Chapter 3

Name_____

Chapter 3 Expressions

Dear Family,

Algebra is used to describe relationships in general terms. Consider the following statements.

• Game tickets are $7 each.	The cost of n tickets is $7n$ dollars.
• It takes 5 minutes to get shoes and car keys and walk to the car.	For a drive of m minutes, allow $m + 5$ minutes.
• Each question on a 20-question test is worth 1 point.	If you miss x questions, your score on the test will be $20 - x$.

On the left, the rule is stated in words, the way you might remember it. On the right, the rule is stated as a mathematical expression with a variable. The number of tickets, the length of the drive, and the number of questions missed are all variables—that is, they might have many different values. The cost of a ticket, the time to get to the car, and the total number of questions on the test are constants—that is, they remain the same. Ask your student to answer each question, using the information above.

- What is the cost of 3 game tickets?
- You want to arrive at baseball practice at 4:30. The drive is 15 minutes. What time should you get ready to leave?
- You miss 2 questions on the test. What is your score?

(Answers: $21, 4:10, 18 points)

Rather than remember all possible ticket costs, driving times, or test scores, you remember the rule for finding them. These examples are uses of algebra in daily life.

With your student, find another algebraic rule you could use in daily life. What are the variables? What are the constants? Have your student evaluate your rule for two different values of the variable(s).

Have fun exploring expressions together!

Expressions (continued)

Lesson	Learning Target	Success Criteria
3.1 Algebraic Expressions	Simplify algebraic expressions.	• I can identify terms and like terms of algebraic expressions. • I can combine like terms to simplify algebraic expressions. • I can write and simplify algebraic expressions to solve real-life problems.
3.2 Adding and Subtracting Linear Expressions	Find sums and differences of linear expressions.	• I can explain the difference between linear and nonlinear expressions. • I can find opposites of terms that include variables. • I can apply properties of operations to add and subtract linear expressions.
3.3 The Distributive Property	Apply the Distributive Property to generate equivalent expressions.	• I can explain how to apply the Distributive Property. • I can use the Distributive Property to simplify algebraic expressions.
3.4 Factoring Expressions	Factor algebraic expressions.	• I can identify the greatest common factor of terms, including variable terms. • I can use the Distributive Property to factor algebraic expressions. • I can write a term as a product involving a given factor.

Nombre_____

Capítulo 3 Expresiones

Querida familia:

El álgebra es usada para describir relaciones en términos generales. Consideren los siguientes enunciados.

• Cada entrada para el juego es a $7.	El costo de n entradas es $7n$ dólares.
• 5 minutos se lleva ponerse los zapatos, tomar las llaves del carro y salir.	Para un recorrido que lleva m minutos, considera $m + 5$ minutos.
• Cada pregunta vale un punto para un examen de 20 preguntas.	Si no contestas x preguntas, tu puntuación en el examen será $20 - x$.

A la izquierda, la regla se indica en palabras, la manera como podría recordarla. A la derecha, la regla se indica como una expresión matemática con una variable. El número de entradas, la duración del recorrido y el número de preguntas sin contestar son todas variables—es decir, pueden tener muchos valores diferentes. El costo de una entrada, el tiempo para llegar hasta el carro y número total de preguntas del examen son constantes—es decir, se mantienen igual. Pida a su estudiante que responda cada pregunta, usando la información anterior.

- ¿Cuál es el costo de 3 entradas para el juego?
- Quieres llegar a la práctica de béisbol a las 4:30. El recorrido es de 15 minutos ¿A qué hora deberías estar listo para salir?
- Dejaste de responder 2 preguntas del examen ¿Cuál es tu puntuación?

(Respuestas: $21, 4:10, 18 puntos)

En vez de recordar todos los costos posibles para las entradas, tiempos de recorrido o puntuaciones del examen, es más fácil recordar la regla para hallar sus diferentes valores. Estos son usos del álgebra con ejemplos la vida cotidiana.

Con su estudiante, encuentre otra regla algebraica que pueda usar en la vida diaria ¿Cuáles son las variables? ¿Cuáles son las constantes? Haga que su estudiante evalúe su regla para dos valores diferentes de la(s) variable(s).

¡Disfruten juntos explorando las expresiones algebraicas!

