + 6 (b) 9 + 6 (c) 5 + 2 (d) 3 + 5

B17.2 Explain the strategy for *1-aparts*. Give examples of when you would use it.

B18.1 Estimate each of the following:
(a) 5.9 + 6.8 (b) 6.2 + 1.99 (c) 8.8 + 5.1 (d) 7.9 + 4.1

B17.3 Explain two strategies that could be used to add 8 + 7.

B17.4 Mentally calculate each of the following:
(a) 300 + 400 (b) 700 + 200 (c) 500 + 900 (d) 100 + 700

B18.2 Explain how you could estimate the sum of $899 + $695.

B17.5 Mentally add 300 to each hundred from 100 to 900, and explain the strategy that can be used to find each sum.

B17.6 Mentally add 9000 to every thousand from 1000 to 9000, and explain the strategy that can be used to find each sum.

B18.3 Estimate each of the following:
(a) $408 + $198 (b) $39.95 + $19.87
(c) $78.99 + $89.90 (d) $3990 + $3989

Suggested Resources

Mental Math, worksheet. (Appendix A)

Mental Math

Outcomes

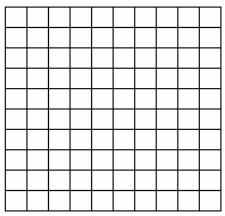
By the end of this course, students will be expected to

B19 mentally calculate 1%, 10%, 15%, and 50% of quantities that are compatible with these percentage

B20 estimate and calculate percentage of quantities as performing operations with decimals, fractions, and percents

Elaboration – Instructional Strategies/Suggestions

B19 You should introduce students to a 10 × 10 grid as a visual representation for 100%, explaining that whatever quantity you are given has to be evenly distributed into all 100 cells. Then what is in one cell is 1% of the quantity you were given, and you can multiply by the number of cells (percent) you want. For example, to visualize and determine 4% of $600, you would see $6 in each of the 100 cells; therefore, 4% would be 4 × $6 or $24.



This so-called one-percent method is a great way to mentally find small percentage of numbers that easily divide by 100. It also clarifies why you divide by 100 and then multiply when calculating percentage by pencil- and- paper or calculator.

You should also help students understand why dividing a given quantity by 10 would be 10% of that quantity. This could be connected to finding the amount in 10 cells in the 10 × 10 grid. You should ask students to find 10% of numbers that divide nicely by 10, such as 70, 800, 480, and 1200.

Once students are comfortable with finding 10%, you should extend the percentage to 15% by finding 10%, then half of this 10% added to 10%. For example, 15% of $400 is found by thinking: 10% of $400 is $40 and half of $40 is $20; so, $40 plus $20 is $60.

B20 Once students are comfortable finding percentage using the one-percent method, you could discuss a strategy for finding estimates. For example, to estimate 3% of $489, you could find 3% of $500 (rounding $489 to the nearest *nice number* to divide by 100) to get 3 × $5 or $15 as an estimate. Similarly, corresponding estimates could be done for 10% and 15%

Mental Math

Worthwhile Tasks for Instruction and/or Assessment
Performance

B19.1 Mentally each of the following:
(a) 1% of 250
(b) 10% of 360
(c) 15% of 1000
(d) 25% of 2000
(e) 50% of 1750
(f) ½ of 1750

B20.1 Estimate the percentage of each of the following:
(a) 250 of 2500
(b) 12.5 of 1250
(c) 8.5 of 34
(d) 42.5 of 85
(e) 14.4 of 96
(f) 16 of 16

Suggested Resources

Mental Math, worksheet. (Appendix A)

Earning and Purchasing

Earning and Purchasing

Outcomes

SCO

By the end of this course, students will be expected to

A1 understand purchasing power

B1 determine the renumeration for chosen occupations, including salary and benefits, and evaluate it in terms of purchasing power and living standards

Elaboration – Instructional Strategies/Suggestions

A1 Using a small group or whole class discussion, you should ask your students to brainstorm their ideas about what purchasing power means to them. You might ask them to choose three items they would like to purchase immediately and three items they would like to purchase some day down the road. After getting their lists together, ask your students to decide what kinds of jobs would enable them to achieve the purchasing power necessary to acquire the items on their wish lists.

- You could prepare a set of cards showing a range of jobs and their estimated yearly salaries. Ask students to calculate the monthly salaries for each job. In a separate bag for each group of students, have a set of cards representing items such as used car, new car, vacation down south, vacation to the beach, new TV, etc. Ask students to pick out items from the bag and decide which job on their job cards will give them the purchasing power to supply them with the items found in the bag. A rich class discussion will provide explanations.

B1 You should have students examine various occupations and consider the salary, benefits, and pay periods of each one. You should allow students to use the *Nova Scotia Career Options* book first and then use the computer to visit websites to compare the same occupations elsewhere. You could also have students visit local business personnel to discuss the education and experience required for the potential salaries that they may receive.

- Compare the choice of an insurance sales person in the *Nova Scotia Career Options* book on the website, and then contact a local insurance agency to discuss the options of working as an insurance broker.
- Have students choose the three top jobs they would like to apply for when they leave school or as they are going through school. After they have made their list, ask students to search out information to find out the estimated weekly or monthly salaries. Once the students have some idea about the potential salaries, ask them to write a story, draw a series of pictures, or make a collage of what they feel their purchasing power may be based on this monthly salary.

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

A1.1 Maria has a job teaching swimming lessons. She gets paid $50.00 per day. Maria works 5 days a week at the indoor university pool. How much does Maria make in one month? Her expenses for the month total $750? How much purchasing power does Maria have at the end of each month?

A1.2 Lynn wants to buy a new computer that costs $1000. She is looking for a job that will allow her to get her computer as quickly as possible. She looks through the want ads and sees that there is an ad for a sandwich artist making $8.50 an hour and one for an office assistant that makes $125 per week. How long would she have to work at each job to get her computer?

B1.1 Assign each student in the class to research three different career options as a resource. The student will then chose one option to study. The study will include the annual salary, the benefits of this salary, and the standards of living that equate to this career. Based on your salary, would you be able to rent an apartment, buy a home, or live at home? Justify your answer. Allow students to present this in class.

Suggested Resources

- Job Futures: Canada's National Career and Education Planning Tool, (http://jobfutures.ca)
- Guide to the Labour Standards Code, (www.gov.ns.ca/enla/employmentrights/docs/LabourStandardsCodeGuide.doc)
- personnel from the community such as salesmen, real estate to present pros and cons for commission vs. salary based work
- *Nova Scotia Career Options Choices* (software)

Earning and Purchasing

Outcomes

SCO

By the end of this course, students will be expected to

B2 solve problems involving various ways that an employee can be paid, using calculators or appropriate software

Elaboration – Instructional Strategies/Suggestions

B2 Through your use of such techniques as brainstorming or small group/whole class discussion, your students should come away from this lesson with the understanding that a person who receives a salary receives this amount based on pay for one year (52 weeks). This is called an annual salary. Your students should also realize that there are various ways of paying a salary, such as weekly earnings, bi-weekly earnings, monthly earnings, and semi-monthly earnings.

- Students should be given various annual salaries and be asked to calculate the different pay amounts (monthly, semi-monthly, bi-weekly, and/or weekly). E.g., annual salary = $36 000.00: monthly salary = $\frac{\$36\,000}{12} = \$3\,000.00$

- Students should be given various pay amounts and be asked to calculate other salaries (either annual salaries or other types of pays) E.g. , weekly salary = $625.00:
  annual salary = $625.00 × 52 = $32,500.00
  monthly salary = $32,500.00 ÷ 12 = $ 2,708.33
  semi-monthly salary = $820.00:
  monthly = $820.00 × 2 = $1,640.00
  annual salary = $1,640.00 × 12 = $19,680.00

You should also help your students understand that an hourly rate is set by the employer and is paid to the employee according to the number of hours worked. Overtime rate should be discussed bringing in various definitions of overtime. Students should also be introduced to the terms piecework and commission, as well as be shown how to calculate salaries for piecework and commission. Computational problems can be given for students to do. Note: Pay = hourly rate × number of hours worked. Overtime pay in Nova Scotia is earned by employees who work more than 48 hours per week. The hourly overtime rate is the hourly rate × 1.5. Therefore, pay = regular earnings + overtime hours × overtime rate. Piecework is pay earned by producing or selling units of product. Commission is a form of pay that is paid by itself or along with a salary and is based on a percentage of the value of the items sold.

- If the total sales are $3000 and the commission is 10%, calculate the salary from the commission.
- Have students create a graphic organizer to help learn the different terms in this outcome. A concept map, the Frayer model, or a VVWA found in Appendix A might work well as examples of graphic organizers

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

B2.1 Joe earns $7.10 per hour working at the local theatre. If he works 21 hours, how much does he get paid every week?

B2.2 Jim earns $75.00 a week working at the local *Ford* dealer. He also earns $4.25 for each car he washes and waxes. If he does 15 cars this week, how much money will he be paid?

B2.3 Quinne works selling magazines door to door. She is paid by piecework, meaning that she will be paid $1.20 for each new subscription she generates and $1.00 for each renewal she signs up. Find out how much money Quinne will make after a hard week signing up 325 subscriptions, 227 of which were new.

B2.4 Jim and Al both work at Canso Ford. Jim gets paid 15% commission on the profit from each vehicle he sells. Al receives $150.00 for each extended warranty he sells. The profit on the 5 vehicles Jim sold last week was $10,000.00. Al sold 9 extended warranties last week. Who made the most money last week and how much more does he make?

B2.5 When buying her new TV, Shianne was told that the commission would be split with her if she was to buy from that particular dealer. The TV cost $1395, and the commission, according to the dealer, was 5%. What would have been the rebate for Shianne?

B2.6 You are working at the local movie theatre and are being paid $7.10 per hour. For each month, you work 26 hours at the regular rate and eight hours at the overtime rate of time and a half for washing and waxing floors. Calculate monthly earnings and the annual salary. If you are paid bi-weekly, how much will you earn?

B2.7 Overtime pays 1.5 (time and a half) times the hourly rate for every hour over and above 40 hours. Calculate your earnings if you work 47 hrs/wk.

Suggested Resources

- Math text: *Mathematics for Everyday Life*

Earning and Purchasing

Outcomes
SCO

By the end of this course, students will be expected to

A2 explain the difference between gross pay and net pay, and describe possible payroll deductions

B3 calculate gross pay and net pay for given situations

F1 read and apply payroll deduction tables

Elaboration – Instructional Strategies/Suggestions

A2/F1 Using a sample pay stub, you should help students read and understand the notations for CPP, EI, and income tax. By using a variety of examples, you should give students ample opportunities to distinguish between net and gross pay. Through various activities, you should help students examine a pay stub and/or a T4 slip to determine what information would be helpful in preparing a tax return. At this time, you may wish to review specific deductions and their purposes. Prepare fictitious pay stubs that mimic those from various businesses and show students where they can locate the net and gross pay amounts as well as the different payroll deductions that appear on the different pay stubs. When doing activities in this section, you should always introduce the deductions slowly. Start with one or two deductions and then, with increasing difficulty, start working up, adding pension plans, health plans, charitable donations, union dues, etc. The number of deductions and their different meanings may seem overwhelming to students who have not seen them on a pay stub.

- Prepare a graphic organizer that could help the students keep the terminology, meaning, and the notation for the different payroll deductions clear when working through this unit.

B3 Students can learn how to calculate their net and gross pay that appears on their pay stubs from their employer. Using a similar set of fictitious pay stubs to those in the previous paragraph, leave out either the net pay or the gross pay and ask students to calculate these amounts knowing the deductions and the pay (net or gross) that is given.

- Prepare a list of deductions (CPP, EI, and income tax) and amounts to go with these deductions. Have students find the net pay from a given gross pay accounting for all of the deductions.
- Give the deductions of a person's pay stub including savings plan, EI, union dues, CPP, and income tax and have students calculate the net pay from the gross pay. Ask students to compare the net pay to the gross pay. Ask for comments such as to why people have these extra deductions, which will lead into investing in the future (or not and the consequences), having health insurance (or not and the consequences), etc.

