3.2 Adding and Subtracting Linear Expressions

Essential Question How can you use algebra tiles to add or subtract algebraic expressions?

Key:  = variable  = −variable  = zero pair

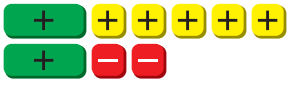
 = 1  = −1  = zero pair

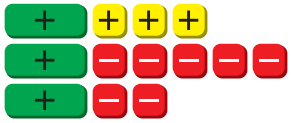
1 ACTIVITY: Writing Algebraic Expressions

Work with a partner. Write an algebraic expression shown by the algebra tiles.

a. 

b. 

c. 

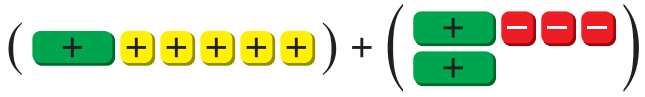
d. 

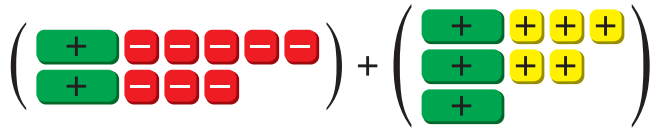
2 ACTIVITY: Adding Algebraic Expressions

Work with a partner. Write the sum of two algebraic expressions modeled by the algebra tiles. Then use the algebra tiles to simplify the expression.

a. 

b. 

c. 

d. 

Linear Expressions

In this lesson, you will

- apply properties of operations to add and subtract linear expressions.
- solve real-life problems.

Laurie's Notes

Introduction

Standards for Mathematical Practice

- **MP2 Reason Abstractly and Quantitatively:** Algebra tiles help students make sense of algebraic expressions by modeling them and finding sums and differences. Algebra tiles are a concrete representation, deepening student understanding of the meaning of each expression.

Discuss

- **FYI:** Show students a collection of yellow integer-tiles and one green variable-tile. Define the yellow integer-tile as having dimensions 1 by 1 with an area of 1 square unit and the variable-tile as having dimensions 1 by x with an area of x square units. The Record and Practice Journal has algebra tiles and they are also available commercially. Be sure to point out to students that the variable-tile is NOT an integral length, meaning you should not be able to *measure* the length of the variable-tile by lining up yellow integer-tiles. The length of the tile is a variable—x!
- Display a collection of tiles, say 1 variable-tile, 3 yellow integer-tiles (+3) and 2 red integer-tiles (−2). Say, "These algebra tiles represent an algebraic expression and just as you simplify algebraic expressions, you are going to simplify expressions modeled by the algebra tiles."

Activity Notes

Activity 1

- **Management Tip:** Distribute a set of algebra tiles to each pair of students. Presort them in baggies for easy distribution and collection.
- Even though the collection of tiles is shown, encourage students to make the collection shown with their own algebra tiles.
- Remind students that any letter can be used to represent a variable.
- Some students may write expressions that represent each algebra tile such as "$x + x - 1 - 1$" for part (b). Ask them "Is your expression in simplest form? If not, how can you write it in simplest form?"
- Ask for volunteers to share their results.
- Students may write $3 + x$ for part (a). Explain that it is more common to state the x-term first, as $x + 3$. The Commutative Property of Addition assures that $3 + x$ and $x + 3$ are equivalent.

Activity 2

- Have each partner represent one of the expressions using their tiles. To add, have them combine their tiles together in the common work space. Then simplify by removing any zero pairs.
- Note that all expressions in Activity 2 have positive coefficients.
- Ask for volunteers to explain how they used the tiles to simplify.
- **MP2:** Handling the tiles helps students understand that $x + x = 2x$ and not x^2. Students who have worked with algebra tiles should not make that mistake.

Common Core State Standards

7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
7.EE.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

Previous Learning

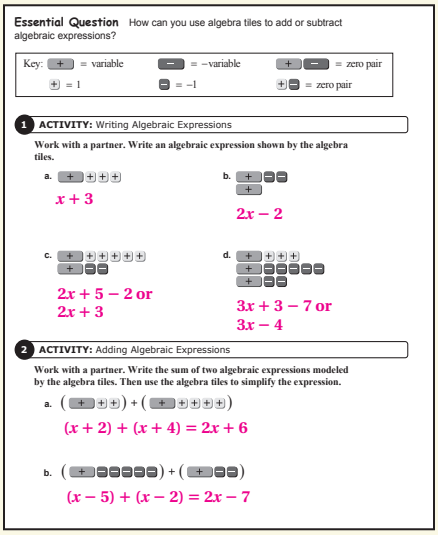
Students should know how to simplify algebraic expressions.

