NAME_____ DATE _____

The Parts of Cars You Don't See!
Relationships between Quantities

Vocabulary

Choose the word that best completes each statement.

sequence	term

1. A _____ is a pattern involving an ordered arrangement of numbers, geometric figures, letters, or other objects.

2. A _____ is a number, variable, or product of numbers and variables.

Problem Set

Write the missing terms in each sequence.

1. Number of pairs of socks: 1, 2, 3, 4, 5, 6
   Number of socks: 2, 4, 6, __8__ , __10__ , __12__

2. Number of dogs: 1, 3, 5, 7, 9, 11
   Number of legs: 4, 12, 20, _____, _____, _____

3. Number of tricycles: 1, 2, 3, 4, 5, 6
   Number of wheels: 3, 6, 9, _____, _____, _____

4. Number of freight trucks: 1, 2, 3, 4, 5, 6
   Number of tires: 10, 20, 30, _____, _____, _____

5. Number of train engines: 2, 4, 6, 8, 10, 12
   Number of wheels: 12, 24, 36, _____, _____, _____

6. Number of spiders: 2, 4, 6, 8, 10, 12
   Number of legs: 16, 32, 48, _____, _____, _____

8

Write an algebraic expression to represent each sequence.

7. 3, 4, 5, 6, …

$n + 2$

8. 3, 6, 9, 12, …

9. 7, 14, 21, 28, …

10. 13, 14, 15, 16, …

11. 6, 11, 16, 21, …

12. 48, 46, 44, 42, …

13. 0, 3, 8, 15, …

14. 50, 150, 250, 350, …

Identify the number of terms and then the terms themselves for each algebraic expression.

15. $2x - 8$

2 terms

The first term is $2x$, and the second term is the constant 8.

16. $3a + 9b - 12$

17. $15 + 35x$

18. $6m - 18n + 7p - 21$

19. $8x - 14y + 5z$

20. $120 - 4a + 25b + 13c$

NAME_____ DATE _____

21. $x - y + 4$

22. $24a + 9b$

Write an algebraic expression that represents each statement.

23. A pencil costs $0.19. How much money will you spend if you buy p pencils?

0.19p

24. You can run a mile in 8 minutes. How long will it take you to run m miles?

25. You have 300 newspapers to deliver. How many newspapers will you have left after delivering newspapers to h houses?

26. You own 9 pairs of socks. How many socks will you own after buying s more pairs?

27. You have 4 bookshelves and you want to have the same number of books on each shelf.
If you have b books, how many books will be on each shelf?

28. You have a roll of 100 stickers that you will share with f friends. How many stickers will each friend get?

8

Write an algebraic expression that represents each word expression.

29. six times a number, *n*

6*n*

30. forty-three less than twice a number, *n*

31. two-thirds of a number, *n*

32. a number, *n,* plus one hundred ten

33. ten times a number, *n,* less seventeen

34. eight hundred five divided by a number, *n*

NAME_____ DATE _____

8

Tile Work
Simplifying Algebraic Expressions

Vocabulary

Match each term to the best definition.

1. Commutative Property of Addition

2. Commutative Property of Multiplication

3. Associative Property of Addition

4. Associative Property of Multiplication

5. simplify

6. like terms

a. For any numbers a and b, $a + b = b + a$.

b. For any numbers a, b, and c, $(a \times b) \times c = a \times (b \times c)$.

c. Two or more terms that have the same variable raised to the same power.

d. For any numbers a and b, $a \times b = b \times a$.

e. For any numbers a, b, and c, $(a + b) + c = a + (b + c)$.

f. To use the rules of arithmetic and algebra to rewrite an expression with fewer terms.

Problem Set

Evaluate each numerical expression using the Order of Operations.

