

Systems of Equations and Inequalities

General Outcome

Develop algebraic and graphical reasoning through the study of relations.

Specific Outcomes

RF6 Solve, algebraically and graphically, problems that involve systems of linear-quadratic and quadratic-quadratic equations in two variables.

RF7 Solve problems that involve linear and quadratic inequalities in two variables.

RF8 Solve problems that involve quadratic inequalities in one variable.

Suggested Timing

30–45 min

Blackline Masters

BLM U4–1 Unit 4 Project Checklist

What's Ahead

In Unit 4, students extend their knowledge of using mathematical models to solve real-world problems. They explore linear and quadratic equations and inequalities, and how these are used to model and solve problems. In Chapter 8, students explore how to solve linear-quadratic and quadratic-quadratic systems of equations. They first explore how to solve these graphically, looking for points of intersection. They are then introduced to solving these systems algebraically, using substitution and elimination. In Chapter 9, students explore solving inequalities. They begin by exploring linear inequalities of two variables, then move on to quadratic inequalities of one variable, and finally quadratic inequalities of two variables. In each of these sections, students explore inequalities involving $>$, $<$, \leq , and \geq , and how the nature of the inequality affects the boundary values.

Planning Notes

Begin the unit by reading and discussing the opener on page 420. Ask students:

- What do you know about linear and quadratic equations? Where have you been introduced to them before?
- What are some of the operations you have performed on these types of equations and graphs? (Examples include finding slopes and intercepts, finding vertices and shapes of parabolas, establishing intersection points, finding zeros and roots graphically and by factoring, completing the square, and using the quadratic formula.)
- What are the characteristics of linear and quadratic equations? By just looking at an equation, do you know if it is a linear or quadratic equation?
- What does the graph of a quadratic equation look like? What parameters affect the shape of the graph of linear and quadratic equations?
- What types of situations can linear equations model? quadratic equations?
- If a quadratic equation is a function, what do you know about the shape of its graph? (It opens up or down, not sideways.)

As a class, look at the collage of images and discuss how mathematical models based on linear and quadratic equations might be used in each of these situations or areas of study. Note that the top photograph on page 420 shows Canadian Wildlife Service scientists evaluating the condition of a tranquilized mother polar bear, in Wapusk National Park, Manitoba. The photos at the top of page 421 depict a scientist doing DNA analysis, and nanospheres arranged in layers. Ask students if they can think of other areas of study where these types of models would be applied.

Unit 4 Project

For the Unit 4 project, students explore an exciting new area of scientific exploration and discovery: nanotechnology. This developing technology has the potential to revolutionize a variety of fields, including electronics, energy, and medicine. For example, ask students to imagine tiny “robots” that are swallowed, and that then seek out, identify, and destroy cancer cells. In this project, students get to envision an object that could be built or enhanced by the use of nanotechnology. They will design the object and then analyse the projected costs of producing it.

With the class, read and discuss the introductory notes for the Unit 4 project. You may wish to point out the Project Corners throughout Chapters 8 and 9. Note that these features are not mandatory, but they are recommended because they provide helpful information about the Unit 4 project. You may wish to provide students with **BLM U4–1 Unit 4 Project Checklist**. Students can use the checklist as they prepare their project.

Have students collect all their work for the Unit 4 project in a portfolio.

For additional information on the Unit 4 project, see pages 461, 506, and 507 in the student resource or pages 310 and 340 to 342 in this Teacher's Resource.