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

A2.1 List all of the deductions that are on every pay stub. List some of the deductions that people may choose to have on their pay stubs.

A2.2 Explain the deductions CPP and EI that are seen on your pay stubs.

B3.1 Determine the missing value from the chart below:

Name	Gross Pay	Deductions	Net Pay
Donna	$569.98		$269.98
Jack		$28.11	$231.12
Thomas	$265.00		$196.34
Erin		$76.00	$276.11

B3.2 One of the four people in the previous question has health insurance. From the pay amounts of these four people, which one do you suppose might have health insurance? How would you know? Explain.

B3.3 Eli makes $11.25 per hour at the local pharmacy as the night watchman. He works his 8-hour shift Monday to Friday. Each week he gets paid with the following deductions:

EI	$10.96
CPP	$12.85
Income tax	$35.87
RRSP	$25.00
Pension plan	$25.00

Calculate Eli's (a) gross pay, (b) deductions, and (c) net pay per week.

Suggested Resources

- CPP and EI rates
- income tax tables
- sample pay stubs

Earning and Purchasing

Outcomes
SCO

By the end of this course, students will be expected to

F2 identify the information and documents required for filing a personal income tax return and explain why they are required (optional)

F3 describe the effects on personal spending habits of the frequency of pay period

Elaboration—Instructional Strategies/Suggestions

F2 You could begin this lesson by opening discussions surrounding personal tax returns and accompanying documents in order to help students gain an understanding of the purpose of the required information and documents. For example, the role of tax returns in relation to statistics, the economy, and fraud/tax evasion. Using a sample tax form, students should be able identify the criteria that define certain classifications (marital status, employment status, or number of dependents) on the form. Students should also learn what criterion determines your requirement to file a tax return. Students could also be exposed, through discussion, to the methods of filing tax returns (e.g., phone, online, in person, mail, tax preparation firms).

- Complete a sample tax form and show students via a transparency, LCD, or handout. You could work through a simple tax return with the students using this handout, having them work through one as well. Students who have jobs, can use their actual data, make up numerical data for those in your class without jobs. As you go through the return, ask students why the information is necessary, why all of the people in Nova Scotia are be required to fill in the information?

F3 You should present the connection between pay periods and personal spending to the students through class discussions. Students could be given scenarios with weekly pay and monthly budgets, biweekly pay and different budgets. Students can play a game of "The Pay Period is Right." You could set up a series of envelopes that contain a mixture of products (necessities and fun stuff) and have students work in groups with a scenario. The scenarios would have the pays and the pay periods listed on them. Students groups would then have to decide if their pay period was right to purchase all of the envelope contents or what contents they would have to choose for this month and what would have to wait for another time.

- Calculations should involve expenses that are considered extraneous and frivolous for some of the budget scenarios.

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

F2.1 Compile all the personal information and fill in the appropriate spaces on an income tax form using information such as; who files the return, social insurance numbers, address, name, contact information, marital status, number of dependents, employment.

F.2 Develop a list of resources that would aid in filing an income tax return (required documents, pen, pencil, calculator).

F2.3 Students should interpret the information from required documents and be able to apply them to the correct section of the tax form.

F2.4 You or a community tax leader can address the importance of tax filing and the consequences of incorrect or illegal tax form preparations. Explain reasons why accurate tax filing is important: fraud/tax evasion, voters list, information for Statistics Canada (marital status, number of dependents, population/economic growth, economical impact).

F2/3 Take one copy of your income tax form and complete the form with your personal information, **using a pencil**. Once you have completed the form, recopy the information in pen. This will be the version you submit; the pencil copy is for your records.

F3.1 Steve earns $1375.00 per month and is paid bi-monthly (middle and end of each month). His rent is $350.00, paid at the beginning of each month. The cable bill, which is $80.00, comes out on the 8th of each month. If he starts with a balance of $472.00, when should he pay his $300.00 Visa bill?

Suggested Resources

- Text: *Mathematics for Everyday Living*
- *Nova Scotia Career Options*
- income tax forms/kit with documents needed to file
- community leaders in tax/accounting
- *Required Documents:*
  - T4
  - proof of private insurance
- *Optional Documents:*
  - medical expenses
  - tuition expenses
  - business-related expenses
  - childcare receipts
  - proof of investments
  - return from previous year
  - appropriate form
  - income tax guides

Earning and Purchasing

Outcomes
SCO

By the end of this course, students will be expected to

B4 estimate and calculate the unit prices of comparable items to determine the best buy

Elaboration – Instructional Strategies/Suggestions

B4 You should begin this topic with mental math activities in which students round amounts to the nearest dollar, quarter, dime, and nickel. Students can then estimate unit price by dividing by the number of units (unit price = total price ÷ number of units). Before calculating, you should help students develop the concept of unit price and difference between purchasing a larger economy-size item or an individually sized item (e.g., 2 L cola vs. 1-500 ml cola). In real-world applications, it would be realistic for students to use calculators to determine the actual unit price of an item. In the classroom setting, however, it might be useful to give your students experiences in estimating and mentally predicting unit prices prior to the actual calculations of unit price. When estimating, students should round to the nearest dollar.

- The unit price is the cost of an item expressed per unit, such as per 100 g, per L, etc. For example, if 200 g costs $2.00, then the unit price per 100 g is $1.00. Repeat similar examples where the unit price is less than a dollar (e.g., $0.50 or $0.25)
- Give students examples of price calculations (with mistakes) and instruct them to find errors and calculate the correct price.

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

B4.1 Obtain a list of grocery items found in several stores from your teacher. Compare the unit prices for the items on the grocery list that appear in the flyers available. Prepare a report that you can post for the class to show your findings.

B4.2 The price of a 900 g can of baby formula is $20.58. A case of 12 × 250 mL cans of the same baby formula is $29.98. Calculate the unit price of each one.

B4.3 Students should be introduced to this concept using whole numbers in a contextual example, such as, a package of 4 golf balls costs $8.00. How much does one ball cost?

B4.4 A package of 4 batteries costs $1.99. Calculate the unit price. Work with a partner.

Suggested Resource

- Text: *Mathematics for Everyday Living*
- Grocery store flyers

Earning, Paying Taxes, and Purchasing

Outcomes
SCO

By the end of this course, students will be expected to

A3 explain indirect and direct forms of taxation

B5 solve problems involving the estimation and calculation of provincial and federal sales taxes

B6 estimate and calculate selling price, discounts, mark up, and taxes

Elaboration – Instructional Strategies/Suggestions

A3 You should begin this section by generating discussions concerning taxes, asking students what they know about taxes and the reasons for taxes. Since students are likely most familiar with sales taxes; initial discussions might centre on GST, PST, and HST. They should know what taxes are, why we have taxes, and the difference between direct and indirect taxes.

- You could have your class brainstorm a list of items or ideas about what items may be taxed directly and what may be taxed indirectly.

B5 Using a map of Canada, showing the sales taxes for the different provinces (see Appendix B), you could have students be involved in a variety of problem-solving activities where they estimate and then calculate sales taxes on a variety of items purchased in the different provinces. Through these activities, students will learn about compound taxes; GST, PST, and HST; and estimating and calculating total cost. You should also have students explore the various exemptions in the different provinces and difficulties associated with the HST.

- As a mental math activity, explain that 15% is 10% + 5% or take 10% of your purchase and add half of that amount again. (e.g., In Nova Scotia tax on $4.20 is 10% of $4.20 = $0.42 + half of $0.42, which is $0.21. Total tax $0.42 + $0.21 = $0.63.)

B6 Your students should be exposed to both the use of percent and fractional forms of discounts to determine the sale prices and discounts. Problem solving in the form of calculations might prove to be beneficial. Through the use of problem-solving exercises, students can solve for either the selling price, the discount, or the taxes charged on an item purchased. You should allow students to estimate their answer before calculating in order to improve their ability to see the reasonableness of their calculated answer.

- Jeans are normally $49.99 at the Jean Barn, but this weekend only they are on sale for $35. What is the discount being offered on jeans this weekend?
- Tires are on sale this weekend only for 1/3 off. The original price per tire is $129.00; how much would it cost, before taxes, for 4 tires, this weekend. (First estimate, then calculate the sale price.)

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

A3.1 Using flyers or magazines, create a collage to represent your understanding of the items that are taxed directly and those that have indirect taxes. Write a short explanation to go with your collage.

A3.2 Write the three most important points you learned about taxes (GST, PST, and HST) as well as indirect and direct taxes.

B5.1 Determine the total cost after taxes for a pair of shoes that costs $75.00 in Nova Scotia. What is the difference in the cost if these same shoes were bought in Ontario?

B5.2 Mentally calculate the 15% HST on the following costs of items: (a) $120, (b) $500, (c) $1000, (d) $600, (e) $80

B5.3 Create a table, using flyers from a local business, to develop a Christmas shopping list. Organize your table to show selling price, tax, and total cost.

B5.4 Redo your "shopping list" from B3.3, assuming that you live in one of the other provinces.

B5.5 Explain in words how to find the sales tax on an item purchased in Nova Scotia.

B6.1 What is the discount on a $75.00 sweater if the sale price is $46.97?

B6.2 Estimate the sale price on laundry detergent that originally sells for $15.99 and is 20% off this week at the local grocery store. Calculate the actual sale price and determine how close your estimate is to the actual cost.

B6.3 Soccer cleats are on sale for 30% off. Estimate then calculate the sale price if the original price is $69.99 before tax.

Suggested Resources

- Map of Canada with information on what taxes are changed in each province (Appendix B)
- Estimating and calculating Nova Scotia sales tax (worksheet 2, 3, and 4, Appendix A)

Earning and Purchasing

Outcomes
SCO

By the end of this course, students will be expected to

B7 provide the correct change for an amount offered and minimize the number of coins/bills

B8 select amounts to offer for a given charge to minimize the number of coins/bills received in the change

Elaboration – Instructional Strategies/Suggestion

B7/8 First introduce students to the various units of currency from coins to bills. You might use features present on the bills such as the Braille symbols and features that deter counterfeiting to provide an interesting sideline to this lesson. Before you address these specific outcomes, you must determine whether your students know the place-value connection to the denominations of money (e.g., $12.13 = one 10-dollar bill, one toonie, one dime, and three pennies). You should also get them to learn to represent the same amount in a variety of ways (e.g., $27.05 may be formed with one 20-dollar bill, one 5-dollar bill, one toonie, and five pennies; or five 5-dollar bills, two loonies, and a nickel; or a variety of other representations). Once your students are comfortable with that, you should have them explore a variety of ways to make change and focus on the one that uses the minimum number of coins and bills. You should discuss both the "counting-up" strategy and the "counting-back" strategy with your students and allow them to choose the one that they are most comfortable with. You should have your students calculate change in a variety of ways, such as paper and pencil (see Appendix A, worksheet 2), mentally in simple situations, and using a calculator when amounts are large.

- Prepare a variety of cards with pictures of articles and price tags. Show each card to the students, assign a specific bill, and ask students to calculate the change from that bill if the item was purchased with no tax. This activity can be done either as a whole class or a small group.
- Have students participate in role-play as customers and cashiers using play money.
- Present a few situations to your students where people offer different amounts to people for the same charge to see if the students can determine why someone might offer more than they have to (E.g., for a charge of $3.76, Don offered a $5.00 bill, while Jane offered a $5.00 bill and one penny).

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

B7.1 a) How much change would you get back from $10.00 if the charge is $6.89?
b) What coins would you expect to get?

B7.2 a) You bought a gift that cost $17.61. The store clerk handed you a loonie, four quarters, nine pennies, and three dimes. Did you get the correct change?
b) How could the clerk have given you fewer coins?

B7.3 Calculate the change from a $9.00 item when the amount tendered is (a) $10.00 and (b) $20.00. What is the change when the item is $9.32.

B7.4 Provide the correct change for a charge of $3.87 when the amount offered is $5.02

B8.1 Explain why Jason offered the cashier a 10-dollar bill, a dime, and two pennies when the charge was $5.12.