Technology for the Teacher

Dynamic Classroom

Lesson Plans
Complete Materials List

3.2 Record and Practice Journal



Essential Question How can you use algebra tiles to add or subtract algebraic expressions?

Key: + = variable, − = −variable, + − = zero pair; + = 1, − = −1, + − = zero pair

1 ACTIVITY: Writing Algebraic Expressions

Work with a partner. Write an algebraic expression shown by the algebra tiles.

a. $x + 3$

b. $2x - 2$

c. $2x + 5 - 2$ or $2x + 3$

d. $3x + 3 - 7$ or $3x - 4$

2 ACTIVITY: Adding Algebraic Expressions

Work with a partner. Write the sum of two algebraic expressions modeled by the algebra tiles. Then use the algebra tiles to simplify the expression.

a. $(x + 2) + (x + 4) = 2x + 6$

b. $(x - 5) + (x - 2) = 2x - 7$

Differentiated Instruction

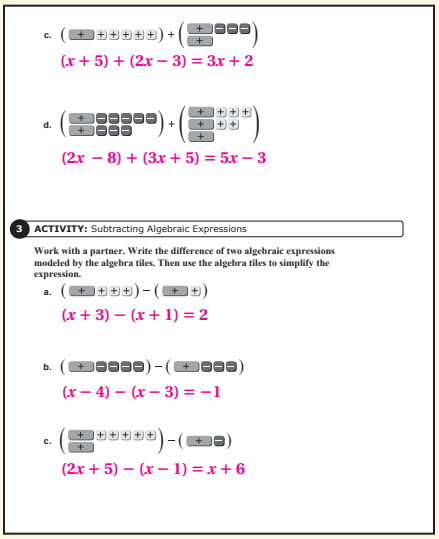
Auditory

Have students verbally describe the difference of two algebraic expressions, such as

$2x - (x + 1)$.

This expression is read as "two x minus the quantity x plus one." Remind students that "the quantity x plus one" means that x and 1 are grouped together.

3.2 Record and Practice Journal



c. $(x + 5) + (2x - 3) = 3x + 2$

d. $(2x - 8) + (3x + 5) = 5x - 3$

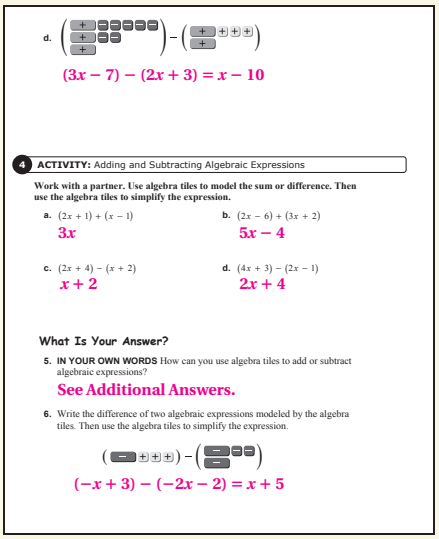
3 ACTIVITY: Subtracting Algebraic Expressions

Work with a partner. Write the difference of two algebraic expressions modeled by the algebra tiles. Then use the algebra tiles to simplify the expression.

a. $(x + 3) - (x + 1) = 2$

b. $(x - 4) - (x - 3) = -1$

c. $(2x + 5) - (x - 1) = x + 6$



d. $(3x - 7) - (2x + 3) = x - 10$

4 ACTIVITY: Adding and Subtracting Algebraic Expressions

Work with a partner. Use algebra tiles to model the sum or difference. Then use the algebra tiles to simplify the expression.

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

b. $(2x - 6) + (3x + 2)$ $5x - 4$

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

d. $(4x + 3) - (2x - 1)$ $2x + 4$

What Is Your Answer?

