

**Lesson: Reviewing Algebraic Expressions and Simple Equations**

## Simplifying Algebraic Expressions

When you simplify expressions using properties, you can combine like terms due to the Distributive Property:  $a(b + c) = ab + ac$  and  $a(b - c) = ab - ac$ .

Simplify each expression.

2.  $\left(3x + \frac{1}{2}\right) + \left(7x - 4\frac{1}{2}\right)$

3.  $(-0.25x + 3) + (1.5x + 1.4)$

## Simplifying More Complex Expressions

You can use the Distributive Property to remove parentheses when simplifying, or *expanding*, an algebraic expression, but be careful with negative signs and subtraction. Consider  $-(x + 5)$ . You can rewrite the expression as shown.

$$-(x + 5) = (-1)(x + 5) = (-1)(x) + (-1)(5) = -x + (-5) = -x - 5$$

## Simplify each expression.

**A**  $5 - 3(7x + 8)$

**B**  $-9a - \frac{1}{3}\left(-\frac{3}{4} - \frac{2}{3}a + 12\right)$

**Simplify each expression.**

**3.**  $0.5(12m - 22n)$

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

**Simplify each expression.**

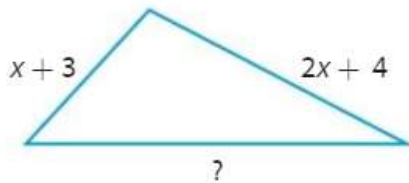
**5.**  $0.2(3b - 15c)$

**6.**  $5x - 3(x - 2) - x$

**7.**  $8.3 + 3.4y - 0.5(12y - 7)$

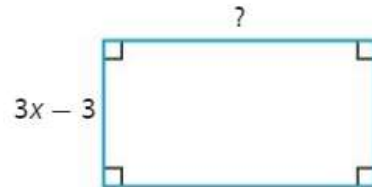
In 14–15, the perimeter of the figure is given. Find the length of the indicated side.

**14.**



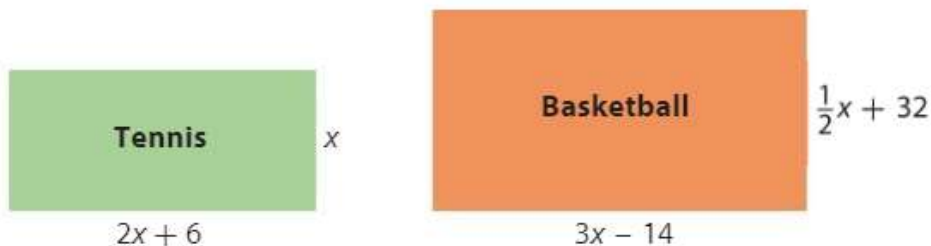
Perimeter =  $6x$  \_\_\_\_\_

**15.**



Perimeter =  $10x + 6$  \_\_\_\_\_

**Persevere in Problem Solving** The figures show the dimensions of a tennis court and a basketball court given in terms of the width  $x$  in feet of the tennis court.



- a. Write an expression for the perimeter of each court. \_\_\_\_\_
- b. Write an expression that describes how much greater the perimeter of the basketball court is than the perimeter of the tennis court. \_\_\_\_\_
- c. Suppose the tennis court is 36 feet wide. Find all dimensions of the two courts. \_\_\_\_\_

**Justify each step in simplifying the expression  $4x - 3(2x - 5) - (x + 4)$ .**

Hoon simplified the expression below using the steps shown. Justify each step in his simplification. There may be more than one property for a step.

$$8\frac{1}{2} - \frac{1}{2}(17 - 6x) + 2\left(\frac{1}{2} - x\right)$$

$$8\frac{1}{2} - 8\frac{1}{2} + 3x + 1 - 2x$$

$$8\frac{1}{2} + \left(-8\frac{1}{2}\right) + 3x + 1 + (-2x)$$

$$0 + 3x + 1 + (-2x)$$

$$3x + 1 + (-2x)$$

$$1 + 3x + (-2x)$$

$$1 + [3x + (-2x)]$$

$$1 + x$$

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**Find and correct the error in the student's work.**

2. Carole wrote  $100 - 10(4 + 2f) = 100 - 40 + 20f$ .

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3. Adiba wrote  $12 - 4(3x - 2) = 12 - 4(2 - 3x)$ .

