1.1 Connect English With Mathematics and Graphing Lines

Student Text Pages
8–19

Suggested Timing
60–80 min

Tools
- placemat or sheet of paper

Technology Tools
- graphing calculator
- *The Geometer's Sketchpad*®
- computer

Related Resources
- G–1 Grid Paper
- G–2 Placemat
- G–3 Coordinate Grids
- T–4 *The Geometer's Sketchpad*® 3
- T–5 *The Geometer's Sketchpad*® 4
- BLM 1–3 Section 1.1 Practice Master

TI-Navigator™

Go to **www.mcgrawhill.ca/books/principles10** and follow the links to the file for this section.

Teaching Suggestions

- Read the opening paragraph to the students before beginning the **Investigate**. This may lead to a discussion of difficulties students have had in the past with word problems in mathematics. The **Investigate** will reinforce the idea that there is a skill to master and they can all do this. (5 min)

Investigate

- Circulate while students are working on the **Investigate**, and be sure to stress that any answer is a good answer. You can use **G–2 Placemat** to support this activity.
- Put a few of the answers on the board for the class to see. (15 min)

Examples

- Discuss the **Examples** as a class. (20 min)
- In **Example 1**, point out that students can use letters from the question to represent the variables. In part c), **E** represents the **E**arnings and **S** represents the **S**ales. This often makes it easier to keep track of what you are looking for in the question.
- When translating words into algebra, encourage students to write a word equation, a summary of the key points that can be translated more directly into an equation. Using **Example 2**,

  \$50 (per hour) + \$300 (per month) equals Total fees — $50h + 300m = TF$

  \$100 (per hour) = Total fees — $100h = TF$
- Also, encourage students to identify their variables at the outset. Identifying the variable often makes it easier to use the variable correctly in an equation.
- With **Example 3** be sure to stress the "check by substitution step" with students. This is a very important concept! Discuss why this is true, and explore the idea that the coordinates of any point on the line should satisfy the equation. If the point is on both lines, then the coordinates should satisfy both equations.
- Students may create a table of values for the situation in **Example 4**. This will connect their understanding from the grade 9 course, since students have a good grasp of graphing to find points of intersection. This may lead to a discussion and more clear understanding of the solution.
- **Example 5** demonstrates the use of a graphing calculator and *The Geometer's Sketchpad*® to find the point of intersection of two lines. Use **T–4 *The Geometer's Sketchpad*® 3** or **T–5 *The Geometer's Sketchpad*® 4** to support this activity.
- A fun way to reinforce the work learned is to play "I have, who has … ." Make up a number of different cards for this game. On one side of each card is an equation/expression in words, and on the other side is a different expression/equation written algebraically. Randomly choose a student to begin by reading the equation/expression written in words on the card. Someone else has to recognize that they have the algebraic equivalent. That person then reads the equation/expression, and so on, until the deck has been exhausted.

Common Errors

- Some students may not choose an appropriate scale for their graphs.

R_x Have students look carefully at their scale, both when drawing by hand and when using the graphing calculator.

- Some students may use only one coordinate as the solution to the linear system.

R_x Remind students that all points on a line relate two variables, and so both coordinates are necessary to locate the point.

Accommodations

Visual—Let students rewrite equations such as $x - y + 5 = 0$ in the form $x + 5 = y$.

Perceptual—Encourage students to show small sequential steps when rewriting equations from the form $Ax + By + C = 0$ to the form $y = mx + b$.

Spatial—Provide students with graphing calculators to check their answers to the questions in this section.

Language—Encourage students to work in pairs when completing the answers to the questions in this section.

Memory—Provide opportunities for students to match the words in formulas with correct formulas that have been developed.

ESL—Allow students to use a dictionary or translator when working through the questions in this section.

- Review the vocabulary in this section (linear system, point of intersection). (2 min)

Communicate Your Understanding

- Have students complete the questions in this section.
- Use the answers to question C1 to make up the cards for the "I have, who has … " game described above.
- Question C4 examines the idea of three possible outcomes: intersect, coincident, or parallel. This is an important concept for students to understand. Discuss the idea of no solution, an infinite number of solutions, and one solution, and the "look" of each of these. This is linked to question 20, where students graph a pair of lines that are the same and a pair that do not cross.
- Use one of C3, C4, or C5 as a journal entry. (10 min)
- Use **BLM 1–1 Section 1.1 Practice Master** for remediation or extra practice.