5. **IN YOUR OWN WORDS** How can you use algebra tiles to add or subtract algebraic expressions?

See Additional Answers.

6. Write the difference of two algebraic expressions modeled by the algebra tiles. Then use the algebra tiles to simplify the expression.

$(-x + 3) - (-2x - 2) = x + 5$

Laurie's Notes

Activity 3

- Review the meaning of subtraction and how it is performed using integer tiles. Begin by representing the first expression on the work space. Students find the difference by removing the algebra tiles in the second expression from the algebra tiles in the first expression.
- For parts (c) and (d), students will need to add zero pairs in order to subtract the second expression.
- Ask for volunteers to share their results. This should include modeling at least one of the problems at the document camera or overhead projector so that the language of the subtraction is heard.
- **MP2:** Using the algebra tiles, it should be clear that $3x - 2x = 1x$. Without the algebra tiles, students may incorrectly reason that $3x - 2x = 1$. They can lose track of what the expressions $3x$ and $2x$ represent and see them only as symbols, not quantities.

Activity 4

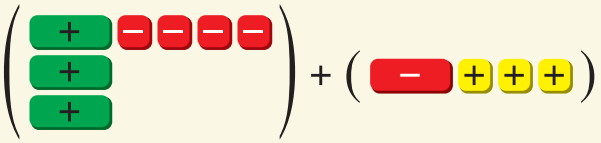
- Now students start with the expressions and create a model using algebra tiles. To model $x - 1$ in part (a), students can think of the equivalent expression $x + (-1)$.
- If time permits, have students model these problems so that classmates hear the language associated with performing these operations.
- Students may need help with part (d). Model $4x + 3$. When students go to remove $2x - 1$, remind them that $2x - 1$ can be written as $2x + (-1)$.

What Is Your Answer?

- In Question 6, students need to add zero pairs to the first expression in order to "take away" the algebra tiles in the second expression. This is also the first problem that uses the negative variable-tile.

Closure

- Use algebra tiles to create the following model and simplify it.



$2x - 1$

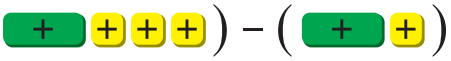
3 ACTIVITY: Subtracting Algebraic Expressions

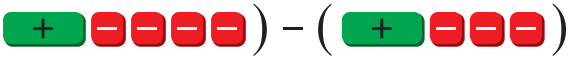
Math Practice

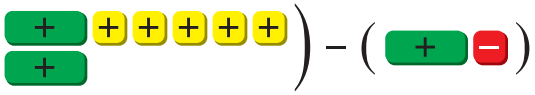
Use Expressions

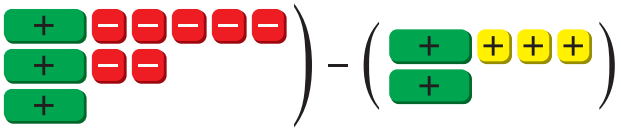
What do the tiles represent? How does this help you write an expression?

Work with a partner. Write the difference of two algebraic expressions modeled by the algebra tiles. Then use the algebra tiles to simplify the expression.

a. 

b. 

c. 

d. 

4 ACTIVITY: Adding and Subtracting Algebraic Expressions

Work with a partner. Use algebra tiles to model the sum or difference. Then use the algebra tiles to simplify the expression.

a. $(2x + 1) + (x - 1)$

b. $(2x - 6) + (3x + 2)$

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

d. $(4x + 3) - (2x - 1)$

What Is Your Answer?

5. IN YOUR OWN WORDS How can you use algebra tiles to add or subtract algebraic expressions?

6. Write the difference of two algebraic expressions modeled by the algebra tiles. Then use the algebra tiles to simplify the expression.

Practice Use what you learned about adding and subtracting algebraic expressions to complete Exercises 6 and 7 on page 90.

3.2 Lesson

Check It Out
Lesson Tutorials
BigIdeasMath.com

Key Vocabulary
linear expression, *p. 88*

A **linear expression** is an algebraic expression in which the exponent of the variable is 1.

Linear Expressions	$-4x$	$3x + 5$	$5 - \frac{1}{6}x$
Nonlinear Expressions	x^2	$-7x^3 + x$	$x^5 + 1$

You can use a vertical or a horizontal method to add linear expressions.