Capítulo 3 Expresiones (continuación)

Lección	Objetivo de aprendizaje	Criterios de éxito
3.1 Expresiones algebraicas	Simplificar expresiones algebraicas.	• Sé identificar términos y términos similares de expresiones algebraicas. • Sé combinar términos similares para simplificar expresiones algebraicas. • Sé escribir y simplificar expresiones algebraicas para resolver problemas de la vida real.
3.2 Sumar y restar expresiones lineares	Hallar sumas y diferencias de expresiones lineares.	• Sé explicar la diferencia entre expresiones lineares y no lineares. • Sé hallar términos opuestos que incluyen variables. • Sé aplicar propiedades de operaciones para sumar y restar expresiones lineares.
3.3 Propiedad distributiva	Aplicar la Propiedad Distributiva para generar expresiones equivalentes.	• Sé explicar cómo aplicar la Propiedad Distributiva. • Sé usar la Propiedad Distributiva para simplificar expresiones algebraicas.
3.4 Factorizando expresiones	Factorizar expresiones algebraicas.	• Sé identificar el mayor factor común de los términos, incluyendo términos de variable. • Sé usar la Propiedad Distributiva para factorizar expresiones algebraicas. • Sé escribir un término como un producto incluyendo un factor dado.

Lesson 3.1 Cumulative Practice

For use before Lesson 3.1

Find the product. Write your answer as a fraction in simplest form.

1. $-\frac{2}{3}\left(-\frac{8}{9}\right) =$ _____

2. $1\frac{3}{5} \cdot \left(-\frac{4}{9}\right) =$ _____

Lesson 3.1 Vocabulary Practice

For use before Lesson 3.1

1. Write what you know about this phrase.

Review: like terms

Lesson 3.1 Prerequisite Skills Practice

For use before Lesson 3.1

Write the phrase as an expression.

1. 7 increased by a number x

2. negative 14 minus y

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Lesson 3.1 Extra Practice

Identify the terms and like terms in the expression.

1. $-4y + 7 + 9y - 3$

2. $3n^2 - 1.4n + 5n^2 - 6.4$

3. $\frac{1}{2}b^3 - b^3 + 2b$

Simplify the expression.

4. $-15m + 9m$

5. $8k - 4 - 3k$

6. $3.2 - 9x + 7.1 - 3x$

7. $25 - 6x - 12 - 2x$

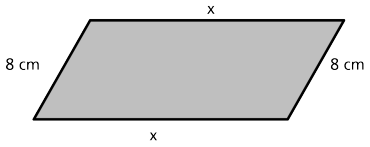
8. $19a - 7 - 3a + 12a$

9. $6x - 7 + 2 + 9x$

10. $\frac{1}{8}h + 7 - \frac{3}{4}h$

11. $\frac{2}{3}y + 5 - 3 - \frac{11}{12}y$

12. Write an expression in simplest form that represents the perimeter of the polygon.



13. Each runner is carrying an 8-ounce bottle of water, a 2.1-ounce energy bar, and a 3-ounce energy drink. Write an expression in simplest form that represents the weight carried by y runners. Interpret the expression.

14. John weighs 65 kilograms, Sam weighs $22x$ kilograms, and Mark weighs $13x$ kilograms. Write an expression in simplest form for their combined weight.

15. Are the expressions $8a^2 - 4b + 7a^2$ and $15a^2 - 10b + 6b$ equivalent? Explain your reasoning.

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Lesson 3.1 Reteach

In an algebraic expression **like terms** are terms that have the same variables raised to the same exponents. Constant terms are also like terms. To identify terms and like terms in an expression, first write the expression as a sum of its terms.

EXAMPLE Identifying Terms and Like Terms

Identify the terms and like terms in $12x + 1 + 4x^2 - 13x + 8 - 3x^2$.

Rewrite as the sum of terms.

$$12x + 1 + 4x^2 + (-13x) + 8 + (-3x^2)$$

Each addend of the expression is a term.

Terms: $12x$, 1, $4x^2$, $-13x$, 8, $-3x^2$

Identify the terms that have the same variables raised to the same exponents and the constant terms.

Like terms: $12x$ and $-13x$, $4x^2$ and $-3x^2$, 1 and 8

▶ The terms of the expression are $12x$, 1, $4x^2$, $-13x$, 8, and $-3x^2$.

The like terms of the expression are $12x$ and $-13x$, $4x^2$ and $-3x^2$, 1 and 8.

When an algebraic expression has no like terms and no parentheses, it is in **simplest form**. To *combine* like terms that have variables, use the Distributive Property to add or subtract the coefficients.

The Distributive Property states $a(b + c) = ab + ac$ and $a(b - c) = ab - ac$.

