

---

---

# MATHEMATICS PREPARATION 10

---

## RATIONALE AND PHILOSOPHY

### Rationale

Mathematics is a common human activity, increasing in importance in a rapidly advancing, technological society. A greater proficiency in using mathematics increases the opportunities available to individuals. Students need to become mathematically literate in order to explore problem-solving situations, accommodate changing conditions, and actively create new knowledge in striving for self-fulfillment.

A significant proportion of Grade 9 Mathematics students have marks that are close to, or slightly under, the pass mark of 50 per cent. These students are not sufficiently prepared to succeed in either Applied Mathematics 10 or Pure Mathematics 10 in senior high school. The alternative of Mathematics 14–24 does not address their needs. Mathematics Preparation 10 is a senior high school mathematics course designed to meet the needs of Grade 10 students who wish to enroll in either Applied Mathematics 10 or Pure Mathematics 10 but do not possess the prerequisite skills.

Students should not have to repeat outcomes for which they have already achieved an acceptable standard. Because of the sequential development of mathematical skills, some

students will need to begin their study with Grade 7 or Grade 8 outcomes. Others may only require preparation in the Grade 9 Mathematics outcomes. Two course delivery options allow for this flexibility. Schools can offer, and students can choose, either 3 or 5 credits for Mathematics Preparation 10 depending on student needs.

### Philosophy

A senior high school mathematics course that simply repeats the outcomes of Grade 9 Mathematics is not the optimal solution for Grade 10 students who have not met the standards of junior high school mathematics. These students require a course that will address their individual needs, with a focus on the mathematics skills and knowledge they lack from junior high school mathematics, or earlier. Students entering Grade 10 need a repertoire of fundamental mathematics skills and concepts. They also need to understand the ideas that make up those concepts and how they are related.

In Mathematics Preparation 10, students are required to demonstrate effective communication skills. When accomplishing outcomes, students will be expected to explain, to illustrate, to reason and to make connections. Multiple solution strategies to problems and problem contexts will be expected as students work through routine and nonroutine problems.

Technology is an integral part of Mathematics Preparation 10. Calculators and computer programs

are used to enhance conceptual understanding and to facilitate higher order thinking through exploration, modelling and problem solving.

Students learn by attaching meaning to what they do, and they must be able to construct their own meaning of mathematics. This meaning is best developed when learners encounter mathematical experiences that proceed from the simple to the complex and from the concrete to the abstract. The use of manipulatives can address the diversity of learning styles and developmental stages of students and can enhance the formation of sound, transferable mathematical concepts. At all levels, students benefit from working with appropriate materials, tools and contexts when constructing personal meaning about new mathematical ideas. The learning environment should value and respect each student's way of thinking, so that the learner feels comfortable in taking intellectual risks, asking questions and posing conjectures.

## STUDENT EXPECTATIONS

It is important for students to develop a positive attitude toward mathematics so they can become confident in their ability to use mathematics to solve real-life problems. Students should receive a level of mathematics education appropriate to their abilities and needs. At the completion of Mathematics Preparation 10, students must have the mathematical knowledge, skills and attitudes needed to allow them to succeed in senior high school mathematics and become mathematically literate adults.

Mathematics Preparation 10 incorporates the seven interrelated mathematical processes that are intended to permeate teaching and learning.

Students are expected to:

- *Communication [C]* – communicate mathematically
- *Connections [CN]* – connect mathematical ideas to other concepts in mathematics, to everyday experiences and to other disciplines
- *Estimation and Mental Mathematics [E]* – use estimation and mental mathematics where appropriate
- *Problem Solving [PS]* – relate and apply new mathematical knowledge through problem solving
- *Reasoning [R]* – reason and justify their thinking
- *Technology [T]* – select and use appropriate technologies as tools to solve problems
- *Visualization [V]* – use visualization to assist in processing information, making connections and solving problems.

For more details on these mathematical processes, please refer to the *Alberta Program of Studies for K–9 Mathematics*, June 1996, pages 6–11.

## INSTRUCTIONAL FOCUS

Students are curious, active learners who have individual interests, abilities and needs. They come to classrooms with different knowledge, life experiences and backgrounds that generate a range of attitudes about mathematics and life. Course delivery must be commensurate with differing abilities, interests and learning styles and be designed to enable students to have success in mathematics. The use of projects and technology should be emphasized to facilitate entrance into Applied Mathematics 10.