EXAMPLE 1 Adding Linear Expressions

Find each sum.

a. $(x - 2) + (3x + 8)$

Vertical method: Align like terms vertically and add.

$$\begin{array}{r} x - 2 \\ +\ 3x + 8 \\ \hline 4x + 6 \end{array}$$

b. $(-4y + 3) + (11y - 5)$

Horizontal method: Use properties of operations to group like terms and simplify.

$(-4y + 3) + (11y - 5) = -4y + 3 + 11y - 5$ Rewrite the sum.

$= -4y + 11y + 3 - 5$ Commutative Property of Addition

$= (-4y + 11y) + (3 - 5)$ Group like terms.

$= 7y - 2$ Combine like terms.

EXAMPLE 2 Adding Linear Expressions

Find $2(-7.5z + 3) + (5z - 2)$.

$2(-7.5z + 3) + (5z - 2) = -15z + 6 + 5z - 2$ Distributive Property

$= -15z + 5z + 6 - 2$ Commutative Property of Addition

$= -10z + 4$ Combine like terms.

On Your Own

Now You're Ready
Exercises 8–16

Find the sum.

1. $(x + 3) + (2x - 1)$
2. $(-8z + 4) + (8z - 7)$
3. $(4 - n) + 2(-5n + 3)$
4. $\frac{1}{2}(w - 6) + \frac{1}{4}(w + 12)$

Laurie's Notes

Introduction

Connect

- **Yesterday:** Students used algebra tiles to develop an understanding of how to add and subtract algebraic expressions. (MP2)
- **Today:** Students will use a horizontal or vertical format to add and subtract linear expressions.

Motivate

- Draw a vertical line on the middle of your board. On the left write "These are" and on the right write "These are not." On each side write examples of expressions that are linear (left side) and are not linear (right side).
- Explain that you are not giving names to either side yet. You are just trying to have them be good detectives in thinking about what characteristics they see.

? "Can you give other examples of what you think would be on the left or right?"

? "What feature(s) distinguish the expressions that **are**, from the expressions that **are not**?" Listen for a reference to exponents (right side) and the lack of exponents (left side).

Discuss

- Tell students that the expressions on the left are examples of **linear expressions**, which are algebraic expressions in which the exponent of the variable is 1. This is not a precise definition because $\frac{1}{x}$ has a variable with an exponent of 1 and it is not a linear expression. However, this description is appropriate for this grade level.

Lesson Notes

Example 1

- **Connection:** When you add (or subtract) whole numbers, you use the place values of the numbers. The same is true when you add (or subtract) decimals—lining up the decimal points assures that this happens. Lining up place values is similar to lining up like terms. Make this connection for students as you begin to work these problems.
- Using the vertical method, students should see the connection to adding two whole numbers.
- **Teaching Tip:** Before adding, rewrite $x - 2$ as $x + (-2)$.
- The Commutative Property of Addition is used to change the order of the terms so that like terms are adjacent to one another.

Example 2

- **MP6 Attend to Precision:** Ask for a volunteer to read the problem. Listen for, "Two times the quantity negative seven point five z plus 3, plus the quantity five z minus two." Students should be able to read this.

? "What is the first step?" Simplify $2(-7.5z + 3)$.

Goal Today's lesson is to add and subtract **linear expressions**.

Technology for the Teacher

Dynamic Classroom

Lesson Tutorials
Lesson Plans
Answer Presentation Tool

Extra Example 1

Find each sum.

a. $(-2x + 2) + (4x - 7)$ $2x - 5$

b. $(7y - 5) + (3y + 8)$ $10y + 3$

Extra Example 2

Find $(7w - 6) + 5(-2.4w + 1)$

$-5w - 1$

On Your Own

1. $3x + 2$ **2.** -3

3. $-11n + 10$

4. $\frac{3}{4}w$

English Language Learners

Vocabulary

The word *variable* is often used in algebra and is represented by a letter. The letter stands for a number that changes, or *varies*. Students find it helpful when the letter is meaningful to the problem. For instance, use the letter t to represent a unit of time or use the letter d to represents dollars.

