

4.4

Convert Linear Equations From Standard Form

Strand
Modelling Linear Relations

Student Text Pages
184–189

Suggested Timing
80–160 min

Tools
• grid paper

Related Resources
BLM 4.4.1 Practice: Convert Linear Equations From Standard Form
BLM G1 Grid Paper

Specific Expectations Manipulating and Solving Algebraic Equations

In this section, students will

ML1.03 express the equation of a line in the form $y = mx + b$ given the form $Ax + By + C = 0$

Link to Get Ready

This section deals with changing the equation of a line from standard form to slope y -intercept form. It builds on the skills and knowledge from Section 4.3. Students will need to be clear on the steps needed to rearrange an equation, which requires a good understanding of opposite operations. These skills are reviewed in questions 4 and 5 of the Get Ready.

Warm-Up

1. Rearrange the formula $SA = 2\pi r^2 + 2\pi rh$ for h , and explain each step in the rearrangement.
2. Use the rearranged equation from question 1 to find h if $SA = 88 \text{ cm}^2$ and $r = 2 \text{ cm}$. [use $\pi = 3.14$.]
3. Mitchell does not understand the difference between the two divisions with fractions below:

$$\begin{array}{ccc} \frac{3}{3} & & \frac{3}{4} \\ \frac{4}{4} & \text{and} & \frac{4}{3} \\ = \frac{1}{4} & & = 3 \times \frac{4}{3} \\ & & = 4 \end{array}$$

Help Mitchell understand the difference.

Warm-Up Answers

1. $h = \frac{SA - 2\pi r^2}{2\pi r}$
2. 5.0 cm
3. Answers will vary. Possible answer: The first division has a fraction in the numerator that reduces to 1, so the final answer is $\frac{1}{4}$. The second has a fraction in the denominator. When dividing by a fraction, you invert and multiply.

Teaching Suggestions

Warm-Up

- Write the Warm-Up questions on the board or on an overhead. Have students complete the questions independently. Then, discuss the solutions as a class. (5–10 min)

Section Opener

- Conduct a discussion on analysing the health of a business from the Section Opener with students' research on the Market Researcher Career Profile from the Chapter Opener. Discuss similarities and differences between the two.

Common Errors

- Some students may forget to change the sign on values when the terms “move” from one side of the expression to the other.
- R_x** Have students write the opposite operation on both sides of the equation before they simplify. For example, $3x + 2 - 2 = 11 - 2$

Ongoing Assessment

- While students are working on the Investigate, circulate to see how well each student works within a group. This may be an opportunity to begin observing and recording the individual student’s learning skills: group work, work habits, organization, and initiative.

Accommodations

Gifted and Enrichment—Encourage students who finish early to check their answers.

Investigate

- Point out the definition of *standard form*.
- Circulate while students complete the Investigate and provide help as needed.
- You may wish to have students work with a partner.
- This is a good section to stress algebraic skills. Students must appreciate that being able to manipulate algebraic expressions is essential for solving equations, graphing, and future work on systems of equations.
- Consolidate students’ understanding by discussing results.
- Use **BLM 4.4.1 Practice: Convert Linear Equations From Standard Form** for extra practice or remediation.

Investigate Answers (page 184)

- 1. a)** slope = $\frac{13}{2}$. The slope represents the change in the total cost of the trip for each change in the number of students going on the trip.
b) y -intercept = 12. The y -intercept represents the fixed cost of the trip before any students sign up.
c) $y = \left(\frac{13}{2}\right)x + 12$
- 2.** The rearrangement of $13x - 2y + 24 = 0$ for y produces the same result as in question 1c).
- 3.** The slope y -intercept form allows a line to easily be graphed by plotting the y -intercept and moving according to slope = $\frac{\text{rise}}{\text{run}}$. Also, rearranging into slope y -intercept form allows an equation to be entered into a graphing calculator.

Examples

- Have students work through the Examples as a class before proceeding to Discuss the Concepts. Alternatively, have students complete the Examples independently or in small groups before reviewing them as a class.
- For Example 1, have students compare the sign on the slope with known slopes for different lines to be sure that their value makes sense.
- For Example 2, be sure that students understand that both the value in front of x as well as the constant must be divided by 3 in the last step of the solution.
- For Example 3, some students may need help setting up the equation. This can be the most challenging part of a word problem.

Key Concepts

- You may wish to take the opportunity to discuss as a class the information available from of an equation written in standard form, $Ax + By + C = 0$ and of an equation written in slope y -intercept form, $y = mx + b$.

Discuss the Concepts

- Give the class time to record their responses before conducting a discussion.

Discuss the Concepts Suggested Answers (page 187)

- D1.** Answers will vary, but any equation in the form $Ax + By + C = 0$, with A being positive and A and B both not zero, is in standard form, and any equation in the form $y = mx + b$ is in slope y -intercept.
- D2.** Marc is correct. When the equation $x + 3y - 15 = 0$ is rearranged to isolate y , the result is $y = -\frac{1}{3}x + 5$.

Practise the Concepts (A)

- Encourage students to refer back to the Examples before asking for assistance.
- Direct students who struggle with question 1 to Section 3.4 to review how to find the slope and y -intercept given a graph of a straight line.

Apply the Concepts (B)

- Have students read the MathConnect before they do question 5. You may wish to have students locate Qinghai on a map.
- Question 6 is a Literacy Connect. As a class, discuss the steps needed to rewrite the equation. Make sure students use proper terminology, such as *term*, *coefficient*, *constant*, and *opposite operations*. Literacy Connect questions offer the opportunity to explore literacy issues in the mathematics classroom and within the context of mathematics. This supports general Think Literacy strategies. For more information visit <http://www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy>.
- Question 7 requires an understanding of tables of values. You may wish to use **BLM G1 Grid Paper** for this activity.
- Questions 8, 9, and 10 all require students to substitute the given point and solve for the unknown.
- Question 11 is a Chapter Problem. Remind students to keep the solution to this question handy as the methods they used may help them with the Chapter Problem Wrap-Up.
- Have students read the MathConnect after they finish question 11. Discuss as a class how the career of an event planner is similar to and different from the career of a market researcher, which was presented in the Chapter Opener.

Extend the Concepts (C)

- Assign the Extend the Concepts questions to students who are not being challenged by questions in Apply the Concepts.
- Extend the Concepts questions can be used as a diagnostic assessment for those students considering a university-level course in grade 11.