Several additional considerations are important.

- The use of diagnostic strategies is encouraged to determine a student's area of strength and weakness. From this, individualized instruction should emerge.
- Concepts should be introduced, using manipulatives, and gradually developed from the concrete, to the pictorial, to the symbolic.
- Problem solving, reasoning and connections are vital to increasing mathematical power and must be integrated throughout the course. A minimum of half the available time within all strands could be dedicated to activities related to these processes. Activities that take place in the classroom should stem from a problem-solving approach with connections to the real world whenever possible.
- In mastering basic facts and arithmetic operations, the emphasis should be on developing understanding of the concept/processes, not on rote drill and practice. Although drill and practice needs to be part of a mathematics program, it should occur after students have developed an understanding of the concept/process and should not occur in isolation. If students understand the process, the amount of time needed for drill and practice is significantly reduced.
- There is to be a balance between estimation and mental mathematics, paper and pencil exercises and the appropriate use of technology, including calculators and computers.
- By decreasing emphasis on the size of numbers used in paper and pencil calculations, more time is available for concept development.
- There is an assumption made that all students have regular access to appropriate technology. For Mathematics Preparation 10, the scientific calculator and standard spreadsheet programs are appropriate.

## STUDENT OUTCOMES

The content of Mathematics Preparation 10 is stated in terms of outcomes. These outcomes are measurable and identify what students are required to know and be able to do. The outcomes included, which have been derived from *The Common Curriculum Framework for K–12 Mathematics: Western Canadian Protocol for Collaboration in Basic Education*, 1995, are those that are judged to be essential for students to advance to Applied Mathematics 10 and Pure Mathematics 10.

Student outcomes are described in terms of:

- **General Outcomes**—general statements that identify what students are expected to know and be able to do upon completion of the course.
- **Specific Outcomes**—statements identifying the component knowledge, skills and attitudes of a general outcome.

### Strands

The student outcomes are organized within four strands:

- **Number**
- **Patterns and Relations**
- **Shape and Space**
- **Statistics and Probability.**

The strands are the formal aspects of the discipline of mathematics that form the foundation of this course and act as connections across the grades. Four strands have been identified to reinforce the interrelationship of mathematical concepts and skills. These strands are split into substrands. However, any such grouping into strands and substrands is for organizational purposes only, and does not reflect the connections among the strands and the underlying themes running throughout all of mathematics.

## Horizontal Correlation

The general outcomes from Mathematics Preparation 10 have been correlated to the corresponding general outcomes in Grade 6 through Grade 9 and to those in Applied Mathematics 10 and Pure Mathematics 10. These are shown in the chart below.

### GENERAL OUTCOMES—Number Strand

Substrand	Grade 6	Grade 7	Grade 8
<p><b>Number Concepts</b> <i>Students will:</i></p> <ul style="list-style-type: none"> <li>• use numbers to describe quantities</li> <li>• represent numbers in multiple ways.</li> </ul>	<p>Develop a number sense for decimals and common fractions, explore integers, and show number sense for whole numbers.</p>	<p>Demonstrate a number sense for decimals and integers, including whole numbers.</p>	<p>Demonstrate a number sense for rational numbers, including common fractions, integers and whole numbers.</p>
<p><b>Number Operations</b> <i>Students will:</i></p> <ul style="list-style-type: none"> <li>• demonstrate an understanding of and proficiency with calculations</li> <li>• decide which arithmetic operation or operations can be used to solve a problem, and then solve the problem.</li> </ul>	<p>Apply arithmetic operations on whole numbers and decimals in solving problems.</p>	<p>Apply arithmetic operations on decimals and integers, and illustrate their use in solving problems.</p> <p>Illustrate the use of rates, ratios, percentages and decimals in solving problems.</p>	<p>Apply arithmetic operations on rational numbers to solve problems.</p> <p>Apply the concepts of rate, ratio, percentage and proportion to solve problems in meaningful contexts.</p>