Extra Example 3

Find each difference.

a. $(-3x + 7) - (4x - 8)$ $-7x + 15$

b. $-3(2y - 9) - (5y + 4)$ $-11y + 23$

Extra Example 4

The original price of a coffee table is d dollars. You use a coupon and buy the table for $(d - 4)$ dollars. You paint the table and sell it for $(3d + 1)$ dollars. Write an expression that represents your earnings from buying and selling the coffee table. Interpret the expression.

$(3d + 1) - (d - 4)$; You earn $(2d + 5)$ dollars.

On Your Own

5. $2m - 15$

6. $-8c - 25$

7. $\$4$

Laurie's Notes

Example 3

- "How do you think you subtract linear expressions?" Subtract like terms.
- Write part (a) and ask, "Can you subtract the quantity $(-x + 6)$ by removing the parentheses? No, you must subtract each term in the linear expression. So, you add the opposite.
- My experience is that students make more errors when subtracting linear expressions using the vertical method unless they take the time to rewrite the problem as shown where *adding the opposite* is obvious. As stated in the Study Tip, to find the opposite of a linear expression you can multiply the expression by -1.
- **MP2 Reason Abstractly and Quantitatively:** It may be helpful to rewrite $(5x + 6) - (-x + 6)$ as $(5x + 6) + [-(-x + 6)]$ and then $(5x + 6) + (-1)(-x + 6)$. This is the Multiplication Property of -1.
- Write part (b). This may be easier for students to understand than part (a) because the constant 2 is written in the problem, whereas the constant 1 in part (a) is not written. When students rewrite the problem as *add the opposite*, they can see that -2 needs to be distributed.
- **MP7 Look for and Make Use of Structure:** Using the Commutative Property to rewrite $7y + 5 - 8y + 6$ as $7y - 8y + 5 + 6$ is not obvious to all students. Take time to probe for understanding. Subtracting $8y$ is the same as adding the opposite of $8y$. You may need to work through these extra steps so students make sense of how the order of the terms can be changed.
- "Do you prefer the vertical or horizontal method? Why?" Answers will vary.

Example 4

- Have a quick discussion about how to calculate the earnings when buying something and reselling it.
- Ask for a volunteer to read the problem. Remind students that the variable d is unknown, and you are not writing an expression for the selling price.
- "What is the value of the coupon? Explain." \$2, because you purchase the hat for $(d - 2)$ dollars.
- Write the verbal model and substitute the linear expressions.
- "This is a subtraction problem. What is our next step?" Add the opposite.
- "If you pay $(d - 2)$ dollars for an item and earn $(d - 2)$ dollars back, what does this mean?" If students are having difficulty interpreting this problem, substitute a value for d, such as \$20, then explain.
- Students can verify that the selling price of $(2d - 4)$ dollars is twice that of the purchase price $(d - 2)$ by multiplying by 2. You could decide to have a quick review of factoring by factoring 2 out of the selling price, or wait and do this as an introduction to 3.2 Extension.

Closure

- **Exit Ticket:** Find the sum or difference.
  $2(3x - 4) + (2x - 5)$ $8x - 13$ $2(3x - 4) - (2x - 5)$ $4x - 3$

To subtract one linear expression from another, add the opposite of each term in the expression. You can use a vertical or a horizontal method.

EXAMPLE 3 Subtracting Linear Expressions

Find each difference.

a. $(5x + 6) - (-x + 6)$ **b.** $(7y + 5) - 2(4y - 3)$

Study Tip

To find the opposite of a linear expression, you can multiply the expression by –1.

a. Vertical method: Align like terms vertically and subtract.

$$\begin{array}{r} (5x + 6) \\ -\ (-x + 6) \end{array} \quad \xrightarrow{\text{Add the opposite.}} \quad \begin{array}{r} 5x + 6 \\ +\quad x - 6 \\ \hline 6x \end{array}$$

b. Horizontal method: Use properties of operations to group like terms and simplify.

$$\begin{aligned} (7y + 5) - 2(4y - 3) &= 7y + 5 - 8y + 6 && \text{Distributive Property} \\ &= 7y - 8y + 5 + 6 && \text{Commutative Property of Addition} \\ &= (7y - 8y) + (5 + 6) && \text{Group like terms.} \\ &= -y + 11 && \text{Combine like terms.} \end{aligned}$$

