Adding Linear Expressions

ISG Interactive Study Guide

See pages 153–154 for:
- Getting Started
- Real-World Link
- Notes

Essential Question

Why are algebraic rules useful?

Common Core State Standards

Content Standards
7.EE.1

Mathematical Practices
1, 2, 3, 4, 7

Vocabulary

linear expression

What You'll Learn
- Add linear expressions.
- Find perimeter by adding linear expressions.

Real-World Link

Engineering A *trebuchet* is a medieval catapult that was used to hurl large stones and other projectiles at castle walls. Building a model trebuchet requires knowledge of science, math, and engineering. If done successfully, a model can launch a clay ball thirty feet or farther!
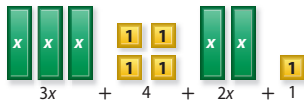
Add Linear Expressions

A **linear expression** is an algebraic expression in which the variable is raised to the first power. You can use models to add linear expressions.
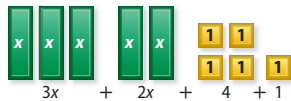
Example 1

Tools **Tutor**

Add. Use models if needed.

a. $(3x + 4) + (2x + 1)$

Model each linear expression.

Combine the tiles that have the same shape.

$(3x + 4) + (2x + 1) = 5x + 5$

b. $(-4x + 2) + (-2x + 2)$

$$-4x + 2$$
$$+ \ -2x + 2$$ Arrange like terms in columns.
$$-6x + 4$$ Add.

So, $(-4x + 2) + (-2x + 2) = -6x + 4$.

Got It? Do these problems to find out.

1a. $(x - 3) + (x - 4)$ **2x − 7**

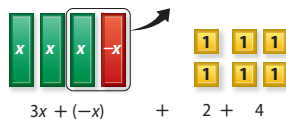**1b.** $(-x + 1) + (-3x)$ **−4x + 1**

Example 2

Add $(3x + 2) + (-x + 4)$.

Model the linear expressions.

$$3x \quad + 2 \quad + (-x) + \quad 4$$

Group tiles with the same shape. Then remove any zero pairs.

$$3x + (-x) \quad + \quad 2 + 4$$

So, $(3x + 2) + (-x + 4) = 2x + 6$.

Got It? Do these problems to find out.

Add. Use models if needed.

2a. $(-2x + 4) + (8x - 4)$ **6x**

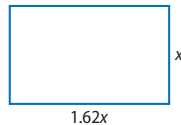**2b.** $(-4x - 1) + (5x - 3)$ **x − 4**

Find Perimeter

Linear expressions can be used to find perimeter.

Example 3

The lengths of the sides of golden rectangles are in the ratio 1:1.62. So, the length of a golden rectangle is approximately 1.62 times greater than its width.

a. Write and simplify a linear expression for the perimeter of a golden rectangle.

$P = 2\ell + 2w$	Formula for the perimeter of a rectangle
$P = 2(\mathbf{1.62x}) + 2\mathbf{x}$	Replace ℓ with 1.62x and w with x.
$P = 3.24x + 2x$ or $5.24x$	Simplify.

The formula is $P = 5.24x$, where x is the measure of the width.

b. Find the perimeter of a golden rectangle if its width is 8.3 centimeters.

$P = 5.24\mathbf{x}$	Perimeter of a golden rectangle
$= 5.24(\mathbf{8.3})$ or 43.492	Replace x with 8.3 and simplify.

The perimeter of the golden rectangle is 43.492 centimeters.

Got It? Do these problems to find out.

3. A rectangle has side lengths of $(5x - 1)$ units and $(2x + 1)$ units.

  a. Write and simplify a linear expression for the perimeter of the rectangle. **14x**

  b. Find the perimeter of the rectangle if the value of x is 5.4 units. **75.6 units**

Guided Practice

Add. Use models if needed. (Examples 1 and 2)

1. $(x + 5) + (2x + 3)$ **$3x + 8$**

2. $(-4x + 3) + (-5x + 2)$ **$-9x + 5$**

3. $(x + 6) + (-2x - 4)$ **$-x + 2$**

4. $(-7x + 2) + (x + 4)$ **$-6x + 6$**

5. Use the figure at the right. (Example 3)

a. Write and simplify a linear expression for the perimeter of the figure.

$6x + 3$

b. Find the perimeter of the figure if $x = 4$. **27 units**