Equations

Vocabulary

equation
solution
root
constant term
formula

Curriculum Expectations
Mathematical Process Expectations

Throughout this course, students will:

PROBLEM SOLVING

MPS.01 develop, select, apply, and compare a variety of problem-solving strategies as they pose and solve problems and conduct investigations, to help deepen their mathematical understanding;

REASONING AND PROVING

MPS.02 develop and apply reasoning skills (e.g., recognition of relationships, generalization through inductive reasoning, use of counter-examples) to make mathematical conjectures, assess conjectures, and justify conclusions, and plan and construct organized mathematical arguments;

REFLECTING

MPS.03 demonstrate that they are reflecting on and monitoring their thinking to help clarify their understanding as they complete an investigation or solve a problem (e.g., by assessing the effectiveness of strategies and processes used, by proposing alternative approaches, by judging the reasonableness of results, by verifying solutions);

SELECTING TOOLS AND COMPUTATIONAL STRATEGIES

MPS.04 select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems;

CONNECTING

MPS.05 make connections among mathematical concepts and procedures, and relate mathematical ideas to situations or phenomena drawn from other contexts (e.g., other curriculum areas, daily life, current events, art and culture, sports);

REPRESENTING

MPS.06 create a variety of representations of mathematical ideas (e.g., numeric, geometric, algebraic, graphical, pictorial representations; onscreen dynamic representations), connect and compare them, and select and apply the appropriate representations to solve problems;

COMMUNICATING

MPS.07 communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary and a variety of appropriate representations, and observing mathematical conventions.

Additional information and teaching materials for this chapter are available on the McGraw-Hill Ryerson web site at http://www.mcgrawhill.ca/books/principles9. You will need your password to access this material.

Overall Expectations

By the end of this course, students will:

NAV.01 demonstrate an understanding of the exponent rules of multiplication and division, and apply them to simplify expressions.

NAV.02 manipulate numerical and polynomial expressions, and solve first-degree equations.

Specific Expectations

Manipulating Expressions and Solving Equations

By the end of this chapter, students will:

NA2.03 relate their understanding of inverse operations to squaring and taking the square root, and apply inverse operations to simplify and solve equations.

NA2.07 solve first-degree equations, including equations with fractional coefficients, using a variety of tools (e.g., computer algebra systems, paper and pencil) and strategies (e.g., the balance analogy, algebraic strategies);

NA2.08 rearrange formulas involving variables in the first degree, with and without substitution (e.g., in analytic geometry, in measurement);

NA2.09 solve problems that can be modelled with first-degree equations, and compare algebraic methods to other solution methods.

Chapter Problem

The Chapter Problem is introduced in the Chapter Opener. The context is based on some popular reality television shows, which should appeal to students of this age. Have students discuss their understanding of the topic. Some students who are more familiar with these shows can describe them to other students who may not have seen them.

You may wish to have students complete the Chapter Problem revisits that occur throughout the chapter. These questions are designed to help students move toward the Chapter Problem Wrap-Up on page 233.

Alternatively, you may wish to assign the entire Chapter Problem when students have completed the chapter. The Chapter Problem Wrap-Up is a summative assessment.