B8.2 If the charge is $9.76 what amount should you offer the cashier to get the minimum number of coins back?

B8.3 What payments might a person offer for a charge of $16.36 in order to reduce the number of coins received in the change?

B8.4 Choose pictures of five items from the weekly flyers or a catalogue with their prices shown. Assume you have purchased these items on a no tax sale. For each item, decide how much you would offer the cashier in order to get the fewest numbers of coins or bills in change.

Suggested Resources

- *T*ext: *Mathematics for Everyday Living*
- Canadian cash kit
- cash overhead kit
- money chart

Earning and Purchasing

Outcomes
SCO

By the end of this course, students will be expected to

A4 identify and explain the advantages and disadvantages of various plans to make purchases

B9 identify, calculate, and compare the interest costs involved in making purchases under various plans

F4 make decisions regarding the purchase of costly items by identifying and ranking criteria for the comparison of possible choices

Elaboration – Instructional Strategies/Suggestion

A4/B9 You could begin this session by brainstorming with your students a list of different methods of payment (e.g., cash, debit, credit card, rent-to-own, installment, lay away, no interest/no payment plan). Through the use of discussion and using this brainstormed list, students should understand both the advantages and disadvantages of the wide variety of payment options available to consumers You could separate students into small groups or pairs and have them research the different payment options available to consumers when they make purchases. Technology (spreadsheets, money-management software) could be helpful in the research report. Students should also be exposed to problem-solving exercises where they would be given a product and asked to calculate the final price given the various plans.

- Jacqueline wanted to buy a washer and dryer for $899. The store offers a payment plan for 12 months, but she must pay a payment, (deferral option, rent-to-own). There is a $35 deferral charge and the rent-to-own option charges an extra 2% processing fee. Students could then be split into groups and then list the pros and cons of each option. What is the total amount of Jacqueline's purchase? What will be her monthly payment? Will the first month's payment be higher? Explain.

F4 You have already planted the prior learning for this outcome earlier in B4 when you and your students looked at the unit price of items. In F4, the discussions and problem solving might go deeper to include more costly items and then ranking of the issues involved in borrowing or using deferred payments, for example, in saving money. Students should be reminded that there may be better strategies for determining what is the better buy. Strategies for making decisions in comparison shopping are essential in today's world and with today's economy

- What is the better buy? 12 fudge sticks for $2.50 or 18 fudge sticks for $3.00. Did you use the unit price to compare? What strategy did you use?
- Uncle Dave's has leather sofas on sale for $999 with no interest and no payment for 1 full year. He does, however, have a deferral charge of $75, and the tax must be paid up front. Sofa Warehouse has the same sofas on for $1050 with the same offer of no-interest, no payment for one year. They have a $150 deferral rate, but they pay the tax. Which is the better deal and why?

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

A4.1 Choose a large-ticket item (e.g., bedroom suite) and ask students to find and calculate the price as if they were purchasing it (a) at Sears (has deferral fee) using credit card but paying it off in 12 months; (b) taking out a small loan for 12 months (requires technology to look up bank rates or conversations with bank personnel); and (c) at a rent-to-own company. Different high priced items can be given to different individual students or small groups. Students can complete the project by discussing the advantages and disadvantages of each of these plans, comparing them to saving up to buy the item(s) with cash (debit).

B9.1 Using the same item(s) as in A4.1, ask students to calculate the amount of interest that would be paid by each method and compare these in order to justify why they would choose one plan over another when purchasing their item(s).

B9.2 A specific credit card company charges 0.05178% per day on the balance. Your balance at the end of the month is $2268.08. You get 21 days to pay your bill with no penalty, but you could not pay it for 28 days.

(a) How much interest did you pay on your outstanding balance?
(b) If you paid half your bill and did not charge any more, how much would your bill be next month, 30 days later?

F4.1 Which is the better deal?

(a) 5 apples for $1.35 or 2 apples for $0.39
(b) 600 mL of pop for $1.75 or 1 L of pop for $2.29

F4.2 Take grocery flyers from 2 different stores. Choose the same 10 items. Compare the unit prices for these comparable items. Post your findings in the classroom.

Suggested Resources

- Text: *Mathematics for Everyday Living*
- catalogues
- newspapers

Earning and Purchasing

Outcomes
SCO

By the end of this course, students will be expected to

F5 make decisions regarding the payment options for purchases

F6 identify various incentives to make purchases

Elaboration –Instructional Strategies/Suggestions

F5 Through the use of various problem-solving activities and by using information obtained from retailers in your area you can help your students become more aware of the different payment options for purchasing (layaway, rent-to-own, instalments, no-interest, no payment) and how these affect the overall price of the item being purchased. Students should also be exposed to the advantages and disadvantages of these options in order to make informed decisions in the future.

- Ron needs to buy a stove that costs $599.97 plus taxes. He puts $150 down and uses the rent-to-own option in order to pay for the rest. The monthly plan offered by the company is $38 per month for 18 months. What was the total cost of the stove? What would have been the total cost if Ron had bought the stove without the rent-to-own option?

F6 Many retailers today have incentives to use their credit systems or to purchase at their stores. By using technology, by sending students on a scavenger hunt to search for information, or through a brainstorming session, your students should be made aware of some of the different incentives to purchase available in your area. Students should be able to identify the various incentives (characteristics) to make purchases (e.g., discount coupons/stamps, Air Miles, interest-free loans, points cards (such as HBC card) and discuss the advantages and disadvantages of each.

- If you buy groceries at a certain grocery store they offer you 1 Air Mile for every $20 of groceries you buy. For every 20 Air Miles you get $20 worth of groceries. If you buy at another grocery chain you get gas savings coupons. Discuss when you would think a consumer would choose the Air Miles option and when they would choose the gas coupons.

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

F5.1 Mitch is planning to get married and has put the wedding rings on layaway. The rings cost $1105.95 plus tax. He must pay 10% down and at least 5% each month until it is paid off.

(a) How much is Mitch's initial payment?
(b) What is the longest time Mitch will have to pay off the rings?

F6.1 Using common items such as light bulbs, determine the cost of purchasing at Canadian Tire, a grocery store offering Air Miles, and Zellers, and which is the better deal with incentives factoring in personal choice. (1 Air Mile = $ 20.00, 1 Club Z point = $ 1.00, Canadian Tire = 1.5% in-store rebate)

Suggested Resources

- Text: *Mathematics for Everyday Living*
- catalogues
- newspapers

Earning and Purchasing

Outcomes
SCO

By the end of this course, students will be expected to

B10 estimate and calculate the price in Canadian funds of items bought in or ordered from another country

Elaboration – Instructional Strategies/Suggestions

B10 Working with exchange rates is an opportunity to develop students' proportional reasoning. By making the connection between exchange rate and unit price, your students can develop this stronger sense of proportional reasoning. Students also need to become familiar with the currency of other countries. Have your students look at a chart of currency exchange rates to Canadian funds. Help them convert Canadian currency to other currency such as the US dollar and the euro. Students should be involved in a discussion surrounding the idea that some currencies are worth more than others (both in value and in stability) and are therefore used more often. For example, many countries use the American dollar. Within this discussion, students could talk about currencies in terms of buying power.

- Amedee has saved $ 349 Canadian dollars for his trip to Maine. He is going to the bank and the teller gives him $276 US in return. How much Canadian money did Amedee have to pay for every 1 US dollar?
- Plan a trip to another country. Calculate the amount you would have to pay in Canadian dollars for the other country's currency. E.g. A trip to Ireland is 500 euro. How much is that in Canadian dollars?

Earning and Purchasing

Worthwhile Tasks for Instruction and/or Assessment
Performance

B10.1 Take currency that Chronicle Herald (shows Canadian purchase for other currencies) and use the calculator to write that in reverse. e.g., Other countries purchase in Canadian dollars.

B10.2 Have students use the Internet to research the currency of at least 5 other countries. Within this, you could ask students to bring in sample of another country's currency or use the Internet to research the designs of the currency and the history behind the designs.

B10.3 Have students estimate and then determine the actual cost in Canadian dollars for items prices in the currency of another country.

B10.4 Have students look at a chart of currency exchange rates to Canadian funds. Have students decide whether each country's currency is worth more or less than the Canadian dollar. Use currency comparison chart from www.oanada.com or www.xe.com for classroom discussion (e.g., Mexican peso - less, US dollar – more).

B10.5 Estimate and then calculate how many Mexican pesos I need to make one Canadian dollar, $100 Canadian dollars, $285 Canadian dollars.

B10.6 How many Canadian dollars are required to equal one euro? How many Canadian dollars on 100 euros? How many Canadian dollars on 527 euro

Suggested Resources

- Text: *Mathematics for Everyday Living*
- newspapers
- www.oanada.com
- www.xe.com

Banking

Banking

Outcomes
SCO

By the end of this course, students will be expected to

A5 understand transactions such as depositing, transferring and withdrawing money, writing cheques and withdrawing money

A6 understand what interest is and how interest is calculated by a bank

Elaboration – Instructional Strategies/Suggestions

A5 As students begin their study of banking, start with a look at the different transactions they may encounter when they deposit or withdraw money. You will also want the students to be aware of the fees associated with these transactions. You could start this activity by providing students with a series of questions to research about their local bank(s) or about available on line banks. These questions might ask about transaction fees for depositing, withdrawing, writing cheques, and transferring money from one account to the other. You might also ask students to research their specific bank about the availability of an ATM for their bank and if not, what the charge is for using another bank's ATM. As well, you could ask about monthly fees for your account, fees for buying cheques, and the interest rate on any balance. Once the questions have been researched, student groups can present their findings, and the class can debate the best attributes for each bank to try to find the "ideal" bank for the consumer.

- Ask students, either alone, in pairs, or in small groups, to prepare a chart with the headers Self-service, Automatic Banking, Electronic (on line) Banking, Telephone Banking. Under each of these headings, place the subheading Advantages and Disadvantages. (Note you could also hang up chart paper with each of these headings on a page and have the students complete a carousel activity.)
- Give students data for monthly fees (e.g., $5.50) plus the transaction fees ($0.50 each) and ask them to calculate the service charge on 5 transactions, 10 transactions, and 50 transactions.

A6 Your students must have some exposure to two types of interest calculations in their study of banking. The first type is simple interest and should be discussed with students before compound interest. In your discussion, you can introduce terms such as principal, investment amount, and interest rate. Once students have had some practice with interest problems and have a clear understanding of what simple interest is, a natural progression into compound interest might be the next step in your lesson. Compound interest involves a few more calculations for students, and therefore more care must be recommended for problem-solving. Remind students that the interest rate is only a percentage. It may be necessary for you to go over the changing from percent to decimal notation.

- Pierre wants to invest $1000 at his bank. The bank investment manager tells Pierre that he can get 5% simple interest over the next 5 years? Explain this to Pierre.
- Pierre goes to a second bank and this manager says they will give him 3% interest compounded annually over 5 years. Explain this to Pierre. How is it different from what he can get at the first bank?

Banking

Worthwhile Tasks for Instruction and/or Assessment
Performance

A5.1 One bank offers 25 free transactions per month with a monthly service fee of $9.95. If you go over your 25 transactions, the fee is $0.75 per transaction. A second bank charges $3.50 for its service fee but has a $1.00 per transaction service charge (no minimum). Which bank would you choose?

A5.2 Using what you know about self-service, automatic banking, electronic banking, and on line banking (research features of the ones you don't know much about), which method of banking do you prefer to use? Explain your choice.

A5.3 Erin has a savings account at the local bank. The monthly fee is $6.95, but if she goes over 20 transactions, she has to pay $1.00 for every transaction over 20. In the month of November, Erin had 16 transactions, but in the month of December she had 45 transactions, what were her service fees for these two months?

A6.1 Name the two biggest differences you see between compound and simple interest. Explain your answer.

A6.2 If you look at investing a sum of money, what method is better one with simple interest or one with compound interest, or is there a better one? Explain your answer.

A6.3 Research the general description of mutual funds and GICs. Go online or contact your local bank to find out the different rates available for both of these savings options.

