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## KNOWLEDGE AND EMPLOYABILITY MATHEMATICS 10-4, 20-4

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**Policy:** Knowledge and Employability courses provide students who meet the criteria with opportunities to experience success and become well prepared for employment, further studies, citizenship and lifelong learning (*Knowledge and Employability Courses Policy 1.4.2*).

### VISION

Through Knowledge and Employability courses, students become active and responsible citizens, achieve their educational and career goals, improve the quality of life for themselves and their families and positively impact their communities.

### PHILOSOPHY AND RATIONALE

The development of the Knowledge and Employability courses was based on input received from consultations with education stakeholders throughout the province. The distinctive sequence of courses was designed to meet the educational needs of students who learn best:

- when focusing on the development and application of reading, writing and mathematical literacy<sup>1</sup>, and on essential employability skills
- through experiential learning activities
- when meaningful connections are made between schooling and personal experiences.

Knowledge and Employability courses assist students in:

- transitioning from school to the workplace and community
- preparing for responsible citizenship
- gaining recognition, respect and value from employers and further education providers.

Knowledge and Employability courses promote student skills, abilities and work ethics, including:

- academic and occupational skills of a standard determined by the workplace to be necessary for success
- practical applications through on- and off-campus experiences and/or community partnerships
- career development skills to explore careers, develop a career-focused portfolio and assess career skills
- interpersonal skills to ensure respect, support and cooperation with others.

### Aboriginal Perspectives and Experiences

For historical, constitutional and social reasons, an understanding of First Nations, Métis and Inuit (FNMI) experiences and perspectives, and

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1. *Mathematical literacy: Selecting and applying appropriate mathematical operations, problem-solving strategies, tools and technology, and communicating using mathematical vocabulary in home, workplace and community experiences.*

recognition that First Nations, Métis and Inuit students have particular needs and requirements, is necessary to enable all students to be respectful and responsible citizens.

Knowledge and Employability courses serve to facilitate positive experiences that will help Aboriginal students better see themselves in the curriculum and assist non-Aboriginal students to develop a better understanding of Alberta's First Nations, Métis and Inuit peoples.

## **GOALS OF KNOWLEDGE AND EMPLOYABILITY COURSES**

Knowledge and Employability courses provide students with practical and applied opportunities to develop competencies necessary to meet or exceed the following goals:

- earn a senior high school credential
- enter the workplace upon leaving school with employability and occupational skills that meet industry standards
- make successful transitions to other courses or to further education and training
- become responsible and contributing members of society.

## **CROSS-CURRICULAR COMMUNITY AND WORKPLACE CONNECTIONS**

Programs of study and resources for Knowledge and Employability courses are distinctive, in part, because they promote cross-curricular, community and workplace connections.

### **Cross-curricular Connections**

Knowledge and Employability courses promote the integration of subjects to emphasize their interrelationships and connections to other school subjects. The philosophy of Knowledge and Employability courses is that students learn best when they can clearly recognize connections, applications and relevance to a variety of everyday experiences. Organizing for instruction may include thematic units, subject integration within units and/or projects in other subjects.

## **Community and Workplace Connections**

Knowledge and Employability courses provide students with practical and applied opportunities to develop basic reading, writing and mathematical literacy. Community and workplace connections ensure learning within applied contexts and connect the school with environments beyond school, and may include tours to local business and industry, mentorships, job shadowing and work experience.

Knowledge and Employability courses promote the development of career portfolios. Career portfolios help students connect their school experience to the world beyond school. Each portfolio will include exemplars of the student's on- and off-campus experiences and can be used when the student is seeking employment or other post-secondary opportunities. Items appropriate for inclusion in career portfolios are: resumes, samples of written work, awards and/or their representations, teacher and self-evaluation checklists, workplace assessment tools and employer letters of recommendation.

## **SAFETY**

Safety is emphasized and incorporated throughout Knowledge and Employability courses. Courses include basic safety rules and guidelines, and the safe use of tools, equipment and materials in school, home, community and workplace settings.

## **TECHNOLOGY**

Because technology is best learned within an applied context, Information and Communication Technology (ICT), and the use of computers and other technologies are included in Knowledge and Employability courses to help students make the transition to the world beyond school.

## **ESSENTIAL UNIVERSAL SKILLS AND STRATEGIES**

Knowledge and Employability courses emphasize universal skills and strategies that are essential to all students, including the following.

- Interpersonal skills promote teamwork and respect for, support of and cooperation with others.
- Critical thinking promotes the analysis and appropriate applications of information.
- Creative thinking promotes the identification of unique connections among ideas and insightful approaches to questions and issues.
- Decision-making processes promote the making of timely and appropriate decisions.
- Problem-solving processes promote the ability to identify or pose problems and apply learning to consider the causes and dimensions of, and the solutions to, problems.
- Metacognition<sup>2</sup> enables students to become more aware, and greater control, of their own thinking and learning processes.

