Chapter **6**

Solve Polynomial Equations

Curriculum Expectations

Polynomial Functions

Solving Problems Involving Polynomial Equations

B3.1 solve polynomial equations in one variable, of degree no higher than four (e.g., $x^2 - 4x = 0$, $x^4 - 16 = 0$, $3x^2 + 5x + 2 = 0$), by selecting and applying strategies (i.e., common factoring; difference of squares; trinomial factoring), and verify solutions using technology (e.g., using computer algebra systems to determine the roots of the equation; using graphing technology to determine the x-intercepts of the corresponding polynomial function)

Sample problem: Solve $x^3 - 2x^2 - 8x = 0$.

B3.2 solve problems algebraically that involve polynomial functions and equations of degree no higher than four, including those arising from real-world applications

B3.3 identify and explain the roles of constants and variables in a given formula (e.g., a constant can refer to a known initial value or a known fixed rate; a variable changes with varying conditions)

Sample problem: The formula $P = P_0 + kh$ is used to determine the pressure, P kilopascals, at a depth of h metres under water, where k kilopascals per metre is the rate of change of the pressure as the depth increases, and P_0 kilopascals is the pressure at the surface. Identify and describe the roles of P, P_0, k, and h in this relationship, and explain your reasoning.

B3.4 expand and simplify polynomial expressions involving more than one variable [e.g., simplify $-2xy(3x^2y^3 - 5x^3y^2)$], including expressions arising from real-world applications

Sample problem: Expand and simplify the expression $\pi(R + r)(R - r)$ to explain why it represents the area of a ring. Draw a diagram of the ring and identify R and r.

B3.5 solve equations of the form $x^n = a$ using rational exponents $\left(\text{e.g., solve } x^3 = 7 \text{ by raising both sides to the exponent } \frac{1}{3}\right)$

B3.6 determine the value of a variable of degree no higher than three, using a formula drawn from an application, by first substituting known values and then solving for the variable, and by first isolating the variable and then substituting known values

Sample problem: The formula $s = ut + \frac{1}{2}at^2$ relates the distance, s, travelled by an object to its initial velocity, u, acceleration, a, and the elapsed time, t. Determine the acceleration of a dragster that travels 500 m from rest in 15 s, by first isolating a, and then by first substituting known values. Compare and evaluate the two methods.

B3.7 make connections between formulas and linear, quadratic, and exponential functions [e.g., recognize that the compound interest formula, $A = P(1 + i)^n$, is an example of an exponential function $A(n)$ when P and i are constant, and of a linear function $A(P)$ when i and n are constant], using a variety of tools and strategies (e.g., comparing the graphs generated with technology when different variables in a formula are set as constants)

Sample problem: Which variable(s) in the formula $V = \pi r^2 h$ would you need to set as a constant to generate a linear equation? A quadratic equation?

B3.8 solve multi-step problems requiring formulas arising from real-world applications (e.g., determining the cost of two coats of paint for a large cylindrical tank)

B3.9 gather, interpret, and describe information about applications of mathematical modelling in occupations, and about college programs that explore these applications

Chapter 6 Planning Chart

Section	Study Guide and Exercise Book Pages	Teacher's Resource Blackline Masters	Assessment	Tools
6.1 Simplifying Polynomial Expressions	111–113	• G–1 Grid Paper • T–2 *The Geometer's Sketchpad*® 4 • T–4 The TI-Nspire™ CAS Calculator • BLM 6–1 Chapter 6 Prerequisite Skills • T6–1 Observe Patterns With Multiplication of Expressions Using TI-Nspire™ CAS	• BLM 6–2 Chapter 6 Self-Assessment Checklist • A–1 Problem Solving • A–2 Reasoning and Proving • A–3 Reflecting • A–4 Selecting Tools and Computational Strategies • A–5 Connecting • A–6 Representing • A–7 Communicating	• graphing calculator • computer algebra system • computer with dynamic geometry software • poster paper • markers • grid paper
6.2 Strategies for Solving Polynomial Equations	114–116	• G–1 Grid Paper • T–4 The TI-Nspire™ CAS Calculator • T6–2 Solve Polynomial Equations Using TI–83 Plus/ TI–84 Plus and TI–Nspire™ CAS		• graphing calculator • computer algebra system • poster paper • markers
6.3 Solving Equations of the Form $x^n = a$	117–119	• T6–3 How to Do Section 6.3 #5a) and b) Using TI–83 Plus/ TI–84 Plus • T6–4 How to Do Section 6.3 #8 Using TI-83 Plus/TI-84 Plus		• graphing calculator • computer algebra system
6.4 Functions and Formulas	120–123	• T6–5 How to Do Section 6.4 #13 Using TI-Nspire™ CAS		• graphing calculator • computer algebra system • large sheets of grid paper • markers
6.5 Solving Multi-Step Problems Using Polynomial Equations	124–127	• G–1 Grid Paper • BLM 6–3 Chapter 6 Review • BLM 6–4 Chapter 6 Practice Test • BLM 6–5 Chapter 6 Case Study • T6–6 How to Do Section 6.5 #10 Using Microsoft® *Excel*		• grid paper • graphing calculator • computer algebra system • computer with a spreadsheet program

Chapter 3 Blackline Masters Checklist

	BLM	Title	Purpose
6.1 Simplifying Polynomial Expressions			
	G–1	Grid Paper	Student Support
	T–2	*The Geometer's Sketchpad*® 4	Technology
	T–4	The TI-Nspire™ CAS Calculator	Technology
	BLM 6–1	Chapter 6 Prerequisite Skills	Practice
	BLM 6–2	Chapter 6 Self-Assessment Checklist	Assessment
	T6–1	Using TI-Nspire™ CAS to Observe Patterns With Multiplication of Expressions	Technology
	A–1	Problem Solving	Assessment
	A–2	Reasoning and Proving	Assessment
	A–3	Reflecting	Assessment
	A–4	Selecting Tools and Computational Strategies	Assessment
	A–5	Connecting	Assessment
	A–6	Representing	Assessment
	A–7	Communicating	Assessment
6.2 Strategies for Solving Polynomial Equations			
	G–1	Grid Paper	Student Support
	T6–2	Solving Polynomial Equations Using TI-83 Plus/TI-84 Plus or TI-Nspire™ CAS	Technology
6.3 Solving Equations of the Form $x^n = a$			
	T6–3	How to Do Section 6.3 #5 Using TI-83 Plus/TI-84 Plus	Technology
	T6–4	How to Do Section 6.3 #8 Using TI-83 Plus/TI-84 Plus	Technology
6.4 Functions and Formulas			
	T6–5	How to Do Section 6.4 #13 Using TI-Nspire™ CAS	Technology
6.5 Solving Multi-Step Problems Using Polynomial Equations			
	G–1	Grid Paper	Student Support
	BLM 6–3	Chapter 6 Review	Practice
	BLM 6–4	Chapter 6 Practice Test	Practice
	BLM 6–5	Chapter 6 Case Study	Practice
	T6–6	How to Do Section 6.5 #10 Using Microsoft® *Excel*	Technology
	BLM 6–6	Chapter 6 BLM Answers	Answers