Name _____ Date _____ Class _____

Ready to Go On?

LESSON 1

Algebraic Reasoning

Skills Intervention: Order of Operations

To simplify a **numerical expression,** an expression made up of numbers and operations, follow the **order of operations.** First, evaluate expressions within grouping symbols. Next, evaluate exponents. Then, multiply and divide, starting at the left. Finally, add and subtract from left to right.

Vocabulary
numerical expression
order of operations

Using the Order of Operations

Evaluate $41 + 3^2 \cdot 2$.

$41 + 3^2 \cdot 2$	Circle your first operation.
$41 + \_\_\_ \cdot 2$	Evaluate.
$41 + 9 \cdot 2$	Circle the next operation.
$41 + \_\_\_$	Evaluate.
___	Add.

Using the Order of Operations with Grouping Symbols

Evaluate. $16 \div (11 - 9)^3 + 22$

$16 \div (11-9)^3 + 22$	Circle your first operation.
$16 \div (\_\_\_)^3 + 22$	Evaluate.
$16 \div (2)^3 + 22$	Circle your next operation.
$16 \div 8 + 22$	Evaluate.
$16 \div 8 + 22$	Should you add or divide next? _____
$2 + 22$	Evaluate.
___	Add.

Personal Finance Application

Jane earns $7.50 per hour cleaning houses. She worked 7 hours on Monday and 8 hours each on Tuesday and Thursday. Evaluate the expression $(7 + 8 \cdot 2) \cdot 7.5$ to find her income for this week.

$(7 + 8 \cdot 2) \cdot 7.5$	Circle your first operation.
$(7 + \_\_\_) \cdot 7.5$	Evaluate.
$(7 + 16) \cdot 7.5$	Circle your next operation.
$23 \cdot 7.5$	Evaluate.
_____	Multiply.

Jane earned _____ in a week.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 1

Algebraic Reasoning

Skills Intervention: Order of Operations

To simplify a **numerical expression,** an expression made up of numbers and operations, follow the **order of operations.** First, evaluate expressions within grouping symbols. Next, evaluate exponents. Then, multiply and divide, starting at the left. Finally, add and subtract from left to right.

Vocabulary
numerical expression
order of operations

Using the Order of Operations

Evaluate $41 + 3^2 \cdot 2$.

$41 + (3^2) \cdot 2$	Circle your first operation.
$41 + \underline{9} \cdot 2$	Evaluate.
$41 + (9 \cdot 2)$	Circle the next operation.
$41 + \underline{18}$	Evaluate.
$\underline{59}$	Add.

Using the Order of Operations with Grouping Symbols

Evaluate. $16 \div (11 - 9)^3 + 22$

$16 \div (11-9)^3 + 22$	Circle your first operation.
$16 \div (\underline{2})^3 + 22$	Evaluate.
$16 \div (2)^3 + 22$	Circle your next operation.
$16 \div 8 + 22$	Evaluate.
$16 \div 8 + 22$	Should you add or divide next? Divide
$2 + 22$	Evaluate.
$\underline{24}$	Add.

Personal Finance Application

Jane earns $7.50 per hour cleaning houses. She worked 7 hours on Monday and 8 hours each on Tuesday and Thursday. Evaluate the expression $(7 + 8 \cdot 2) \cdot 7.5$ to find her income for this week.

$(7 + 8 \cdot 2) \cdot 7.5$	Circle your first operation.
$(7 + \underline{16}) \cdot 7.5$	Evaluate.
$(7 + 16) \cdot 7.5$	Circle your next operation.
$23 \cdot 7.5$	Evaluate.
$\underline{172.50}$	Multiply.

Jane earned $\underline{\$172.50}$ in a week.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 2

Algebraic Reasoning

Skills Intervention: Properties of Numbers

Vocabulary
Commutative Property
Associative Property
Identity Property
Distributive Property

Many properties are helpful when performing mathematical operations. The **Commutative Property** states that you can add or multiply numbers in any order and get the same result. The **Associative Property** states that when you add or multiply, you can group numbers together in any order and get the same result. The **Identity Property** states that any number plus 0 is equal to that number and any number times 1 is equal to that number. The **Distributive Property** states that when multiplying, you can break a number into smaller numbers, multiply each number by the second number, and add the products.

Using the Identity Property to Simplify Expressions

Simplify.

A. $73 + 0 =$ _____

Any number plus 0 is equal to _____.