## RELATIONSHIP TO OTHER COURSES

Each Knowledge and Employability course is consistent with the rationale, philosophy, program foundations and organization of other secondary courses. This consistency enables students, as appropriate, to progress through the Knowledge and Employability course sequence and/or to other secondary courses.

## ENROLLMENT IN KNOWLEDGE AND EMPLOYABILITY COURSES

Students may take one or more courses in the sequence at any time during grades 8 through 12. Students may be enrolled in all courses or in a combination of Knowledge and Employability and other secondary courses.

Information regarding the identification of students for enrollment in one or more courses can be accessed in the *Knowledge and Employability Courses Policy 1.4.2* and the *Information Manual for Knowledge and Employability Courses grades 8–12*.

## RATIONALE AND PHILOSOPHY OF KNOWLEDGE AND EMPLOYABILITY MATHEMATICS

Knowledge and Employability mathematics courses focus on developing essential mathematics knowledge, skills and attitudes needed for everyday living at home, in the workplace and in the community.

This sequence is designed for students whose needs, interests and abilities focus on basic mathematical understanding; e.g., literacy. Emphasis is on the acquisition of practical life skills and competency in using mathematics to solve everyday problems, interpret information and create new knowledge within the contexts of the home, the workplace and the community.

Mathematics competencies are developed through a problem-solving, experiential approach, using information and activities that directly relate to students' current and future experiences. A variety of activities and problems, along with community partnerships, help students understand and appreciate the role of mathematics in our society. The use of manipulatives and other strategies/tools in Knowledge and Employability mathematics courses assists in addressing the diversity of learning styles and different developmental stages of individual students.

Knowledge and Employability mathematics courses emphasize career/life skills, teamwork, communication skills and thinking processes. Information and Communication Technology (ICT) outcomes, and the use of calculators, computers and other technologies, are integrated into the courses to help provide quick and accurate computation and manipulation and to enhance conceptual understanding.

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2. *Metacognition: Learning-to-learn strategies; awareness of processes and strategies one uses when learning.*

Knowledge and Employability mathematics courses are derived from The Common Curriculum Framework for K–12 Mathematics: Western Canadian Protocol for Collaboration in Basic Education (1995) and The Common Curriculum Framework for K–12 Mathematics Grade 10 to Grade 12: Western Canadian Protocol for Collaboration in Basic Education (1996). Outcomes have been created and/or modified as needed.

These courses follow standards set out by the National Council of Teachers of Mathematics (NCTM).

### **GOALS OF KNOWLEDGE AND EMPLOYABILITY MATHEMATICS**

Students will develop the following mathematic competencies in the context of solving everyday problems. Students will:

- identify the problem and select and apply appropriate problem-solving strategies, mathematical operations and tools
- estimate and calculate solutions accurately
- evaluate the process, result and personal/group performance
- develop teamwork skills and use appropriate vocabulary to reason and communicate mathematically
- apply mathematical literacy to everyday situations.

### **COMPONENTS OF KNOWLEDGE AND EMPLOYABILITY MATHEMATICS**

Mathematics has similarities with, and linkages to, other mathematics courses. However, Knowledge and Employability courses and resources are distinctive in that they:

- provide students with practical and applied opportunities to develop mathematical competencies

- promote the integration of curriculum and community partnerships to connect mathematics to other school subjects and to other environments.

### **CONCEPTUAL FRAMEWORK FOR K–12 MATHEMATICS**

Within the context and nature of mathematics, the courses include the development of mathematical processes to assist students in achieving their learning goals and to encourage lifelong learning in mathematics.