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Lesson 3.1 Reteach (continued)

EXAMPLE Simplifying an Algebraic Expression

Simplify $8.4x - 2.2x$.

The expression has two terms, $8.4x$ and $-2.2x$. They are like terms, so $8.4x$ and $-2.2x$ can be combined.

$$8.4x - 2.2x = (8.4 - 2.2)x \quad \text{Distributive Property}$$
$$= 6.2x \quad \text{Subtract 2.2 from 8.4.}$$

▶ So, the simplified expression is $6.2x$.

You can use other properties of addition, such as the Commutative Property and Associative Property, to simplify an algebraic expression.

EXAMPLE Simplifying an Algebraic Expression

Simplify $\frac{2}{4}a + 7 + \frac{1}{4}a - 2$.

$$\frac{2}{4}a + 7 + \frac{1}{4}a - 2 = \frac{2}{4}a + 7 + \frac{1}{4}a + (-2) \quad \text{Rewrite as a sum.}$$
$$= \frac{2}{4}a + \frac{1}{4}a + 7 + (-2) \quad \text{Commutative Property of Addition}$$
$$= (\frac{2}{4} + \frac{1}{4})\,a + 7 + (-2) \quad \text{Distributive Property}$$
$$= \frac{3}{4}a + 5 \quad \text{Combine like terms.}$$

▶ So, the simplified expression is $\frac{3}{4}a + 5$.

Identify the terms and like terms in the expression.

1. $4.2x - 3.9 - 5.1x + 6$

2. $16 - \frac{7}{10}m + 8 + \frac{1}{5}m$

Simplify the expression.

3. $-13.4h + 4.2h$

4. $20n - 5 - 3n + 10$

5. $12 - 15r + 4r - 7$

6. $7p - 13p + 4 - 5p$

7. $10b + 3b - 6 + 2b$

8. $5 + \frac{1}{5}x - \frac{1}{5}x + 2$

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Lesson 3.1 Enrichment and Extension

Matching

Simplify the expressions on the left by using the Distributive Property and combining like terms. Then, match it to an equal expression on the right by connecting the two with a line.

1. $6x + 2x$

2. $14x - 12 - x - 3$

3. $-5x + 14 - x - 2$

4. $-3 - 5x - 3x + 11x + 3$

5. $-2(-5 - x) + x - x + 1$

6. $\frac{1}{2}(12) + 4x - (x - 1)$

7. $6(x^2 - 2) + 1 - 16 + x$

8. $4(\frac{1}{2}x + 4) + 1 - 16 + x$

9. $5(x^2 + x)$

10. $x + (1 - \frac{1}{2}x)$

11. $x^3 + x^2 + x + x - x^2 - x^3$

a. $8x$

b. $\frac{1}{2}x + 1$

c. $13x - 15$

d. $2x + 11$

e. $2x$

f. $6x^2 + x - 27$

g. $3x$

h. $3x + 1$

i. $3x + 7$

j. $-6x + 12$

k. $5x^2 + 5x$

12. Write an expression containing x-terms and constants. The x-terms should combine to $7x$ and the constants should sum to 13.

13. Write an expression containing x^2-terms, x-terms and constants. The x^2-terms should combine to $-2x^2$ the x-terms should subtract to $3x$, and the constants should sum to 3.

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3.1 Puzzle Time

How Can You Turn A Pumpkin Into A Squash?

A	B	C	D	E	F
G	H	I	J	K	L

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

Simplify the expression.

A. $8x + 13x$

B. $15x + 10 - 6$

C. $7x - 4x + 3$

D. $5.3x - 9 + 7.6x$

E. $6x - 4x - 2 + 11x$

F. $\frac{3}{4}x + 11 - 5\frac{1}{2} + \frac{1}{4}x$

G. $5x + 40 + 3$

H. $3.6x - 7 - 5.1x$

I. $4 + 8x + 2.2 - 10x$

J. $\frac{5}{6}x - 9 + 3 - \frac{2}{3}x$

K. $2.4x + 7.2 - 4.3$

L. The length of a rectangle is 7 inches and the width is $(x + 2)$ inches. Write an expression in simplest form that represents the perimeter of the rectangle.

$2x + 4$ SMASH		$x + 5\frac{1}{2}$ AIR
$13x - 2$ THE		$3x + 3$ UP
$-2x + 6.2$ COME		$5x + 43$ IT
$2.4x + 2.9$ AND		$x - 4\frac{1}{2}$ TOSS
$21x$ THROW		$12.9x - 9$ IN
$-1.5x - 7$ WILL		$\frac{1}{6}x - 6$ DOWN
$2x + 18$ SQUASH		$15x + 4$ IT

Lesson 3.2 Cumulative Practice

For use before Lesson 3.2

Find the sum. Write your answer as a decimal.