B. $45 \cdot 1 =$ _____

Any number times 1 is equal to _____.

Using Properties to Simplify Expressions

Simplify each expression using one or more of the properties.

A. $8 + 17 + 12 = 17 + 12 + 8$ is an example of the _____.

$= 17 + (12 + 8)$ is an example of the _____.

$= 17 + (\_\_\_\_\_)$

$=$ _____

B. $2 \cdot 14 \cdot 5 = 14 \cdot 2 \cdot 5$ is an example of the _____.

$= 14 \cdot (2 \cdot 5)$ is an example of the _____.

$= 14 \cdot (\_\_\_\_\_)$

$=$ _____

Using the Distributive Property to Multiply Mentally

Use the Distributive Property to find the product.

$6(22) = 6(\_\_\_\_\_)$	Rewrite the number as two smaller parts.
$= (6 \cdot \_\_\_\_\_) + (6 \cdot \_\_\_\_)$	Use the Distributive Property.
$=$ _____ $+$ _____	Multiply.
$=$ _____	Add.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 2

Algebraic Reasoning

Skills Intervention: Properties of Numbers

Vocabulary
Commutative Property
Associative Property
Identity Property
Distributive Property

Many properties are helpful when performing mathematical operations. The **Commutative Property** states that you can add or multiply numbers in any order and get the same result. The **Associative Property** states that when you add or multiply, you can group numbers together in any order and get the same result. The **Identity Property** states that any number plus 0 is equal to that number and any number times 1 is equal to that number. The **Distributive Property** states that when multiplying, you can break a number into smaller numbers, multiply each number by the second number, and add the products.

Using the Identity Property to Simplify Expressions

Simplify.

A. $73 + 0 =$ 73

Any number plus 0 is equal to that number.

B. $45 \cdot 1 =$ 45

Any number times 1 is equal to that number.

Using Properties to Simplify Expressions

Simplify each expression using one or more of the properties.

A. $8 + 17 + 12 = 17 + 12 + 8$ is an example of the Commutative Property.

$= 17 + (12 + 8)$ is an example of the Associative Property.

$= 17 + (20)$

$= 37$

B. $2 \cdot 14 \cdot 5 = 14 \cdot 2 \cdot 5$ is an example of the Commutative Property.

$= 14 \cdot (2 \cdot 5)$ is an example of the Associative Property.

$= 14 \cdot (10)$

$= 140$

Using the Distributive Property to Multiply Mentally

Use the Distributive Property to find the product.

$6(22) = 6(20 + 2)$ Rewrite the number as two smaller parts.

$= (6 \cdot 20) + (6 \cdot 2)$ Use the Distributive Property.

$= 120 + 12$ Multiply.

$= 132$ Add.

Name _____ Date _____ Class _____

Ready to Go On?

SECTION 1A

Algebraic Reasoning

SECTION A: Quiz for Lessons 1 Through 2

1 Order of Operations

Simplify each expression.

1. $(10 + 4) - 6 + 4^2$ _____

2. $35 - 4 \cdot 9 + 5^3$ _____

3. $(3 \cdot 7) + 6 \cdot 4 - 17$ ____

4. $10^2 \div 5^2 + (28 - 13)$ ____

5. $5(7 - 3)^3 + 2^4$ _____

6. $2(6 + 8) \div (4^2 - 9)$ ____

2 Properties of Numbers

Name the property you should use to simplify each expression.

7. $7(35)$ _____

8. $64 \cdot 1$ _____

9. $4 + 59 + 36$ _____

10. $(4 \cdot 9) \cdot 25$ _____

Simplify each expression using mental math.

11. $(88 + 0) + (12 \cdot 1)$ _____

12. $6(49)$ _____

13. $(14 + 9) + 6$ _____

14. $8(23)$ _____

15. $2 \cdot (5 \cdot 16)$ _____

16. $3 + 89 + 17$ _____

Name _____ Date _____ Class _____

Ready to Go On?

SECTION 1A

Algebraic Reasoning

SECTION A: Quiz for Lessons 1 Through 2

1 Order of Operations

Simplify each expression.

1. $(10 + 4) - 6 + 4^2$ 24

2. $35 - 4 \cdot 9 + 5^3$ 124

3. $(3 \cdot 7) + 6 \cdot 4 - 17$ 28

4. $10^2 \div 5^2 + (28 - 13)$ 19

5. $5(7 - 3)^3 + 2^4$ 336

6. $2(6 + 8) \div (4^2 - 9)$ 4

2 Properties of Numbers

Name the property you should use to simplify each expression.

