Linear Equations and Graphs

Opener

***Mathematics 10*, pages 338–339**

Suggested Timing

30–40 min

Blackline Masters

- BLM 7–2 Chapter 7 Prerequisite Skills
- BLM 7–4 Chapter 7 Unit 3 Project
- BLM U3–2 Unit 3 Project Checklist

Key Terms

y-intercept
slope-intercept form
parameter
general form (of a linear equation)
x-intercept
slope-point form
parallel lines
perpendicular lines

What's Ahead

This chapter introduces students to three different forms of writing linear equations: slope-intercept form ($y = mx + b$), general form ($Ax + By + C = 0$), and slope-point form ($y - y_1 = m(x - x_1)$). Students explore the information that can be easily obtained from each form, such as the *y*-intercept, slope, or *x*-intercept, and they use this information to graph linear equations. Students create their graphs using paper and pencil and with technology.

Students convert linear equations among the three forms presented and they use the slope-point form to determine the equation of a line given a graph. Students determine the equation of a line that is parallel or perpendicular to a given line using a specified point that lies on the line.

Planning Notes

Begin Chapter 7 by having students discuss what aspects of their daily life might involve a linear equation. Invite students to suggest an example of what one equation would be. Then, have students compare the forms that they wrote the equations in. You may wish to write two or three sample equations that are in different forms on the board and then ask students the following questions:

- Do these equations represent the same relationship?
- What variables are involved in this relation?
- In what ways are these equations similar? In what ways do the equations differ?
- How could you get one equation to resemble the other equation?

Unit Project

You may wish to discuss the Unit 3 project described in the Unit 3 opener. Unit project questions are integrated throughout the chapter. The questions are not mandatory, but are recommended, because they provide some of the work needed for the Unit 3 project assignment. You will find questions related to the project in the Check Your Understanding of sections 7.1 and 7.3. You may wish to introduce the project by discussing the popularity of mystery novels, television shows, and movies. As background information, you may wish to share the history of the Klondike Gold Rush.

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 339 and how it might be used to summarize Chapter 7. Encourage students to suggest revisions for this Foldable, or to replace this Foldable with another design of their choice. You may wish to suggest the four-door fold as an alternative design. Allowing personal choice in this way will increase student ownership of their work.

Give students time to develop the summary method. You may wish to suggest that the concept map provided in the text be incorporated into the Foldable as a summative tool. Ask students to include some method of keeping track of what they need to work on; discuss the advantage of doing this.

Ensure that students understand that linear relations can be determined, written, and graphed in a variety of ways. The advantage to the Foldable design used in this chapter is that each section has its own blank two-page spread for notes, key definitions, reflections on the students' own learning, and a grid page that provides an opportunity to model the graph associated with an equation. Encourage students to write their own examples, using those in the textbook as a model, and have a partner check their equations and graphs.

The final tab provides a location for students to complete or keep a record of the questions that have been completed relating to the unit project. An additional benefit of this design is that pages can be easily added to the Foldable.

As students progress through the chapter, provide time for them to keep track of what they need to work on. The back of the Foldable could be used for students to record samples of project work. The checklist for the unit project provided on **BLM U3–2 Unit 3 Project Checklist** could be stapled to the back of the Foldable and students could then keep track of the project-related questions and concepts that they have completed.

Meeting Student Needs

- Consider having students complete the questions on **BLM 7–2 Chapter 7 Prerequisite Skills** to activate the prerequisite skills for this chapter.
- Hand out to students **BLM U3–2 Unit 3 Project Checklist**, which provides a list of all of the requirements for the Unit 3 project.
- Some students may benefit from completing all unit project questions.
- **BLM 7–4 Chapter 7 Unit 3 Project** includes all of the unit project questions for this chapter. These questions provide a beginning for the Unit 3 project.
- Have students discuss where they may have seen equations used in their life. Encourage students to discuss equations with one or both of their parents to determine how equations affect their life. Have students report their findings to the class or fill in a short questionnaire next class.
- To help students relate to the chapter opener, you may wish to discuss the kinds of archaeological material Inuit have left behind. Brainstorm a list of information that might be obtained from tent rings, kayak stands, and discarded tools. You may wish to discuss the kinds of things our present cultures will leave behind and what this says about us.

Enrichment

- When real-life data is used to create an expression, outliers are often not included in the expression. This is because outliers are often thought to be incorrect or errors. Challenge students to describe a real-life situation where a table of values contains an outlier that should not be ignored. For example, outliers that are appropriate include black holes in mass data or diamonds in hardness testing.

Gifted

- The equation $d = vt$ is used to find distance travelled by an object moving at a certain velocity for a certain period of time. Einstein found that as objects move at velocities approaching the velocity of light, time slows down. Challenge students to speculate what this theory means to the graph of distance versus time for objects travelling close to the velocity of light. (Example: As velocity approaches the velocity of light, the time axis becomes extended between values as the value of time itself changes.)

Career Connection

Several careers that use linear equations are mentioned in the chapter opener. These include archaeologists, paleontologists, police detectives, forensic analysts, developers, and civil engineers. Have students who are interested in any of these careers explore newspapers, the Internet, and local employment offices to find out what career opportunities exist in their local area and how that particular career uses mathematics.

Web Link

For information about some of the careers mentioned in the chapter opener, go to www.mhrmath10.ca and follow the links.