A6.4 What is the rate of interest you would receive on a savings account? Contact your bank or go online and obtain information from various banks concerning interest and savings accounts.

Suggested Resources

- www. scotiabank.com
- www.royalbank.com
- http://www4.bmo.com/
- http://www.cibc.com/ca/personal.html
- brochures from banks
- personnel from banks

Banking

Outcomes
SCO

By the end of this course, students will be expected to

B11 calculate simple and compound interest

C1 recognize patterns in tables where simple and compound interest has been calculated

Elaboration – Instructional Strategies/Suggestions

B11 Both simple and compound interest were introduced to your students earlier, but now it is time to delve deeper into the calculations so that where students have a chance to compare simple interest to interest compounded annually, semi-annually, quarterly, monthly, and daily. You should try to link these calculations to GICs and mutual funds or to savings accounts. Students should understand and be able to calculate the different amounts they would receive or pay in all of these situations. You may find compound interest calculations too difficult for students to do on their own, so this could be made optional.

- After going through some examples with the students, have them play a game where they are to answer questions calculating either the interest or the amount of an investment. Start with easy questions and increase in difficulty the more your students are able to complete the questions.

C1 For simple interest, it may prove useful for students to look at a table comparing invested amount and the amount of interest. (Note: this is a more difficult task with compound interest tables.) Students could use these tables to actually find the interest rate, or they could look at a table and determine earnings on GICs or mutual funds. Students can learn by looking at tables what type of an investment to make.

- Have students examine tables that have been filled in with numerical data. (See the task at C1.1 on the next page for an example of the table.) Ask students to comment on the last column in the table, what does this suggest about the interest rate?

Banking

Worthwhile Tasks for Instruction and/or Assessment
Performance

B11.1 Emilie has invested $2500 in a simple interest account that pays 5.6% per year. At the end of the first year how much does Emilie have? What about the end of the second year? Third year?

B11.2 Connor has invested $2500 in a compound interest account that pays 5.6% per year. At the end of the first year how much does Connor have? What about the end of the second year? Third year?

B11.3 If you look at the two investments for Emilie and Connor, what method is better for investing? Explain your answer.

B11.4 You plan to invest $2000 for 2 years. Choose an investment option (savings, GIC, mutual fund), explain using words, diagrams, or pictures why you made this choice; and prepare a display of your results to show to the class.

C1.1 Complete the following chart for an investment of $5000 for 1 year. When you are done, make some comments about the Amount column to the right. Why do you think more people do not invest with the interest rate that yields the largest number in the last column of the table?

Rate per annum (%)	Compounded	Compounding periods in one year	Rate per compounding period, I (%)	Number of compounding periods, n	Amount, A ($)
	Annually				
	Semi-annually				
	Quarterly				
	Monthly				
	Daily				

C1.2 Using the same table as in C1.1, say you were saving $5000 in a bank savings account for the next 10 years. What rate of return do banks normally give on money simply placed in a bank account? Research your local banks if you do not yet know the answer.

Suggested Resources

- websites on banking, investing
- newspapers
- magazines
- brochure

Measurement

Measurement

Outcomes
SCO

By the end of this course, students will be expected to

D1 demonstrate a working knowledge of the metric system and imperial system

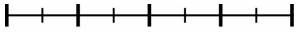
D2 measure lengths accurately, using the metric system and the imperial system

Elaboration – Instructional Strategies/Suggestions

D1 You should begin the measurement unit by asking students to relate their knowledge of everyday objects (personal referents) that they know the exact measurements of. For example, a small juice = 300 mL, and a medium pop bottle = 500 mL. You may then wish to create a list of words (brainstorm) with the class that represents measurements (mm, cm, m, km, ml, L, mg, g, kg, °C). From here, students can discuss buying things where these measurements are used. Students should also be able to convert between kilo, hecto, deka, deci, centi, and milli. Through the use of discussion, examples, and various problem-solving activities, your students should learn to decide the most appropriate unit to use for a measurement and also to convert from one unit to another.

- Have students convert measurements from metres to centimetres, metres to kilometres, litres to millilitres, and grams to kilograms using real-life examples.
- Give each group of four students 100 pennies, 20 nickels, 10 dimes, 4 quarters, and 1 loonie. Have them do replacements from smaller units to larger units and from larger units to smaller units.

D2 Have table with conversion of metric to imperial (e.g., 12" = 30 cm, 1 lb = 454 g). Before students practise taking measurements accurately, you should start with how to measure and how to use a ruler in metric (and imperial). You may also need to show fractions in an inch (?, ¼, ½) used in measuring lengths and heights. Students should practise taking measurements with you (to test accuracy) by taking measurements of objects around the classroom in both imperial and metric. Have students make their own measuring tape (with both metric and imperial measurements) to use in their measuring questions.



(lable fractions in different colours)

- Measure your height in imperial (feet/inches) and in metric (metres/cm). Why do you think height is one of the places many people still use imperial measure?
- Have students estimate (or measure) the length of their desks in centimetres, metres, and kilometres. Ask students to decide which would be the most appropriate unit to use for this measurement.
- Now have your students measure their arms and compare their arm length to their height. Now compare the arm length and height of several classmates. Do they all have the same or similar arm length to height ratios as you? Explain.
- Using appropriate units, measure examples of floor plans, head size of screws/bolts/nails (etc., using appropriate units: floor (imp.), carpet (m), tile (in. /cm), screws/nails (mm)).

Measurement

Worthwhile Tasks for Instruction and/or Assessment
Performance

D1.1 Grace states that the distance from Halifax to Kentville is approximately 100 000 m. Has Grace used the best units to measure this distance? If not, convert the distance to the units you think would be most appropriate.

D1.2 When Beth measured Victoria she was just less than 2 m tall. About how many centimetres tall do you think Victoria is?

D1.3 How many 500 mL containers of Ben and Jerry's Ice Cream can fit into an empty 2 L container.

D1.4 Jill is working on her car and measures a bolt to be 0.5 cm wide. If her measuring set is in millimetres, what size tool will she need to remove the bolt?

D2.1 Measure accurately the perimeter of odd shaped figures in the classroom or at home as if you were going to wrap a border (or ribbon) around them.

D2.2 Compare the measurement of inches and centimetres of
(a) your textbook
(b) your binder

D2.3 Measure the windows at home for blinds. Figure out what blinds you would buy from a catalogue based on your measurements.

D2.4 Hannah is going to build a shelving unit that measures 37.5 cm wide, 35 cm deep, and 195 cm high. The store clerk at the building supply store can work only in imperial measure; Hannah can work only in metric. Help her convert the measurements?

Suggested Resources

- catalogues
- imperial to metric conversion chart
- class set of imperial rulers
- metre sticks

Measurement

Outcomes
SCO

By the end of this course, students will be expected to

D3 estimate distances in metric units and in imperial units by applying personal referents

D4 estimate capacities in metric units by applying personal referents

D5 estimate, with reasonable accuracy, large numbers that are illustrated visually and explain the strategies used.

Elaboration – Instructional Strategies/Suggestions

D3/4/5 You should present the students with personal referents for the purpose of estimation. Some examples of personal referents that you could use include the following examples: the width of their finger is about 1 cm, the length of a piece of loose leaf is 1 foot, a can of pop is about 350 mL, and the distance from the floor to the door knob is about 1 metre. Students should be given an opportunity to think about and share any personal referents that they may have and use. Estimation is done without a calculator. Show emphasis on doing things mentally and efficiently. If a student takes too much time, try to determine what, if any, strategies they are using. You could ask students to practise estimation by trying to estimate the number of books on a wall in a library, the number of people in a picture of a crowd, or populations that live in a high-rise apartment building and then to explain how they estimated these numbers.

- Have the measurement from your school to place one kilometre from school. This will act as the student's personal referent. Using this personal referent, ask students to estimate the distance from the school to different places around your school.
- Collect different capacities of tin cans (e.g., juice, tuna, soup, etc.). Use one size can as a non-standard unit to estimate and have students measure the capacity of other size cans.
- Divide the students into two groups. Allow group one to measure the length of their gait. These students will then walk around the perimeter of the room to determine the dimensions of the room. The students in group two will estimate the length of their gait and follow the same procedure to determine the dimensions of the room. Students will then compare the results. Have students explain discrepancies based on their strategies used.

Measurement

Worthwhile Tasks for Instruction and/or Assessment
Performance

D3.1 Form groups of three students and have them circulate around the room and find five objects that are approximately
(a) 1 cm long
(b) 10 cm long
(c) 30 cm (length of most rulers)
(d) 1 m long

D3.2 Measure the span of your hand in imperial units. Use this to estimate:
(a) the inseam of your pants
(b) the height of the classmate sitting behind you
(c) the measurement of the desktop

D4.1 Visualize a 2 L milk carton. Estimate the capacity of
(a) your kitchen sink
(b) your filled bathtub

D4.2 Which of the following has a capacity of approximately 2 L?
(a) a large Tim Horton's coffee cup
(b) 3 cans of tomato soup
(c) a 4-cup Tupperware container; and/or (d) empty tuna fish can

D4.3 You want to fill a punch bowl that serves 20 people.
(a) If you are going to fill it completely with large cans of pineapple juice, how many cans would you use?
(b) If you are going to fill it completely with small cans of pop, how many cans would you use?
(c) If you are going to mix equal amounts of juice and pop, how many cans of each would you use?

D5.1 Using an aerial photo of a Christmas tree lot, answer the following questions:
(a) Estimate the number of Christmas trees in the tree lot.
(b) If 1/10 of the trees are cut each year, mentally determine how many trees will be cut this year.

D5.2 Fill jars with various items such as jelly beans, pennies or buttons, and have students estimate how many are in each jar. Go over the estimates and strategies used as a class discussion.

D5.3 Show a picture of dandelions on the lawn next to East Bay church and estimate how many dandelions are on this lawn.

D5.4 You want to renovate your bedroom measuring 9' × 10' but haven't decided whether to use carpet or tile. How many metres of carpet needed? How many square feet of tiles would be required? If screws were placed 6 inches apart, how many would be needed to secure the subfloor? Using nails the spacing would be 12 cm apart; calculate the number of nails required.

Suggested Resources

- Dept. of Lands and Forrest web site
- Dandelion photos found in Appendix C
- Aerial view of Christmas tree lot found on Google images or using Google Earth
- metre sticks
- class set of imperial ruler

Measurement

Outcomes
SCO

By the end of this course, students will be expected to

A7 recognize and find equivalencies among common fractions and percentages

A8 compare and order common fractions and percentages

A9 rename common fractions

A10 round rational numbers and percentages in contexts

C2 recognize and apply the patterns in the metric system

C3 recognize and apply the common fraction patterns found on an imperial ruler

Elaboration – Instructional Strategies/Suggestions

A7/8/9/10 You should work with your students with common fractions relevant to linear measure in the imperial system (e.g., denominations, halves, quarters, eighths, and sixteenths). They should compare these fractions and mixed numbers with a number line. They should rename these fractions and find equivalents among these fractions. Students should also be exposed to problem solving where they add and subtract fractions and mixed numbers with these denominators. Estimation activities should focus on rounding to the nearest whole number and/or half. Students should also work with percent, recognizing equivalencies, comparing and ordering, and rounding. Mental math activities should be used to help students develop a strong working knowledge of fractions.

- Appendix A, Worksheet 6
- Appendix A, Fraction Strip Activity

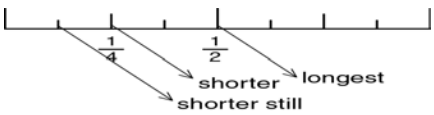
C2 You should start showing students patterns in the metric system by first showing them the relationship between
km → m → cm → mm.

1 km → 1000m
1 m → 100 cm
1 cm → 10 mm

Following this, the same pattern can be shown for kg → g and L → mL (the most common of the mass and volume units).

