9-4

1. Plan

Objectives
1 To find the square of a binomial
2 To find the difference of squares

Examples
1 Squaring a Binomial
2 Real-World Problem Solving
3 Mental Math
4 Finding the Difference of Squares
5 Mental Math

Professional Development

Math Background

All polynomials can be multiplied using the processes taught in the previous lessons. Some special cases are easy to identify and have a pattern to their products that makes their multiplication quicker and easier.

More Math Background: p. 492C

Lesson Planning and Resources

See p. 492E for a list of the resources that support this lesson.

PowerPoint

Bell Ringer Practice

Check Skills You'll Need
For intervention, direct students to:

More Multiplication Properties of Exponents
Lesson 8-4: Example 3
Extra Skills and Word Problem Practice, Ch. 8

Multiplying Binomials
Lesson 9-3: Example 2
Extra Skills and Word Problem Practice, Ch. 9

Multiplying Special Cases

What You'll Learn

- To find the square of a binomial
- To find the difference of squares

. . . And Why

To find the probability of a Labrador retriever inheriting dark fur, as in Example 2

Check Skills You'll Need

GO for Help Lessons 8-4 and 9-3

Simplify.

1. $(7x)^2$ $49x^2$
2. $(3v)^2$ $9v^2$
3. $(-4c)^2$ $16c^2$
4. $(5g^3)^2$ $25g^6$

Use FOIL to find each product.

5. $(j + 5)(j + 7)$ $j^2 + 12j + 35$
6. $(2b - 6)(3b - 8)$ $6b^2 - 34b + 48$
7. $(4y + 1)(5y - 2)$ $20y^2 - 3y - 2$
8. $(x + 3)(x - 4)$ $x^2 - x - 12$
9. $(8c^2 + 2)(c^2 - 10)$ $8c^4 - 78c^2 - 20$
10. $(6y^2 - 3)(9y^2 + 1)$ $54y^4 - 21y^2 - 3$

1 Finding the Square of a Binomial

Activity: Exploring Special Products

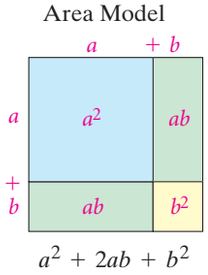
1. Find each product. 1–3. See back of book.

Row 1:	$(x + 8)(x + 8)$	$(y + 5)(y + 5)$	$(2p + 3)(2p + 3)$
Row 2:	$(d - 3)(d - 3)$	$(t - 1)(t - 1)$	$(9r - 2)(9r - 2)$
Row 3:	$(x + 4)(x - 4)$	$(k + 9)(k - 9)$	$(3c + 7)(3c - 7)$

2. Describe the pattern or patterns you found in each row.
3. Based on the patterns you found, predict each product.
   $(p + 6)(p + 6)$ $(v - 5)(v - 5)$ $(x + 8)(x - 8)$
4. Use FOIL to find each product in Question 2. Were your predictions correct? yes

You can write the expression $(a + b)^2$ as $(a + b)(a + b)$. You can find $(a + b)^2$ using the methods you learned in Lesson 9-3.

Area Model



FOIL

$(a + b)(a + b)$
$= a^2 + ab + ba + b^2$ Use FOIL.
$= a^2 + 2ab + b^2$ Simplify.

Differentiated Instruction Solutions for All Learners

Special Needs L1
Pair students who have visual or dyslexic difficulties with other students to complete the activity. Have them dictate alternate answers in the matrix.

learning style: verbal

Below Level L2
Suggest to students that when squaring a binomial, they write out what *a* and *b* equal before substituting in the formula.

learning style: verbal

The expressions $(a - b)^2$ and $(a + b)^2$ are squares of binomials. To square a binomial, you can use FOIL or the following rule.

Key Concepts

Rule **The Square of a Binomial**

$(a + b)^2 = a^2 + 2ab + b^2$

$(a - b)^2 = a^2 - 2ab + b^2$

The square of a binomial is the square of the first term plus twice the product of the two terms plus the square of the last term.

1 EXAMPLE Squaring a Binomial

a. Find $(x + 7)^2$.

$(x + 7)^2 = x^2 + 2x(7) + 7^2$ **Square the binomial.**

$= x^2 + 14x + 49$ **Simplify.**

b. Find $(4k - 3)^2$.