Grade 9	Mathematics Preparation 10	Applied Mathematics 10/ Pure Mathematics 10
<p>Explain and illustrate the structure and the interrelationship of the sets of numbers within the rational number system.</p> <p>Develop a number sense of powers with integral exponents and rational bases.</p>	<p><b>Demonstrate a knowledge of the interrelationship of the sets of numbers within the real number system.</b></p> <p><b>Develop a number sense of powers with integral exponents and rational bases.</b></p>	<p>Analyze the numerical data in a table for trends, patterns and interrelationships. [Applied Mathematics 10 and Pure Mathematics 10]</p> <p>Explain and illustrate the structure and the interrelationship of the sets of numbers within the real number system. [Applied Mathematics 10 and Pure Mathematics 10]</p>
<p>Use a scientific calculator or a computer to solve problems involving rational numbers.</p> <p>Explain how exponents can be used to bring meaning to large and small numbers, and use calculators or computers to perform calculations involving these numbers.</p>	<p><b>Use a scientific calculator to solve problems involving real numbers.</b></p> <p><b>Demonstrate an understanding of and proficiency with calculations on rational numbers.</b></p> <p><b>Decide which arithmetic operations can be used to solve a problem and then solve the problem.</b></p> <p><b>Illustrate and apply the concepts of rates, ratios, percentages and proportions to solve problems.</b></p> <p><b>Apply exponent laws to solve problems.</b></p>	<p>Use basic arithmetic operations on real numbers to solve problems. [Applied Mathematics 10 and Pure Mathematics 10]</p> <p>Describe and apply arithmetic operations on tables to solve problems, using technology as required. [Applied Mathematics 10 and Pure Mathematics 10]</p> <p>Use exact values, arithmetic operations and algebraic operations on real numbers to solve problems. [Pure Mathematics 10]</p>

## GENERAL OUTCOMES—Patterns and Relations Strand

Substrand	Grade 6	Grade 7	Grade 8
<p><b>Patterns</b> <i>Students will:</i></p> <ul style="list-style-type: none"> <li>use patterns to describe the world and to solve problems.</li> </ul>	<p>Use relationships to summarize, generalize and extend patterns, including those found in music and art.</p>	<p>Express patterns, including those used in business and industry, in terms of variables, and use expressions containing variables to make predictions.</p>	<p>Use patterns, variables and expressions, together with their graphs, to solve problems.</p>
<p><b>Variables and Equations</b> <i>Students will:</i></p> <ul style="list-style-type: none"> <li>represent algebraic expressions in multiple ways.</li> </ul>	<p>Use informal and concrete representations of equality and operations on equality to solve problems.</p>	<p>Use variables and equations to express, summarize and apply relationships as problem-solving tools in a restricted range of contexts.</p>	<p>Solve and verify one-step and two-step linear equations with rational number solutions.</p>

Grade 9	Mathematics Preparation 10	Applied Mathematics 10/ Pure Mathematics 10
Generalize, design and justify mathematical procedures, using appropriate patterns, models and technology.	<b>Generalize, design and justify mathematical procedures, using appropriate patterns and technology.</b>	Generate and analyze number patterns. [Pure Mathematics 10]
Solve and verify linear equations and inequalities in one variable.  Generalize arithmetic operations from the set of rational numbers to the set of polynomials.	<b>Solve and verify linear equations and inequalities in one variable.</b>  <b>Generalize arithmetic operations from the set of rational numbers to the set of polynomials.</b>	Generalize operations on polynomials to include rational expressions. [Pure Mathematics 10]

## GENERAL OUTCOMES—Shape and Space Strand

Substrand	Grade 6	Grade 7	Grade 8
<p><b>Measurement</b> <i>Students will:</i></p> <ul style="list-style-type: none"> <li>describe and compare everyday phenomena, using either direct or indirect measurement.</li> </ul>	Solve problems involving perimeter, area, surface area, volume and angle measurement.	Solve problems involving the properties of circles and their connections with angles and time zones.	<p>Apply indirect measurement procedures to solve problems.</p> <p>Generalize measurement patterns and procedures, and solve problems involving area, perimeter, surface area and volume.</p>
<p><b>3-D Objects and 2-D Shapes</b> <i>Students will:</i></p> <ul style="list-style-type: none"> <li>describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.</li> </ul>	Use visualization and symmetry to solve problems involving classification and sketching.	Link angle measures to the properties of parallel lines.	Link angle measures and the properties of parallel lines to the classification and properties of quadrilaterals.
<p><b>Transformations</b> <i>Students will:</i></p> <ul style="list-style-type: none"> <li>perform, analyze and create transformations.</li> </ul>	Create patterns and designs that incorporate symmetry, tessellations, translations and reflections.	Create and analyze patterns and designs, using congruence, symmetry, translation, rotation and reflection.	Create and analyze design problems and architectural patterns, using the properties of scaling, proportion and networks.