- Appendix A, Worksheet 5

C3 You should show students the meaning of division markers on a metric ruler/metre stick and on an imperial ruler/measuring tape. Students should be able to recognize the patterns and relationships between 1, 1/10, 1/100 on a metric ruler/metre stick and between ½, ¼, 1/8, 1/16 when they see them on an imperial measuring tape/ruler. When showing the ruler, it may be useful to relate the fraction to the length of the division line on the rule (longest line being the biggest fraction, shortest line being the smallest fraction).

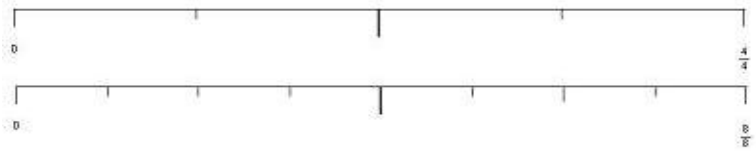


- Worksheet 5, Appendix A

Measurement

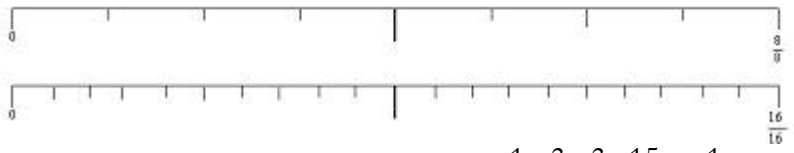
Worthwhile Tasks for Instruction and/or Assessment
Performance

A7.1Show that 3/4 and 6/8 are equivalent on the following number lines.



A7.2 A store offers ¼ off the selling price on all regular priced items. What percentage off is this equivalent to?

A8.2 On the number lines below show where ½ and 3/8 are located?



A8.3 Order these numbers on a number line: $1\frac{1}{8}; \frac{3}{4}; \frac{3}{2}; \frac{15}{16}; 2\frac{1}{4}$

A8.4 Using an appropriate number line show the sum or difference of each of the following:

(a) $1\frac{1}{2}+\frac{3}{4}$ (b) $2\frac{1}{4}-\frac{1}{2}$ (c) $\frac{7}{8}+\frac{1}{4}$ (d) $1\frac{1}{2}+\frac{7}{8}$

A9.2 (a) Rename the following fractions with smaller denominators:

$$(i)\ \frac{1}{2} \quad (ii)\ \frac{3}{4} \quad (iii)\ \frac{3}{8} \quad (iv)\ \frac{1}{4}$$

(b) Rename the following fractions with larger denominators:

$$(i)\ \frac{1}{2} \quad (ii)\ \frac{3}{4} \quad (iii)\ \frac{3}{8} \quad (iv)\ \frac{1}{4}$$

A10.2 Round these numbers to the nearest whole number and/or half:

$$(a)\ 1\frac{1}{8} \quad (b)\ 2\frac{1}{4} \quad (c)\ 1\frac{15}{16} \quad (d)\ \frac{7}{8}$$

C2.1 If 1 km = 1000 m, what will 2.2 km measure in metres? What will this measure be in cm? What do you think the most useful measurement unit is? Explain.

C2.2 What will 300 mL measure in L? What do you think the most useful measurement unit is? Explain.

C3.1 Draw a diagram of imperial rulers showing the following measurements: (a) 1/6, (b) 7/8, (c) 5/16, (d) 15/32.

Suggested Resources

- Mental Math Activities, Worksheets 5 and 6 (Appendix A)
- Fraction Strip Activity in Appendix A

Geometry

Geometry

Outcomes
SCO

By the end of this course, students will be expected to

E1 identify the first five regular polygons and understand basic properties (number of sides, lines of symmetry, and definitions of geometric terms)

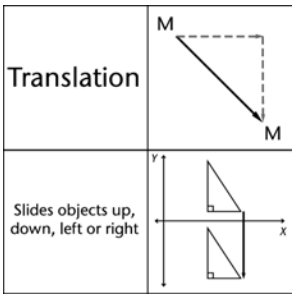
E2 describe and apply translations, reflections, rotations, and dilatations as they relate to symmetry and design, with the aid of technology

Elaborations – Instructional Strategies/Suggestions

E1 You could introduce the section using regular polygon templates. Students could use these templates to investigate/discover the basic properties of the polygons. For example, regular means all sides are equal, versus different-length (irregular) sides, and all interior angles are equal. This is also an opportunity to introduce lines of symmetry (reflectional) and the turn symmetry (rotational) through a template-holding activity.

- Give students different polygon shapes. Ask them to first determine if they are regular or not regular. Following this, students can find the line symmetry (reflectional) and/or turn symmetry (rotational) of a figure.

E2 Brainstorm with students where they would see instances of symmetry in their everyday lives. You could provide students with a number of logos or pictures that they can relate to or that you know are from their previous experiences. From here, students should be able to find all lines of symmetry and find if the figure has turn symmetry. Through discussion, either group or whole class, and through working with different visuals, students should be able to distinguish between the terms translation, rotation, reflection, and dilatation. You could use a variety of strategies such as a VVWA (visual, verbal, word, association) which is explained below, tessellation exploration software, or other dynamic geometry software to help students visualize the difference between the terms.



- VVWA: Have students cut a piece of heavy paper into four pieces (or use index cards). Each of the four pieces will have lines drawn on them as shown above so it has four blocks to write in. For each new term learned, have students write the term in one block, draw a picture defining the term in another block, write a definition (in their own words) in the third block, and write something to help them remember the term in the last block.
- Using polygons as templates, students can conduct explorations with translations, reflections, rotations, and dilatations. Ask students to create an image by cutting out a template and moving it around to create a pattern.

Geometry

Worthwhile Tasks for Instruction and/or Assessment
Performance

E1.1 Cut out a variety of shapes from magazines or catalogues. Tell whether they are regular or irregular and tell how you know. Describe any symmetry you see in the shapes. After you are done, write out your method for determining the symmetry of a regular polygon.

E1.2 Find at least two examples of the regular polygons in your daily life or surrounding environment. Draw diagrams of these polygons and describe the general symmetry that you notice about each of the polygons.

E2.1 Find a person's name with reflective symmetry. Using a checkmark, complete the following chart for each letter of the alphabet.

Letter of the alphabet	Has reflective symmetry	Has rotational symmetry	Has no symmetry
A			
B			
C			
. . .			
Z			

E2.2 Pick a letter from your name. Using this letter apply translations, reflections, rotations, dilatations. Show your transformations on graph paper.

E2.3 Complete a VVWA for:
(a) reflections
(b) rotations
(c) dilatations

Suggested Resources

- Interlocking cubes such as Cube-a-Links
- Three dimensional construction shapes
- tessellation software
- Georgia Tech website: http://www.intermath-uga.gatech.edu/dictnary/homepg.asp
- NCTM Grade 6 – 8 Geometry Addendum resource

Geometry

Outcomes
SCO

By the end of this course, students will be expected to

E3 determine (through investigations using concrete materials and technology) the characteristics of shapes that will tile the plane with a reflecting pattern

E4 create designs involving tiling patterns (e.g., Escher-type designs, wallpaper or fabric designs), using technology (e.g., dynamic geometry software, design or drawing software)

Elaboration – Instructional Strategies/Suggestions

E3 Students should have ample opportunities to look at and observe what is happening in different wallpaper designs. They should then write in their own words what they see. Following this, it may be good to have a class discussion to review the terms that represent these different transformations. The discussion can also review "regular" (all sides and angles equal in measure) polygons and other polygons ($\triangle$, $\square$, $\parallelogram$, etc). Students can experiment with shapes in order to observe that only the regular polygons allow them to tile a plane. The following activities should help students build an understanding of the relationship between tessellations and regular polygons.

- Provide students with cardboard cut-outs of a triangle, square, regular pentagon, hexagon, and octagon or with pattern blocks. Experiment by moving and tracing on paper to investigate which ones can tile a plane.
- If tessellation software is available, allow students to experiment with regular polygons in order to tile a plane.

E4 Students should understand how to design their own tessellations. Introduce students to the software packages available at your school. Have students experiment and create their own unique tessellations. If special software is unavailable, you may wish to create tessellations using the manual method of the cut, move, and paste using word processing software. In addition, you may be able to find a tessellating applet online.

- On the computer using a tessellation program, an online applet, or a word processing program, have students create a swatch on an 8 ½" × 11" piece of paper to represent wallpaper or a border pattern. In an additional class, have students create a panel of designs for your classroom or door.
- Have students create a design and tile it with pattern blocks.

Geometry

Worthwhile Tasks for Instruction and/or Assessment

Performance

E3.1 Students have a worksheet with several shapes, some regular and some not. Ask students to choose the shapes that they could use for a tessellation. Using various examples of wallpaper, students analyse and record any and all evident patterns.

E3.2 Use cut-outs of equilateral, isosceles, and scalene triangles to investigate which triangle will tile a plane. Will all triangles tile a plane?

E4.1 Anne and Zack are planning to tile a plane with triangles. Zack has chosen a variety of triangle shapes and Anne has picked all the regular triangles. Using your triangle templates they will investigate if both be able to tile a plane with no gaps between the tile.

E4.2 Kevin and Jane are working with a variety of regular polygons. They are interested in finding which polygons will fit together to tile a plane. Use your templates of regular polygons to determine which polygons will tile a plane with no gaps.

E4.3 Research and analyse some of Escher's designs to see if you can figure out what polygons were the original shapes in the image. Computer software can help you with some of this.

Suggested Resources

- several software programs
- pattern blocks
- wallpaper books
- scrapbook paper

Geometry

Outcomes
SCO

By the end of this course, students will be expected to

E5 analyse the geometric aspects of logos and designs

E6 create a personal logo, using the mathematics of symmetry, translations, reflections, rotations, or dilatations, with the aid of technology

Elaboration – Instructional Strategies/Suggestions

E5 You could begin the analysis of the geometric aspects of logos and designs by giving students examples of wallpaper, neckties, etc., and exploring them. Students can then discuss their findings as a group. You should also ask students, in small groups, to find different geometric aspects within the classroom, and then have a class discussion. At this time you may choose to conduct various activities where students use the regular polygon templates to create logos and designs. Students should create a design by reflecting, rotating, translating, dilating, or any combination thereof. This may also be an opportunity for students to present and explain their work to the class. Using examples of commercial logos, flags, traffic signs, etc., you should expose students and involve them in finding real life examples (stencils, design, quilts, scrapbooking, etc.) of shapes in their environment (wallpaper, carpets, logos) in order to analyse their geometric aspects.

- Give students examples of commercial or corporate logos or have them search for them on the Internet and then analyse them. Have students pair with each other and compare their analysis with each other.

E6 Before beginning, students should review the definitions of symmetry, translations, reflections, rotations, and dilatations. Your students should return to the VVWA cards they made earlier for review of terms. (Symmetry: the property of a figure or expression that allows for parts of it to be interchanged without forcing a change in the whole; translation: a transformation that "slides" each point of a figure the same distance in the same direction; reflection: a transformation that "flips" a figure over a mirror of a reflection line; rotation: a transformation that turns a figure about a fixed point at a given angle and a given direction; dilatation: a transformation that changes the size of an object but not the shape.) Students should be given an opportunity to explore various on-line websites in search of these attributes in logos. Students should then be provided with the appropriate software (e.g., dynamic geometry software, design or drawing software) to draw or design their logo. Students should also be able to present their own logos to the class and explain how they created their designs.

- You could create a short Jeopardy game to review the terms and examples that are characteristic of these terms. Have students play the game in order to review the terms.

Geometry

Worthwhile Tasks for Instruction and/or Assessment
Performance

E5.1 Using magazines or the Internet, create of a collage of corporate and a commercial logos. Analyse each of the logos and record the information under each of the pictures.

E5.2 Look at and observe what is happening in different wallpaper designs. Write in your own words what you see. Be prepared to discuss your wallpaper design in a class discussion.

E5.3 Select 3–5 logos from magazines and cut them out. For each logo you selected:

(a) Glue it on the top of a sheet of loose leaf.
(b) Explain what stands out for you in this logo.
(c) Discuss with a partner the features of these logos you selected. Be prepared to share with the class.

E6.1 Complete the activities associated with Tessellation Exploration software program.