Chapter 4 Planning Chart

Section Suggested Timing	Student Text Page (s)	Teacher's Resource Blackline Masters	Assessment	Tools
Chapter 4 Opener • 15 min	182–183			
Get Ready • 40–80 min	184–185	• BLM 4.GR.1 Practice: Get Ready	• BLM 4.GR.2 Get Ready Self-Assessment Checklist	
4.1 Solve Simple Equations • 80–160 min	186–195	• BLM 4.1.1 Practice: Solve Simple Equations • BLM 4.1.2 Use Algebra Tiles • BLM T7	• The Computer Algebra System (CAS) on the TI-89 Calculator • BLM A9 Communication General Scoring Rubric • BLM 4.1.3 Achievement Check Rubric	**Tools** • algebra tiles **Technology Tools** • *The Geometer's Sketchpad®* • computers • Computer Algebra System • TI-89 calculators • calculators
4.2 Solve Multi-Step Equations • 80–160 min	196–203	• BLM T7 The Computer Algebra System (CAS) on the TI-89 Calculator • BLM 4.2.1 Alternate Solution Method • BLM 4.2.2 Construct a Geometric Model With *The Geometer's Sketchpad®* • BLM T4 *The Geometer's Sketchpad®* 3 • BLM T5 *The Geometer's Sketchpad®* 4 • BLM 4.2.3 Practice: Solve Multi-Step Equations • BLM G10 Grid Paper	• BLM A7 Thinking General Scoring Rubric	**Tools** • grid paper **Technology Tools** • Computer Algebra System • TI-89 calculators • calculators • *The Geometer's Sketchpad®* • computers
4.3 Solve Equations Involving Fractions • 80 min	204–210	• BLM 4.3.1 Practice: Solve Equations Involving Fractions • BLM T7 The Computer Algebra System (CAS) on the TI-89 Calculator • BLM 4.3.2 Cross-Multiplication Solution Method • BLM T4 *The Geometer's Sketchpad®* 3 • BLM T5 *The Geometer's Sketchpad®* 4 • BLM 4.3.4 Student Success: Decision Tree	• BLM A8 Application General Scoring Rubric • BLM 4.3.3 Achievement Check Rubric • BLM A17 Teamwork Self Assessment	**Technology Tools** • Computer Algebra System • TI-89 calculators • calculators • *The Geometer's Sketchpad®* • computers • graphing calculators
4.4 Modelling With Formulas • 80 min	211–219	• BLM 4.4.1 Practice: Modelling With Formulas • BLM T7 The Computer Algebra System (CAS) on the TI-89 Calculator • BLM T4 *The Geometer's Sketchpad®* 3 • BLM T5 *The Geometer's Sketchpad®* 4 • BLM 4.4.2 Use a Computer Algebra System Directly • BLM 4.4.3 Student Success: Terrific Triangles • BLM G10 Grid Paper	• BLM A18 My Progress as a Problem Solver	**Tools** • grid paper • rulers or metre sticks **Technology Tools** • Computer Algebra System • TI-89 calculators • calculators • *The Geometer's Sketchpad®* • computers • graphing calculators
4.5 Modelling With Algebra • 80–160 min	220–229	• BLM 4.5.1 Investigate: Magic With Algebra • BLM T4 *The Geometer's Sketchpad®* 3 • BLM T5 *The Geometer's Sketchpad®* 4 • BLM 4.5.2 Practice: Modelling With Algebra • BLM G10 Grid Paper	• BLM 4.5.3 Achievement Check Rubric • BLM A22 Earning Money Report Checklist	**Tools** • grid paper **Technology Tools** • *The Geometer's Sketchpad®* • computers • Internet access

Section Suggested Timing	Student Text Page (s)	Teacher's Resource Blackline Masters	Assessment	Tools
Chapter 4 Review • 80 min	230–231	• BLM 4.CR.1 Chapter 4 Review	• BLM A14 Self-Assessment Recording Sheet • BLM A15 Self-Assessment Checklist	**Technology Tools** • Computer Algebra System • TI-89 calculators • calculators
Chapter 4 Practice Test • 60–80 min	232–233	•BLM T4 *The Geometer's Sketchpad*® 3 •BLM T5 *The Geometer's Sketchpad*® 4 •BLM G10 Grid Paper	•BLM 4.PT.1 Chapter 4 Practice Test •BLM 4.CT.1 Chapter 4 Test •BLM A8 Application General Scoring Rubric •BLM 4.P.1 Performance Task	**Tools** • grid paper **Technology Tools** • Computer Algebra System • TI-89 calculators • *The Geometer's Sketchpad*® • computers
Chapter 4 Problem Wrap-Up • 30 min	233		• BLM 4.CP.1 Chapter 4 Problem Wrap-Up Rubric	**Technology Tools** • Computer Algebra System • TI-89 calculators • calculators

Chapter 4 Blackline Masters Checklist

BLM	Title	Purpose
Get Ready		
BLM 4.GR.1	Practice: Get Ready	Practice
BLM 4.GR.2	Get Ready Self-Assessment Checklist	Student Self-Assessment
4.1: Solve Simple Equations		
BLM 4.1.1	Practice: Solve Simple Equations	Practice
BLM 4.1.2	Use Algebra Tiles	Student Support
BLM T7	The Computer Algebra System (CAS) on the TI-89 Calculator	Technology
BLM A9	Communication General Scoring Rubric	Assessment
BLM 4.1.3	Achievement Check Rubric	Assessment
4.2: Solve Multi-Step Equations		
BLM T7	The Computer Algebra System (CAS) on the TI-89 Calculator	Technology
BLM 4.2.1	Alternate Solution Method	Student Support
BLM 4.2.2	Construct a Geometric Model with *The Geometer's Sketchpad*®	Student Support Technology
BLM T4	*The Geometer's Sketchpad*® 3	Technology
BLM T5	*The Geometer's Sketchpad*® 4	Technology
BLM 4.2.3	Practice: Solve Multi-Step Equations	Practice
BLM A7	Thinking General Scoring Rubric	Assessment
BLM G10	Grid Paper	Teacher Support
4.3: Solve Equations Involving Fractions		
BLM 4.3.1	Practice: Solve Equations Involving Fractions	Practice
BLM T7	The Computer Algebra System (CAS) on the TI-89 Calculator	Technology
BLM 4.3.2	Cross-Multiplication Solution Method	Student Support
BLM A8	Application General Scoring Rubric	Assessment
BLM T4	*The Geometer's Sketchpad*® 3	Technology
BLM T5	*The Geometer's Sketchpad*® 4	Technology
BLM A8	Application General Scoring Rubric	Assessment
BLM 4.3.3	Achievement Check Rubric	Assessment
BLM A17	Teamwork Self Assessment	Student Self-Assessment
BLM 4.3.4	Student Success: Decision Tree	Student Success

