LESSON 1-7

Practice A

Simplifying Expressions

Simplify each expression.

1. $13 + 4 + 7 + 6$ — 30
2. $5 \cdot 3 \cdot 4$ — 60
3. $12 + 9 + 11 + 6$ — 38
4. $2 \cdot 16 \cdot 50$ — 1600
5. $-15 + 7 + 13 + 15$ — 20
6. $-8 \cdot 7 \cdot 10$ — -560

Fill in the blanks to write each product using the Distributive Property.

7. $25(11)$
   $= 25(\underline{10}) + 25(1)$
   $= 250 + 25$
   $= \underline{275}$
8. $15(18)$
   $= 15(20) - \underline{15}(2)$
   $= \underline{300} - 30$
   $= 270$
9. $3(109)$
   $= 3(100) + 3(\underline{9})$
   $= 300 + \underline{27}$
   $= \underline{327}$

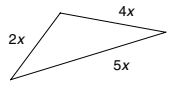
Simplify each expression by combining like terms.

10. $12x + 18x$ — $30x$
11. $9n^2 - 4n^2$ — $5n^2$
12. $-16y + 18y$ — $2y$
13. $4t^3 - 2t^2$ — $4t^3 - 2t^2$
14. $17d - 20d$ — $-3d$
15. $-4r^3 + 11r^3$ — $7r^3$

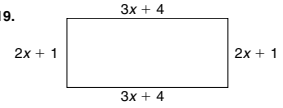
Fill in the blanks with the property that was used for that step: Associative, Commutative, or Distributive.

16. $3n + 8 + 12n$
    $= 8 + 3n + 12n$ — Commutative
    $= 8 + (3n + 12n)$ — Associative
    $= 8 + 15n$ — Add like terms.
17. $4(x + 5) - 2x$
    $= 4x + 20 - 2x$ — Distributive
    $= 4x - 2x + 20$ — Commutative
    $= 2x + 20$ — Subtract like terms.

Write and simplify an expression that represents the perimeter of each figure shown.

18. 

$4x + 5x + 2x$; $11x$

19. 

$2x+1+3x+4+2x+1+3x+4$; $10x+10$

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LESSON 1-7

Practice B

Simplifying Expressions

Simplify each expression.

1. $18 + 9 + 1 + 12$ — 40
2. $7 \cdot 15 \cdot 2$ — 210
3. $3 + 4\frac{1}{2} + 11 + 5\frac{1}{2}$ — 24
4. $-5 \cdot 7 \cdot 20$ — -700
5. $-12 + 3 + 12 + 19$ — 22
6. $-1 \cdot 5 \cdot 9 \cdot 2$ — -90

Write each product using the Distributive Property. Then simplify.

7. $14(12)$ — $14(10) + 14(2)$; 168
8. $5(47)$ — $5(50) - 5(3)$; 235
9. $4(106)$ — $4(100) + 4(6)$; 424

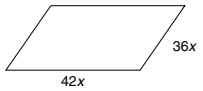
Simplify each expression by combining like terms.

10. $16x + 27x$ — $43x$
11. $-4m + 12m$ — $8m$
12. $6t^2 - 2t^2$ — $4t^2$
13. $-5w^3 + 18w^3$ — $13w^3$
14. $4p + 7p^2$ — $4p + 7p^2$
15. $-2.6d - 3.4d$ — $-6d$

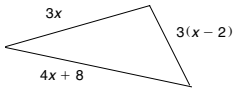
Simplify each expression. Justify each step.

16. $4(x + 9) + 5x$
    $4x + 36 + 5x$ Dist. Property
    $4x + 5x + 36$ Comm. Property
    $(4x + 5x) + 36$ Assoc. Property
    $9x + 36$ Combine Like Terms
17. $-12d + 3 + 14d + 18$
    $-12d + 14d + 3 + 18$ Comm.
    $(-12d + 14d) + (3 + 18)$ Assoc.
    $2d + 21$ Combine Like Terms

Give an expression in simplified form for the perimeter of each figure.