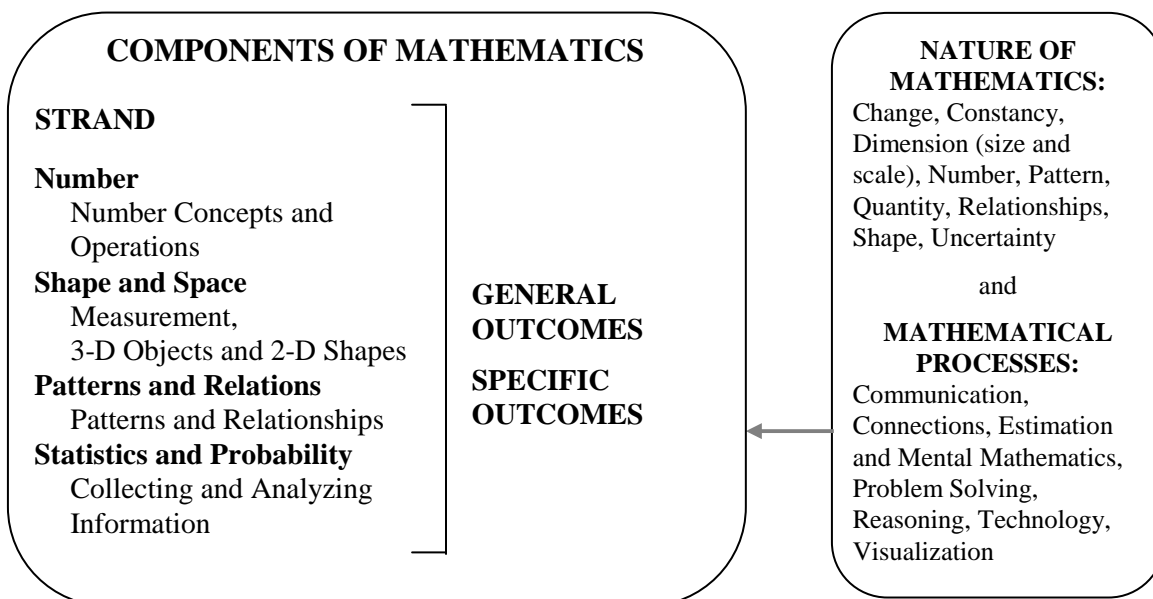
The conceptual framework outlined in this section presents:

- a multifaceted view of mathematics
- the discipline as a set of interwoven skills, procedures and concepts.

The following graphic illustrates how student outcomes are organized by strand and are designed to be influenced by mathematical processes and the nature of mathematics.

## KNOWLEDGE AND EMPLOYABILITY MATHEMATICS

Students use a **PROBLEM SOLVING APPROACH** to complete calculations and solve word problems in everyday home, workplace and community contexts.



### MATHEMATICAL PROCESSES

There are critical components that students must encounter in a mathematics program in order to achieve the goals of mathematics education and to encourage lifelong learning in mathematics. Students in Knowledge and Employability mathematics courses will build on and apply mathematical processes, using everyday home, workplace and community problems.

This program of studies incorporates the following seven interrelated mathematical processes that are intended to permeate teaching and learning.

#### Communication [C]

Students need opportunities to read about, represent, view, write about, listen to and discuss mathematical ideas in everyday and workplace contexts. These opportunities allow students to create links between their own language and ideas and the formal language and symbols of mathematics.

Communication is important in clarifying, reinforcing and modifying ideas, attitudes and beliefs about mathematics. Students should be encouraged to use a variety of forms of communication while learning mathematics. Students also need to communicate their learning using mathematical terminology.

Communication can help students make connections among concrete, pictorial, symbolic, verbal, written and mental representations of mathematical ideas.

#### Connections [CN]

Contextualization and making connections to experience are powerful processes in developing mathematical understanding. When mathematical ideas are connected to each other through concrete, pictorial, symbolic, verbal, written and mental representations, or through real-world contexts, students can begin to view mathematics as useful, relevant and integrated.

Learning mathematics within contexts and making relevant connections can validate past experiences and increase student willingness to participate and be actively engaged.

The brain is constantly looking for and making connections. “Because the learner is constantly searching for connections on many levels, educators need to orchestrate the experiences from which learners extract understanding... Brain research establishes and confirms that multiple, complex and concrete experiences are essential for meaningful learning and teaching”<sup>3</sup>

### **Estimation and Mental Mathematics [E]**

Students need to know the how and when, and what strategy to use, when estimating. Estimation is a strategy for determining approximate values or quantities, usually by referring to benchmarks, or for determining the reasonableness of calculated values. Estimation is used to make mathematical judgements and develop useful, efficient strategies for dealing with situations in daily life.

Mental mathematics is a combination of cognitive strategies that enhances flexible thinking and number sense and enables students to determine answers without paper and pencil. It improves computational fluency by developing efficiency, accuracy and flexibility. Mental mathematics “is the cornerstone for estimation and leads to better understanding of number concepts and number operations.”<sup>4</sup>

### **Problem Solving [PS]**

Learning through problem solving should be the focus of mathematics at all grade levels. When students encounter new situations and respond to questions of the type, “*How would you...?*” or “*How could you...?*” the problem-solving approach is being modelled. A true

understanding of mathematical concepts and procedures is developed when the problems are solved in meaningful contexts and students develop their own problem-solving strategies by being open to listening, discussing and trying different strategies.

Problem solving is a powerful teaching tool that fosters multiple, creative and innovative solutions. Creating an environment where students openly engage in finding a variety of strategies for solving problems empowers students to explore alternatives and develops confident, cognitive, mathematical risk takers.

### **Reasoning [R]**

Students need to develop confidence in their ability to reason and justify their thinking within and outside of mathematics. Mathematical reasoning helps students think logically and make sense of mathematics.