1. $3(2) + 4(5)$

$$3(2) + 4(5) = 6 + 20$$
$$= 26$$

2. $43 - 4^2$

3. $4 + 6 \times 8$

4. $14 + (13 + 12)$

8

5. $7 + 8 - 15 \div 5$

6. $72 \div 3^2 - 2$

7. $(4 \times 7) - (32 \div 8)$

8. $24 \div (2 + 4)$

9. $(3 + 3)^2 \div (7 + 2)$

10. $(9 - 4) \times (1 + 5) + 5^2$

Evaluate each pair of numerical expressions using the Order of Operations.

11. $13 - (8 + 2)$ and $(13 - 8) + 2$

$13 - (8 + 2) = 13 - 10 = 3$

and $(13 - 8) + 2 = 5 + 2 = 7$

12. $88 \div (4 + 7)$ and $(88 \div 4) + 7$

13. $2(7 \times 8)$ and $(2 \times 7)8$

14. $(16 - 2) + (9 - 5)$ and $16 - (2 + 9) - 5$

15. $(4 + 1)(2 + 3)$ and $4 + (1 \times 2) + 3$

16. $5 + (8 + 7)$ and $(5 + 8) + 7$

NAME _____ DATE _____

Write an equivalent numerical expression for each using the Commutative and Associative Properties. Then determine the sum or product.

17. $7 + 6 + 3$

Answers may vary.

$(7 + 3) + 6 = 10 + 6$

$\qquad\qquad = 16$

18. $5 \times 6 \times 4$
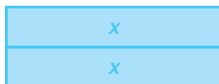
19. $2 \times 8 \times 3 \times 5$

20. $9 + 4 + 11 + 16$

21. $8 \times 2 \times 8$

22. $4 + 7 + 1 + 6 + 3$

Represent each algebraic expression using algebra tiles. Then sketch the model.

23. $2x$

24. $x + 5$

25. $3y + 1$
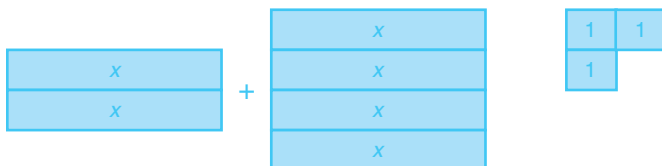
26. $6y$

27. 8

28. $4x + 3$

NAME_____ DATE _____

Simplify each algebraic expression using a model.

29. $2x + (4x + 3)$

$6x + 3$

30. $(3y + 1) + 8$

31. $(x + 5) + 2x + 8$

32. $(3y + 1) + 6y$

8

33. $(4x + 3) + (x + 5) + 2x$

34. $6y + 8 + (3y + 1)$

Simplify each algebraic expression.

35. $(7x + 3) + (x + 2)$
    $8x + 5$

36. $4y + 9y + 8y + 5$

37. $(2y - 1) + (4y + 8)$

38. $(5x + 4y) + (3x - 3y)$

39. $3x - 9y + 4$

40. $4.5x + (6y - 3.5x) + 7$

41. $\left(\frac{2}{3}y + \frac{5}{8}x + \frac{1}{4}\right) + \left(\frac{1}{4}x + \frac{1}{2}\right)$

42. $(5.3x - 8.2y) + (13.3y - 4.1x)$

NAME_____   DATE _____

Blueprints to Floorplans to Computers
Using the Distributive Property to Simplify Algebraic Expressions

Vocabulary

For any numbers *a, b,* and *c,* write the property.

  1. Distributive Property of Multiplication over Addition

  2. Distributive Property of Multiplication over Subtraction

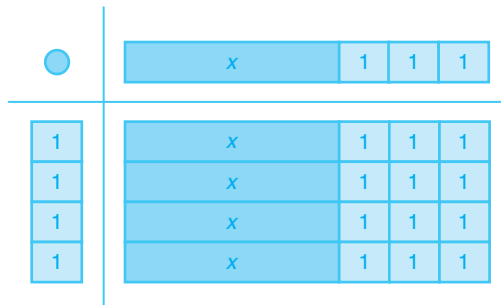 **3.** Distributive Property of Division over Addition

  4. Distributive Property of Division over Subtraction

8

Problem Set

Use algebra tiles to simplify each expression. Sketch the model. Then, rewrite the expression using the Distributive Property.