	BLM	Title	Purpose
4.4: Modelling With Formulas			
	BLM 4.4.1	Practice: Modelling With Formulas	Practice
	BLM T7	The Computer Algebra System (CAS) on the TI-89 Calculator	Technology
	BLM T4	*The Geometer's Sketchpad*® 3	Technology
	BLM T5	*The Geometer's Sketchpad*® 4	Technology
	BLM 4.4.2	Use a Computer Algebra System Directly	Student Support Technology
	BLM 4.4.3	Student Success: Terrific Triangles	Student Success
	BLM A18	My Progress as a Problem Solver	Student Self-Assessment
	BLM G10	Grid Paper	Student Support
4.5: Modelling With Algebra			
	BLM 4.5.1	Investigate: Magic With Algebra	Student Support
	BLM T4	*The Geometer's Sketchpad*® 3	Technology
	BLM T5	*The Geometer's Sketchpad*® 4	Technology
	BLM 4.5.2	Practice: Modelling With Algebra	Practice
	BLM 4.5.3	Achievement Check Rubric	Assessment
	BLM G10	Grid Paper	Student Support
	BLM A22	Earning Money Report Checklist	Assessment
Chapter 4 Review			
	BLM 4.CR.1	Chapter 4 Review	Practice
	BLM A14	Self-Assessment Recording Sheet	Student Self-Assessment
	BLM A15	Self-Assessment Checklist	Student Self-Assessment
Chapter 4 Practice Test			
	BLM 4.PT.1	Chapter 4 Practice Test	Diagnostic Assessment
	BLM 4.CT.1	Chapter 4 Test	Summative Assessment
	BLM 4.P.1	Performance Task	Performance Task
	BLM A8	Application General Scoring Rubric	Assessment
	BLM T4	*The Geometer's Sketchpad*® 3	Technology
	BLM T5	*The Geometer's Sketchpad*® 4	Technology
	BLM G10	Grid Paper	Student Support
Chapter 4 Problem Wrap-Up			
	BLM 4.CP.1	Chapter 4 Problem Wrap-Up Rubric	Summative Assessment

Get Ready

Suggested Timing
40–80 min

Related Resources
BLM 4.GR.1 Practice: Get Ready

BLM 4.GR.2 Get Ready
  Self-Assessment Checklist

Common Errors

- Some students may collect like terms incorrectly (e.g., change the variable parts, or collect unlike terms).

R_x Use algebra tiles to help consolidate students' understanding. Provide additional remediation, as needed.

- Some students may mix up integer signs when applying the distributive property.

R_x Review integer operations and the distributive property with students, as needed. Review the use of brackets as indicators of how far to distribute the monomial factor.

- Some students may simply multiply numbers together to find a common denominator, which is not generally the least common denominator.

R_x Review the methods as shown, using multiples and factors. Assign extra practice, as needed. You may wish to use **BLM 4.GR.1 Practice: Get Ready** as remediation.

- Some students may add or subtract fractions incorrectly.

R_x Review the methods for performing these operations. Use manipulatives (e.g., pattern blocks, fraction rings, and circles) to develop understanding. Assign extra practice, as needed. You may wish to use **BLM 4.GR.1 Practice: Get Ready** as remediation.

Accommodations

Memory—Encourage students to write out cue cards to remember the rules for multiplying positive and negative numbers. Let the students use visual clues when adding like terms.

Teaching Suggestions

- The selection of topics is eclectic, as dictated by the needs of the chapter contents. One approach is to use each relevant part just prior to the section being taught.
- Alternatively, assigning the entire Get Ready at the beginning of the chapter could provide an opportunity to generate student interest, e.g., How will all of these different topics be combined and used in the upcoming chapter? Whichever approach is taken, it is important for students to develop some appreciation of how the various branches of mathematics are connected to each other.
- All BLMs referred to throughout this chapter can be found on the *Principles of Mathematics 9* Teacher's Resource CD-ROM.
- You may wish to use **BLM 4.GR.1 Practice: Get Ready** for remediation or extra practice.

Assessment
Assess student readiness to proceed by informal observation as students are working on the exercises. A formal test would be inappropriate since this material is not part of the grade 9 curriculum for this chapter. Student self-assessment is also an effective technique; students can place a checkmark beside topics in the Get Ready in which they feel confident with the necessary skills. You may wish to use **BLM 4.GR.2 Get Ready Self-Assessment Checklist** as a self-assessment for students. Remedial action can be taken in small groups or with a whole class skill review.