Grade 9	Mathematics Preparation 10	Applied Mathematics 10/ Pure Mathematics 10
<p>Use trigonometric ratios to solve problems involving a right triangle.</p> <p>Describe the effects of dimension changes in related 2-D shapes and 3-D objects in solving problems involving area, perimeter, surface area and volume.</p>	<p><b>Solve problems, using right triangles.</b></p> <p><b>Solve problems involving perimeter, area, surface area and volume.</b></p>	<p>Demonstrate an understanding of scale factors and their interrelationship with the dimensions of similar shapes and objects. [Applied Mathematics 10]</p> <p>Solve problems involving triangles, including those found in 3-D and 2-D applications. [Applied Mathematics 10 and Pure Mathematics 10]</p> <p>Use measuring devices to make estimates and to perform calculations in solving problems. [Applied Mathematics 10]</p>
<p>Specify conditions under which triangles may be similar or congruent, and use these conditions to solve problems.</p> <p>Use spatial problem solving in building, describing and analyzing geometric shapes.</p>	<p><b>Specify conditions under which triangles may be similar, and use these conditions to solve problems.</b></p>	<p>Solve coordinate geometry problems involving lines and line segments. [Applied Mathematics 10 and Pure Mathematics 10]</p>
<p>Apply coordinate geometry and pattern recognition to predict the effects of translations, rotations, reflections and dilatations on 1-D lines and 2-D shapes.</p>	<p><b>Create and analyze patterns and designs, using symmetry, translation, rotation and reflection.</b></p>	

## GENERAL OUTCOMES—Statistics and Probability Strand

Substrand	Grade 6	Grade 7	Grade 8
<p><b>Data Analysis</b>  <i>Students will:</i></p> <ul style="list-style-type: none"> <li>• collect, display and analyze data to make predictions about a population.</li> </ul>	<p>Develop and implement a plan for the collection, display and analysis of data gathered from appropriate samples.</p>	<p>Develop and implement a plan for the collection, display and analysis of data, using measures of variability and central tendency.</p>	<p>Develop and implement a plan for the collection, display and analysis of data, using technology, as required.</p> <p>Evaluate and use measures of central tendency and variability.</p>

<b>Grade 9</b>	<b>Mathematics Preparation 10</b>	<b>Applied Mathematics 10/ Pure Mathematics 10</b>
Collect and analyze experimental results expressed in two variables, using technology, as required.	<p><b>Develop and implement a plan for the display and analysis of data.</b></p> <p><b>Analyze experimental results expressed in two variables.</b></p>	<p>Implement and analyze sampling procedures, and draw appropriate inferences from the data collected. [Pure Mathematics 10]</p> <p>Apply line-fitting and correlation techniques to analyze experimental results. [Applied Mathematics 10]</p>

## **Coding of Outcomes for Mathematics Preparation 10**

- The specific outcomes for Mathematics Preparation 10 have been numbered sequentially within each strand.
- Each specific outcome has been cross-referenced to the *Alberta Program of Studies for K–9 Mathematics*, June 1996. For example, (8–7) refers to Grade 8, Specific Outcome 7, in the same strand as the stated outcome. This cross-referencing will allow teachers to refer to the *Alberta Program of Studies for K–9 Mathematics* for illustrative examples of the specific outcomes.
- The mathematical processes to be addressed in conjunction with the specific outcomes are included after each outcome. For example, [C, R, V] means the students should use the mathematical processes of communication, reasoning and visualization in addressing this specific outcome.

## MATHEMATICS PREPARATION 10

### Strand: Number (Number Concepts)

Students will:

- use numbers to describe quantities
- represent numbers in multiple ways.

<b>C</b>	Communication	<b>PS</b>	Problem Solving
<b>CN</b>	Connections	<b>R</b>	Reasoning
<b>E</b>	Estimation and Mental Mathematics	<b>T</b>	Technology
		<b>V</b>	Visualization