1. $4(x + 3)$

	x	1	1	1

1	x	1	1	1
1	x	1	1	1
1	x	1	1	1
1	x	1	1	1

$4x + 12$

2. $3(3x + 1)$

8

NAME_____ DATE _____

3. $6(x + 2)$

4. $(2x + 4)5$

8

5. $(x + 5)3$

6. $2(4x + 3)$

NAME_____ DATE _____

Rewrite each expression using the Distributive Property. Then, simplify if possible.

7. $6(3x + 4)$

$18x + 24$

8. $3(5x + 1) + 5(x + 6)$

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

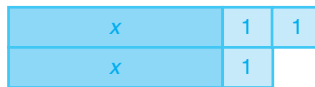**10.** $2(7x - 8) + x$

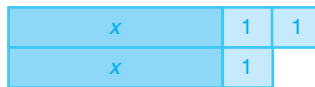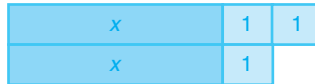**11.** $9x + 4(2x + 20)$

12. $7(4x - 9)$

13. $\frac{3}{8}(16x - 48) + 3x$

14. $5(x + 4) + 8(y - 2)$

8

Use algebra tiles to divide each expression by the number given. Sketch the model. Write an expression to represent the model.

15. $6x + 9$ into 3 equal groups

x	1	1
x	1	

x	1	1
x	1	

x	1	1
x	1	

$3(2x + 3)$

16. $4y + 10$ into 2 equal groups

17. $3 + 2(5x + 6)$ into 5 equal groups

18. $14 + 4x + 18y$ into 2 equal groups

19. $12x + 32$ into 4 equal groups

8

20. $3(2x + 9) + 6x$ into 3 equal groups

Simplify each expression using a Distributive Property.

21. $\dfrac{8x + 14}{2}$

$$\dfrac{8x + 14}{2} = \dfrac{8x}{2} + \dfrac{14}{2}$$
$$= 4x + 7$$

22. $\dfrac{26 - 12x}{2}$

23. $\dfrac{3(5x + 11) + 7}{5}$

24. $\dfrac{4x - 9}{2}$

25. $\dfrac{6(x + 1) + 30}{6}$

26. $\dfrac{13 + 2(7x - 3)}{7}$

NAME_____   DATE _____

Are They Saying the Same Thing?
Multiple Representations of Equivalent Expressions

Vocabulary

Define the term in your words.

1. equivalent expressions

Problem Set

Determine if the two expressions may be equivalent. Use 3 different values for *x* and complete the table.

1.

x	7(5x + 3)	35x + 21
1	56	56
3	126	126
5	196	196

$7(5x + 3) \approx 35x + 21$

2.

x	(2x − 9)8	16x + 72

3.

x	$\frac{4}{5}(x + 3)$	$\frac{4}{5}x + \frac{7}{5}$

8

4.

x	$\frac{3}{7}(x-5)$	$\frac{3}{7}x - \left(\frac{15}{7}\right)$

5.

x	$(3x+8)+(6-x)$	$4x+14$

6.