Mathematical experiences in and out of the classroom provide opportunities for inductive and deductive reasoning. Inductive reasoning occurs when students explore and record results, analyze observations, make generalizations from patterns and test these generalizations. Deductive reasoning occurs when students reach new conclusions based on what is already known or assumed to be true.

### **Technology [T]**

Technology contributes to the learning of a wide range of mathematical outcomes and enables students to explore and create patterns, examine relationships, test assumptions and solve problems.

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3. Renate Numella Caine and Geoffrey Caine., *Making Connections: Teaching and the Human Brain* (Menlo Park, CA: Addison-Wesley Publishing Company, 1991), p. 5.

4. Jack A. Hope et al, *Mental Math in the Primary Grades* (Palo Alto, CA: Dale Seymour Publications, 1988), pp. 161–173.

Calculators and computers can be used to:

- explore and demonstrate mathematical relationships and patterns
- organize and display data
- assist with calculation procedures as part of problem solving
- decrease the time spent on computations when other mathematical learning is the focus
- reinforce the learning of basic facts and test properties
- develop personal procedures for mathematical operations
- create geometric displays
- simulate situations.
- develop number sense.

### Visualization [V]

Visualization “involves thinking in pictures and images, and the ability to perceive, transform and recreate different aspects of the visual-spatial world”.<sup>5</sup> The use of visualization in the study of mathematics provides students with opportunities to understand mathematical concepts and make connections among them.

Visualization is fostered through the use of concrete materials, technology and a variety of visual representations.

### NATURE OF MATHEMATICS

Knowledge and Employability mathematics courses focus on making connections between the components of mathematics and everyday home, workplace and community applications.

*Change*

*Constancy*

*Dimension*

*Number*

*Pattern*

*Quantity*

*Relationships*

*Shape*

*Uncertainty*

### Change

To make predictions, students need to describe and quantify their observations, attempt to build patterns and identify those quantities that remain fixed and those that change.

### Constancy

Students are expected to communicate ideas visually, using diagrams and spoken and written forms, when describing constancy. The most important properties in mathematics and science relate to those properties that do not change when outside conditions do.

Stability, conservation, equilibrium, steady state and symmetry are terms used to describe constancy.

Students need to be aware of the properties that remain fixed so that they can solve problems involving constant rates of change, lines with constants; e.g., slope, direct variation situations or the angle sums of triangles.

### Dimension (size and scale)

The concept of dimension is generally associated with 3-D objects, 2-D shapes or 1-D lines and needs to be developed within an environment of physical objects.

Physical objects can also be described using measurement concepts and pattern recognition, rather than the memorization of formulas.

### Number

Number, number systems and number operations are vital to all mathematics learning. The use of number must include number sense. Number sense includes:

- an intuitive feeling about numbers and their multiple relationships
- the construction of the meaning of number through a variety of experiences
- the development of an appreciation of the need for numbers beyond whole numbers

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5. Thomas Armstrong, *Seven Kinds of Smart: Identifying and Developing Your Many Intelligences* (New York, NY: NAL-Dutton, 1993), p. 10.

- an appreciation of, and the ability to make, quick and accurate estimations for computation and measurement
- the ability to detect arithmetic errors
- knowledge of place value and the effects of arithmetic operations.

Number sense includes the recognition of number patterns that can be used to count, make predictions, describe shapes and make comparisons.

### **Pattern**

“Mathematics is an exploratory science that seeks to understand every kind of pattern.”<sup>6</sup>

Patterns exist in numbers, geometry, algebra and data. Mathematics becomes a useful tool to assist students in their systematic and intellectual understanding of their environment by helping them recognize, extend, create and use patterns as a routine aspect of their lives.

### **Quantity**

In everyday situations, individuals classify, measure and order. Some outcomes therefore address single numbers, numbers attached to units of measure and ordered sets of numbers. Other outcomes address the interpretation of numbers and number systems.

With the growing use of technology to process numerical information, it is essential for students to have a wide range of estimation skills to evaluate whether the numerical output provided by a calculator or a computer is a reasonable solution to a given problem.

### **Relationships**

The study of mathematics is the development of relationships between and among things. Mathematics should prepare for students to make their own relationships between mathematics in school, at home and in the community. Students should look for relationships among physical things and the data used to describe those things.

Descriptions of the attributes of objects are used to examine symmetry and congruence and to classify things. Relationships will be described visually, symbolically, orally and in written form.

### **Shape**

Shape in mathematics is central to geometry but also includes:

- geometric representations of algebraic relations
- the geometry of maps
- the creation of networks of plane figures that can be used to construct 3-D objects.