$(4k - 3)^2 = (4k)^2 - 2(4k)(3) + 3^2$ **Square the binomial.**

$= 16k^2 - 24k + 9$ **Simplify.**

Quick Check

1 Find each square. See left.

a. $(t + 6)^2$ **b.** $(5y + 1)^2$ **c.** $(7m - 2p)^2$ **d.** $(9c - 8)^2$

1a. $t^2 + 12t + 36$

b. $25y^2 + 10y + 1$

c. $49m^2 - 28mp + 4p^2$

d. $81c^2 - 144c + 64$

You can square binomials to find probabilities that apply to real-world situations.

2 EXAMPLE Real-World Problem Solving

Real-World Connection

The color of a Labrador retriever is determined by a pair of genes. The offspring inherits a single gene at random from each of its parents.

Among Labrador retrievers, the dark-fur gene D is dominant, and the yellow-fur gene Y is recessive. This means that a dog with at least one dominant gene (DD or DY) will have dark fur. A dog with two recessive genes (YY) will have yellow fur.

The Punnett square at the right models the possible combinations of color genes that parents who carry both genes can pass on to their offspring. Since YY is $\frac{1}{4}$ of the outcomes, the probability that a puppy has yellow fur is $\frac{1}{4}$.

	D	Y
D	DD	DY
Y	DY	YY

You can model the probabilities found in the Punnett square with the expression $(\frac{1}{2}D + \frac{1}{2}Y)^2$. Show that this product gives the same result as the Punnett square.

$(\frac{1}{2}D + \frac{1}{2}Y)^2 = (\frac{1}{2}D)^2 + 2(\frac{1}{2}D)(\frac{1}{2}Y) + (\frac{1}{2}Y)^2$ **Square the binomial.**

$= \frac{1}{4}D^2 + \frac{1}{2}DY + \frac{1}{4}Y^2$ **Simplify.**

The expressions $\frac{1}{4}D^2$ and $\frac{1}{4}Y^2$ indicate that the probability offspring will have either two dominant genes or two recessive genes is $\frac{1}{4}$. The expression $\frac{1}{2}DY$ indicates that there is $\frac{1}{2}$ chance that the offspring will inherit both genes. These are the same probabilities shown in the Punnett square.

2. Teach

Guided Instruction

Activity

Teaching Tip

Ask: *Why do you think the first two rows are referred to as "squares of binomials?"* **Each factor is the same.** *How is Row 3 different from the other two rows?* **The signs of the second terms are not the same.** *What happens when the signs of the second terms are different?* **There is no middle term in the product.**

1 EXAMPLE Error Prevention

Some students may think the product is $x^2 + 7^2$, or $x^2 + 49$. Remind students that the expression $(x + 7)^2$ means to write the group of terms that are inside the parentheses twice, and then multiply them. Writing the product as $x^2 + 7^2$ is squaring each term separately.

3 EXAMPLE Auditory Learners

Students sometimes forget the factor 2 in the middle term. Have students repeat the following: *For the second term, multiply the product by 2.* Encourage students to stress *second* and *2* while they repeat the phrase five more times.

Advanced Learners L4

Ask students to compute $(a + b)^3$ and $(a - b)^3$.

learning style: verbal

English Language Learners ELL

Some students may not understand the concepts of *dominant gene* and *recessive gene*. Relate the words to the verbs *dominate* and *recede*.

learning style: verbal

Additional Examples

1 a. Find $(y + 11)^2$.
$y^2 + 22y + 121$
b. Find $(3w - 6)^2$.
$9w^2 - 36w + 36$

2 Among guinea pigs, the black fur gene (B) is dominant and the white fur gene (W) is recessive. This means that a guinea pig with at least one dominant gene (BB or BW) will have black fur. A guinea pig with two recessive genes (WW) will have white fur. You can model the probabilities with the expression $\left(\frac{1}{2}B + \frac{1}{2}W\right)^2$. Show the result this product gives.
$\frac{1}{4}B^2 + \frac{1}{2}BW + \frac{1}{4}W^2$

3 a. Find 81^2 using mental math. 6561
b. Find 59^2 using mental math. 3481

4 EXAMPLE Teaching Tip

Have students multiply the binomials using the FOIL method to reassure themselves that the sum of the middle terms is zero.

