

Functions and Equations

General Outcome

Develop algebraic reasoning and number sense.

Specific Outcomes

- AN1** Demonstrate an understanding of the absolute value of real numbers.
- AN2** Solve problems that involve operations on radicals and radical expressions with numerical and variable radicands.
- AN3** Solve problems that involve radical equations (limited to square roots).
- AN4** Determine equivalent forms of rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials).
- AN5** Perform operations on rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials).
- AN6** Solve problems that involve rational equations (limited to numerators and denominators that are monomials, binomials or trinomials).

General Outcome

Develop algebraic and graphical reasoning through the study of relations.

Specific Outcomes

- RF2** Graph and analyze absolute value functions (limited to linear and quadratic functions) to solve problems.
- RF11** Graph and analyze reciprocal functions (limited to the reciprocal of linear and quadratic functions).

Suggested Timing

30–40 min

Blackline Masters

BLM U3–1 Unit 3 Project Checklist

What's Ahead

In Unit 3, students explore radical and rational expressions and equations, absolute value functions and equations, and reciprocal functions. They simplify radical expressions and perform operations on these expressions. Students determine the restrictions on the values of variables in radical expressions that are real numbers and identify extraneous roots in radical equations. They determine equivalent forms of rational expressions and perform operations on these expressions. They learn about absolute value and how to use absolute value to determine changes in values. Students graph absolute value functions using a table of values, generalize a rule for writing absolute value functions in piecewise notation, and solve absolute value equations graphically and algebraically. They graph and analyse the reciprocal of a given function. Students study both linear and quadratic functions.

Throughout the unit, students model situations and solve problems involving equations and functions using a variety of methods.

Planning Notes

Introduce Unit 3 by reading the opening paragraph on page 268 of the student resource with the class. Have students share what they know about any non-linear models used in meteorology, astronomy, and population ecology. You might prompt them to use the photo collage for ideas. The collage shows several situations that involve using non-linear models to represent relationships including the velocity of a spacecraft leaving Earth, a business forecast, and the movement of a hurricane or other extreme weather event.

The Looking Ahead box at the bottom of page 268 identifies the types of problems students will solve throughout the unit. You may wish to reactivate students' knowledge of topics, such as radical and rational expressions and equations, linear functions, and quadratic functions that lead to learning about absolute value and reciprocal value functions.

Unit 3 Project

For the Unit 3 project, students explore functions and equations, and how they relate to space exploration. Students may be interested to learn that the Arctic is not an ideal place for astronomy. The continuous twilight for most of spring and summer prevents the viewing of stars; as does blowing snow, ice fog, or the Aurora borealis, in the winter. Despite these conditions, Inuit do have a system of astronomy and knowledge of stars.

In Chapter 5, the Project Corner boxes provide information about applications of radicals in space exploration. In Chapter 6, the Project Corner box focusses on peculiarities in space, such as the passage of time and black holes. In Chapter 7, the Project Corner box focusses on space tourism. At the end of the unit, students will choose one of three options:

- Examine an application of radicals in space or in the contributions of an astronomer.
- Research an application of rational expressions in space and investigate why a rational expression models a particular situation.
- Apply the skills learned about absolute value functions and reciprocal functions to graphic design.

Regardless of the option they choose, students will showcase what they have learned about radical, rational, absolute value, and reciprocal functions and equations.

With the class, read and discuss the introductory notes for the Unit 3 project. You may wish to point out the Project Corners throughout Chapters 5, 6, and 7. Note that these features are not mandatory, but they are recommended because they provide helpful information about the Unit 3 project. You may wish to provide students with **BLM U3–1 Unit 3 Project Checklist**. Students can use the checklist as they prepare their project.

Have students collect all their work for the Unit 3 project in a portfolio.

For additional information on the Unit 3 project, see pages 269 and 415 in the student resource or pages 279 and 280 in this Teacher's Resource.