1. $-1.4 + (-2.2) =$ _____

2. $-5.53 + 2.6 =$ _____

Lesson 3.2 Vocabulary Practice

For use before Lesson 3.2

1. Write what you know about this phrase.

Preview: linear expression

Lesson 3.2 Prerequisite Skills Practice

For use before Lesson 3.2

Simplify the expression.

1. $4x + 2 - 3x$

2. $8y - 3 - 10y - 6$

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Lesson 3.2 Extra Practice

Identify the terms and like terms in the expression.

1. $(p - 3) + (p - 7)$

2. $(3n - 1) + (4 - n)$

3. $(-3r + 8) + (5r - 1)$

4. $6(x - 3) + (2x - 9)$

5. $(3c + 2) + 4(1.3c - 5)$

6. $10(2.1q - 2) + (7.5q + 18)$

7. $(-6y - 2) + 5(3 + 2.5y)$

8. $\frac{1}{2}(6x - 10) + \frac{1}{3}(6 + 9x)$

9. After a week of rain, tadpoles appeared in your pond. After t minutes, you have $(7t + 5)$ tadpoles and your friend has $(8t - 3)$ tadpoles.

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

b. Who has more tadpoles after 9 minutes?

Find the difference.

10. $(k + 3) - (3k - 5)$

11. $(-6d + 2) - (7 + 2d)$

12. $(10j - 7) + (-9j + 2)$

13. $(3x + 8) - 6(2.5x - 3)$

14. $(7 - 3t) - 5(-1.6t + 5)$

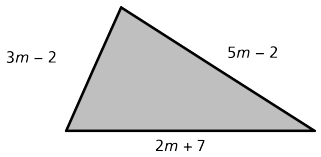
15. $\frac{1}{2}(12w + 8) - \frac{1}{5}(10w - 5)$

16. The admission to a local fair is \$10.00 for each adult and \$6.00 for each child. Each ride costs \$1.50 for an adult and \$1.00 for a child.

a. Write an expression that represents how much more an adult will spend at the fair.

b. An adult and a child each go on 7 rides. How much more did the adult spend?

17. Write an expression that represents the perimeter of the triangle.



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Lesson 3.2 Reteach

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

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

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

EXAMPLE Adding Linear Expressions

Find the sum $(x - 8) + (4x + 1)$.

Vertical method: Write the expressions vertically, aligning like terms. Then add.

$$\begin{array}{r} x - 8 \\ +\ 4x + 1 \\ \hline 5x - 7 \end{array}$$

Horizontal method: Group like terms using properties of operations and simplify.

$$\begin{aligned} (x - 8) + (4x + 1) &= x + (-8) + 4x + 1 && \text{Rewrite the sum.} \\ &= x + 4x + (-8) + 1 && \text{Commutative Property of Addition} \\ &= (x + 4x) + (-8 + 1) && \text{Group like terms.} \\ &= 5x - 7 && \text{Combine like terms.} \end{aligned}$$

Notice that both methods result in the same sum.

▶ The sum is $5x - 7$.

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Lesson 3.2 Reteach (continued)

To subtract one linear expression from another, add the opposite of each term in the expression. Make sure you add the opposite of each term in the expression, not just the first term. You can use a vertical or horizontal method.

EXAMPLE Subtracting a Linear Expression

Find the difference $(11w + 3) - (5w - 2)$.

Vertical method: Write the expressions vertically, aligning like terms. Then subtract by adding the opposite of each term in the second expression.

$$\begin{array}{r} 11w + 3 \\ \underline{-\,(5w - 2)} \end{array} \xrightarrow{\text{Add the opposite.}} \begin{array}{r} 11w + 3 \\ \underline{+\,(-5w) + 2} \\ 6w + 5 \end{array}$$

Horizontal method: Group like terms using properties of operations and simplify.

$(11w + 3) - (5w - 2) = (11w + 3) + (-5w + 2)$ Add the opposite.

$= 11w + (-5w) + 3 + 2$ Commutative Property of Addition

$= [11w + (-5w)] + (3 + 2)$ Group like terms.

$= 6w + 5$ Combine like terms.

Notice that both methods result in the same difference.

▶ The difference is $6w + 5$.

Find the sum.