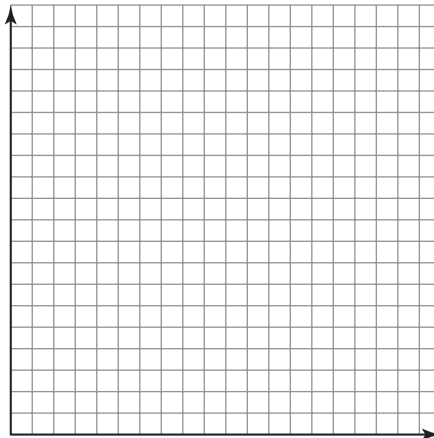| x	$4(4x-7)+2(6x+15)$	$28x+2$

NAME_____ DATE _____

Determine if the two expressions in each pair equivalent using a graphical approach.
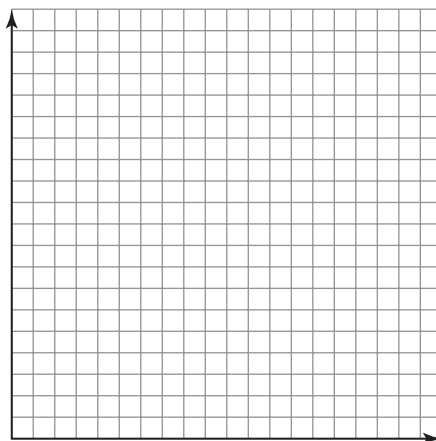
7. $2x + 1$ and $2\left(x + \dfrac{1}{2}\right)$
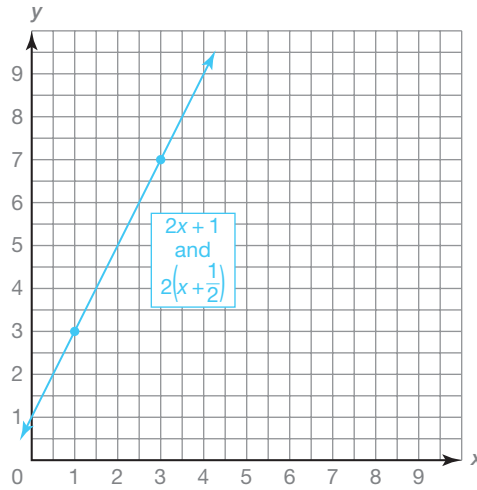
$$2x + 1 = 2\left(x + \dfrac{1}{2}\right)$$
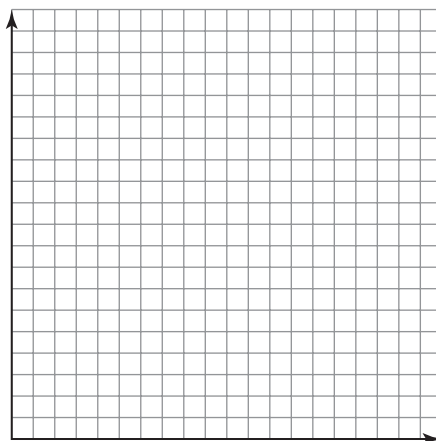
8. $x + 3(2x + 1)$ and $7x + 3$

8

9. $\frac{2}{3}(x + 3)$ and $\frac{2}{3}(x + 5)$
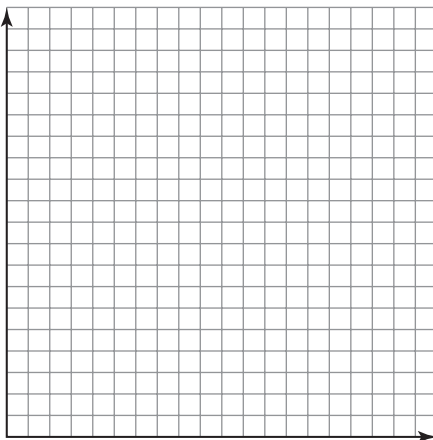

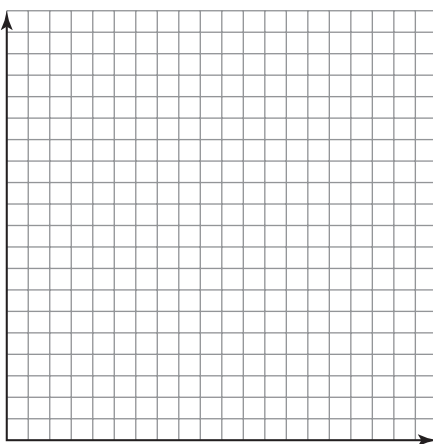**10.** $2(3x + 2) - 2x$ and $4x + 2$

NAME_____ DATE _____

8

11. $3x + 4$ and $\frac{1}{4}(8x + 4) + x$

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

8

Answer each question. Then write an expression that can be used to solve for any input.
Be sure to define the variable.