It is very important for students to look for and use similarities, congruences, patterns, transformations, dilatations and tessellations in the solution of a range of everyday problems.

The use of language to describe shapes is an important aspect of mathematics and allows for the classification of objects according to various attributes and the naming and analysis of objects.

### **Uncertainty**

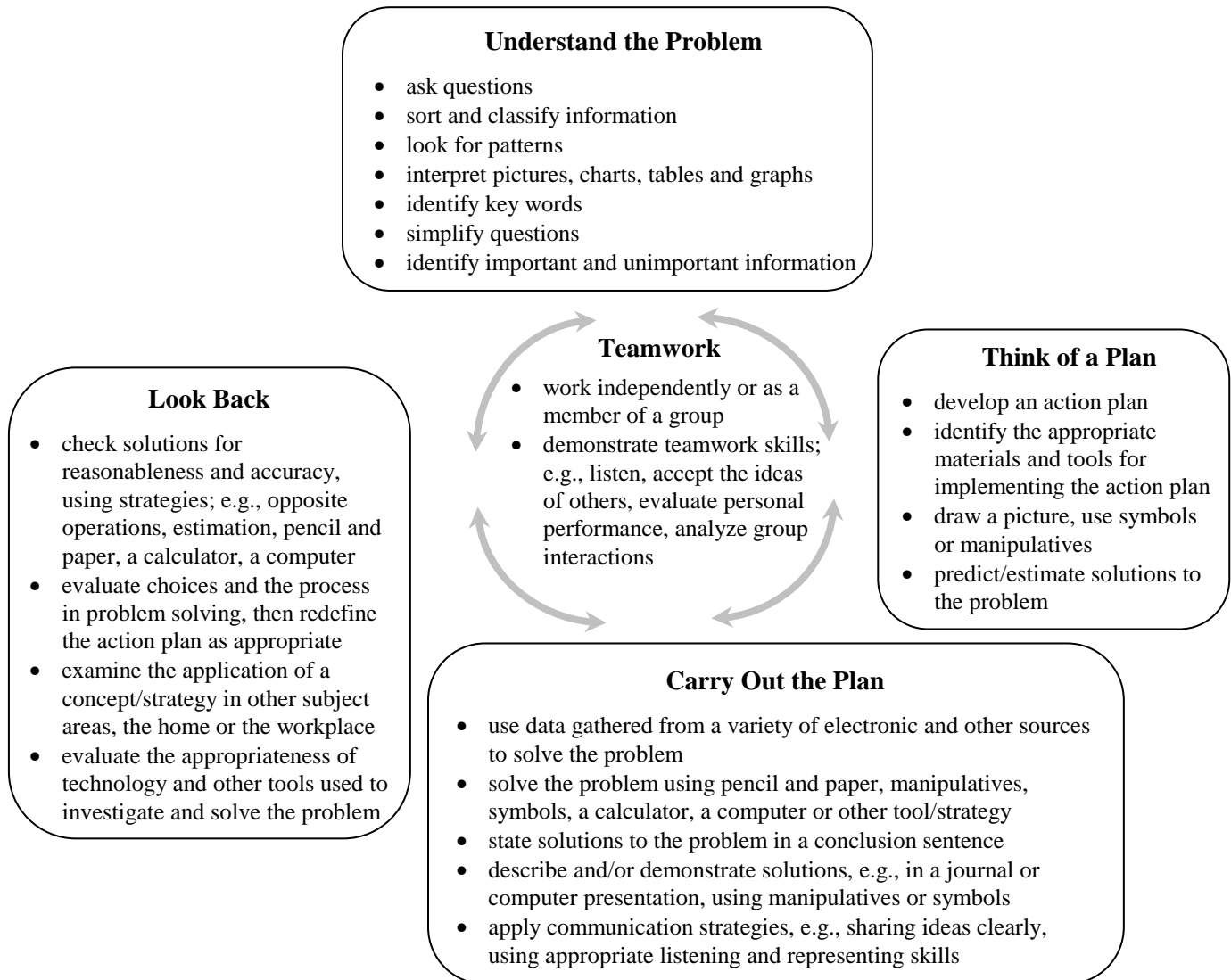
Uncertainty involves data, chance, measurements and errors. Problems dealing with data, together with numbers found in various contexts, can be solved within the school mathematics program as long as the data provided and the problems posed have some meaning and relevance to students.

Chance deals with the predictable and the unpredictable outcomes of events. From an early age, students are expected to deal with the concept of chance. As they mature, the language they use to describe chance becomes more sophisticated and involves the vocabulary of probability theory.

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6. Lynn Arthur Steen, ed., *On the Shoulders of Giants, New Approaches to Numeracy* (Washington, DC: National Academy Press, 1990), p. 8.