Additional Examples

4 Find $(p^4 - 8)(p^4 + 8)$ $p^8 - 64$

5 Find $43 \cdot 37$. 1591

Resources
- Daily Notetaking Guide 9-4 L3
- Daily Notetaking Guide 9-14—Adapted Instruction L1

Closure

Ask students to describe in words how to square a binomial. **The square of a binomial is the square of the first term, plus twice the product of the two terms, plus the square of the last term.**

Quick Check 2 **Games** When you play a game with two number cubes, you can find probabilities by squaring a binomial. Let A represent rolling 1 or 2 and B represent rolling 3, 4, 5, or 6. The probability of A is $\frac{1}{3}$, and the probability of B is $\frac{2}{3}$.
a. Find $\left(\frac{1}{3}A + \frac{2}{3}B\right)^2$. $\frac{1}{9}A^2 + \frac{4}{9}AB + \frac{4}{9}B^2$
b. What is the probability that both number cubes you roll show 1 or 2? $\frac{1}{9}$
c. What is the probability that one number cube shows a 1 or 2 and the other shows 3, 4, 5, or 6? $\frac{4}{9}$
d. What is the probability that both number cubes show 3, 4, 5, or 6? $\frac{4}{9}$

Using mental math, you can square a binomial to find the square of a number.

3 EXAMPLE Mental Math

a. Find 51^2 using mental math.

$51^2 = (50 + 1)^2$
$= 50^2 + 2(50 \cdot 1) + 1^2$ ← Square the binomial. → $= 50^2 - 2(50 \cdot 1) + 1^2$
$= 2500 + 100 + 1 = 2601$ ← Simplify. → $= 2500 - 100 + 1 = 2401$

b. Find 49^2 using mental math.

Quick Check 3 Find each square using mental math.
a. 31^2 961 **b.** 29^2 841 **c.** 98^2 9604 **d.** 203^2 41,209

2 Difference of Squares

The product of the sum and difference of the same two terms also produces a pattern.

$$(a + b)(a - b) = a^2 - ab + ba - b^2$$
$$= a^2 - b^2$$

Notice that the sum of $-ab$ and ba is 0, leaving $a^2 - b^2$. This product is called the difference of squares.

Key Concepts

Rule The Difference of Squares

$(a + b)(a - b) = a^2 - b^2$

The product of the sum and difference of the same two terms is the difference of their squares.

4 EXAMPLE Finding the Difference of Squares

Find $(t^3 - 6)(t^3 + 6)$.

$(t^3 - 6)(t^3 + 6) = (t^3)^2 - (6)^2$ Find the difference of squares.
$= t^6 - 36$ Simplify.

Quick Check 4 Find each product.
a. $(d + 11)(d - 11)$ $d^2 - 121$ **b.** $(c^2 + 8)(c^2 - 8)$ $c^4 - 64$ **c.** $(9v^3 + w^4)(9v^3 - w^4)$ $81v^6 - w^8$

pages 515–517 Exercises
1. $c^2 + 2c + 1$
2. $x^2 + 8x + 16$
3. $4v^2 + 44v + 121$

You can use the difference of squares to calculate products using mental math.

5 EXAMPLE **Mental Math**

Find $82 \cdot 78$.

$82 \cdot 78 = (80 + 2)(80 - 2)$ Express each factor using 80 and 2.

$= 80^2 - 2^2$ Find the difference of squares.

$= 6400 - 4 = 6396$ Simplify.

Quick Check 5 Find each product.

a. $18 \cdot 22$ 396 **b.** $19 \cdot 21$ 399 **c.** $59 \cdot 61$ 3599 **d.** $87 \cdot 93$ 8091

EXERCISES

For more exercises, see *Extra Skill and Word Problem Practice.*

Practice and Problem Solving

A Practice by Example

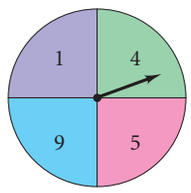
Examples 1, 2 (page 513)

GO for Help

Find each square. 1–8. See margin p. 514.

1. $(c + 1)^2$ 2. $(x + 4)^2$ 3. $(2v + 11)^2$ 4. $(3m + 7)^2$
5. $(w - 12)^2$ 6. $(b - 5)^2$ 7. $(6x - 8)^2$ 8. $(9j - 2)^2$

9. **Games** Suppose you play a game with two spinners like the one shown at the right. Let C represent spinning an even number. Let D represent spinning an odd number. The probability of C is $\frac{1}{4}$. The probability of D is $\frac{3}{4}$.



a. Simplify $\left(\frac{1}{4}C + \frac{3}{4}D\right)^2$. $\frac{1}{16}C^2 + \frac{3}{8}CD + \frac{9}{16}D^2$

b. Find $P(C \text{ and } C)$. $\frac{1}{16}$

c. How does the answer in part (b) relate to the polynomial in part (a)? It is the coefficient of C^2.

Example 3 (page 514)

Mental Math **Find each square.**

10. 61^2 3721 11. 99^2 9801 12. 48^2 2304 13. 302^2 91,204 14. 499^2 249,001

Example 4 (page 514)

Find each product. 15–20. See margin.