13. Marc gets $20 per week allowance. He also makes $10 per lawn he mows. If he saves half
of his money, at the end of the week, how much will he have to spend if he mows 4 lawns?

$$\frac{20 + 10(4)}{2} = 30$$

Marc will have $30 to spend.

$$\frac{20 + 10m}{2} = 10 + 5m$$

Let m represent the number of lawns Marc mows during the week.

14. Grace is trying to read as many books over the summer as she can. Her father promised
to give her a quarter for every book she reads. She has already read 17 books. If she reads
25 more, how much money will her father owe her?

15. Four students are assigned a project. They must each write an even portion of their
summary paper. If they each already wrote one page of introduction and the paper is
supposed to be 40 pages, how many more pages does each student need to write?

NAME_____ DATE _____

16. Mr. Hartman joined the Book-of-the-Month Club. In his first order, he received an initial
3 books for $0.10 each. In the same order, he also bought a number of additional books for
$9.99 each. If he spent $70.23 on his total order, how many books did Mr. Hartman buy?

17. Every Saturday, Tyler buys comic books. A third of the comics he buys are collector's items
and he puts them in storage. He gives half of the rest to his brother and reads the other
half himself. If Tyler buys 18 comic books, how many will he have to read?

18. Yasmine is making friendship bracelets for her friends. She uses $\frac{3}{4}$ yard of jute to make
each bracelet and she already has 5 yards of jute. Two of her friends are allergic to jute, so
she must use cotton string, which she already has. How much more jute will she need to
buy to make bracelets for her 20 friends?

NAME_____ DATE _____

Like and Unlike
Combining Like Terms

Problem Set

Represent each algebraic expression using algebra tiles and the operation symbols.

1. $4x + 1$

| x |
| x |
| x |
| x |

$+$ | 1 |

2. $2y + 3$

3. $x^2 + 2y^2 + 5$
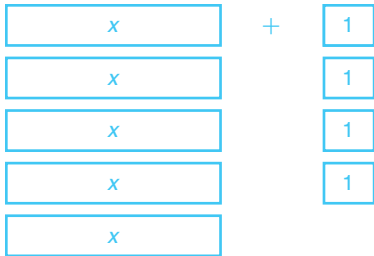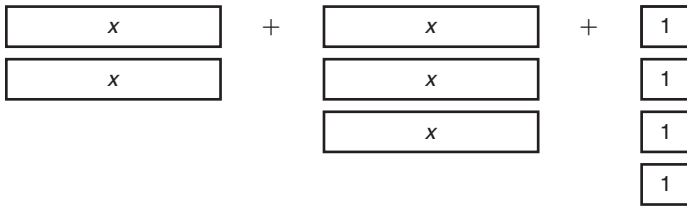
8

4. $y^2 + 3y + 1 + y$

5. $x + 2 + 3x + 3$

6. $2x^2 + 2y^2 + x + 6$

NAME _____ DATE _____

8

Each algebraic expression is represented using algebra tiles and the operation symbols. If possible, rearrange the tiles to combine like terms and to reduce the number of terms to the fewest possible terms. Then write the algebraic expression represented by the new model.
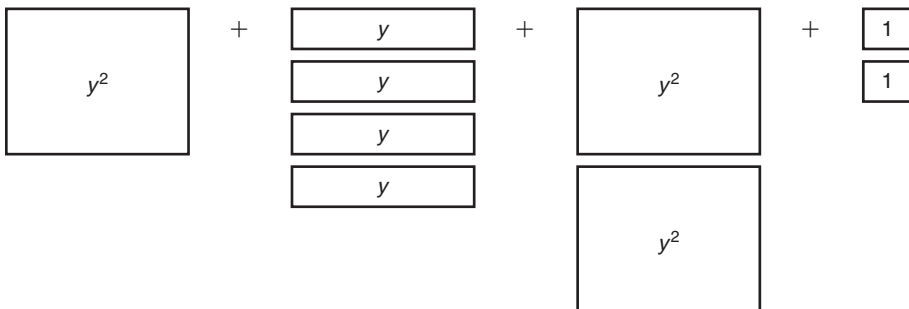
7. $2x + 3x + 4$