# PROBLEM-SOLVING FRAMEWORK FOR KNOWLEDGE AND EMPLOYABILITY MATHEMATICS



**Strand: Number (Number Concepts and Number Operations)**

*Students will:*

- estimate and solve problems using numbers, money, decimals, percents, fractions, ratios and proportion in everyday home, workplace and community contexts, using technology as appropriate
- develop and demonstrate number sense to describe quantities, represent numbers in multiple ways and apply appropriate arithmetic operations
- assess the reasonableness of calculations and problem-solving strategies
- communicate mathematically and investigate the application of number concepts and operations in a variety of career and workplace situations, working individually or as a member of a team.

- C** Communication
- CN** Connections
- E** Estimation and Mental Mathematics
- PS** Problem Solving
- R** Reasoning
- T** Technology
- V** Visualization

<b>Mathematics 10-4</b>	<b>Mathematics 20-4</b>
<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>develop and demonstrate a number sense for whole numbers, common fractions, decimals, percents and integers and apply arithmetic operations to solve everyday problems.</p>	<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>solve everyday home, community and workplace problems by applying arithmetic operations to whole numbers, decimals, common fractions, percents and integers.</p>
<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>1. use estimation strategies to estimate and round numbers to the nearest unit, tenth and hundredth to solve problems in everyday contexts [E, PS, R]</li> <li>2. represent and describe the relationships between proper/improper fractions, equivalent fractions and mixed numbers concretely, pictorially and symbolically [C, CN, R, V]</li> <li>3. convert among fractions, decimals and percents concretely, pictorially and symbolically to facilitate the solving of problems [C, CN, R, V]</li> <li>4. represent and explain the meaning of integers in everyday contexts concretely, pictorially and symbolically [C, CN, R, V]</li> <li>5. estimate and apply arithmetic operations to solve everyday problems, using:               <ul style="list-style-type: none"> <li>• whole numbers</li> <li>• decimals</li> <li>• fractions</li> <li>• mixed numbers</li> <li>• percents</li> </ul>               [CN, E, PS]             </li> </ol>	<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>1. use estimation strategies to estimate and apply arithmetic operations to solve everyday problems, using:               <ul style="list-style-type: none"> <li>• whole numbers</li> <li>• integers (add/subtract only)</li> <li>• decimals</li> <li>• fractions</li> <li>• mixed numbers</li> <li>• percents</li> </ul>               [CN, E, PS, R]</li> <li>2. estimate and round numbers and decimals, e.g., money, to the nearest unit, tenth and hundredth to solve problems in everyday contexts [E, PS, R]</li> <li>3. assess the reasonableness of applied calculations and problem-solving strategies, using a variety of tools and/or strategies; e.g., estimation, charts, graphs, calculators and/or computers [E, R, T, V]</li> <li>4. identify and use appropriate tools, e.g., tables, charts, spreadsheets and calculators, to increase accuracy in everyday and/or work-related problem-solving situations [CN, PS, R, T]</li> </ol>

Mathematics 10-4	Mathematics 20-4
<p><b>Specific Outcomes</b> (continued)</p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>6. estimate, add and subtract integers concretely, pictorially and symbolically in everyday contexts [CN, E, PS]</li> <li>7. assess the reasonableness of applied calculations and problem-solving strategies, using a variety of tools and/or strategies, e.g., estimation, charts, graphs, calculators and/or computers [E, R, T, V]</li> <li>8. calculate and compare rates and unit prices by writing ratios that involve numbers with different units [CN, PS, R]</li> <li>9. determine the value of a power, using a whole number base with exponents of 2 and 3 [CN, R, V]</li> <li>10. recognize and explain numbers in scientific notation form [C, CN, R, V]</li> </ol>	<p><b>Specific Outcomes</b> (continued)</p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>5. create, use and modify a spreadsheet template for a variety of everyday contexts, including the determining of interest rates, vehicle payments, investments or budgets [CN, PS, R, T]</li> <li>6. use a variety of methods and tools to convert fractional percents to decimal forms [CN, PS, R]</li> <li>7. express rates and ratios in equivalent forms to solve problems in everyday contexts [PS, R, T]</li> <li>8. estimate unit costs and compare costs of everyday purchases [CN, E, PS, R]</li> </ol>

**Strand: Patterns and Relations (Patterns and Relationships)**

*Students will:*

- recognize that patterns and relationships exist in nature and everyday living
- use patterns and relationships to develop a better understanding of their environments and to solve everyday problems at home, in the workplace and in the community, using technology as appropriate
- assess the reasonableness of calculations and problem-solving strategies
- communicate mathematically and investigate the application of patterns and relationships in a variety of career and workplace situations, working individually or as a member of a team.