18. 

$156x$

19. 

$10x + 2$

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LESSON 1-7

Practice C

Simplifying Expressions

Simplify each expression.

1. $-63 + 8 + 63 + 15$ — 23
2. $24 + 19 + 21 + 2$ — 66
3. $5\frac{1}{2} + 7 + 3\frac{1}{2} + 1$ — 17
4. $-6 + 9 + 26 + 8$ — 37
5. $\frac{1}{4} \cdot 3 \cdot 28$ — 21
6. $-4 \cdot 23 \cdot 250$ — $-23{,}000$

Write each product using the Distributive Property. Then simplify.

7. $18(12)$ — $18(10) + 18(2)$; 216
8. $7(57)$ — $7(60) - 7(3)$; 399
9. $13(103)$ — $13(1000) + 13(3)$; 1339

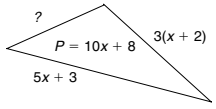
Simplify each expression by combining like terms.

10. $32y + 17y$ — $49y$
11. $8.3p^2 + 4.8p^2$ — $13.1p^2$
12. $-22n + 18n - 15n$ — $-19n$
13. $3x + 17.2x + 8x^2$ — $20.2x + 8x^2$
14. $-6 + 7m + 8$ — $7m + 2$
15. $9t - 4t^2 - 12t + 15t^2$ — $-3t + 11t^2$

Simplify each expression. Justify each step.

16. $-13b^2 + 5b - b^2$
    $-13b^2 - b^2 + 5b$ Comm.
    $(-13b^2 - b^2) + 5b$ Assoc.
    $-14b^2 + 5b$ Combine Like Terms
17. $-3(8x + 4) + \frac{1}{2}(6x - 24)$
    $-24x - 12 + 3x - 12$ Dist.
    $-24x + 3x - 12 - 12$ Comm.
    $(-24x + 3x) + (-12 - 12)$ Assoc.
    $-21x - 24$ Combine Like Terms

Given the perimeter *P*, find the missing measurement.

18. 

$2x - 1$

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LESSON 1-7

Reteach

Simplifying Expressions

The following properties make it easier to do mental math.

Property	Addition	Multiplication
Commutative Property	$3 + 4 = 4 + 3$	$2 \cdot 5 = 5 \cdot 2$
Associative Property	$(3 + 4) + 5 = 3 + (4 + 5)$	$(2 \cdot 4) \cdot 10 = 2 \cdot (4 \cdot 10)$
Distributive Property	$2(5 + 9) = 2(5) + 2(9)$	

Simplify 14 + 37 + 6.

$14 + 37 + 6$ *Identify compatible numbers.*
$37 + 14 + 6$ *Use the Commutative Property to rearrange the numbers.*
$37 + (14 + 6)$ *Use the Associative Property to group the compatible numbers.*
$37 + 20$ *Add.*
57

Simplify 5(24).

$5(24)$
$5(20 + 4)$ *"Break apart" 24 into numbers compatible with 5.*
$5(20) + 5(4)$ *Distribute 5.*
$100 + 20$ *Multiply.*
120 *Add.*

Use the properties above to simplify each expression.

1. $7 + 36 + 3$ — 46
2. $13.2 + 15 + 5 + 1.8$ — 35
3. $4 \cdot 9 \cdot 5$ — 180
4. $6(32)$ — 192
5. $23 \cdot \frac{1}{2} \cdot 200$ — 2300
6. $4(88)$ — 352

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LESSON 1-7

Reteach

Simplifying Expressions continued

Terms can be combined only if they are **like terms**. Like terms can have different coefficients, but they must have the same variables raised to the same powers.

Like Terms	Not Like Terms
$4x^2$, $7x^2$	$3m$, $5m^3$
$12y$, $18y$	$12y$, $12xy$
$5ab^2$, $-ab^2$	st^4, $3s^4t$

Simplify $24x^3 - 4x^3$.