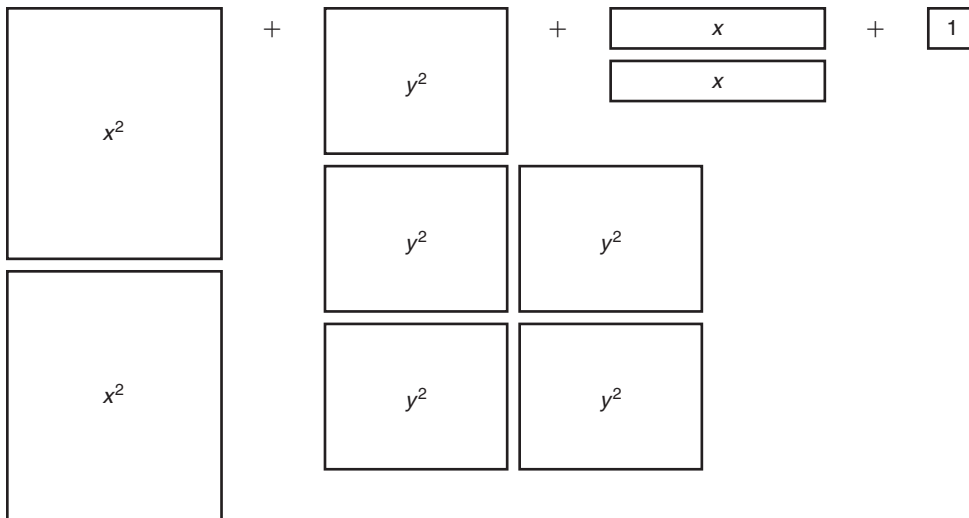| x | $+$ | x | $+$ | 1 |
x		x		1
		x		1
				1

x	$+$	1
x		1
x		1
x		1
x		

$5x + 4$

8

8. $y^2 + 4y + 2y^2 + 2$

y^2	+	y	+	y^2	+	1
		y				1
		y		y^2		
		y				

NAME_____ DATE _____

9. $2x^2 + 5y^2 + 2x + 1$

$$x^2$$ + $$y^2$$ + $$x$$ + $$1$$

$$x^2$$ $$y^2$$ $$y^2$$ $$x$$

$$y^2$$ $$y^2$$

8

10. $5 + 2y + 3 + 6y$

1	+	y	+	1	+	y
1		y		1		y
1				1		y
1						y
1						y
						y
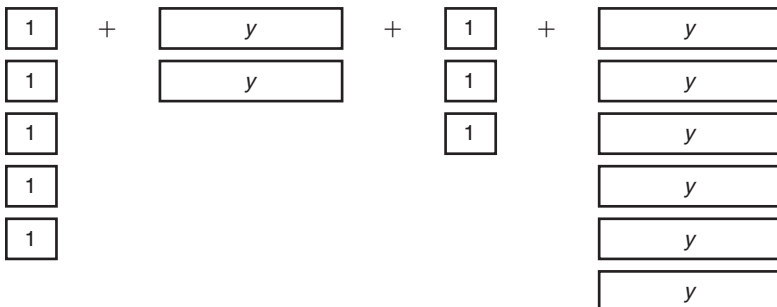
NAME_____ DATE _____