- C** Communication
- CN** Connections
- E** Estimation and Mental Mathematics
- PS** Problem Solving
- R** Reasoning
- T** Technology
- V** Visualization

<b>Mathematics 10-4</b>	<b>Mathematics 20-4</b>
<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>express and use patterns, variables and expressions, including those used in business and industry, with graphs to solve problems at home, in the community and in the workplace.</p>	<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>express and use patterns, variables and expressions, including those used in business and industry, with graphs to solve problems at home, in the community and in the workplace.</p>
<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>1. identify, describe and draw conclusions about patterns and relationships, in oral and written form, in nature and everyday contexts [C, CN, R, V]</li> <li>2. create expressions, make predictions and develop rules to describe, complete and extend patterns and relationships in everyday contexts [C, CN, PS, R]</li> <li>3. distinguish between the use of variables and constants in everyday situations [CN, R]</li> <li>4. graph relationships using everyday home, community and workplace contexts and draw conclusions using patterns and relationships [CN, R, V]</li> </ol>	<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>1. use relationships and patterns to summarize, generalize and predict when problem solving and decision making in life- and work-related contexts [CN, PS, R]</li> <li>2. generalize patterns arising from everyday problem-solving contexts, using mathematical expressions and equations and/or verifying by substitution [CN, PS, R]</li> </ol>

**Strand: Patterns and Relations (Variables and Equations)**

*Students will:*

- represent algebraic expressions in multiple ways to solve problems, using technology as appropriate
- communicate mathematically and investigate the application of variables and equations in a variety of career and workplace situations, working individually or as a member of a team.

- C** Communication
- CN** Connections
- E** Estimation and Mental Mathematics
- PS** Problem Solving
- R** Reasoning
- T** Technology
- V** Visualization

<b>Mathematics 10-4</b>	<b>Mathematics 20-4</b>
<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>use variables and equations to express, summarize and apply relationships as problem-solving tools in a restricted range of contexts.</p>	<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>use variables and equations to express, summarize and apply relationships as problem-solving tools in a restricted range of contexts.</p>
<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>5. use variables, formulas and/or substitutions to solve problems in practical situations [CN, PS, R]</li> <li>6. substitute numbers for variables in expressions and graph and examine the relationship [C, PS, R, V]</li> </ol>	<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>3. interpret formulas related to practical situations and solve everyday problems using common arithmetic expressions and relationships; e.g., perimeter and area [CN, PS, R, V]</li> </ol>

**Strand: Shape and Space (Measurement)**

*Students will:*

- estimate and take accurate measurements using everyday metric (SI) and Imperial units of measure
- solve problems using appropriate measuring devices, i.e., metric (SI) and Imperial, strategies and technology in home, workplace and community contexts
- communicate mathematically and investigate the application of measurement knowledge and skills in a variety of career and workplace situations, working individually or as members of a team
- assess the reasonableness of calculations and problem-solving strategies.

- C Communication
- CN Connections
- E Estimation and Mental Mathematics
- PS Problem Solving
- R Reasoning
- T Technology
- V Visualization

<b>Mathematics 10-4</b>	<b>Mathematics 20-4</b>
<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>estimate, measure and compare using whole numbers, decimals, fractions and metric (SI) and Imperial units of measure to solve everyday problems.</p>	<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>estimate, measure and compare using whole numbers, decimals, fractions and metric (SI) and Imperial units of measure to solve everyday problems.</p>
<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>1. select and use appropriate metric (SI) and Imperial measuring devices and units to take measurements in home and work-related contexts, including: <ul style="list-style-type: none"> <li>• length</li> <li>• mass (weight)</li> <li>• volume (capacity)</li> </ul>                     [CN, PS, R, T]                 </li> <li>2. measure within acceptable degrees of accuracy [CN, R]</li> <li>3. compare, convert and apply metric (SI) and Imperial units of measure, as appropriate in everyday contexts [CN, R, T]</li> <li>4. solve problems involving perimeter, area, mass (weight) and volume (capacity) [CN, PS, R, T]</li> <li>5. use conversion charts, calculators and/or other tools to compare and convert common metric (SI) and Imperial units of measure, as required in everyday contexts [CN, PS, R, T]</li> <li>6. estimate the measurements of angles in a diagram and in various environments [E]</li> </ol>	<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>1. use appropriate metric (SI) and Imperial measuring strategies, tools and units to measure: <ul style="list-style-type: none"> <li>• length</li> <li>• volume (capacity)</li> <li>• mass (weight)</li> <li>• angles</li> <li>• time</li> <li>• temperature</li> </ul> </li> <li>2. measure within acceptable degrees of accuracy as required in life- and work-related situations [CN, PS, R, T]</li> <li>3. calculate elapsed time in everyday contexts [CN, R]</li> <li>4. use conversion charts, calculators and/or other tools to compare and convert common metric (SI) and Imperial units of measure, as required in everyday contexts [R, T]</li> <li>5. investigate the types and uses of measuring tools and units within the community and workplace [C, V]</li> </ol>

