# Prerequisite Skills

**Student Text Pages**
76 to 77

**Suggested Timing**
45–60 min

**Tools**
- grid paper

**Related Resources**
- G–3 Four Quadrant Grids
- BLM 2–1 Prerequisite Skills

**Assessment**
You may wish to use **BLM 2–1 Prerequisite Skills** as a diagnostic assessment. Refer students to the Skills Appendix for examples and further practice of the topics.

## Teaching Suggestions

- Students could partner up to verify each other's solutions.
- Stress that factoring expressions is an important prerequisite skill for this section.

### Chapter Problem

The Chapter Problem is introduced on page 77. You may use this context as an opportunity to show that mathematics shows up in many jobs and can be used to analyse complex situations. The Chapter Problem is revisited in Section 2.1 (question 10), Section 2.3 (question 15), Section 2.5 (question 9), and Section 2.7 (question 13). These questions are designed to help students move toward the Chapter Problem Wrap-Up on page 143. The Chapter Problem questions may be assigned in each section where they appear. Alternatively, you may wish to assign them all with the Chapter Problem Wrap-Up when students have completed the chapter, as part of a summative assessment. It is important to coach students throughout the chapter on what they will be expected to produce at the end.

**Common Errors**

- Students may forget to multiply all terms by the value outside the brackets when using the distributive property.

$R_x$ Post some worked examples around the class for students to refer to.

# 2.1 Functions and Equivalent Algebraic Expressions

**Student Text Pages**
78 to 85

**Suggested Timing**
50 min

**Tools**
- grid paper
- graphing calculator

## Teaching Suggestions

- This is the first time that students are exposed to the idea of restrictions, so it is important for them to understand why they are there. For example, although the expression $\frac{x^2 + 5x + 6}{x + 3}$ simplifies to $x + 2$, they are not equal without restrictions. Since the original function is undefined when $x = -3$, the simplified expression must also be undefined at $x = -3$.
- For a numerical investigation, use **BLM 2–2 Section 2.1 Investigate**. In this investigation, familiar forms of quadratic equations are used to show that different forms of the same equation can give the same result.
- In **Example 1**, note that the second equation is graphed with a thicker line. This is an effective technique to show the two functions may be equivalent.
- For **Example 2**, review factoring methods if you have not already assigned factoring as a prerequisite skill.

**Related Resources**
- G–1 Grid Paper
- BLM 2–2 Section 2.1 Investigate
- BLM 2–3 Section 2.1 Practice

- In **Example 3**, part of the intent is to show that using different forms of the same equation can speed up the calculation process.
- Read through the **Key Concepts** with students to be sure that they have mastered the skills developed in this section.
- In **question C2**, the classic cancelling mistake is used as an example. To show that these are not equal, choose values of $x$ to substitute in and show that the answers are different.
- In **question C3**, mention to students that polynomial functions are always continuous and thus will never have restrictions.

**Differentiated Instruction**

- Use **timed retell** to summarize the Key Concepts in determining equivalent algebraic expressions. Have students write a summary of the talk in their **journal**.

**Communicate Your Understanding Responses (page 83)**

**C1** Answers may vary. Sample answer: Checking two or more points may suggest that the expressions are equivalent, but it does not prove that they are. To prove that the functions are equivalent, simplify both expressions to see if they are algebraically the same.

**C2** Answers may vary. Sample answer: The right side of the expression has been simplified by dividing terms out of the expression instead of dividing out *factors*. This will give a wrong answer. Substitute a value for $x$ to check. For example, substitute $x = 2$ into the original expression and the simplified expression to determine that the value of the original expression is $\frac{19}{15}$ and the value of the simplified expression is 4. Since these two values are not equivalent, the rational expression has not been simplified correctly.

**C3** Answers may vary. Sample answer: This polynomial expression is made up of terms that are added and subtracted. Therefore, there will be no restriction on the variable $x$ that can be evaluated in the function. The function is a continuous one, and the domain for the variable $x$ is the set of real numbers.

**Common Errors**

- Students may include zeros of the numerator as restrictions when simplifying a rational expression.

**$R_x$** Have students focus on the idea that only zeros of the denominator should be considered.

## Practise, Connect and Apply, Extend

- The intent of **question 7** is for students see the value of simplifying by having to evaluate a complex expression for several points. That is, if they simplify the expression first, evaluating it at different values for $x$ will be easier than if the original expression was used.
- **Question 9** allows students to use their reasoning skills while connecting present concepts with mathematical material learned in the past in order to represent different functions algebraically in terms of $x$.
- For **question 10**, encourage students to create a chart similar to the following one to help determine the correct quadratic relationship:

| Number of Green Lights Per Hour | Number of Cars Per Green Light | Total Number of Cars Per Hour |
|---|---|---|
| ⋮<br>16<br>17<br>18<br>19<br>20<br>⋮ | 12 | $18 \times 12 = 216$ |

- In **question 11**, the book *The Curious Incident of the Dog in the Night-Time*, by Mark Haddon, is referenced. Besides being filled with mathematics (e.g., the chapters are numbered using only prime numbers), the book also gives some insight into how a child with mild autism might see the world. **Question 11** gives students the opportunity to connect the Pythagorean theorem with their reasoning skills to prove concepts related to right triangles. They will use their reflecting skills to examine the expressions found for the three sides of the triangle and communicate how they determined which side is the hypotenuse.
- For **question 12**, graphing calculators or graphing software is needed.

- In **question 14**, due to the construction of the inner square, there is a lower bound that is not zero. For a dynamic version of this question using *The Geometer's Sketchpad*®, see the sketch **2.1_squares.gsp**.
- **Question 15** is a classic question that should remind students that when you divide by zero (even in algebraic form), strange things can happen.
- Use **BLM 2–3 Section 2.1 Practice** for remediation or extra practice.

### Mathematical Process Expectations

The table shows questions that provide good opportunities for students to use the mathematical processes.

| Process Expectation | Selected Questions |
|---|---|
| Problem Solving | 10, 15 |
| Reasoning and Proving | 1–5, 7–15 |
| Reflecting | 10, 11, 13–15 |
| Selecting Tools and Computational Strategies | 5, 6, 10, 12 |
| Connecting | 1–15 |
| Representing | 8, 9 |
| Communicating | 1, 7, 11–13, 15 |

# Use Technology

**Student Text Pages**
86 to 87

**Suggested Timing**
10–15 min

**Tools**
- TI-Nspire™ CAS graphing calculator

## Graph Functions Using a TI-Nspire™ CAS Graphing Calculator

### Teaching Suggestions

- The split screen capability of the calculator makes it easy to compare graphs. However, you will sacrifice resolution. Unless direct comparisons are needed, it is more useful to open each graph on a new page.