EXAMPLE 4 Real-Life Application

The original price of a cowboy hat is d dollars. You use a coupon and buy the hat for $(d - 2)$ dollars. You decorate the hat and sell it for $(2d - 4)$ dollars. Write an expression that represents your earnings from buying and selling the hat. Interpret the expression.

$$\begin{aligned} \text{earnings} &= \text{selling price} - \text{purchase price} && \text{Use a model.} \\ &= (2d - 4) - (d - 2) && \text{Write the difference.} \\ &= (2d - 4) + (-d + 2) && \text{Add the opposite.} \\ &= 2d - d - 4 + 2 && \text{Group like terms.} \\ &= d - 2 && \text{Combine like terms.} \end{aligned}$$

∴ You earn $(d - 2)$ dollars. You also paid $(d - 2)$ dollars, so you doubled your money by selling the hat for twice as much as you paid for it.

On Your Own

Now You're Ready
Exercises 19–24

Find the difference.

5. $(m - 3) - (-m + 12)$ **6.** $-2(c + 2.5) - 5(1.2c + 4)$

7. WHAT IF? In Example 4, you sell the hat for $(d + 2)$ dollars. How much do you earn from buying and selling the hat?

3.2 Exercises

Check It Out
Help with Homework
BigIdeasMath.com

Vocabulary and Concept Check

VOCABULARY **Determine whether the algebraic expression is a linear expression. Explain.**

1. $x^2 + x + 1$ **2.** $-2x - 8$ **3.** $x - x^4$

4. WRITING Describe two methods for adding or subtracting linear expressions.

5. DIFFERENT WORDS, SAME QUESTION Which is different? Find "both" answers.

Subtract x from $3x - 1$.

Find $3x - 1$ decreased by x.

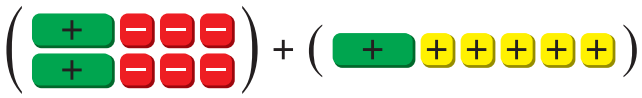
What is x more than $3x - 1$?

What is the difference of $3x - 1$ and x?

Practice and Problem Solving

Write the sum or difference of two algebraic expressions modeled by the algebra tiles. Then use the algebra tiles to simplify the expression.

6.



7.

Find the sum.

8. $(n + 8) + (n - 12)$ **9.** $(7 - b) + (3b + 2)$ **10.** $(2w - 9) + (-4w - 5)$

11. $(2x - 6) + 4(x - 3)$ **12.** $5(-3.4k - 7) + (3k + 21)$ **13.** $(1 - 5q) + 2(2.5q + 8)$

14. $3(2 - 0.9h) + (-1.3h - 4)$ **15.** $\frac{1}{3}(9 - 6m) + \frac{1}{4}(12m - 8)$ **16.** $-\frac{1}{2}(7z + 4) + \frac{1}{5}(5z - 15)$

17. BANKING You start a new job. After w weeks, you have $(10w + 120)$ dollars in your savings account and $(45w + 25)$ dollars in your checking account. Write an expression that represents the total in both accounts.

18. FIREFLIES While catching fireflies, you and a friend decide to have a competition. After m minutes, you have $(3m + 13)$ fireflies and your friend has $(4m + 6)$ fireflies.

a. Write an expression that represents the number of fireflies you and your friend caught together.

b. The competition ends after 5 minutes. Who has more fireflies?

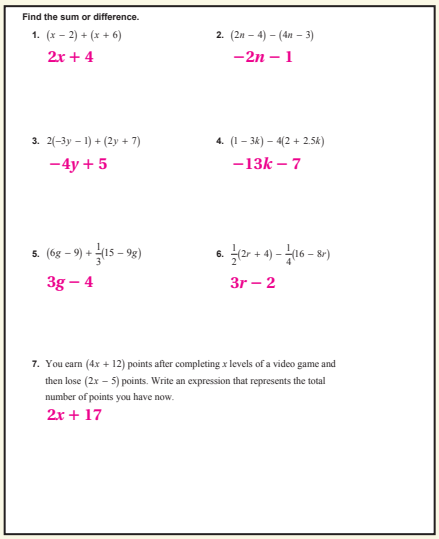
Assignment Guide and Homework Check

Level	Day 1 Activity Assignment	Day 2 Lesson Assignment	Homework Check
Basic	6 and 7, 32–35	1–5, 9–29 odd	9, 13, 17, 21
Average	6 and 7, 32–35	1–5, 9–25 odd, 26–30 even	9, 13, 17, 23, 26
Advanced	6 and 7, 32–35	1–5, 10–24 even, 25, 26–30 even	10, 16, 18, 24, 28
Accelerated	1–7, 10–24 even, 25, 26–30 even, 32–35		10, 16, 18, 24, 28