15. $(x + 4)(x - 4)$ 16. $(a + 8)(a - 8)$ 17. $(d + 7)(d - 7)$
18. $(h + 15)(h - 15)$ 19. $(y + 12)(y - 12)$ 20. $(k + 5)(k - 5)$

Example 5 (page 515)

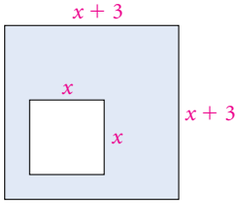
Mental Math **Find each product.**

21. $31 \cdot 29$ 899 22. $89 \cdot 91$ 8099 23. $52 \cdot 48$ 2496 24. $197 \cdot 203$ 39,991 25. $299 \cdot 301$ 89,999

B Apply Your Skills

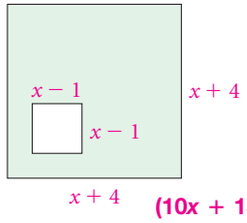
Geometry **Find an expression for the area of each shaded region. Write your answers in standard form.**

26.



$(6x + 9)$ units^2

27.



$(10x + 15)$ units^2

4. $9m^2 + 42m + 49$
5. $w^2 - 24w + 144$
6. $b^2 - 10b + 25$
7. $36x^2 - 96x + 64$
8. $81j^2 - 36j + 4$
15. $x^2 - 16$
16. $a^2 - 64$
17. $d^2 - 49$
18. $h^2 - 225$
19. $y^2 - 144$
20. $k^2 - 25$

3. Practice

Assignment Guide

1 A B	1-14, 26-40, 42-43
2 A B	15-25, 41, 44-52
C Challenge	53-57
Test Prep	58-63
Mixed Review	64-80

Homework Quick Check

To check students' understanding of key skills and concepts, go over Exercises 8, 22, 40, 41, 44.

Error Prevention!

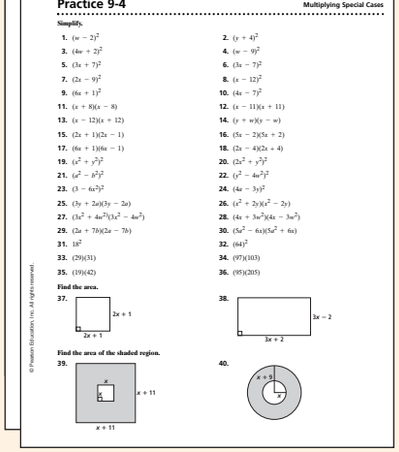
Exercises 1–8 Remind students that the square of a binomial has a negative middle term only when the binomial is a difference.

Careers

Exercise 40 A genetic counselor helps families analyze inheritance patterns and risks of recurrence of genetic disorders. Have interested students research inheritance of diseases such as cystic fibrosis that result from having two copies of a mutant gene. They could create different scenarios and tell the probabilities that a child would be born with the disease.

Differentiated Instruction Resources

GPS Guided Problem Solving L3
Enrichment L4
Reteaching L2
Adapted Practice L1
Practice L3


Practice 9-4 Multiplying Special Cases

Simplify.

1. $(w - 2)^2$
2. $(y + 4)^2$
3. $(4w + 2)^2$
4. $(w - 9)^2$
5. $(3x + 7)^2$
6. $(3x - 7)^2$
7. $(2x - 9)^2$
8. $(x - 12)^2$
9. $(6x + 1)^2$
10. $(4x - 7)^2$
11. $(x + 8)(x - 8)$
12. $(x - 11)(x + 11)$
13. $(x - 12)(x + 12)$
14. $(y + w)(y - w)$
15. $(2x + 1)(2x - 1)$
16. $(5x - 2)(5x + 2)$
17. $(6x + 1)(6x - 1)$
18. $(2x - 4)(2x + 4)$
19. $(x^2 + y^2)^2$
20. $(2x^2 + y^2)^2$
21. $(a^2 - b^2)^2$
22. $(y^2 - 4w^2)^2$
23. $(3 - 6x^2)^2$
24. $(4x - 3y)^2$
25. $(3y + 2a)(3y - 2a)$
26. $(x^2 + 2y)(x^2 - 2y)$
27. $(3x^2 + 4w^2)(3x^2 - 4w^2)$
28. $(4x + 3w^2)(4x - 3w^2)$
29. $(2a + 7b)(2a - 7b)$
30. $(5a^2 - 6x)(5a^2 + 6x)$
31. 19^2
32. $(64)^2$
33. $(29)(31)$
34. $(97)(103)$
35. $(19)(42)$
36. $(99)(205)$

Find the area.