7. $7(35)$ Distributive

8. $64 \cdot 1$ Identity

9. $4 + 59 + 36$ Commutative

10. $(4 \cdot 9) \cdot 25$ Associative

Simplify each expression using mental math.

11. $(88 + 0) + (12 \cdot 1)$ 100

12. $6(49)$ 294

13. $(14 + 9) + 6$ 29

14. $8(23)$ 184

15. $2 \cdot (5 \cdot 16)$ 160

16. $3 + 89 + 17$ 109

Name _____ Date _____ Class _____

Ready to Go On?

SECTION 1A

Algebraic Reasoning

SECTION A Enrichment: Finding Math Mistakes

The order of operations is a system decided upon by mathematicians to avoid confusion. By having a standard method for simplifying expressions, every person should find the same answer. If not for the order of operations, people might arrive at different answers for the same expression. The solution on the left uses the order of operations to get the correct answer. The solution on the right is incorrect because it does not follow the order of operations.

$(6 + 4)^2 - 2 \cdot 30$	Parentheses	$(6 + 4)^2 - 2 \cdot 30$	Parentheses
$(10)^2 - 2 \cdot 30$	Exponents	$(10)^2 - 2 \cdot 30$	Exponents
$100 - 2 \cdot 30$	Multiply	$100 - 2 \cdot 30$	Subtract
$100 - 60$	Subtract	$98 \cdot 30$	Multiply
40		2,940	

By following the order of operations, you get the correct answer, the same answer anyone else would get. When simplifying expressions with many terms, if you have a different answer than someone else who is simplifying the same expression, most likely one of you did not follow the order of operations.

Use an equal or unequal symbol to tell whether or not the order of operations was followed correctly.

1. $5 + 15 \div 3$ ____ 10

2. $42 - 3 \cdot 7$ ____ 273

3. $(5 \cdot 2) - 4$ ____ -10

4. $3 + 6 \cdot 4^2$ ____ 99

5. $21 - 7 \cdot 2^2$ ____ 784

6. $(13 - 5) \div 2 \cdot 2$ ____ 2

Find the mistakes. Tell what operations were performed out of order.

7. $(60 \div 4)^2 - 3 \cdot 4 = 888$ _____

8. $(4 \cdot 10) + 3 = 52$ _____

9. $3 \cdot 4 + 7^2 = 361$ _____

10. $28 \div 4 - 3 = 28$ _____

Use the order of operations to correct each answer.

11. $(8 \div 4)^5 - 6 \cdot 4 \neq 104$ _____

12. $5 \cdot 6 - 4^2 \neq 676$ _____

13. $54 \div 9 + 9 \neq 3$ _____

14. $(6 \cdot 8) + 5 \neq 78$ _____

15. $(15 - 7)^2 - 7 \cdot 5 \neq 285$ _____

16. $(36 \div 4) + 5 \neq 4$ _____

Name _____ Date _____ Class _____

Ready to Go On?

SECTION 1A

Algebraic Reasoning

SECTION A Enrichment: Finding Math Mistakes

The order of operations is a system decided upon by mathematicians to avoid confusion. By having a standard method for simplifying expressions, every person should find the same answer. If not for the order of operations, people might arrive at different answers for the same expression. The solution on the left uses the order of operations to get the correct answer. The solution on the right is incorrect because it does not follow the order of operations.

$(6 + 4)^2 - 2 \cdot 30$	Parentheses	$(6 + 4)^2 - 2 \cdot 30$	Parentheses
$(10)^2 - 2 \cdot 30$	Exponents	$(10)^2 - 2 \cdot 30$	Exponents
$100 - 2 \cdot 30$	Multiply	$100 - 2 \cdot 30$	Subtract
$100 - 60$	Subtract	$98 \cdot 30$	Multiply
40		$2{,}940$	

By following the order of operations, you get the correct answer, the same answer anyone else would get. When simplifying expressions with many terms, if you have a different answer than someone else who is simplifying the same expression, most likely one of you did not follow the order of operations.

Use an equal or unequal symbol to tell whether or not the order of operations was followed correctly.