E6.2 Your goal is to create, complete and produce a personal logo. You will then discuss your logo in class, (business logo, business card), etc. using the terms and ideas presented in this unit.

E6.3 The class then will be having a competition where all of the class members can create and submit their ideas for a class logo. Get started and create what you believe is a logo that best represents our class. Make sure you have considered the symmetry of the design as well as the transformations that you will use to create it.

Suggested Resources

- everyday objects (wallpaper samples, ties, rugs, flooring, signs)
- commercial and corporate logos
- Internet search engines
- Geometer's Sketchpad
- websites:
  - http://www.intermath-uga.gatech.edu/dictnary/homepg.asp
  - http//:www.aaa-logo.com
- Tessellation Exploration software
- previously made "card" packs can be used by the students for completing their designs

Transportation and Travel

Transportation and Travel

Outcomes
SCO

By the end of this course, students will be expected to

A11 describe the procedures and costs involved in obtaining a driver's licence

B12 calculate the fixed and variable costs involved in owning and operating a vehicle

A12 describe the costs of failing to operate a vehicle responsibly

Elaboration – Instructional Strategies/Suggestions

A11 A thorough discussion of the following requirements should be done in class: drivers licence (graduated licence), proof of age (for obtaining a driver's licence), handbook to prepare for beginners test (fee involved), written test and visual test to obtain beginner's licence (discuss fees and the limitations of a beginner's licence), driver training (cost, advantages, disadvantages, options for driver training), road test (appointment, cost), pass or fail (options when failure results), and the actual licence (cost, limitations, duration of limitations).

- Have students create a spreadsheet or a table to allow them to itemize and then calculate the total cost of obtaining a driver's licence. Go to the Registry of Motor Vehicles website to compare information found there with the information in the spreadsheet. Have students edit their charts and create additions where necessary.

B12 Students should understand the difference between fixed and variable costs when operating a car and be able to calculate these costs. The fixed costs include, among others, insurance (discuss the options and the legal requirements), registration, and safety inspection. The variable costs include, among others, fuel and maintenance (regular repairs, windshield washer fluid, tires, etc.) Problem-solving exercises along with explanations of their solutions could be used to enhance the students' understanding. An example might look like the following.

- Kate has the following costs associated with operating her car over the next year. Her insurance is $1800, licence is $12, inspection is $15 + tax, and registration is $72. She also broke a windshield which cost her $500, and she pays, on average, $235 per month in gasoline to drive to work.
  (a) Calculate Kate's monthly car expenses assuming that each of the yearly car bills is distributed over the whole year.
  (b) Which bills are the fixed costs and which are the variable costs for Kate? Why are they considered fixed and why are they considered variable?

A12 Students should be involved in discussions about the violations with operating a motor vehicle and the consequences of each. These include charges under the Motor Vehicle Act that may result in fines, the towing of your vehicle, or the accumulation of points, such as driving with no registration, no insurance, no licence, or no safety inspection; parking tickets; speeding tickets; driving while impaired or with open liquor; and failing to stop at stop signs or for school busses or pedestrians. You could have a class debate where students could reason out what it means to truly operate a vehicle responsibly.

- In pairs or small groups, have students make a list from the local newspaper of the most common driving offences and their associated charges. Ask students if fines are the only consequence of the typical driving offences and, if not, what other consequences there are and for what offences. Have students explain their conclusions.

Transportation and Travel

Worthwhile Tasks for Instruction and/or Assessment
Performance

A11.1 Create a flow chart (using Inspiration if available) using the information from the driver's handbook in order to develop a study guide for the driver's test. What do you think are the most important points to learn in order to pass a driver's test? Justify your choices.

A12.1 List 5–10 of the most common driving violations and the range of fines, points lost, and privileges lost. Share this list with a partner to see what the similarities and differences are.

A12.2 What legal cost would you incur if you decide to fight any of the above charges in court?

A12.3 (a) If you are caught going 65 km/h in a 40 km/h zone, what are the consequences? Fines? Points lost?
(b) You also ran a red light. What additional fines would you face?
(c) Assuming you have lost your licence for 1 week. Determine the transportation cost to get to and from work (25 km one way). Determine the cost by taxi, by bus. Is there any increase in cost of your car insurance premiums as a result of these violations?

B12.1 List the fixed costs involved in owning and operating a vehicle.

B12.2 List the variable costs in owning and operating a vehicle.

B12.3 Gas costs $ 1.119 per litre. Joe's car requires 45 litres to fill his tank. He is travelling to Halifax, so he has decided to get an oil change that costs $ 23.95 + HST. If one tank of fuel takes him to the city, how much will it cost? What kind of costs are these? Explain. What is Joe's entire bill to get ready for his trip to Halifax?

B12.4 Sam's truck payment is $468.00 per month. The insurance for the year is $1800.00, her driver's licence is $60.00 for 5 years, the motor vehicle inspection is $15.00 + HST for 1 year, and the registration is $144 for 2 years. What is the total of the fixed costs for 1 month?

Suggested Resources

- Websites:
  - Registry of Motor Vehicles http://www.gov.ns.ca/snsmr/rmv/
  - Access Nova Scotia: www.gov.ns.ca/contact/locations.asp
- local newspapers

Transportation and Travel

Outcomes
SCO

By the end of this course, students will be expected to

A13 compare the procedures, costs, advantages, and disadvantages involved in buying a new versus a used vehicle

A14 explain the factors and costs involved in insuring a vehicle

B13 compare the costs involved in buying versus leasing the same new vehicle

B14 compare the costs of owning or leasing and maintaining a vehicle with the costs of other forms of transportation

F7 make personal decisions regarding the best form of transportation

Elaboration – Instructional Strategies/Suggestions

A13/B13 You should discuss the advantages and disadvantages of buying a new vehicle, buying a used vehicle, and leasing a vehicle. Students should have the opportunities to learn about warranties and other costs associated with these types of purchases. You could provide a variety of sources such as the local newspaper(s), *Auto Trader*, Internet or car dealership brochures for the purpose of price comparison. Within the discussion, you could include the options for vehicles and their costs, and what are necessary options and what are not. You should discuss with students terms such as depreciation, buy-out costs, as well as giving them an opportunities to learn about taxes associated with payments.

- Choose a car that you would like to drive. Make a chart to include all of the options that you would like to have in your car. Next look in the brochures, in the newspapers, and in the *Auto Trader* to see if you can find the price for (a) a new car, (b) a used car, and (c) a car to lease that has most or all of your options and record the total cost and monthly payments that you would have to make.

A14 There are a number of types of vehicle insurance that one can have put on his or her car. You should elaborate on the types of insurance and the necessity of each. Students should be aware of the costs of insurance and what factors affect the rate of their insurance. You could invite a guest speaker from an insurance company to discuss age, sex, rates, and various types of coverage. It might be interesting to invite an agent from a second company to discuss the same. This will show students the difference in prices.

- Prepare a scenario to present to an insurance agent as if you were asking for a quote. Make sure you include the type of car you want covered, your age, sex, and number of years of accident free driving. Prepare a letter that you would be sending to the insurance company to ask for a quote.

B14/F7 Have students refer to their career choices to determine if they have the salary required to make monthly payments. Some students may not have the necessary salary for vehicle payments, especially if one includes the cost of insurance and other fixed and variable costs. Here is the time for you to discuss other means of transportation (bus, taxi, car pool). This discussion can be quite positive, as more people are choosing the alternative methods of transportation for environmental reasons rather than monetary.

- Have students do a web search to research the costs of owning/leasing and operating the vehicle of their choice for one month. Then have students compare this cost to the cost of using other forms of transportation. Have students prepare a chart or diagram to display their results.

Transportation and Travel

Worthwhile Tasks for Instruction and/or Assessment
Performance

A13.1 Use a Similarities and Differences chart to compare new and used cars. For each car, ask about how they run, the appearance, safety features, any rust, condition of tires, exhaust, fuel tank, radiator, and overall condition, plus give your overall rating.

A13.2 (a) Check newspaper ads for pricing on a new vehicle.
(b) Compare pricing to same model from a used car lot (newspaper, *Auto Trader*, Internet)
(c) What would be your choice of purchase? Explain.

A14.1 You are a 16-year-old newly licensed male driver. Your grandparents have given you a 1997 Ford Tempo car. What will your cost be for one year of coverage if you purchase personal liability and property damage only? What if you purchased $1 million versus $2 million liability? What are two additional packages that you could be offered?

A14.2 You rear-end the driver in front of you. You cause $ 2,500.00 damage to the person's vehicle. You cause $ 1,500.00 damage to your own vehicle. You carry only PL/PD coverage. How will the insurance company handle this situation? Include all of the factors in your explanation.

B13.1 Gather some information from car dealerships or the Internet regarding leasing and purchasing the same vehicle. Work through the math of choosing to either buy or lease. Prepare a presentation or display of your vehicle choice, the reasons for your choice, and the costs associated with each option. Finally, explain why you would choose to buy or lease your vehicle, based on your work.

B14.1 Examine the pros and cons of owning a vehicle in rural Nova Scotia versus downtown Toronto. What about in PEI?

F7.1 Of these three options, which would you choose and why?
(a) Peter can ride the bus for one hour to school, which costs $1.75 each way, or he can drive his car which takes 15 minutes each way and costs a total of $ 5.00 per day.
(b) Dave can drive to school for $ 50.00 per week, or he can carpool for the same amount.
(c) Jennifer needs to fill her car on the way home from work. She can fuel up at the Maple Leaf gas bar, which sells gas for $ 0.97/L and is self-serve, or the Red Wing gas bar, which is $ 0.99/L and is full service.

Suggested Resources

- Websites:
  - dealerships, auto trader, consumer report
  - Registry of Motor Vehicles http://www.gov.ns.ca/snsm/rmv/
- newspapers
- *Auto Trader*
- insurance agents from 2 companies

Transportation and Travel

Outcomes
SCO
By the end of this course, students will be expected to

B15 complete a project involving the purchase or lease of a new vehicle or the purchase of a used vehicle, including the cost of insurance

Elaboration – Instructional Strategies/Suggestions

B15 You might have started the course working with your students on their career choices and discussing purchasing power based on the career options they wanted to pursue. Students have now been exposed to the fixed and variable costs of owning and operating a vehicle, as well as the pros and cons of buying versus leasing, buying a new car versus buying a used car. It is now time for your students to tie all of this information together by working out a potential scenario of looking for a car to get to work.

- Given their career choice and their potential salary, have students complete a research report on a realistic choice of vehicle, (new, used, or lease) and include in this report a chart showing the cost per month for insurance and the cost for the car and registration. They should explain their personal decision for choosing the vehicle (new, used, or lease). Students can use visuals, technology, or a paper to present their report. You may also want some (or all) members to explain their reports to the class.

Transportation and Travel

Worthwhile Tasks for Instruction and/or Assessment
Performance

B15.1 Look up the price to purchase a new Toyota Camry and the cost to lease the same car, then find a used one in the local paper or *Auto Trader*. Prepare a table that would show the cost per month for each of these options. Also include in your table, for each vehicle, what features are present in the cars.

(a) What features are the same and what are different on each vehicle?
(b) What option would you choose and why?

B15.2 Look up the price to purchase a new Honda Civic and the cost to lease the same car, then find a used one in the local paper or *Auto Trader*. Prepare a table that would show the cost per month for each of these options. Also include in your table, for each vehicle, what features are present in the cars.

(a) What features are the same and what are different on each vehicle?
(b) What car would you choose and why?

B15.3 If you needed to buy a car, what would be the steps in your search for a new/used/leased vehicle. Draw a flow chart to outline your step-by-step procedure. Along with your flow chart, include any comments or notes that you would have to keep in mind as you went through the process of buying your car.