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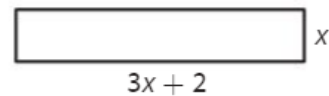
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**Critical Thinking** The perimeter of the rectangle is  $3x + 2 + x + 3x + 2 + x$ .

Alix expressed the perimeter as  $2(3x + 2) + 2x$ . Babat expressed it as

$8x + 4$ . Describe in words how each expression represents the perimeter in terms of the length  $3x + 2$ , the width  $x$ , or both.

Then identify one benefit of each form of the expression.




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# One-Step Equations

Solve each of the following one-step equations for the unknown variable.

Begin with the equation  $x + 3.2 = -8.5$

Begin with the equation  $-\frac{2}{3} + y = 8$

Begin with the equation  $30 = -0.5a$

Begin with the equation  $-\frac{q}{3.5} = 9.2$

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Use inverse operations to solve each equation.

1.  $4.9 + z = -9$

2.  $r - 17.1 = -4.8$

3.  $-3c = 36$

Use inverse operations to solve each equation.

3.  $-2x = 34$

4.  $y - 3.5 = -2.1$

5.  $\frac{2}{3}z = -6$

## Writing Two-Step Equations

You can write two-step equations to represent real-world problems by translating the words of the problems into numbers, variables, and operations.

**A one-year membership to Metro Gym costs \$460. There is a fee of \$40 when you join, and the rest is paid monthly. Write an equation to represent the situation that can help members find how much they pay per month.**

Billy has a gift card with a \$150 balance. He buys several video games that cost \$35 each. After the purchases, his gift card balance is \$45. Write an equation to help find out how many video games Billy bought.

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| <p><b>8.</b> Val rented a bicycle while she was on vacation. She paid a flat rental fee of \$55.00, plus \$8.50 each day. The total cost was \$123. Write an equation you can use to find the number of days she rented the bicycle.</p> <hr/> | <p><b>9.</b> A restaurant sells a coffee refill mug for \$6.75. Each refill costs \$1.25. Last month Keith spent \$31.75 on a mug and refills. Write an equation you can use to find the number of refills that Keith bought.</p> <hr/> |
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**Multistep** Sandy charges each family that she babysits a flat fee of \$10 for the night and an extra \$5 per child. Kimmi charges \$25 per night, no matter how many children a family has.

- a.** Write a two-step equation that would compare what the two girls charge and find when their fees are the same. \_\_\_\_\_
- b.** How many children must a family have for Sandy and Kimmi to charge the same amount? \_\_\_\_\_
- c.** The Sanderson family has five children. Which babysitter should they choose if they wish to save some money on babysitting, and why?
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## Solving Two-Step Equations

You can use inverse operations to solve equations with more than one operation.

Solve the equation.

$$2w - 20 = 180$$

An airplane flies at an altitude of 38,000 feet. As it nears the airport, the plane begins to descend at a rate of 600 feet per minute. At this rate, how many minutes will the plane take to descend to 18,800 feet?

**STEP 1** Write an equation. Let  $m$  represent the number of minutes.

How can you decide which operations to use to solve a two-step equation?

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**Solve.**

**6.**  $9s + 3 = 57$

**7.**  $4d + 6 = 42$

**8.**  $-3y + 12 = -48$

**9.**  $\frac{k}{2} + 9 = 30$

**10.**  $\frac{g}{3} - 7 = 15$

**11.**  $\frac{z}{5} + 3 = -35$

**12.**  $-9h - 15 = 93$

**13.**  $-3(n + 5) = 12$

**14.**  $-17 + \frac{b}{8} = 13$

**15.**  $7(c - 12) = -21$

**16.**  $-3 + \frac{p}{7} = -5$

**17.**  $46 = -6t - 8$



**Write and solve a two-step equation for the following 2 problems.**

Paula bought a ski jacket on sale for \$6 less than half its original price. She paid \$88 for the jacket. What was the original price?

The McIntosh family went apple picking. They picked a total of 115 apples. The family ate a total of 8 apples each day. After how many days did they have 19 apples left?

**Use a calculator to solve each equation.**

**25.**  $-5.5x + 0.56 = -1.64$

**26.**  $-4.2x + 31.5 = -65.1$

**27.**  $\frac{k}{5.2} + 81.9 = 47.2$