1. $5 + 15 \div 3$ ___=___ 10

2. $42 - 3 \cdot 7$ ___≠___ 273

3. $(5 \cdot 2) - 4$ ___≠___ -10

4. $3 + 6 \cdot 4^2$ ___=___ 99

5. $21 - 7 \cdot 2^2$ ___≠___ 784

6. $(13 - 5) \div 2 \cdot 2$ ___=___ 2

Find the mistakes. Tell what operations were performed out of order.

7. $(60 \div 4)^2 - 3 \cdot 4 = 888$ — subtracted before multiplying

8. $(4 \cdot 10) + 3 = 52$ — added before parentheses

9. $3 \cdot 4 + 7^2 = 361$ — multiplied and added before exponent

10. $28 \div 4 - 3 = 28$ — subtracted before dividing

Use the order of operations to correct each answer.

11. $(8 \div 4)^5 - 6 \cdot 4 \neq 104$ ___8___

12. $5 \cdot 6 - 4^2 \neq 676$ ___14___

13. $54 \div 9 + 9 \neq 3$ ___15___

14. $(6 \cdot 8) + 5 \neq 78$ ___53___

15. $(15 - 7)^2 - 7 \cdot 5 \neq 285$ ___29___

16. $(36 \div 4) + 5 \neq 4$ ___14___

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 3

Algebraic Reasoning

Skills Intervention: Variables and Algebraic Expressions

Letters, called **variables,** may be used to represent numbers whose values can vary. Numbers whose values do not change are called **constants. Algebraic expressions** include variables, constants, and operations. When a specific value is assigned to a variable, the expression can be **evaluated,** or given a single value that is equal to the whole expression.

Vocabulary
- variable
- constant
- algebraic expression
- evaluate

Evaluating an Algebraic Expression for Different Values of a Variable

Evaluate $x - 6$ for $x = 12$.

$x - 6$

___ − 6	What do you substitute for x?
___	Evaluate.

Evaluating Algebraic Expressions Involving Order of Operations

Evaluate each algebraic expression for the given variable values.

A. $9 + 4m$ for $m = 3$

9 + 4(___)	What do you substitute for m?
9 + ___	Multiply.
___	Add.

B. $2x^2 - 3x + 4$ for $x = 5$

$2(\_\_\_)^2 - 3(\_\_\_) + 4$	What do you substitute for x?
$2(\_\_\_) - 3(5) + 4$	Evaluate the exponent.
___ − ___ + 4	Do you multiply or add next?
___ + 4	Subtract.
___	Add.

Evaluating Algebraic Expressions With Two Variables

Evaluate the algebraic expression for the given variable values.

$2n + m^2$ for $n = 9$ and $m = 12$

$2(\_\_\_) + (m)^2$	What do you substitute for n?
$2(9) + (\_\_\_)^2$	What do you substitute for m?
2(9) + ____	First, evaluate the exponent.
___ + 144	Do you multiply or add next?
____	Add.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 3

Algebraic Reasoning

Skills Intervention: Variables and Algebraic Expressions

Letters, called **variables,** may be used to represent numbers whose values can vary. Numbers whose values do not change are called **constants. Algebraic expressions** include variables, constants, and operations. When a specific value is assigned to a variable, the expression can be **evaluated,** or given a single value that is equal to the whole expression.

Vocabulary
- variable
- constant
- algebraic expression
- evaluate

Evaluating an Algebraic Expression for Different Values of a Variable

Evaluate $x - 6$ for $x = 12$.

$x - 6$

12 $- 6$	What do you substitute for x?
6	Evaluate.

Evaluating Algebraic Expressions Involving Order of Operations

Evaluate each algebraic expression for the given variable values.

A. $9 + 4m$ for $m = 3$

$9 + 4($3$)$	What do you substitute for m?
$9 +$ 12	Multiply.
21	Add.

B. $2x^2 - 3x + 4$ for $x = 5$

$2($5$)^2 - 3($5$) + 4$	What do you substitute for x?
$2($25$) - 3(5) + 4$	Evaluate the exponent.
50 $-$ 15 $+ 4$	Do you multiply or add next?
35 $+ 4$	Subtract.
39	Add.

Evaluating Algebraic Expressions With Two Variables

Evaluate the algebraic expression for the given variable values.

$2n + m^2$ for $n = 9$ and $m = 12$

$2($9$) + (m)^2$	What do you substitute for n?
$2(9) + ($12$)^2$	What do you substitute for m?
$2(9) +$ 144	First, evaluate the exponent.
18 $+ 144$	Do you multiply or add next?
162	Add.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 4

Algebraic Reasoning

Skills Intervention: Translating Words into Math

To solve real world problems, expressions using words must be translated into algebraic expressions.