Investigate Answers (page 8)

1.–8. Answers will vary.

9. Addition: plus, increased by, sum of
Subtraction: less, minus, decreased by, taken away from
Multiplication: times, product of, doubled, tripled, etc., increased by a factor of
Division: quotient of, split into, shared among

Communicate Your Understanding Responses (page 16)

C1. Answers will vary.

C2. Answers will vary.

C3. Answers will vary. For example: Solving a system of equations means finding the values of x and y that are true for both equations. Graphically, the solution of a system of equations is the point of intersection.

C4. Answers will vary. For example: No, there will be no points of intersection if the lines are parallel (distinct), or there can be an infinite number of points of intersection if the equations represent the same line (lines are coincident).

C5. Answers will vary. For example: Graph the lines $y = 3x + 1$ and $y = -2x + 3$ on the same set of axes using the slopes and y-intercepts. For $y = 3x + 1$, the y-intercept is 1 and the slope is 3. For $y = -2x + 3$, the y-intercept is -2 and the slope is -2. The point of intersection of the lines will be the solution of the linear system.

Practise

- Do **questions 1** through **4** orally with the class to make sure that everyone is able to translate the expressions and equations. Discuss the difference between an expression and an equation.
- **Question 5b)** asks students to work with a partner.
- For **question 6**, use **A–9 Communication General Scoring Rubric** when assessing students.
- Circulate while students are working on these initial questions so you can see who may be having trouble. Pair up students for this work to have a strong student work with a weaker one.
- **Questions 11** and **12** may initiate discussion of actual fees for a variety of activities enjoyed by the students. You could discuss costs for their after-school activities such as soccer, fitness clubs, karate or judo, fencing, and so on. You could also discuss the costs to rent a movie and video game at their favourite store.
- For **question 13** refer students to **Example 4**.

Student Success

Have students research break-even analysis used in business and write a journal entry summarizing their findings.

Have students invent a business that manufactures and sells some item of interest. Students need to provide information on costs and revenues. Then, use three-part interviews to role-play the businessperson, a loans officer from a bank, and a recorder.

Use graphic organizers (e.g., timelines for age-related information) to help students organize information.

- If graphing calculators are available, they will allow students to find the point of intersection more quickly. If students are graphing all the questions by hand, then **questions 14** and **15** will be quite difficult to do to scale.
- If you wish to have the students create a card game to use for this unit, ask pairs of students to make up three examples of changing words into algebra for expressions and three examples for equations. Have the students write their examples on 3×5 cards, with the answers on the back. Gather all the cards to create your own Translation in Mathematics card game. Have students play this game when you have a few minutes left at the end of class.
- For **question 16**, a student could contact a local bank or trust company to find out the current interest rates. Students could then create their own questions based on this new information.
- **Question 17** refers to the Chapter Problem. Students may answer this question here, or wait until the Chapter Problem Wrap-Up.
- Spend time discussing **question 20**. Have students do the graphs first. Then look at and discuss the idea of lines that intersect, are coincident, or are parallel. Have students refer to their original ideas from question C4 in **Communicate Your Understanding**.

Literacy Connections

Draw student attention to the Literacy Connections on page 10. Have one student read the questions aloud. Then have another student read the same question aloud and rephrase the question. Then have a third student read the question and make suggestions as to how to solve it. Discuss this strategy with students to see if they agree that this is a good method to follow.

Start a Word Wall for this chapter. Words to include in addition to those in the vocabulary list are "coincident" and "parallel."

Be sure to stress the difference between an expression and an equation.

Mathematical Processes Integration

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

Process Expectations	Selected Questions
Problem Solving	16, 22–24
Reasoning and Proving	6, 14
Reflecting	11, 14, 15, 21
Selecting Tools and Computational Strategies	7–9, 16
Connecting	11–15, 17, 18
Representing	1–3, 11–15, 17, 18
Communicating	6, 11, 19, 20

Ongoing Assessment

- Chapter Problem question 17 can be used as an assessment tool.
- Communicate Your Understanding questions can be used as quizzes to assess students' communication skills.