General Outcomes	Specific Outcomes
<p>Demonstrate a knowledge of the interrelationship of the sets of numbers within the real number system.</p> <p>Develop a number sense of powers with integral exponents and rational bases.</p>	<ol style="list-style-type: none"> <li>1. Compare and order integers. [R, V] (7–12)</li> <li>2. Find and be able to model an understanding of common multiples, common factors, lowest common multiple and greatest common factor as they apply to whole numbers. [C, PS, R, V] (6–4)</li> <li>3. Demonstrate and explain the meaning of proper and improper fractions. [C, R, V] (6–9)</li> <li>4. Distinguish between exact values and decimal approximations of square roots and cube roots. [E, T] (8–8)</li> <li>5. Differentiate between principal square root and positive and negative square roots of a number; give examples where answers would involve the positive (principal) square root or both positive and negative square roots of a number. [C, CN, PS, R] (9–3)</li> <li>6. Recognize and illustrate the meaning of a power, base, coefficient and exponent, including rational numbers or variables as bases or coefficients. [R, V] (9–4)</li> <li>7. Explain and apply the exponent laws for powers with integral exponents.               <math display="block">x^m \bullet x^n = x^{m+n}</math> <math display="block">x^m \div x^n = x^{m-n}</math> <math display="block">(x^m)^n = x^{mn}</math> <math display="block">(xy)^m = x^m y^m</math> <math display="block">\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}, y \neq 0</math> <math display="block">x^0 = 1, x \neq 0</math> <math display="block">x^{-n} = \frac{1}{x^n}, x \neq 0</math> </li> </ol> <p>[PS, R] (9–5)</p>

**Strand: Number (Number Operations)**

*Students will:*

- demonstrate an understanding of and proficiency with calculations
- decide which arithmetic operation or operations can be used to solve a problem, and then solve the problem.

- |           |                                      |           |                 |
|-----------|--------------------------------------|-----------|-----------------|
| <b>C</b>  | Communication                        | <b>PS</b> | Problem Solving |
| <b>CN</b> | Connections                          | <b>R</b>  | Reasoning       |
| <b>E</b>  | Estimation and<br>Mental Mathematics | <b>T</b>  | Technology      |
|           |                                      | <b>V</b>  | Visualization   |

General Outcomes	Specific Outcomes
<p>Use a scientific calculator to solve problems involving real numbers.</p> <p>Demonstrate an understanding of and proficiency with calculations on rational numbers.</p> <p style="text-align: center;"><b>AND</b></p> <p>Decide which arithmetic operations can be used to solve a problem and then solve the problem.</p>	<p>8. Document and explain the calculator keying sequences used to perform:</p> <ul style="list-style-type: none"> <li>• square roots, cube roots</li> <li>• exponents</li> <li>• scientific notation</li> <li>• sine, cosine, tangent</li> <li>• integers.</li> </ul> <p>[PS, R, T] (9–10)</p> <p>9. Perform arithmetic operations with integers concretely, pictorially and symbolically. [PS, V] (7–16)</p> <p>10. Illustrate and explain the order of operations. [PS, T, V] (7–17)</p> <p>11. Add, subtract, multiply and divide fractions concretely, pictorially and symbolically. [E, PS, V] (8–9)</p> <p>12. Convert among fractions, decimals and percents to solve problems. [E, PS, R, T] (8–12)</p> <p>13. Estimate and calculate operations on rational numbers. [E, PS, T] (8–10)</p> <p>14. Solve problems involving multiple steps and multiple operations, and accept that other methods may be equally valid. [PS] (5–13)</p> <p>15. Use a variety of methods to solve problems, such as drawing a diagram, making a table, guessing and testing, using objects to model, making it simpler, looking for a pattern, using logical reasoning and working backward. [PS, R, T, V] (6–14)</p>

**Strand: Number (Number Operations)***Students will:*

- demonstrate an understanding of and proficiency with calculations
- decide which arithmetic operation or operations can be used to solve a problem, and then solve the problem.

<b>C</b>	Communication	<b>PS</b>	Problem Solving
<b>CN</b>	Connections	<b>R</b>	Reasoning
<b>E</b>	Estimation and Mental Mathematics	<b>T</b>	Technology
		<b>V</b>	Visualization

General Outcomes	Specific Outcomes
<p>Illustrate and apply the concepts of rates, ratios, percentages and proportions to solve problems.</p> <p>Apply exponent laws to solve problems.</p>	<p>16. Understand the meaning of rate, ratio, percentage and proportion; and apply these concepts to solve problems. [E, PS, T] (8–12)</p> <p>17. Express rates and ratios in equivalent forms. [CN, PS, R] (8–15)</p> <p>18. Use exponent laws to evaluate expressions with numerical bases. [PS, R, T] (9–9)</p> <p>19. Understand and use the exponent laws to simplify expressions with variables as bases, and use substitution to calculate a numerical value. [PS, R, T] (9–9)</p>

**Strand: Patterns and Relations (Patterns)***Students will:*

- use patterns to describe the world and to solve problems.