Translating Simple Verbal Expressions into Algebraic Expressions

Write each phrase as an algebraic expression.

A. the quotient of 40 and *m*

The word *quotient* means _____. The symbol is _____.

Write the expression: _____.

B. 17 more than a number, *n*

The words *more than* mean _____. The symbol is _____.

Write the expression: _____.

Translating Complex Verbal Expressions into Algebraic Expressions

Write an algebraic expression.

A. 3 times the difference of a number and 10

Write an expression for *3 times*. _____

What does *difference* mean? _____ What symbol do you use? _____

Write an expression for the *difference of a number and 10.* _____

Write the expression. _____

B. the sum of 6 times a number and 5

Write an expression for 6 *times a number.* _____

What operation and symbol do you use for the word *sum*? _____

Write the expression. _____

Translating Real-World Problems Into Algebraic Expressions

Geraldine pays a flat monthly cable fee of $35.00 per month and $5.00 for every movie she orders. Write an expression to represent her monthly cable bill.

Let ___ represent the number of movies she orders.

How much does she pay for one movie? _____

The total amount spent for movies ordered every month is _____.

The monthly cable bill is the _____ of the flat fee and the movie fee,

or _____ + _____.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 4

Algebraic Reasoning

Skills Intervention: Translating Words into Math

To solve real world problems, expressions using words must be translated into algebraic expressions.

Translating Simple Verbal Expressions into Algebraic Expressions

Write each phrase as an algebraic expression.

A. the quotient of 40 and *m*

The word *quotient* means divide. The symbol is ÷.

Write the expression: 40 ÷ *m*.

B. 17 more than a number, *n*

The words *more than* mean add. The symbol is +.

Write the expression: *n* + 17.

Translating Complex Verbal Expressions into Algebraic Expressions

Write an algebraic expression.

A. 3 times the difference of a number and 10

Write an expression for *3 times*. 3 •

What does *difference* mean? subtract What symbol do you use? −

Write an expression for the *difference of a number and 10.* *x* − 10

Write the expression. 3 • (*x*−10)

B. the sum of 6 times a number and 5

Write an expression for 6 *times a number.* (6*x*)

What operation and symbol do you use for the word *sum*? addition, +

Write the expression. 6*x* + 5

Translating Real-World Problems Into Algebraic Expressions

Geraldine pays a flat monthly cable fee of $35.00 per month and $5.00 for every movie she orders. Write an expression to represent her monthly cable bill.

Let *m* represent the number of movies she orders.

How much does she pay for one movie? $5.00

The total amount spent for movies ordered every month is 5.00*m*.

The monthly cable bill is the sum of the flat fee and the movie fee, or 35.00 + 5.00*m*.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 4

Algebraic Reasoning

Problem Solving Intervention: Translating Words into Math

To solve some problems, you may need to write an expression that contains more than one operation.

You are painting model cars. It takes a total of 20 minutes to set up and clean up. It takes 8 minutes to paint each car. Write an expression to show the total time it takes to paint *n* cars.

Understand the Problem

1. What will *n* stand for in the expression you write?

_____

2. How many minutes are spent on each part of the job?

_____

Make a Plan

3. Write an expression for the time in minutes you spend actually painting the *n* cars, not counting setting up and cleaning up.

_____

Solve

4. Write an expression for the total time in minutes needed to paint *n* cars, including setting up and cleaning up.

_____

Look Back

5. According to the expression you wrote, how many minutes in all are needed for one car? Why does that make sense?

_____

_____

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 4

Algebraic Reasoning

Problem Solving Intervention: Translating Words into Math

To solve some problems, you may need to write an expression that contains more than one operation.

You are painting model cars. It takes a total of 20 minutes to set up and clean up. It takes 8 minutes to paint each car. Write an expression to show the total time it takes to paint *n* cars.

Understand the Problem

1. What will *n* stand for in the expression you write?

The number of cars you paint

2. How many minutes are spent on each part of the job?

8 minutes for each car and 20 minutes for setting up and cleaning up

Make a Plan

3. Write an expression for the time in minutes you spend actually painting the *n* cars, not counting setting up and cleaning up.

