Solving Systems of Linear Equations Algebraically

Opener

***Mathematics 10*, pages 466–467**

Suggested Timing

20–30 min

Blackline Masters

BLM 9–2 Chapter 9 Prerequisite Skills
BLM 9–4 Chapter 9 Unit 4 Project
BLM U4–2 Unit 4 Project Checklist

Key Terms

substitution method elimination method

What's Ahead

In this chapter, students continue their work with linear systems from Chapter 8. Students construct a system of linear equations from a problem and then solve the linear system algebraically. The two algebraic methods students use are substitution and elimination. Also, students compare these two methods with the graphical method from Chapter 8 and use strategies to determine which method is most appropriate and efficient for a particular problem.

Planning Notes

With the class, discuss the images in the collage and how they may relate to a linear system. Ask guiding questions to assist their thinking:

- What variables would be involved in these different occupations and activities?
- How do some of these variables relate?

Read through the section on air traffic controllers. Ask students what variables an air traffic controller might have to deal with and how they interact with each other.

Unit Project

You might take the opportunity to discuss the Unit 4 project described in the Unit 4 opener. See TR page 298. Throughout the chapter, there are individual questions for the unit project.

These questions are not mandatory but are recommended because they provide some of the work needed for the final report for the Unit 4 project assignment.

You will find questions related to the project in the Check Your Understanding in sections 9.1, 9.2, and 9.3.

Foldables™ Study Tool

Discuss with students the benefits of keeping a summary of what they are learning in the chapter. If they have used Foldables before, you may wish to have them report on how useful they found various designs.

- What designs have they used?
- Which designs were the most useful?
- Which, if any, designs were hard to use?
- What disadvantages do Foldables have?
- What other method(s) could they use to summarize their learning?

Discuss the Foldable design on page 467 and how it might be used to summarize Chapter 9. Point out to students that the design of this Foldable allows them to add additional pages of blank or graph paper if needed. Encourage students to suggest revisions for this Foldable, or to replace this Foldable with another design of their choice. Allowing personal choice in this way will increase student ownership in their work.

Give students time to develop the summary method they have chosen. Ask them to include some method of keeping track of what they need to work on; discuss the advantage of doing this.

Students may wish to use the fronts of the shutters to highlight some of the methods they preferred to use in solving systems of equations in Chapter 8. Remind them that this chapter is an extension of what they have learned in Chapter 8 and will provide additional methods to solve linear systems. You may wish to suggest to them that they staple the Foldable from Chapter 8 to the back of the centre page of the Foldable for Chapter 9, which will then provide them easy reference for all concepts related to systems of equations. On the right and left sides of the Foldable, students have a sufficient number of pages to personalize their strategies and examples for the substitution method and the elimination method.

The large open centre in the middle allows students to include several different approaches to problems involving systems of equations.

As students progress through the chapter, provide time for them to keep track of what they need to work on, which they can record on the back of the Foldable. This will assist them in identifying and solving any difficulties with concepts, skills, and processes. Have them check off each item as they deal with it.

Meeting Student Needs

- Consider having students complete the questions on **BLM 9–2 Chapter 9 Prerequisite Skills** to activate the prerequisite skills for this chapter.
- Consider having students staple a copy of **BLM U4–2 Unit 4 Project Checklist** to the back of the Foldable. This master provides a list of all the related questions for the Unit 4 project. Students can use it to keep track of the questions they have completed.
- Some students may benefit from completing all unit project questions.
- **BLM 9–4 Chapter 9 Unit 4 Project** includes all of the unit project questions for this chapter. These provide a beginning for the Unit 4 project analysis.
- If you have students do the Unit 4 project questions, consider offering them the option of working on these alone or with a partner.
- Tell students that as they work through the first two sections of the chapter, they should think about reasons why each method of solving might be more appropriate for certain questions than others. They will explore this concept in detail in section 9.3.
- Refresh students' understanding of the vocabulary for this chapter, and explain what the new concepts will be.
- Post the outcomes in the classroom where they can be seen by all students.
- To build students' math vocabulary, consider maintaining a math wall of new terms.
- With the class, read the introduction and Big Ideas, and explain the Key Terms. Use real-life examples to assist students in understanding the Key Terms.
- Regarding the Did You Know? on page 467, students may be interested to know that commercial aircraft that fly over the Arctic are likely to be headed to or from Asia. Improved technology and increasesd extended range capabilities have opened up the Arctic, with air routes now passing over the North Pole.

ELL

- For each section of the student resource, you may want to consider the following approach as a way to assist students:
  - Read the opening paragraph as a class, and discuss any definitions given in the paragraph. Identify any words with which students are unfamiliar. Suggest that students restate the meaning of the material in their own words. You may even consider having students translate the material into their own language first, and then restate it in English.
  - Discuss and identify examples of any definitions.
  - Work through the investigation as a class exercise. It may assist students to work in pairs to respond to the Reflect and Respond question. You may have the class share their findings and then construct a class response.
  - Work through each example and solution as a class, demonstrating the process of solving each problem. Ask students to work in pairs to solve the Your Turn questions.
- As students work through the chapter, have them record definitions for the Key Terms and write into their Foldable examples that model the various approaches used in the chapter.

Enrichment

- Challenge students to create and solve a system of equations that represents the following situation: The numerator of a fraction is four less than the denominator. Increasing both by one makes the fraction $\frac{1}{2}$. Hint: Let n be the numerator and d the denominator. $\left(\frac{3}{7}\right)$

Gifted

- Challenge students to explain why an algebraic solution to a system of equations might be more precise than a graphical one. Have them give an example of why the precision of algebra might be needed or applied in a real-life situation. (Example: The programs that aim lasers for industrial applications need to be precise.)

Career Connection

Use the photograph and the text to start a discussion about the career of air traffic controller. Invite students to research training and qualifications, employment opportunities, and career outlook. You might have them address how math concepts and skills are important in what air traffic controllers do. They may find the related Web Link in the student resource helpful.