1. $(2a - 3) + (5a - 6)$

2. $(7q + 1) + (9q - 13)$

3. $(8 - k) + (4 + 3k)$

4. $(12x - 2) + (7x - 1)$

5. $(5.7t + 1.9) + (2.6t + 4.1)$

6. $\left(\frac{3}{4}c - 8\right) + \left(\frac{1}{2}c + 5\right)$

Find the difference.

7. $(6d - 2) - (3d + 2)$

8. $(4 - v) - (11 + 2v)$

9. $(5h + 7) - (9h - 6)$

10. $(10x - 1) - (4x + 5)$

11. $(8.7y - 3.3) - (7.2y - 4.9)$

12. $\left(\frac{2}{5}f + 12\right) - \left(\frac{3}{10}f - 9\right)$

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Lesson 3.2 Enrichment and Extension

Using the Distributive Property

When working with algebraic expressions and the Distributive Property, the exponents of the variables are added.

Example: Simplify $x(x + 6)$.

Distribute x to each term inside the parentheses. (Remember that x can be rewritten as $1 \bullet x^1$.) Then multiply the coefficients.

$x(x + 6)$	$= (1x \bullet 1x) + (1x \bullet 6)$	Distribute x to each term.
	$= (1x^1 \bullet 1x^1) + (1x^1 \bullet 6)$	Rewrite to show exponents.
	$= 1x^{1+1} + 6x^1$	Multiply coefficients and add exponents.
	$= x^2 + 6x$	Simplify.

Simplify the expression.

1. $x^2(x + 1)$

2. $-x(2x - 8)$

3. $x(x^4 - 1)$

4. $x(3x - 1)$

5. $3x(x - 1)$

6. $2x(x - 1)$

7. $4x(-4x - 3)$

8. $n(n - 4)$

9. $-b(3b + 9)$

10. $2w(-4w - 14)$

11. $2x(4x - 9) - 3x(4x - 2)$

12. $3k(-5k + 21) + 2(2.5k + 9)$

13. $4(1 + 8h) + h(2.2h + 5)$

14. $\frac{1}{2}m(10 + 6m) - \frac{1}{5}m(10m + 10)$

15. $\frac{1}{3}(6z - 6) - \frac{1}{4}z(4z + 16)$

16. $3d^6(24d^3 + 6)24d^9$

Name _____ Date _____

3.2 Puzzle Time

What Did The Candle Say To The Match?

Write the letter of each answer in the box containing the exercise number.

1. $(x + 10) + (x - 14)$

2. $(9 - 2x) + (6x + 4)$

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

4. $(2x - 7) + 5(x - 3)$

5. $6(-2.3x - 5) + (4x + 11)$

6. $(8 - 2x) + 3(4.5x + 9)$

7. $\frac{1}{2}(8 - 4x) + \frac{1}{3}(9x - 6)$

8. $-\frac{3}{4}(3x + 7) + \frac{1}{4}(12x + 20)$

Find the difference.

9. $(-3x + 8) - (x + 10)$

10. $(5x + 4) - (1 - 2x)$

11. $(3 - 4x) - 3(2.4x - 7)$

12. $(4x - 8) - 4(-6.5x + 5)$

13. $\frac{1}{9}(-9x + 18) - \frac{1}{5}(10 + 15x)$

14. $\frac{4}{7}(4x + 3) - \frac{1}{7}(9x + 5)$

15. $\frac{1}{2}(-4x + 8) - \frac{1}{4}(8x - 12)$

16. Your class project involves recycling aluminum cans. After x weeks, your class has $(13x + 50)$ aluminum cans. The class goal is to collect $(80x + 120)$ aluminum cans. How many more aluminum cans does your class need to collect?

Answers

U. $-4x - 2$

P. $30x - 28$

T. $-9.8x - 19$

E. $x + 2$

I. $2x - 4$

L. $67x + 70$

H. $-11.2x + 24$

Y. $7x - 22$

I. $4x + 13$

U. $\frac{3}{4}x - \frac{1}{4}$

G. $x + 1$

L. $-4x + 7$

Y. $11.5x + 35$

F. $-4x$

M. $7x + 3$

O. $-x - 15$

6	3	9		16	2	14	11	5		8	12		10	4		15	1	13	7

Lesson 3.3 Cumulative Practice

For use before Lesson 3.3

1. The table shows the annual profits (in millions of dollars) of a company for five years. Find the profit over the five-year period.