Common Errors

- **Exercise 30** Students may count the corner tiles twice. Remind them that the corner tiles are the end of one length and the beginning of another, and should not be counted twice.
- **Exercise 31** Students may try to make distance negative. Remind them that distance is always positive.

3.2 Record and Practice Journal



Find the sum or difference.

1. $(x - 2) + (x + 6)$
   $2x + 4$
2. $(2n - 4) - (4n - 3)$
   $-2n - 1$
3. $2(-3y - 1) + (2y + 7)$
   $-4y + 5$
4. $(1 - 3k) - 4(2 + 2.5k)$
   $-13k - 7$
5. $(6g - 9) + \frac{1}{3}(15 - 9g)$
   $3g - 4$
6. $\frac{1}{2}(2r + 4) - \frac{1}{4}(16 - 8r)$
   $3r - 2$
7. You earn $(4x + 12)$ points after completing x levels of a video game and then lose $(2x - 5)$ points. Write an expression that represents the total number of points you have now.
   $2x + 17$

Vocabulary and Concept Check

1. not linear; An exponent of a variable is not equal to 1.
2. linear; The exponent of the variable is equal to 1.
3. not linear; An exponent of a variable is not equal to 1.
4. Vertical method: Align like terms vertically and add or subtract the opposite. Horizontal method: Group like terms using properties of operations and simplify.
5. What is x more than $3x - 1$?; $4x - 1$; $2x - 1$

Practice and Problem Solving

6. *Sample answer:* $(2x - 6) + (x + 5) = 3x - 1$
7. *Sample answer:* $(2x + 7) - (2x - 4) = 11$
8. $2n - 4$
9. $2b + 9$
10. $-2w - 14$
11. $6x - 18$
12. $-14k - 14$
13. 17
14. $-4h + 2$
15. $m + 1$
16. $-2\frac{1}{2}z - 5$
17. $55w + 145$
18. **a.** $7m + 19$
    b. you

Practice and Problem Solving

19. $-3g - 4$

20. $9d + 3$

21. $-12y + 20$

22. $14n - 29$

23. $-2c$

24. $x + 10\frac{1}{2}$

25. See Additional Answers.

26. **a.** 7 fireflies per minute

b. 19 fireflies

27. no; If the variable terms are opposites, the sum is a numerical expression.

28. $8n$

29. $0.25x + 0.15$

30. See *Taking Math Deeper*.

31. $|x - 3|$, or equivalently $|-x + 3|$; 0; 6

Fair Game Review

32. $-\frac{7}{15}$

33. $\frac{2}{5}$

34. $2\frac{2}{15}$

35. D

Mini-Assessment

Find the sum or difference.

1. $(5m + 3) + (-8m + 8)$ $-3m + 11$

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

3. $(8x - 3) - (2x + 6)$ $6x - 9$

4. $(2 - 7y) - 3(y - 9)$ $-10y + 29$

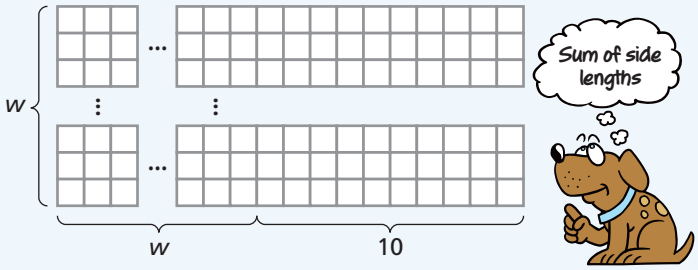
5. A rectangle has side lengths $(x + 5)$ meters and $(2x - 1)$ meters. Write an expression in simplest form that represents the perimeter of the rectangle.
$6x + 8$ meters

Taking Math Deeper

Exercise 30

It is easy to count tiles more than once in this problem and then write an incorrect expression. You can avoid this pitfall by drawing a diagram.