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

| x^2 | + | y^2 | + | x^2 | + | y^2 |
| | | | | | | y^2 |

| x^2 | x^2 |

8
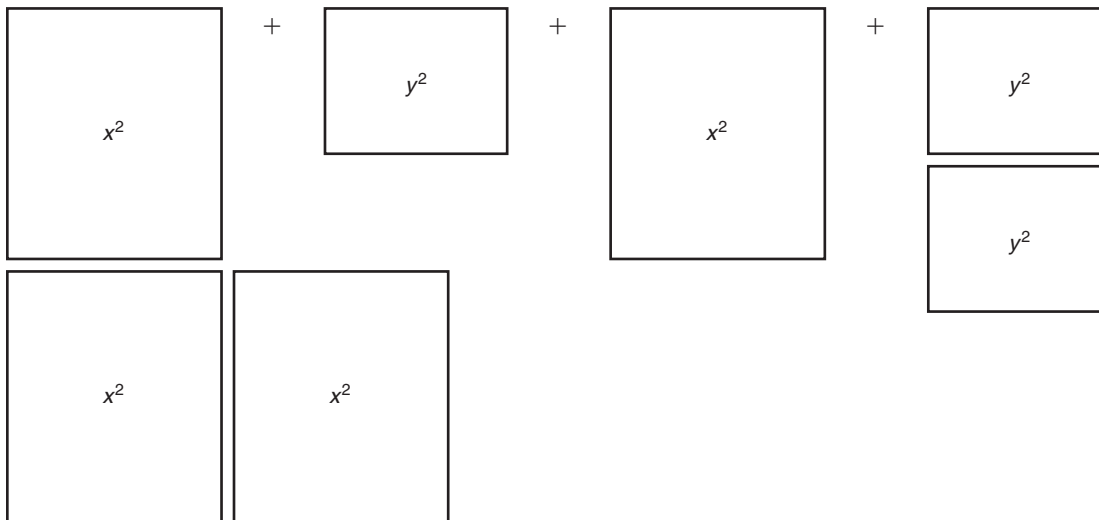
12. $y^2 + x^2 + y^2 + 2x^2$

| y^2 | + | x^2 | + | y^2 | + | x^2 | x^2 |
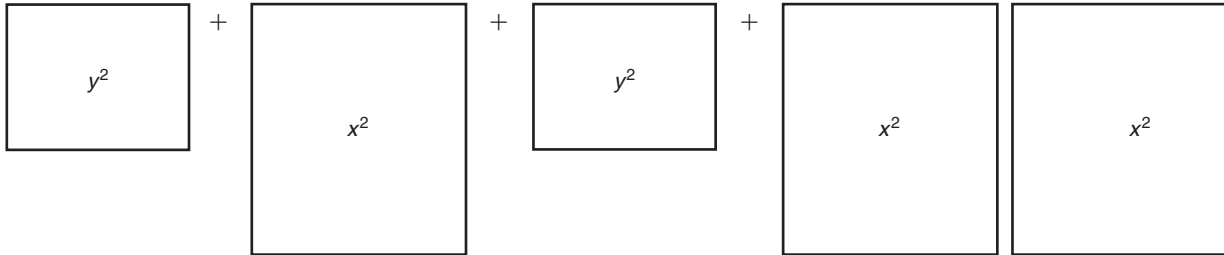
Simplify each algebraic expression by combining like terms.

13. $2x^2 + 7x - x^2 + 2x$

$2x^2 + 7x - x^2 + 2x = 2x^2 - x^2 + 7x + 2x$

$= x^2 + 9x$

14. $3y - 2x - 3y + 7x$

15. $5x^3 + 2x^2 + 8 - 5x^2$

16. $12x + 3y^3 - 8x + 2y^2$

17. $3x^2 + 6x - 2y + 4x^2 + 3y - x$

18. $7y^3 + 3x - 7y^2 - 2y^3 - x$

Simplify each algebraic expression by using the distributive properties and then combining like terms.