Year	Profit (millions of dollars)
1	4.1
2	0.5
3	3.81
4	−1.6
5	−2.84

The profit over the five-year period is $_____ million.

Lesson 3.3 Vocabulary Practice

For use before Lesson 3.3

1. Write what you know about this phrase.

Review: simplest form

Lesson 3.3 Prerequisite Skills Practice

For use before Lesson 3.3

Find the product.

1. 2.3×4.1

2. $-4\left(-3\frac{3}{4}\right)$

Name _____ Date _____

Lesson 3.3 Extra Practice

Simplify the expression.

1. $4(a + 9)$

2. $-3(x - 5)$

3. $11(6p + 7)$

4. $1.5(6 + 3d)$

5. $5.8(-4g - 2)$

6. $2(10 + 3y - 5)$

7. $\frac{2}{3}(1 - 7h)$

8. $\frac{3}{5}(-5g + 4 + 2g)$

9. $-6(-7k + 3 - k)$

10. Your friend simplifies the expression. Is your friend correct? Explain your reasoning.

$$-3(z - 11 + 6z) = -3z - 11 + 6z$$
$$= 3z - 11$$

Simplify the expression.

11. $3(4w + 2) + 13w$

12. $-5m - 10(m + 4)$

13. $16 - 7(y + 6) + 2y$

14. $-1 + 8(9q - 6) - 20q$

15. A rectangular room is 12 feet wider than it is long. How many 1-foot square tiles does it take to tile along the inside walls of the room?

16. The cost (in dollars) of a custom-made T-shirt is represented by $0.75n + 9.99$, where n is the number of words in the design. Write and interpret a simplified expression that represents the cost of 12 T-shirts.

Find the difference.

17. $3(4w + 2)$

18. $-2(7 - m)$

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Lesson 3.3 Reteach

You can use the Distributive Property to simplify expressions involving variable terms and rational numbers. Remember that the Distributive Property states: $a(b + c) = ab + ac$ and $a(b - c) = ab - ac$.

EXAMPLE Using the Distributive Property

Simplify each expression.

a. $-2(r + 6)$

$$\begin{aligned} -2(r + 6) &= -2(r) + (-2)(6) && \text{Distributive Property} \\ &= -2r + (-12) && \text{Multiply.} \\ &= -2r - 12 && \text{Rewrite as subtraction.} \end{aligned}$$

b. $\frac{2}{3}(6j - 9)$

$$\begin{aligned} \tfrac{2}{3}(6j - 9) &= \tfrac{2}{3}(6j) - \tfrac{2}{3}(9) && \text{Distributive Property} \\ &= 4j - 6 && \text{Multiply.} \end{aligned}$$

EXAMPLE Simplifying an Expression

Simplify $4(5x + 6 - 9)$.

Method 1: Use the Distributive Property before combining like terms.

$$\begin{aligned} 4(5x + 6 - 9) &= 4(5x) + 4(6) - 4(9) && \text{Distributive Property} \\ &= 20x + 24 - 36 && \text{Multiply.} \\ &= 20x - 12 && \text{Combine like terms.} \end{aligned}$$

Method 2: Combine like terms in parentheses before using the Distributive Property.

$$\begin{aligned} 4(5x + 6 - 9) &= 4(5x - 3) && \text{Combine like terms.} \\ &= 4(5x) - 4(3) && \text{Distributive Property} \\ &= 20x - 12 && \text{Multiply.} \end{aligned}$$

▶ So, the simplified expression is $20x - 12$.

Name _____ Date _____

Lesson 3.3 Reteach (continued)

EXAMPLE Simplifying an Expression

Simplify each expression.

a. $-3\left(5y + \frac{1}{3}\right) - 9y$

$-3\left(5y + \frac{1}{3}\right) - 9y = -3(5y) + (-3)\left(\frac{1}{3}\right) - 9y$ Distributive Property

$= -15y + (-1) - 9y$ Multiply.

$= -24y - 1$ Combine like terms.

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

$(6m + 3) - 5(4m - 2) = (6m + 3) - [5(4m) - (5)(2)]$ Distributive Property

$= (6m + 3) - (20m - 10)$ Multiply.

$= (6m + 3) + (-20m + 10)$ Add the opposite.

$= [6m + (-20m)] + (3 + 10)$ Group like terms.

$= -14m + 13$ Combine like terms.

Simplify the expression.