Mathematics 10-4	Mathematics 20-4
<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>7. measure and draw angles using a straight edge, protractor and other technology [CN, R]</li> <li>8. estimate, measure and calculate the area of a circle [E, PS]</li> <li>9. calculate the unknown when given the circumference, diameter and/or radii of a circle to solve everyday problems [PS, T]</li> <li>10. estimate and calculate the area of a circle to solve problems in everyday contexts [E, PS]</li> <li>11. estimate and apply a variety of arithmetic operations, using hours and minutes, in everyday applications [CN, E, PS, T]</li> <li>12. estimate and measure temperature and calculate changes in temperature [E, PS]</li> </ol>	

**Strand: Shape and Space (3-D Objects and 2-D Shapes and Transformations)**

*Students will:*

- create, examine and manipulate 3-D objects and 2-D shapes using transformations and technology, and other tools as appropriate, to better understand shapes and objects at home, in the workplace and in the community
- communicate mathematically and investigate the application of shape and space in a variety of career and workplace situations, working individually or as members of a team.

- C Communication
- CN Connections
- E Estimation and Mental Mathematics
- PS Problem Solving
- R Reasoning
- T Technology
- V Visualization

<b>Mathematics 10-4</b>	<b>Mathematics 20-4</b>
<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>use visualization and symmetry to:</p> <ul style="list-style-type: none"> <li>• extend their awareness of objects and shapes</li> <li>• create and examine patterns and designs using congruence, symmetry, translation, rotation and reflection.</li> </ul>	<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>use visualization and symmetry to:</p> <ul style="list-style-type: none"> <li>• extend their awareness of objects and shapes</li> <li>• create and examine patterns and designs using congruence, symmetry, translation, rotation and reflection.</li> </ul>
<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>13. measure and classify pairs of angles as either complementary or supplementary [CN, E, R]</li> <li>14. represent, examine and describe enlargements and reductions [CN, R]</li> <li>15. interpret scale models and identify the geometric properties associated with figures and shapes used in representations [CN, R, T]</li> <li>16. reproduce drawings or objects to scale, using a variety of strategies; e.g., grid paper, dot paper and/or computer software [CN, R, T]</li> <li>17. draw designs, using ordered pairs, in all four quadrants of a coordinate grid, with translation and reflection images [PS, V]</li> </ol>	<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>5. read and interpret scale drawings and models in workplace and community situations [C, R, T]</li> <li>6. use scale diagrams, including enlargements and reductions, to solve construction, renovation and other related problems [CN, PS, R, T]</li> <li>7. give oral and written directions, applying appropriate communication skills [C, R]</li> <li>8. read and interpret maps to locate specific sites, determine distances, give directions or use public transportation [C, CN, R, V]</li> </ol>

**Strand: Statistics and Probability (Collecting and Analyzing Information)**

*Students will:*

- collect, generate, interpret, examine and maintain data, charts, graphs and other records for personal use at home, in the workplace and in the community, using technology as appropriate
- use probability, chance and predictions when planning and making everyday decisions
- assess the reasonableness of calculators and problem-solving strategies
- communicate mathematically and investigate, collect and examine information in a variety of career and workplace situations, working individually or as members of a team.

- C** Communication
- CN** Connections
- E** Estimation and Mental Mathematics
- PS** Problem Solving
- R** Reasoning
- T** Technology
- V** Visualization

<b>Mathematics 10-4</b>	<b>Mathematics 20-4</b>
<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>develop and implement a plan for the collection, display and examination of data and information, using technology and other strategies as required.</p>	<p><b>General Outcome</b></p> <p><i>Students will:</i></p> <p>develop and implement a plan for the collection, display and examination of data and information, using technology and other strategies as required.</p>
<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>1. predict, interpret, make comparisons and communicate information from graphs, tables, charts and other sources at home and in the workplace [CN, R]</li> <li>2. recognize the uses of data and data collection and display tools in life- and work-related situations [CN, R]</li> <li>3. record information and organize files and directories, using computers and/or other tools [CN, PS, R, T]</li> <li>4. examine a plan for collecting and processing information and modify as appropriate for everyday situations [CN, PS, R]</li> </ol>	<p><b>Specific Outcomes</b></p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> <li>1. use information and data from a variety of sources to make comparisons, predictions, inferences, conclusions and/or decisions in everyday situations [CN, E, PS, R]</li> <li>2. record and organize information and data as appropriate in life- and work-related situations [CN, R]</li> <li>3. use probability and statistics to predict upcoming events and to make decisions in everyday life [CN, E, R]</li> </ol>