$8n$

Solve

4. Write an expression for the total time in minutes needed to paint *n* cars, including setting up and cleaning up.

$8n + 20$

Look Back

5. According to the expression you wrote, how many minutes in all are needed for one car? Why does that make sense?

28 minutes; That makes sense because you use 8 minutes to paint and 20 minutes for clean up and set up.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 5

Algebraic Reasoning

Skills Intervention: Simplifying Algebraic Expressions

A **term** can be a number, a variable, or a product of numbers and variables. A **coefficient** is the number a variable is multiplied by. Like terms are terms that have the same variable raised to the same power. Like terms do not have to have the same coefficient.

Vocabulary
term
coefficient

Identifying Like Terms

Identify like terms.

6 $5x$ $\frac{3}{7}x^2$ xy x^2y^2 $1.3x^2y^2$ $9x$ $\frac{1}{2}x^2y^2$ $5x^2$

Look for variables with the same power.

What is the power of $5x$? _____

What is the power of $5x^2$? ____

Like terms: ____ and ____; $\frac{3}{7}x^2$ and 5____; x^2y^2, _____ and _____

____ and ____ are not like terms with any other term.

Simplifying Algebraic Expressions

Combine like terms.

A. $4m + 2m$

$4m + 2m$

____

Are $4m + 2m$ like terms? _____

Add the coefficients.

B. $14x^2 + 8x - 5x^2 - 2x + x$

____x^2 ____x^2 ____x ____x ____ x

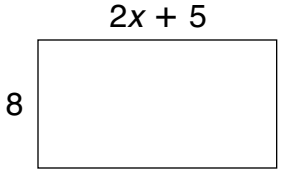
$9x^2 + 7x$

Rearrange terms so like terms are together.
Add or subtract the coefficients.

Geometry Application

Write an expression for the perimeter, p, of the rectangle.

How do you find the perimeter of a rectangle?



_____

p = _____ + 8 + $(2x + 5)$ + ____

When you add $2x$ and $2x$, you only add the _____.

p = ____ + ____

Combine like terms.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 5

Algebraic Reasoning

Skills Intervention: Simplifying Algebraic Expressions

A **term** can be a number, a variable, or a product of numbers and variables. A **coefficient** is the number a variable is multiplied by. Like terms are terms that have the same variable raised to the same power. Like terms do not have to have the same coefficient.

Vocabulary
term
coefficient

Identifying Like Terms

Identify like terms.

$6 \quad 5x \quad \frac{3}{7}x^2 \quad xy \quad x^2y^2 \quad 1.3x^2y^2 \quad 9x \quad \frac{1}{2}x^2y^2 \quad 5x^2$

Look for variables with the same power.

What is the power of $5x$? **1**

What is the power of $5x^2$? **2**

Like terms: **$5x$** and **$9x$**; $\frac{3}{7}x^2$ and 5 **x^2**; x^2y^2, **$1.3x^2y^2$,** and **$\frac{1}{2}x^2y^2$**

6 and **xy** are not like terms with any other term.

Simplifying Algebraic Expressions

Combine like terms.

A. $4m + 2m$

$4m + 2m$

$6m$

Are $4m + 2m$ like terms? **yes**

Add the coefficients.

B. $14x^2 + 8x - 5x^2 - 2x + x$

14 x^2 **$-$ 5** x^2 **$+$ 8** x **$-$ 2** x **$+$** x

Rearrange terms so like terms are together.

$9x^2 + 7x$

Add or subtract the coefficients.

Geometry Application

Write an expression for the perimeter, p, of the rectangle.

$2x + 5$

8 [ ]

How do you find the perimeter of a rectangle?

Find the sum of all four sides.

$p =$ **$(2x + 5)$** $+ 8 + (2x + 5) +$ **8**

When you add $2x$ and $2x$, you only add the **coefficients**.

$p =$ **$4x$** $+$ **26**

Combine like terms.

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 5

Algebraic Reasoning

Problem Solving Intervention: Simplifying Algebraic Expressions

Sometimes when you combine like terms, you get 0. If that happens, you may be able to solve a problem even though there doesn't seem to be enough information, like in the problem below.

Brian and Alex shopped at a music store that sells all their used CDs at one price and all their new CDs at another price. Brian bought 5 used CDs and 3 new CDs. Alex bought 7 used CDs and returned 3 new CDs for a cash refund. Together they left the store with $90 less than they had when they entered. How much was each used CD?