19. $3(x + 2) - 4x$

$$3(x + 2) - 4x = 3x + 6 - 4x$$
$$= 6 - x$$

8

20. $2(5 - x) + 3(x - 2y)$

21. $7(2x + y) + 5(x + 4y)$

22. $8x + 3(2x - 9)$

23. $\dfrac{6y - 8x}{2} - 3x + 5y$

24. $9x + 6y + \dfrac{12y + 16x}{4}$

NAME_____ DATE _____

DVDs and Songs: Fun with Expressions
Using Algebraic Expressions to Analyze and Solve Problems

Problem Set

Define variables and write an algebraic expression that represents each situation.

1. Miguel has three times as many books as Jose.

Let *j* represent the number of books that Jose has.

Let *m* represent the number of books that Miguel has.

$m = 3j$

Answers will vary.

2. Rosa has 5 fewer bracelets than Maria.

3. Edward has 6 more model planes than Jeremy.

8

4. Chloe has half as many stamps as Morgan.

5. Brittany has 5 more pairs of shoes than Emily. Sarah has twice as many pairs of shoes as Brittany.

6. Terrance has one fewer sibling than Casey. Kolbie has three more siblings than Terrance.

NAME_____   DATE _____

7. Conner has half as many comic books as Devyn. Isaac has 4 more comic books than Conner.

8. Hayle has 2 more swimming trophies than Anastasia. Jenna has three times as many trophies as Hayle.

9. Dustin has 2 more hockey jerseys than Zachary. Mason has 1 fewer hockey jersey than Dustin.

8

10. Kasey has filled 5 fewer water balloons than Tyler. Jacob has filled twice as many water balloons as Kasey. Let *k, t,* and *j* represent the number of water balloons that Kasey, Tyler, and Jacob have, respectively. The algebraic expressions $k = t - 5$ and $j = 2(t - 5)$ represent the number of water balloons that each boy has filled. If Tyler has 10 water balloons, calculate the number of water balloons that Kasey and Jacob have.

11. Sierra has twice as many pairs of earrings as Laney. Autumn has 4 more pairs of earrings than Sierra. Let *s, l,* and *a* represent the number of pairs of earrings that Sierra, Laney and Autumn have, respectively. The algebraic expressions $s = 2l$ and $a = 2l + 4$ represent the number of pairs of earrings each girl has. If Laney has 8 pairs of earrings, calculate the number of pairs of earrings that Sierra and Autumn have.

NAME_____ DATE _____

12. Lucas sold half as many granola bars for the school fundraiser as Caleb. Nathan sold 3 times as many granola bars as Lucas. Let *l, c,* and *n* represent the number of granola bars that Lucas, Caleb, and Nathan sold, respectively. The algebraic expressions $l = \frac{c}{2}$ and $n = 3\left(\frac{c}{2}\right)$ represent the number of granola bars that each boy sold. If Caleb sold 24 granola bars, calculate the number of granola bars that Lucas and Nathan sold.

13. Zain swam 3 more laps during swim class than Hannah. Elise swam 4 fewer laps than Hannah. Let *z, h,* and *e* represent the number of laps that Zain, Hannah and Elise swam, respectively. The algebraic expressions $z = h + 3$ and $e = h - 4$ represent the number of laps that each student swam. If Hannah swam 9 laps, calculate the total number of laps swam by all three students.

8

14. Tristan has 4 fewer grapes than Reagan in his lunch. Abby has 2 more grapes than Tristan. Let $t, r,$ and a represent the number of grapes that Tristan, Reagan, and Abby have, respectively. The algebraic expressions $t = r - 4$ and $a = (r - 4) + 2$ represent the number of grapes that each student has. If Regan has 15 grapes, calculate the total number of grapes that all three students have.

15. Matthew has 3 more pens than Lisa in his backpack. Daniel has twice as many pens as Matthew. Let $m, l,$ and d represent the number of pens that Matthew, Lisa, and Daniel have, respectively. The algebraic expressions $m = l + 3$ and $d = 2m$ represent the number of pens that each student has. If Lisa has 2 pens in her backpack, calculate the total number of pens that the boys have.