1. $3(h + 6)$

2. $-4(x - 12)$

3. $10(2n + 5)$

4. $9(1 + 7c)$

5. $2.5(-5t - 3)$

6. $5(6 + 4y - 2)$

7. $\frac{3}{4}(8 - 16g)$

8. $\frac{1}{3}(-15z - 6 + 9z)$

9. $-7(-3a - 5 + a)$

Simplify the expression.

10. $6(2f + 1) - 8f$

11. $-25d - 8(d + 3)$

12. $5 - 2(3s - 4) + 2s$

13. $-17 + 4(5p - 1) + 14p$

14. $-11(y - 6) + 4y - 2$

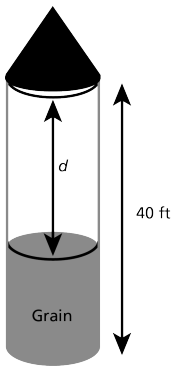
15. $9 + 3(8q + 2) - 16q$

Name _____ Date _____

Lesson 3.3 Enrichment and Extension

Feed the Herd

The weight (in pounds) of grain inside the cylindrical silo shown is represented by $8800(40 - d)$, where d is the distance (in feet) from the top of the grain to the top of the silo.



1. Simplify the expression that represents the weight of grain in the silo.
2. What is the weight of the grain if the distance from the top of the grain to the top of the silo is 12 feet?
3. You have a herd of 70 dairy cows. Each cow eats 5 pounds of grain each day. How many days will the amount of grain in Exercise 2 feed the herd of cows?

Name _____ Date _____

3.3 Puzzle Time

Which Birds Steal Soap From The Bath?

Write the letter of each answer in the box containing the exercise number.

Find the difference.

1. $-3(9 - x) + 6x$
2. $4(x - 2)$
3. $5(7x + 2 + 4x)$
4. $9(3x + 1) + 4x - 3$
5. $-8(-2x - 3)$
6. $-5(8x - 7 + 3x)$
7. $10x - 2(4x + 5) + 6$
8. $7(2x + 4) - 5x$
9. $2x + 14 - 3(x - 9)$
10. $-2(3 - x)$
11. $6(2x + 1)$

Answers

B. $-6 + 2x$

D. $4x - 8$

U. $-x + 41$

O. $55x + 10$

R. $16x + 24$

R. $31x + 6$

S. $-55x + 35$

B. $-27 + 9x$

C. $2x - 4$

E. $9x + 28$

K. $12x + 6$

5	3	10	1	8	4		2	9	7	11	6

Lesson 3.4 Cumulative Practice

For use before Lesson 3.4

Find the difference. Write your answer as a fraction or mixed number in simplest form.

1. $-\frac{7}{9} - \frac{8}{9} =$ _____

2. $-1\frac{3}{4} - \left(-\frac{1}{4}\right) =$ _____

Lesson 3.4 Vocabulary Practice

For use before Lesson 3.4

1. Write what you know about this phrase.

Review: factoring an expression

Lesson 3.4 Prerequisite Skills Practice

For use before Lesson 3.4

Find the GCF.

1. 2, 10

2. 3, 24

Name _____ Date _____

Lesson 3.4 Extra Practice

Factor the expression using the GCF.

1. $8 - 22a$

2. $25d + 30$

3. $6y + 3$

4. $2t - 10$

5. $16p - 8$

6. $21s + 15$

7. $32v + 24w$

8. $9b + 4c$

9. $12y - 42z$

Factor out the coefficient of the variable term.

10. $\frac{1}{2}m + \frac{1}{2}$

11. $\frac{2}{3}j - \frac{2}{9}$

12. $1.2k + 2.4$

13. $1.5a - 4.5$

14. $3f + 5$

15. $\frac{3}{10}x - \frac{3}{10}$

Factor out the indicated number.

16. Factor $-\frac{1}{3}$ out of $-\frac{1}{3}x - 12$.

17. Factor $-\frac{1}{6}$ out of $-\frac{1}{3}x + \frac{5}{6}y$.

18. Factor $-\frac{1}{2}$ out of $-\frac{1}{2}x + 8$.

19. The area of the rectangle is $(18x - 12)$ square inches. Write an expression that represents the length of the rectangle (in inches).

Name _____ Date _____

Lesson 3.4 Reteach

When **factoring an expression** you write the expression as a product of factors. You can use the Distributive Property to factor any rational number from an expression.

EXAMPLE Factoring Out the GCF

Factor $16x + 12$ using the GCF.

Find the GCF of $16x$ and 12.

$16x = 2 \cdot 2 \cdot 2 \cdot 2 \cdot x$
$12 = 2 \cdot 2 \cdot 3$

Circle the common prime factors.