Understand the Problem

1. Are you asked to find the cost of each used CD? The cost of each new CD? _____

Make a Plan

2. If you write an expression for the total amount that Brian and Alex spent, what variables will you use and what will they stand for?

_____

_____

3. What will be the value of the expression? _____

Solve

4. Write algebraic expressions for the money spent by Brian, the money spent by Alex, and the money spent by Brian and Alex together.

_____

5. Combine like terms to simplify the last expression you wrote in Exercise 4. _____

6. What is the value of u if $12u$ is 90? What is the cost of each used CD? _____

Look Back

7. Suppose each new CD cost $10. Would Brian and Alex still have left the store with $90 less than they entered with? Explain.

_____

_____

_____

Name _____ Date _____ Class _____

Ready to Go On?

LESSON 5

Algebraic Reasoning

Problem Solving Intervention: Simplifying Algebraic Expressions

Sometimes when you combine like terms, you get 0. If that happens, you may be able to solve a problem even though there doesn't seem to be enough information, like in the problem below.

Brian and Alex shopped at a music store that sells all their used CDs at one price and all their new CDs at another price. Brian bought 5 used CDs and 3 new CDs. Alex bought 7 used CDs and returned 3 new CDs for a cash refund. Together they left the store with $90 less than they had when they entered. How much was each used CD?

Understand the Problem

1. Are you asked to find the cost of each used CD? The cost of each new CD?

yes; no

Make a Plan

2. If you write an expression for the total amount that Brian and Alex spent, what variables will you use and what will they stand for?

u stands for the cost of a used CD and *n* for the cost of a new CD.

(Students may use letters other than *u* and *n*.)

3. What will be the value of the expression?

$90

Solve

4. Write algebraic expressions for the money spent by Brian, the money spent by Alex, and the money spent by Brian and Alex together.

$5u + 3n$; $7u - 3n$; $5u + 3n + 7u - 3n$

5. Combine like terms to simplify the last expression you wrote in Exercise 4.

$12u$

6. What is the value of u if $12u$ is 90? What is the cost of each used CD?

$u = 7.5$; $7.50

Look Back

7. Suppose each new CD cost $10. Would Brian and Alex still have left the store with $90 less than they entered with? Explain.

Yes; Brian would have spent 5(7.50) + 3(10), or $67.50. Alex would have spent 7(7.50) − 3(10), or $22.50. Their total spent would be $67.50 + $22.50, or $90.

Name _____ Date _____ Class _____

Ready to Go On?

SECTION 1B

Algebraic Reasoning

SECTION B: Quiz for Lessons 3 Through 5

3 Variables and Algebraic Expressions

Evaluate each expression for the given value of the variable.

1. $6x - 14$ for $x = 5$ _____

2. $3r^2 \div 12$ for $r = 4$ _____

3. $(9 + k) \cdot 8$ for $k = 1$ _____

4. $4(y \div 3)$ for $y = 15$ _____

5. $n^3 - 35$ for $n = 6$ _____

6. $4pt$ for $p = 3$ and $t = 5$ _____

7. $9 - x + t$ for $x = 3$ and $t = 10$ _____

8. $4q^2 - (m \div 3)$ for $q = 7$ and $m = 33$ _____

4 Translating Words into Math

Write each phrase as an algebraic expression.

9. the product of a number and 7 _____

10. add 25 to a number _____

11. a number decreased by 6 _____

12. the quotient of a number and 5 _____

13. 3 times a number _____

14. take away 14 from a number _____

15. Sarah was 116 cm tall when she started to measure her height. She grows an average of 3 cm each month. Write an algebraic expression to show Sarah's height after h months.

_____

5 Simplifying Algebraic Expressions

Simplify each expression.

16. $6x - 7 + 3x - 7x$

_____

17. $3y^3 + 3y^2 + y^2 - 8$

_____

18. $5 - 6b + a + b$

_____

19. $2h + 10 - 5h + 7g + 3g$

_____

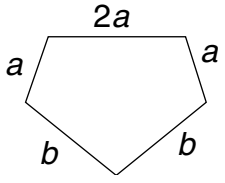
20. $5r^2 - 34 + 100 + 3r^2$

_____

21. $10 - 4h - 5h - 2h$

_____

22. Write an expression for the perimeter of the figure. Then simplify the expression.



_____

Name _____ Date _____ Class _____

Ready to Go On?