<b>C</b>	Communication	<b>PS</b>	Problem Solving
<b>CN</b>	Connections	<b>R</b>	Reasoning
<b>E</b>	Estimation and Mental Mathematics	<b>T</b>	Technology
		<b>V</b>	Visualization

<b>General Outcome</b>	<b>Specific Outcomes</b>
Generalize, design and justify mathematical procedures, using appropriate patterns and technology.	<ol style="list-style-type: none"><li>1. Generalize a pattern arising from a problem-solving context, using mathematical expressions and equations, and verify by substitution. [C, CN, PS, R] (8–1, 9–1)</li><li>2. Given a first-degree equation, substitute numbers for variables and graph and analyze the relation. [C, PS, R, V] (8–2)</li><li>3. Translate between an oral or written expression and an equivalent algebraic expression. [C, CN] (8–3, 9–8)</li><li>4. Write equivalent forms of algebraic expressions, or equations, with integral coefficients. [C, CN, R] (9–3)</li></ol>

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

*Students will:*

- represent algebraic expressions in multiple ways.

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

General Outcome	Specific Outcomes
<p>Generalize arithmetic operations from the set of rational numbers to the set of polynomials.</p>	<ol style="list-style-type: none"> <li>5. Identify constant terms, coefficients and variables in polynomial expressions. [C] (9–7)</li> <li>6. Evaluate polynomial expressions, given the values of the variables. [E] (9–8)</li> <li>7. Represent and justify the addition and subtraction of polynomial expressions, using concrete materials and diagrams. [C, R, V] (9–9)</li> <li>8. Perform the operations of addition and subtraction on polynomial expressions. [R] (9–10)</li> <li>9. Represent multiplication, division and factoring of monomials, binomials and trinomials of the form <math>x^2 + bx + c</math>, using concrete materials and diagrams. [R, V] (9–11)</li> <li>10. Find the product of:             <ul style="list-style-type: none"> <li>• two monomials</li> <li>• a monomial and a polynomial</li> <li>• two binomials.</li> </ul>                 [R] (9–12)             </li> <li>11. Determine equivalent forms of algebraic expressions by identifying common factors. [PS, R] (9–13)</li> <li>12. Factor trinomials of the form <math>ax^2 + bx + c</math>, where <math>a = 1</math>, or of the form <math>ax^2 + abx + ac</math>. [PS, R] (9–13)</li> <li>13. Factor polynomials of the form <math>A^2 - B^2</math>, where <math>A</math> and <math>B</math> are both monomial expressions. [PS, R]</li> <li>14. Find the quotient when a polynomial is divided by a monomial. [PS, R] (9–14)</li> </ol>

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

*Students will:*

- represent algebraic expressions in multiple ways.

<b>C</b> Communication	<b>PS</b> Problem Solving
<b>CN</b> Connections	<b>R</b> Reasoning
<b>E</b> Estimation and Mental Mathematics	<b>T</b> Technology
	<b>V</b> Visualization

General Outcome	Specific Outcomes
Solve and verify linear equations and inequalities in one variable.	<p>15. Illustrate the solution process for a one-step, single variable, first-degree equation, using concrete materials or diagrams.</p> <ul style="list-style-type: none"> <li>• <math>x + a = b</math></li> <li>• <math>x - a = b</math></li> <li>• <math>ax = b</math></li> <li>• <math>\frac{x}{a} = b</math></li> </ul> <p>[CN, PS, V] (7–7)</p> <p>16. Solve and verify, using a variety of techniques, one-step linear equations of the form:</p> <p><math>x + a = b</math></p> <p><math>\frac{x}{a} = b</math></p> <p><math>ax = b</math></p> <p>where <math>a</math> and <math>b</math> are integers.</p> <p>[PS, R] (7–8)</p> <p>17. Illustrate the solution process for a two-step, single variable, first-degree equation, using concrete materials or diagrams.</p> <p>[CN, PS, V] (8–4)</p> <p>18. Solve and verify one- and two-step first-degree equations of the form:</p> <ul style="list-style-type: none"> <li>• <math>\frac{x}{a} + b = c</math></li> <li>• <math>ax + b = c</math></li> </ul> <p>where <math>a</math>, <math>b</math> and <math>c</math> are integers.</p> <p>[PS, V] (8–5)</p> <p>19. Solve and verify first-degree, single variable equations of the form:</p> <ul style="list-style-type: none"> <li>• <math>ax = b + cx</math></li> <li>• <math>a(x + b) = c</math></li> <li>• <math>ax + b = cx + d</math></li> <li>• <math>a(bx + c) = d(ex + f)</math></li> <li>• <math>\frac{a}{x} = b</math></li> </ul> <p>where <math>a</math>, <math>b</math>, <math>c</math>, <math>d</math>, <math>e</math> and <math>f</math> are rational numbers (with a focus on integers); and use equations of this type to model and solve problem situations.</p> <p>[C, PS, V] (9–5)</p>