So, the GCF of $16x$ and 12 is $2 \cdot 2 = 4$.

Use the GCF to factor the expression.

$16x + 12 = 4(4x) + 4(3)$ Rewrite using GCF.

$= 4(4x + 3)$ Distributive Property

▶ So, the factored expression is $4(4x + 3)$.

EXAMPLE Factoring Out a Rational Number

Factor $\frac{1}{3}$ out of $\frac{1}{3}x + \frac{5}{3}$.

Write each term as a product of $\frac{1}{3}$ and another factor.

$\frac{1}{3}x = \frac{1}{3} \cdot x$ Think: $\frac{1}{3}x$ is $\frac{1}{3}$ times what?

$\frac{5}{3} = \frac{1}{3} \cdot 5$ Think: $\frac{5}{3}$ is $\frac{1}{3}$ times what?

Use the Distributive Property to factor out $\frac{1}{3}$.

$\frac{1}{3}x + \frac{5}{3} = \frac{1}{3} \cdot x + \frac{1}{3} \cdot 5$ Rewrite the expression.

$= \frac{1}{3}(x + 5)$ Distributive Property

▶ So, the factored expression is $\frac{1}{3}(x + 5)$.

Name _____ Date _____

Lesson 3.4 Reteach (continued)

EXAMPLE Factoring Out a Negative Number

Factor -5 out of $-10g + 25$.

Write each term as a product of -5 and another factor.

$-10g = -5 \cdot 2g$ Think: $-10g$ is -5 times what?

$25 = -5 \cdot (-5)$ Think: 25 is -5 times what?

Use the Distributive Property to factor out -5.

$-10g + 25 = -5(2g) + (-5)(-5)$ Rewrite the expression.

$= -5[2g + (-5)]$ Distributive Property

$= -5(2g - 5)$ Simplify.

▶ So, the factored expression is $-5(2g - 5)$.

Factor the expression using the GCF.

1. $6k + 3$ **2.** $-21z + 35$ **3.** $15m - 36$

4. $14 + 26u$ **5.** $16n - 64p$ **6.** $24a + 2b$

Factor out the coefficient of the variable term.

7. $\frac{1}{5}c + \frac{4}{5}$ **8.** $\frac{1}{12}x - \frac{1}{12}$ **9.** $\frac{4}{5}n + \frac{4}{10}$

10. $7.5 + 1.5h$ **11.** $0.7s - 6.3$ **12.** $2.4y + 14.4$

Factor out the indicated number.

13. Factor -5 out of $-20v + 45$.

14. Factor $-\frac{1}{2}$ out of $-\frac{1}{2}x - 28$.

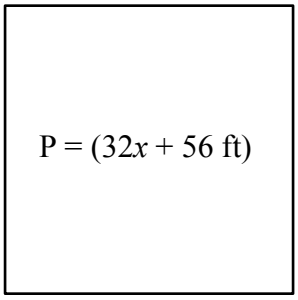
15. Factor -0.36 out of $-1.8w + 3.96$.

Name _____ Date _____

Lesson 3.4 Enrichment and Extension

Walk Around the Garden

You take your puppy for a walk around a square flower garden like the one shown.



1. What is the length of a side of the garden? Explain how you found your answer.
2. Factor the expression for the length of a side using the GCF.
3. Suppose you walk your puppy around the garden 3 times. If $x = 2$, how many feet do you and your puppy walk?
4. Write an expression that represents the area in square feet of the garden.

Name _____ Date _____

3.4 Puzzle Time

What Do You Call A Bee That Buzzes Quietly?

Write the letter of each answer in the box containing the exercise number.

Factor the expression using the GCF.

1. $8x - 22$

2. $9x + 33$

3. $3x + 18$

4. $15x - 20$

Factor out the coefficient of the variable term.

5. $1.1x + 12.1$

6. $1.4x + 7.7$

7. $0.6x - 4.8$

Factor out the indicated number.

8. Factor -4 out of $-4x + 24$.

9. Factor -6 out of $-24x + 6$.

10. Factor -2 out of $-36x - 42$.

Answers

E. $-2(18x + 21)$

M. $2(4x - 11)$

U. $1.1(x + 11)$

A. $1.4(x + 5.5)$

B. $-4(x - 6)$

L. $5(3x - 4)$

E. $0.6(x - 8)$

B. $3(3x + 11)$

E. $-6(4x - 1)$

M. $3(x + 6)$

6		3	5	1	8	4	9		2	10	7