SECTION 1B

Algebraic Reasoning

SECTION B: Quiz for Lessons 3 Through 5

3 Variables and Algebraic Expressions

Evaluate each expression for the given value of the variable.

1. $6x - 14$ for $x = 5$ **16**

2. $3r^2 \div 12$ for $r = 4$ **4**

3. $(9 + k) \cdot 8$ for $k = 1$ **80**

4. $4(y \div 3)$ for $y = 15$ **20**

5. $n^3 - 35$ for $n = 6$ **181**

6. $4pt$ for $p = 3$ and $t = 5$ **60**

7. $9 - x + t$ for $x = 3$ and $t = 10$ **16**

8. $4q^2 - (m \div 3)$ for $q = 7$ and $m = 33$ **185**

4 Translating Words into Math

Write each phrase as an algebraic expression.

9. the product of a number and 7 **7x**

10. add 25 to a number **d + 25**

11. a number decreased by 6 **t − 6**

12. the quotient of a number and 5 **a ÷ 5**

13. 3 times a number **3q**

14. take away 14 from a number **p − 14**

15. Sarah was 116 cm tall when she started to measure her height. She grows an average of 3 cm each month. Write an algebraic expression to show Sarah's height after h months.

116 + 3h

5 Simplifying Algebraic Expressions

Simplify each expression.

16. $6x - 7 + 3x - 7x$ **2x − 7**

17. $3y^3 + 3y^2 + y^2 - 8$ **$3y^3 + 4y^2 - 8$**

18. $5 - 6b + a + b$ **5 − 5b + a**

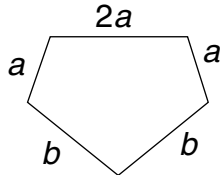
19. $2h + 10 - 5h + 7g + 3g$ **−3h + 10 + 10g**

20. $5r^2 - 34 + 100 + 3r^2$ **$8r^2 + 66$**

21. $10 - 4h - 5h - 2h$ **10 − 11h**

22. Write an expression for the perimeter of the figure. Then simplify the expression.

a + a + 2a + b + b; 4a + 2b



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Ready to Go On?

SECTION 1B

Algebraic Reasoning

SECTION B Enrichment: Evaluating Expressions with Expressions

A variable is used for an unknown number. When given a value for the variable, you substitute that value into the expression and simplify. Can the value given also be an expression?

Yes. Substitute the expression that the variable is equal to into the given expression and simply. If the expression being substituted has a variable, then the simplified form will still have a variable.

Evaluate $x + 20$ when $x = y + 15$.

$x + 20$	
$(y + 15) + 20$	Substitute $y + 15$ for x.
$y + (15 + 20)$	Use the Associative Property.
$y + 35$	Add.

Evaluate each expression for the given expression of the variable.

1. $x + 8$ when $x = a + 4$ _____

2. $b - 16$ when $b = 12 + c$ _____

3. $x + 8$ when $x = 2y$ _____

4. $14 - v$ when $v = y + 1$ _____

5. $x + 100$ when $x = y - 100$ _____

6. $100 + 2x$ when $x = 3y$ _____

7. $4t + 5$ when $t = x + 5$ _____

8. $w + 2$ when $w = 10z + 1$ _____

Name _____ Date _____ Class _____

Ready to Go On?

SECTION 1B

Algebraic Reasoning

SECTION B Enrichment: Evaluating Expressions with Expressions

A variable is used for an unknown number. When given a value for the variable, you substitute that value into the expression and simplify. Can the value given also be an expression?

Yes. Substitute the expression that the variable is equal to into the given expression and simply. If the expression being substituted has a variable, then the simplified form will still have a variable.

Evaluate $x + 20$ when $x = y + 15$.

$x + 20$	
$(y + 15) + 20$	Substitute $y + 15$ for x.
$y + (15 + 20)$	Use the Associative Property.
$y + 35$	Add.

Evaluate each expression for the given expression of the variable.

1. $x + 8$ when $x = a + 4$ — $a + 12$
2. $b - 16$ when $b = 12 + c$ — $c - 4$
3. $x + 8$ when $x = 2y$ — $2y + 8$
4. $14 - v$ when $v = y + 1$ — $13 - y$
5. $x + 100$ when $x = y - 100$ — y
6. $100 + 2x$ when $x = 3y$ — $100 - 6y$
7. $4t + 5$ when $t = x + 5$ — $4x + 25$
8. $w + 2$ when $w = 10z + 1$ — $10z + 3$