Suggested Resources

- Websites:
  - dealerships, auto trader, consumer report
  - Registry of Motor Vehicles http://www.gov.ns.ca/snsm/rmv/
- newspapers
- *Auto Trader*
- insurance agents from 2 companies

Probability

Probability

Outcomes
SCO

By the end of this course, students will be expected to

G1 express probabilities of simple events as the number of favourable outcomes divided by the total number of outcomes

G2 express probabilities as fractions, decimals, and percentages and interpret probabilities expressed in each of these forms

G3 predict and describe the results obtained in carrying out probability experiments related to familiar situations involving chance

G4 compare predicted and experimental results for familiar situations involving chance, using technology to extend the number of experimental trials

Elaboration – Instructional Strategies/Suggestions

G1/2 Probability and chance affect our everyday lives. You should start this unit with a discussion of how students interact with probability events. Examples could include planning a ski trip and getting no snow, rooting for your school hockey team (will they win?) or scratching that crossword ticket and seeing what letters are underneath. From this discussion, students should understand that expressing probability is the same as expressing the number of favourable outcomes out of the number of possible outcomes. We have a 50% chance of snow for our trip; therefore, we could have a 1 (favourable outcome = snow) in 2 (total outcomes = snow or no snow) chance of the hill having fresh snow on it tomorrow. You can simulate probability events in the classroom by using simple scenarios (flip coins, roll dice, spin spinners, draw cards) to show the formula favourable outcomes ÷ total # of outcomes. This formula can be expressed as a fraction (most often expressed this way), decimal, or a percentage.

- There are 100 tickets sold on a basket of goods from local businesses. You buy 10 tickets. What are your chances of winning? What are your chances of losing? Express your answers in fractions, decimals, and percent.
- A personal identification number (PIN) can sometimes be a four digit number. What is the probability of a thief guessing the first digit (X _ _ _)? the first 2 digits (XX _ _)? the first 3 digits (XXX _)? all 4 digits (XXXX)?

G3/4 Have students define theoretical and experimental probabilities through experimentation/simulations. At this stage, students should conduct simple experiments surrounding probability. Before beginning each experiment, they should be asked to predict the outcomes and describe the results they expect to obtain. Once completed, they should compare their predicted (theoretical) probabilities to the experimental results. For example, you could give the students a die and ask them to roll the die 10 times. Before the do, ask them to predict how many times they think they would see a 5 show up in those 10 rolls. Then test their predictions by carrying out the experiment. Graphing technology can be used to carry out some probability experiments using random numbers and coin tosses (TI-83 Plus feature).

- Predict the probability of getting heads on the flip of a coin. What about 10 flips? Test your prediction.
- Using a spinner with numbers 1 through 6, predict the probability of landing on a 6. Test your prediction.
- Predict the probability of rolling a 6 if you were to roll the die 10 times. What about 100 times? Using a graphing calculator, generate a list of random numbers from 1 to 6. {Keystrokes: randInt(1,6,# trials), therefore, if you only want to try it once, one roll, the # trials = 1 and you would type in randInt(1,6,# trials) or just randInt(1,6); for two rolls, type in randInt(1,6,2)}

Probability

Worthwhile Tasks for Instruction and/or Assessment
Performance

G1.1 If there are 52 cards in a deck, what is the probability of picking the following (Express your answer as a fraction)

(a) a heart
(b) an ace
(c) the queen of hearts

G1.2 If the letters C A P E B R E T O N were in a bag, what would the probability of the following (Express your answer as a fraction)

(a) choosing a vowel
(b) choosing a consonant
(c) choosing an E
(d) choosing a B

G2.1 If a contest has 100 tickets and you buy 2 tickets, what are your chances of winning? Express your answer in fraction form, decimal notation, and as a percentage. Based on these chances would you buy a ticket?

G2.2 If there are 3 tickets in a book of tickets and 50 books are sold, and you bought 2 books of the tickets, what is the probability of your winning? Express your answer in fraction form, decimal notation, and as a percentage. Based on these chances would you buy a ticket?

G3.1 Four friends are going to the movies, and each friend wants to see a different movie. How could you use a deck of cards to decide which movie they will see together? (For example, each friend could be assigned a suit and whichever suit is drawn first, the assigned friend chooses the movie.)

G3.2 On the game show "The Price is Right" contestants play the Roll the Dice game. If you don't roll the correct number you have to guess whether the number is higher or lower. Discuss with the class which numbers are the best and worst to roll. (You can reproduce this game.)

G4.1 Construct a frequency table with the numbers 1-6 across the top. If you were to roll a die 20 times predict how many times (the frequency) you would see each of the numbers 1, 2, 3, 4, 5, or 6 during those 20 rolls. If graphing technology is available, try the experiment again using the randInt feature.

(a) Compare the results of your theoretical and experimental probabilities.
(b) Compare the results for your two experiments.

Suggested Resources

- Website:
  - edhelper.com
- Department of Health Teaching Gambling Kits
- class sets of dice, spinners, marbles, cards
- coin sets
- graphing calculators

Probability

Outcomes
SCO

By the end of this course, students will be expected to

G5 simulate familiar situations involving chance and explain the choice of simulation

G6 interpret information about probabilities to assist in making informed decisions in a variety of situations

G7 interpret and assess probabilistic information used in the media and in common conversation

Elaboration – Instructional Strategies/Suggestions

G5 When doing probability experiments, like all experiments, the choice of the experimental technique must always be explained. Students should be involved in simulation experiments but then asked to justify their choice of experimental design. For example, the chance of you having a boy when a mother has a baby is 50%, so flipping a coin is an appropriate choice for an experimental design in a simulation if you ask students to simulate an experiment to estimate the probability of having four boys out of six children.

- Each day for two school weeks, your teacher is going to let one of four of you leave early for lunch because of good behaviour. What are your chances of going 5 of the 10 days? Design an appropriate simulation that would allow you test this theory.

G6 Being able to use their knowledge about probability can help students make informed choices in the real world. For example, when purchasing lottery tickets or gambling of any sort, students have to be able to evaluate the risk versus the reward. They have to be able to use their knowledge about probability to understand the likelihood of a favourable outcome.

- A new store is advertising Sale on Seconds. There is no refund or exchanges on any of these items but they are 50–75% off the price of their retail store competitors. The store guarantees that no more than 25% of their 78-item inventory has flaws. You are thinking about buying a 3 items. What do you think are your chances of getting a flawed piece of clothing? Explain.

G7 The media uses probability statements, either directly or indirectly, everyday to describe events happening around the world. For example, they may quote a baseball players batting average and make a statement about whether he will have a good performance in his upcoming game. You often hear announcers predicting the success or failure of upcoming movies or music stars. And, of course, forecasting the weather uses probability. You could bring in newspapers and magazines for students to search through and try to find examples of uses of probability examples. From here, they could be asked to state not only how the example uses probability but also to evaluate the reasonableness of the statements made and the value of the information.

- Weather POP. What does it mean? If you were planning the school ice carving/snow sculpture competition for this year's winter carnival, how would POP help you?

Probability

Worthwhile Tasks for Instruction and/or Assessment
Performance

G5.1 You are given a bag of 50 marbles, 25 of one colour and 25 of another. What is the probability that you would pick out three marbles of the same colour? If you didn't have the bag of marbles to test your experiment, describe a way you could simulate this experiment.

G5.2 A new pizza company offers only six toppings on its pizza: pepperoni, salami, mushrooms, onions, broccoli, and pineapple. Design an experiment to show the company what percentage of the next 100 customers will actually choose broccoli on their pizza. Do you think this is a reasonable result based on your knowledge about pizza eaters?

G6.1 Which is a better situation? Lotto 649: odds are 11 million different numbers: $2 per ticket. Super 7: 500 million different combinations; 3 tickets for $1.

G6.2 We know that half of all Canadians get the flu each winter. Last year 14 students out of a class of 30 got the flu. Are these results close to what you expect? Why?

G7.1 If you are planning to have an outdoor event on Saturday, what POP would cause you to consider cancelling your event? Discuss.

G7.2 A recent toothpaste company sent out free samples of its toothpaste to every household in a small town in Nova Scotia. A month later, the local paper had the headline "It's a majority vote – we all choose Teeth-Bright in Apple Tree Lane." Discuss this media headline.

G7.3 A new movie is about to be released that is a remake of a 1950s alien movie. The critics are saying it is going to be a box office hit, and it will make more than any movie made this year. On what basis do you think they are making these statements? Make sure you justify any decisions you make. Pair up with a classmate or get into small groups and discuss your answers to see if you have any similar or different statements.

Suggested Resources

- Website:
  - edhelper.com
- Department of Health Teaching Gambling Kits
- newspapers
- magazines

Appendices

Appendix A: Worksheets

Work Sheet 1: Calculating Change

1. Calculate the change for each cash customer.

Charge	Cash Tendered	Change
E.g. $21.45	***$40.00***	***$18.55***
a) $18.38	$20.00	
b) $5.66	$10.00	
c) $ 28.34	$40.00	
d) $31.29	$50.00	
e) $14.05	$20.25	
f) $3.12	$20.00	

2. For the change given in question 1, what is the least number of coins and bills that would be given to each customer?

Change Chart

$ 20.00	$ 10.00	$ 5.00	$2.00	$ 1.00	$ 0.25	$ 0.10	$ 0.05	$ 0.01
E.g. $18.55	✓	✓	✓	✓	✓✓		✓	
a)								
b)								
c)								
d)								
e)								
f)								

Earning and Purchasing

Work Sheet 2: Find the Nova Scotia tax on each of the following purchases:

Purchase Amount	10%	5%	Total Tax (15%)
E.g. $8.00	***80 ¢***	***40 ¢***	***$1.20***
a) $ 4.00			
b) $ 20.00			
c) $12.00			
d) $ 6.00			
e) $ 8.00			
f) $ 16.00			
g) $ 14.00			
h) $ 11.00			
i) $ 15.00			
j) $ 17.00			

Work Sheet 3: Estimating Tax

Purchase Amount	10%	5% (1/2 of 10%)	Total Tax (15%)
E.g. $39.97	***$4.00***	***$ 2.00***	***$6.00***
a) $ 89.99			
b) $ 30.16			
c) $ 3.92			
d) $ 5.55			
e) $ 9.99			
f) $ 21.80			
g) $ 127.99			
h) $ 482.41			
i) $ 75.24			
j) $ 0.89			

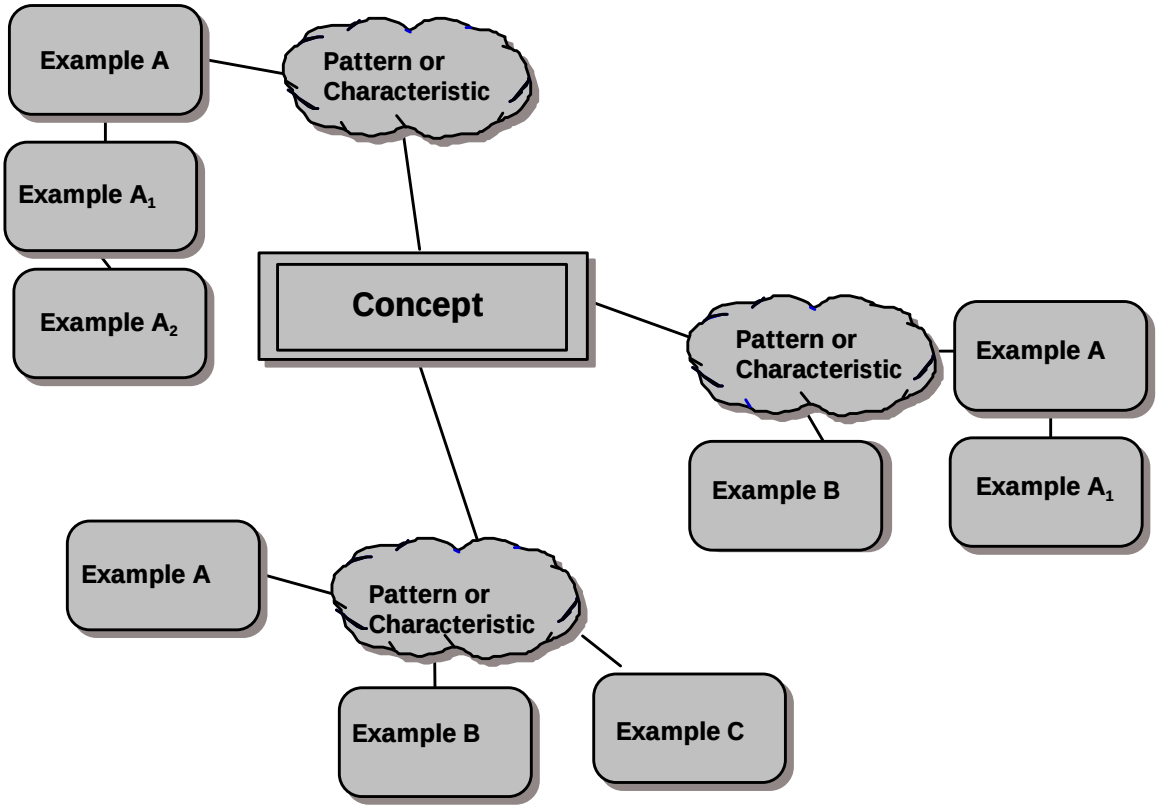
Work Sheet 4: Estimating Final Price

Item and Amount	10% + 1/2 of 10%	Estimated Total Tax	Estimated Final Price (taxes included)
E.g. 43" projection TV $2299.99	***$230.00 + $115.00***	***$345.00***	***$2644.99***
a) car $ 14 000.00			
b) DVD player $ 163.23			
c) 2 concert tickets $ 71.50			
d) digital camera $ 299.95			
e) cell phone monthly payment $ 20.00			
f) Nintendo Game Cube $ 139.97			
g) MP3 Player $ 159.97			
h) jeans $ 43.50			
i) CD $ 17.99			
j) Nintendo game $ 63.99			