$24x^3 - 4x^3$	
$20x^3$	*Subtract the coefficients only.*

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

$\mathbf{4x + 4y} + 5x - 9$	*Distribute 4.*
$4x + \mathbf{5x + 4y} - 9$	*Use the Commutative Property.*
$\mathbf{9x} + 4y - 9$	*Add the like terms 4x and 5x.*
$9x + 4y - 9$	*No other terms are like terms.*

State whether each pair of terms are like terms.

7. $4xy$ and $3xy$ — yes

8. $2s^2$ and $5s$ — no

9. $-10a$ and $-10b$ — no

If possible, simplify each expression by combining like terms.

10. $7st - 3st$ — $4st$

11. $10y^3 + 5y - 4y^3$ — $6y^3 + 5y$

12. $12x^3 + 6x^4$ — $12x^3 + 6x^4$

Simplify each expression.

13. $3(x + 6) - 2$ — $3x + 16$

14. $7y + 2(y - 5) + y$ — $10y - 10$

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LESSON 1-7

Challenge

Distributing More Than Once

Sometimes it is helpful to use the Distributive Property more than once.

Write the product $82(63)$ using the Distributive Property. Then simplify.

$82(63)$	
$(80 + 2)(60 + 3)$	*Rewrite 82 as 80 + 2, and rewrite 63 as 60 + 3.*
$(80 + 2)(60) + (80 + 2)(3)$	*Use the Distributive Property to distribute (80 + 2).*
$80(60) + 2(60) + 80(3) + 2(3)$	*Distribute 60 through (80 + 2). Do the same for 3.*
$4800 + 120 + 240 + 6$	*Multiply.*
5166	*Add.*

Write each product using the Distributive Property. Then simplify.

1. $51(74)$

$(50 + 1)(70 + 4)$
$(50 + 1)(70) + (50 + 1)(4)$
$50(70) + 1(70) + 50(4) + 1(4)$
$3500 + 70 + 200 + 4$
3774

2. $39(92)$

$[40 + (-1)][90 + 2)]$
$[40 + (-1)](90) + [40 + (-1)](2)$
$40(90) + (-1)(90) + 40(2) + (-1)(2)$
$3600 - 90 + 80 - 2$
3588

3. $96(98)$

$[100 + (-4)][100 + (-2)]$
$[100 + (-4)](100) + [100 + (-$
$100(100) + (-4)(100) + 100(-2) +$
$10{,}000 - 400 - 200 + 8$
9408

You can also distribute several times to simplify algebraic expressions.

Use the Distributive Property to simplify the product $(x + 5)(x - 4)$.

$(x + 5)(x - 4)$	
$(x + 5)[x + (-4)]$	*To subtract 4, add −4.*
$(x + 5)(x) + (x + 5)(-4)$	*Distribute (x + 5).*
$x(x) + 5(x) + x(-4) + 5(-4)$	*Distribute x through (x + 5). Do the same for −4.*
$x^2 + 5x - 4x - 20$	*Multiply. x(x) can be written as the power x^2.*
$x^2 + x - 20$	*Combine like terms.*

Use the Distributive Property to simplify each product.

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

$(x + 3)(x) + (x + 3)(8)$
$x(x) + 3(x) + x(8) + 3(8)$
$x^2 + 3x + 8x + 24$
$x^2 + 11x + 24$

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

$[x + (-2)](x + 7)$
$[x + (-2)](x) + [x + (-2)](7)$
$x(x) + (-2)(x) + x(7) + (-2)(7)$
$x^2 - 2x + 7x - 14$
$x^2 + 5x - 14$

6. $(a + b)(c + d)$

$(a + b)(c) + (a + b)(d)$
$ac + bc + ad + bd$

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LESSON 1-7

Problem Solving

Simplifying Expressions

Write the correct answer.