1 Let w represent the width of the room in feet. The expression $(w + 10)$ represents the length of the room. Draw the room using 1-foot-by-1-foot tiles.



2 Using the diagram, you can see that if you find the sum $w + w + (w + 10) + (w + 10)$, then you will count each corner tile twice. So, you must subtract 4 from this sum.

$$\begin{aligned} w + w + (w + 10) + (w + 10) - 4 \\ = w + w + w + w + 10 + 10 - 4 \\ = 4w + 16 \end{aligned}$$

3 Another way to find the sum is to keep track when you are counting each corner tile. Starting at the bottom and adding side lengths counterclockwise, you can write

$$\begin{aligned} w + 10 + (w - 1) + (w + 9) + (w - 2) \\ = w + w + w + w + 10 - 1 + 9 - 2 \\ = 4w + 16. \end{aligned}$$

So, an expression for the number of tiles along the outside of the room is $4w + 16$.

Project

Research the costs of at least 3 different types of floor tiles. Choose a reasonable value for the width and find how much more it would cost to tile the room with the most expensive tile than with the least expensive tile.

Reteaching and Enrichment Strategies

If students need help. . .	If students got it. . .
Resources by Chapter • Practice A and Practice B • Puzzle Time Record and Practice Journal Practice Differentiating the Lesson Lesson Tutorials Skills Review Handbook	Resources by Chapter • Enrichment and Extension • Technology Connection Start the next section

Find the difference.

19. $(-2g + 7) - (g + 11)$ **20.** $(6d + 5) - (2 - 3d)$ **21.** $(4 - 5y) - 2(3.5y - 8)$

22. $(2n - 9) - 5(-2.4n + 4)$ **23.** $\frac{1}{8}(-8c + 16) - \frac{1}{3}(6 + 3c)$ **24.** $\frac{3}{4}(3x + 6) - \frac{1}{4}(5x - 24)$

25. ERROR ANALYSIS Describe and correct the error in finding the difference.

$$(4m + 9) - 3(2m - 5) = 4m + 9 - 6m - 15$$
$$= 4m - 6m + 9 - 15$$
$$= -2m - 6$$

26. STRUCTURE Refer to the expressions in Exercise 18.

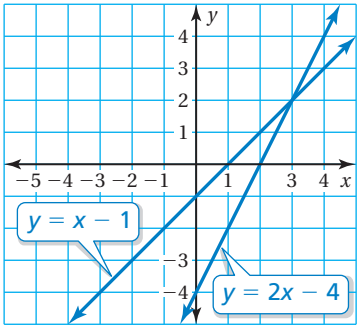
a. How many fireflies are caught each minute during the competition?

b. How many fireflies are caught before the competition starts?

27. LOGIC Your friend says the sum of two linear expressions is always a linear expression. Is your friend correct? Explain.

28. GEOMETRY The expression $17n + 11$ represents the perimeter (in feet) of the triangle. Write an expression that represents the measure of the third side.

29. TAXI Taxi Express charges \$2.60 plus \$3.65 per mile, and Cab Cruiser charges \$2.75 plus \$3.90 per mile. Write an expression that represents how much more Cab Cruiser charges than Taxi Express.



30. MODELING A rectangular room is 10 feet longer than it is wide. One-foot-by-one-foot tiles cover the entire floor. Write an expression that represents the number of tiles along the outside of the room.

31. Reasoning Write an expression in simplest form that represents the vertical distance between the two lines shown. What is the distance when $x = 3$? when $x = -3$?

Fair Game Review *What you learned in previous grades & lessons*

Evaluate the expression when $x = -\frac{4}{5}$ and $y = \frac{1}{3}$. *(Section 2.2)*

32. $x + y$ **33.** $2x + 6y$ **34.** $-x + 4y$

35. MULTIPLE CHOICE What is the surface area of a cube that has a side length of 5 feet? *(Skills Review Handbook)*

A 25 ft^2 **B** 75 ft^2 **C** 125 ft^2 **D** 150 ft^2