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

- describe and compare everyday phenomena, using either direct or indirect measurement.

<b>C</b>	Communication	<b>PS</b>	Problem Solving
<b>CN</b>	Connections	<b>R</b>	Reasoning
<b>E</b>	Estimation and Mental Mathematics	<b>T</b>	Technology
		<b>V</b>	Visualization

General Outcomes	Specific Outcomes
<p>Solve problems involving perimeter, area, surface area and volume.</p> <p>Solve problems, using right triangles.</p>	<ol style="list-style-type: none"> <li>Estimate, measure and calculate the surface area and volume of any right prism, cylinder, cone or pyramid. [E, PS, R, T] (6–4, 7–2, 8–4)</li> <li>Demonstrate concretely, pictorially and symbolically that many rectangles are possible for a given perimeter or a given area. [CN, R] (6–7)</li> <li>Use the Pythagorean relationship to calculate the measure of the third side of a right triangle, given the other two sides, in 2-D applications. [PS] (8–2)</li> <li>Estimate, measure and classify angles as: <ul style="list-style-type: none"> <li>acute</li> <li>obtuse</li> <li>right</li> <li>straight</li> <li>reflex.</li> </ul> [E] (6–10) </li> <li>Explain the meaning of sine, cosine and tangent ratios in right triangles. [C, R] (9–1)</li> <li>Calculate an unknown side or an unknown angle in a right triangle, using trigonometric ratios. [PS, T, V] (9–3)</li> <li>Model and then solve given problem situations involving only one right triangle. [PS, T, V] (9–4)</li> </ol>

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

*Students will:*

- describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

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

General Outcome	Specific Outcome
Specify conditions under which triangles may be similar, and use these conditions to solve problems.	8. Recognize when, and explain why, two triangles are similar; and use the properties of similar triangles to solve problems. [C, PS, R, T] (9–8)

**Strand: Shape and Space (Transformations)***Students will:*

- perform, analyze and create transformations.

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

<b>General Outcome</b>	<b>Specific Outcomes</b>
Create and analyze patterns and designs, using symmetry, translation, rotation and reflection.	9. Draw designs, using ordered pairs, in all four quadrants of the coordinate grid. [PS, V] (7–13)  10. Draw and interpret scale diagrams, including: <ul style="list-style-type: none"><li>• enlargements</li><li>• reductions.</li></ul> [PS, T, V] (8–11)

**Strand: Statistics and Probability (Data Analysis)***Students will:*

- collect, display and analyze data to make predictions about a population.

<b>C</b> Communication	<b>PS</b> Problem Solving
<b>CN</b> Connections	<b>R</b> Reasoning
<b>E</b> Estimation and Mental Mathematics	<b>T</b> Technology
	<b>V</b> Visualization

General Outcomes	Specific Outcomes
<p>Develop and implement a plan for the display and analysis of data.</p> <p>Analyze experimental results expressed in two variables.</p>	<ol style="list-style-type: none"> <li>1. Read and interpret graphs that are provided. [C, E, PS, R] (6–7)</li> <li>2. Create scatterplots for discrete and continuous variables. [C, V] (9–2)</li> <li>3. Interpret a scatterplot to determine if there is an apparent relationship. [E, R] (9–3)</li> <li>4. Determine, by inspection, the line of best fit from a scatterplot for an apparent linear relationship. [E, PS] (9–4)</li> <li>5. Draw and justify conclusions from the line of best fit, by:             <ul style="list-style-type: none"> <li>• interpolation</li> <li>• extrapolation.</li> </ul> [C, R] (9–5)           </li> </ol>