1. An English teacher gives students 1 point for reading a magazine article, 5 points for reading a chapter of a book, and 20 points for completing an entire book. If Sue reads 4 magazine articles, 7 chapters, and completes 2 books this term, how many points will she earn?

79

2. A recipe for chocolate chip cookies calls for $2\frac{1}{2}$ cups of flour, 1 cup of butter, $\frac{1}{2}$ cup of brown sugar, $\frac{3}{4}$ cup of sugar, and 1 cup of chocolate chips. Find the total number of cups of ingredients.

$5\frac{3}{4}$ cups

3. A rectangular desktop has a length of $3(x + 2)$ units and a width of $x - 7$ units. Write an expression, in simplified form, for the perimeter of the desktop.

$8x - 2$

4. Lucy is k years old. She has a sister who is three years younger than she is and another sister who is five years less than twice Lucy's age. Write an expression, in simplified form, for the sum of the three girls' ages.

$4k - 8$

Use the table below for questions 5 – 7, which shows expected flight times to and from New York City and five other cities. The legs of each trip vary in time due to the wind. Select the best answer.

Expected Flight Times

City	Inbound (h)	Outbound (h)
Mexico City	5.5	4.5
Paris	7.25	8.0
San Diego	5.4	4.75
Atlanta	2.3	2
Rome	7.75	8.5

5. Find the sum of the expected outbound flight times.

A 23 h **C** 27.75 h
B 26 h **D** 28.25 h

6. If Marty plans to travel from New York to Paris and back in February, and then from New York to Rome and back in April, what will be his total flight time for both trips?

F 15.25 h **H** 31.0 h
G 16.25 h **J** 31.5 h

7. Juan's flight time to San Diego was x hours longer than expected. His flight back was y hours less than expected. Which expression shows Juan's total flight time?

A $10.15xy$ **C** $10.15 + x - y$
B $5.4x - 4.75y$ **D** $5.4x(4.75y)$

8. Last month, Heather flew from New York to Atlanta and back twice a week for 3 weeks. What was her total flight time if there were no delays?

F 12.9 h **H** 19.8 h
G 13.8 h **J** 25.8 h

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LESSON 1-7

Reading Strategies

Focus on Vocabulary

The Commutative, Associative, and Distributive Properties are used to simplify expressions and combine like terms. By connecting each property with a vocabulary word that has the same root, you will better understand how to use each property.

Commutative Property → think "**commute**": to travel back and forth
Ex: $7 \cdot 5 = 5 \cdot 7$ → changing the order is okay for + and ×

Asscociative Property → think "**associate**": to be in a group with
Ex: $(9 + 8) + 2 = 9 + (8 + 2)$ → changing the grouping is okay for + and ×

Distributive Property → think "**distribute**": to spread out to all
Ex: $2(8 + 3) = 2 \cdot 8 + 2 \cdot 3$ → the lead number is multiplied by all in ( )

Answer each problem.

1. Give an example of the Commutative Property for addition.

Possible answer: $18 + 9 + 2 = 18 + 2 + 9$

2. Write a non-mathematical sentence using the word "distribute."

Possible answer: Mr. Wiley will distribute the test to all the students.

An expression is simplified below. Justify each step of the process by naming the property that was used or by writing "combine like terms."

$27 + 3(2x + 6) + 2x$	
$27 + 6x + 18 + 2x$	**3.** Distributive Property
$27 + 18 + 6x + 2x$	**4.** Commutative Property
$(27 + 18) + (6x + 2x)$	**5.** Associative Property
$45 + (6x + 2x)$	**6.** combine like terms
$45 + 8x$	**7.** combine like terms

Use the properties above to simplify each expression.

8. $8 \cdot 3 \cdot 5$ — 120

9. $7(3 + x) + 6$ — $27 + 7x$

10. $12x + 4(8x + 2) + 8x$ — $52x + 8$

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