Earning and Purchasing (and all others)

Graphic Organizer: Concept Map

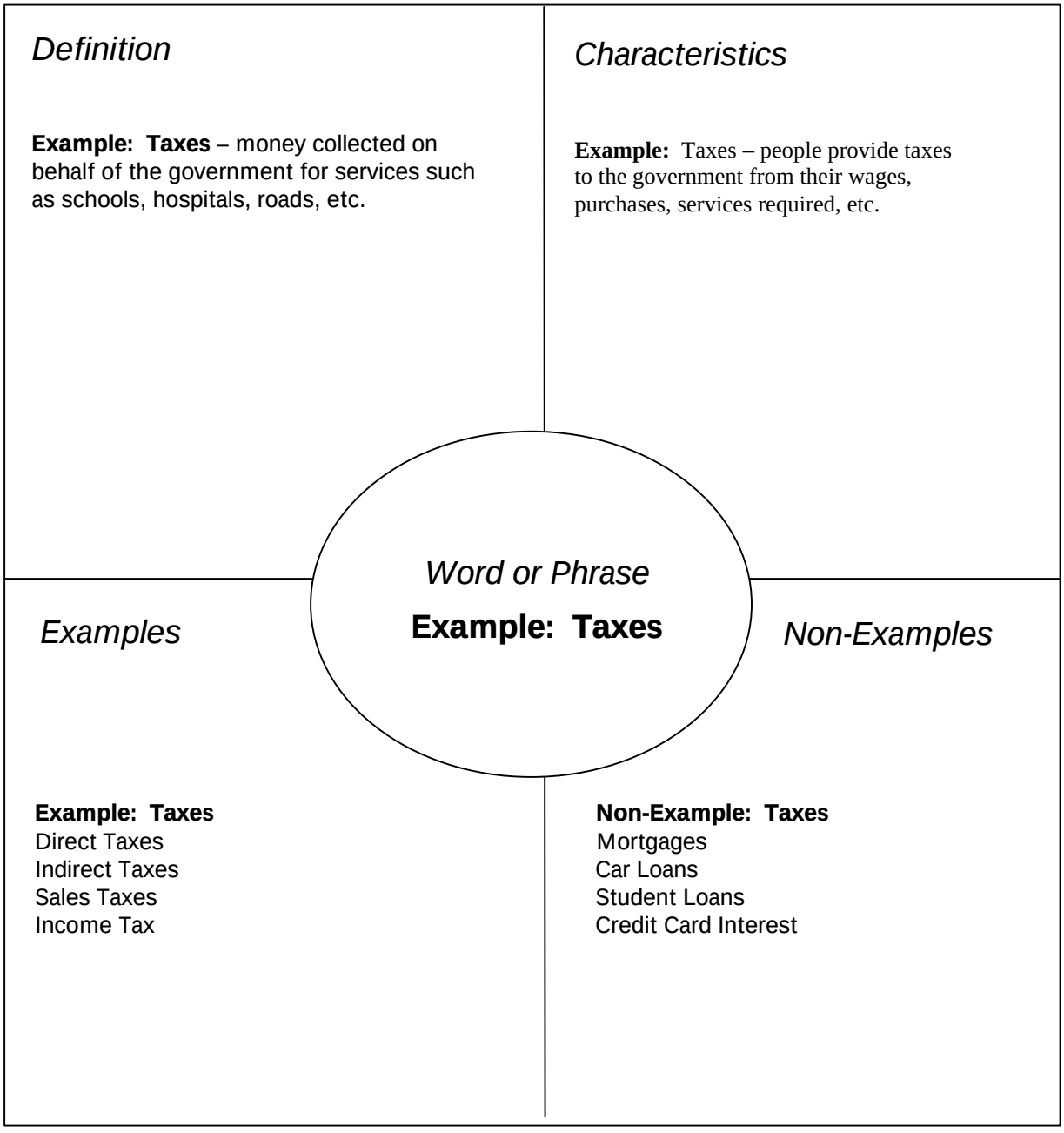
Concept Maps can be used to help students organize the connections between concepts and patterns (problem-solving). The concept map can also be used for vocabulary learning as students can work outward from the central box clarifying their definition. The software program Inspiration is commonly used to quickly develop concept maps. Your students could draw their own or use a template from a variety of resources available from the web or from you. Look in the Secondary Science Resource for Teachers document available through the Department of Education for some examples of concept maps.



Earning and Purchasing (and all others)

Graphic Organizer: Frayer Model

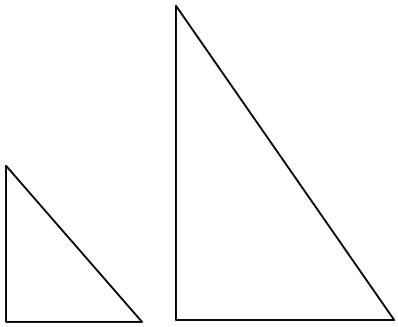
The Frayer Model is used to help students in the development of key vocabulary terms. This graphic organizer is an adaptation of the concept map. Look in the Secondary Science Resource for Teachers document available through the Department of Education for some examples of the use of and additional information on the Frayer Model.



Earning and Purchasing (and all others)

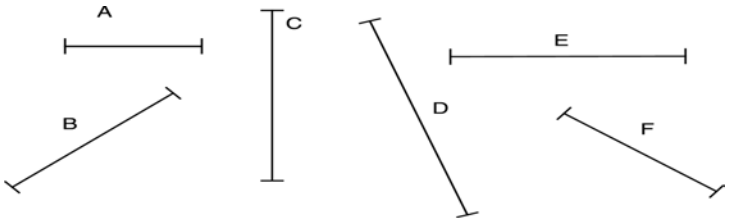
Graphic Organizer: Verbal Visual Word Association (VVWA)

VVWA is a graphic organizer used to help students develop vocabulary terms.

Write the TERM **Example: Dilatation**	*Draw a Picture (VISUAL)* 
Write the definition (VERBAL) **Definition: Dilatation:** a transformation that changes the size of an object but not the shape	*Write or draw something to remember (WORD ASSOCIATION)* **Word Association: Dilatation:** model cars vs cars people can drive

Measurement

Worksheet 5: Length Recording Sheet



Put the line segments in order from shortest to longest.

Activity 1:
by inspection

Activity 2:
by indirect comparison

Activity 3:
using nonstandard units

Activity 4:
using standard units

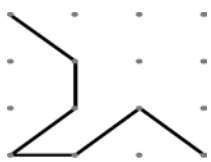
Activity 5:
using a ruler (cm)

Questions:

1. Discuss common units heard/used in the outside world. (e.g., cm, inches, foot, etc.)
2. Discuss with students where they might come in contact with each of these units. (e.g., fabric store for metre, lumber yard for feet)
3. Create benchmarks, both personal and universal, for these common units.

Mm	inch	mile
cm	foot	km
m	yard	

4. Provide students with activities where they must estimate the length of the room, length of a shoe, distance from here to there, etc., then measure later on and compare previous answers.
5. Given line segments, mark/draw/divide into cm segments or inch segments.
   For example:



6. Use a string on a geoboard in a zigzag pattern and estimate it's length by chunking then straightening it out on the g

Measurement

Work Sheet 6: 1% Method Investigation

Purpose:
To gain a visual understanding and the concept of percent.

Materials:
- 10×10 grid

Procedure:
1. The 10×10 grid represents 100%, each cell is 1%. Ask students if there was $100 and it needed to be divided equally among cells, how much would each cell contain? How much would 2 cells contain? What about 3 cells?
2. Repeat with $200.00, $300.00, $600.00, $800.00, $1,000.00
3. Repeat with non-multiples of 100 (i.e., $50.00, $237.00, $643.00)
4. Students can now use their calculators to calculate the value of each cell. Show what 2 cells (2%) equals? Show what 3 cells (3%) equals? Etc.

Questions:
1. 4% of $ 180.00 = _____
2. 2% of _____ = 18
3. _____ % of 700 = 35
4. 3% of $450 = _____
5. _____% of 825 = 25

Measurement

Dandelion Photo: Question D5.3

Measurement

Fraction Strip Activity

Purpose:

Students will learn what different fractions look like and compare them to other fractions (common fractions to be focussed on: 1/2, 1/4, 1/8, 1/16).

Materials:

- equal-length paper strips (5 different colours)
- number line sheet

Procedure:

1. Label strip as 1 to represent one whole
2. Fold second strip into two equal parts, label each as 1/2
3. Fold third strip into four equal parts, label each as 1/4
4. Continue procedure for 1/8 and 1/16.
5. Compare each of the fraction strips to each other.
6. Answer the following questions:
    - How many 1/8s are in 1/16? How many 1/16s are in 1/4?
    - How many ways can you rename 1/2?
    - Draw a number line using the strips.

Mental Math

Worksheet 7: First estimate then calculate each of the following.

1. 7 + 7
2. 20 + 20
3. 30 + 30
4. 200 + 200
5. 500 + 500
6. 1000 + 1000
7. 8000 + 8000
8. 5000 – 5000
9. 2000 – 2000
10. 700 – 200
11. 600 – 200
12. 70 – 20
13. 50 – 20
14. 6 – 2
15. 20 × 2
16. 80 × 2
17. 120 ÷ 2
18. 100 ÷ 2
19. 60 ÷ 2
20. 180 ÷ 2
21. 80 ÷ 2
22. 140 + 3456
23. 2340 + 125
24. 160 – 25
25. 1/2 of 300
26. 1/2 of 5000
27. 1/2 of 150
28. 1/2 of 900
29. 1/2 of 500
30. 1/2 of 8000
31. 1/2 of 880
32. 1/2 of 8400
33. 1% of 100
34. 1% of 200
35. 1% of 50
36. 1% of 880
37. 1% of 950
38. 10% of 100
39. 10% of 200
40. 10% of 50
41. 10% of 880
42. 10% of 950
43. 15% of 100
44. 15% of 200
45. 15% of 50
46. 15% of 880
47. 15% of 950
48. 25% of 100
49. 25% of 200
50. 25% of 200
51. 25% of 50
52. 25% of 880
53. 25% of 950
54. 50% of 100
55. 50% of 200
56. 50% of 50
57. 50% of 880
58. 50% of 950
59. 50% of 2120
60. 1/2 of 212

Appendix B: Map of Canada

Independent = GST is calculated on selling price, the PST is calculated on the selling price, and then the two taxes are added together.