37. $2x + 1$, $2x + 1$
38. $3x - 2$, $3x + 2$

Find the area of the shaded region.

39. x, x, $x + 11$, $x + 11$
40. $x + 9$

4. Assess & Reteach

PowerPoint

Lesson Quiz

Find each square.

1. $(y + 9)^2$ $y^2 + 18y + 81$
2. $(2h - 7)^2$ $4h^2 - 28h + 49$
3. 41^2 1681
4. 29^2 841
5. Find $(p^3 - 7)(p^3 + 7)$. $p^6 - 49$
6. Find $32 \cdot 28$. 896

Alternative Assessment

Group students in pairs. Give each group three number cubes. Instruct the students to write down any variable. Then have them roll one number cube and write the result as the exponent of the variable. Instruct students to roll another number cube. If the result is even, they are to write a plus sign; if it is odd, they are to write a negative sign. Tell students to roll the last number cube and write the result as the second term of the binomial. Have each student in the group square the binomial and check their results with the others. Repeat. You may also wish to have students just roll two number cubes and let these results represent a and b. Then have students write a plus sign and a minus sign in the binomials and square them.

pages 515–517 Exercises

28. $x^2 + 6xy + 9y^2$
29. $25p^2 - 10pq + q^2$
30. $36m^2 + 12mn + n^2$
31. $x^2 - 14xy + 49y^2$
32. $16k^2 + 56kj + 49j^2$
33. $4y^2 - 36xy + 81x^2$
34. $9w^2 + 60wt + 100t^2$
35. $36a^2 + 132ab + 121b^2$
36. $25p^2 - 60pq + 36q^2$
37. $36h^2 - 96hp + 64p^2$
38. $y^{10} - 18x^4y^5 + 81x^8$
39. $64k^2 + 64kh + 16h^2$

Find each square. 28–39. See margin.

28. $(x + 3y)^2$ **29.** $(5p - q)^2$ **30.** $(6m + n)^2$ **31.** $(x - 7y)^2$

32. $(4k + 7j)^2$ **33.** $(2y - 9x)^2$ **34.** $(3w + 10t)^2$ **35.** $(6a + 11b)^2$

36. $(5p - 6q)^2$ **37.** $(6h - 8p)^2$ **38.** $(y^5 - 9x^4)^2$ **39.** $(8k + 4h)^2$

Real-World Connection

The cow in the photo shows a typical roan coat.

40a. $\left(\frac{1}{2}R + \frac{1}{2}W\right)^2 = \frac{1}{4}R^2 + \frac{1}{2}RW + \frac{1}{4}W^2$

40. Biology The coat color of shorthorn cattle is determined by two genes, Red R and White W. RR produces red, WW produces white, and RW produces a third type of coat color called roan.

	R	W
R	RR	RW
W	RW	WW

a. Model the Punnett square with the square of a binomial. See below left.

b. If both parents have RW, what is the probability the offspring will also be RW? $\frac{1}{2}$

c. Write an expression to model a situation where one parent is RW while the other is RR. $\left(\frac{1}{2}R + \frac{1}{2}W\right)(R) = \frac{1}{2}R^2 + \frac{1}{2}RW$

d. What is the probability that the offspring of the parents in step (c) will have a white coat? 0

41. a. Copy and complete the table. a–c. See margin.

b. Describe any patterns you see.

c. Writing How does the difference of squares account for the pattern in the table?

$4^2 = 16$	$3 \cdot 5 = 15$
$5^2 = \blacksquare$	$4 \cdot 6 = 24$
$6^2 = \blacksquare$	$5 \cdot 7 = \blacksquare$
$7^2 = \blacksquare$	$6 \cdot 8 = \blacksquare$

42. Open-Ended Give a counterexample to show that $(x + y)^2 = x^2 + y^2$ is false. Answers may vary. Sample: $(2 + 2)^2 \stackrel{?}{=} 2^2 + 2^2$, $16 \neq 8$

43. Critical Thinking Does $(3\frac{1}{2})^2 = 9\frac{1}{4}$? Explain. See margin.

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Find each product. 44–52. See margin.

44. $(3y + 5w)(3y - 5w)$ **45.** $(p + 9q)(p - 9q)$ **46.** $(2d + 7g)(2d - 7g)$

47. $(7b - 8c)(7b + 8c)$ **48.** $(g + 7h)(g - 7h)$ **49.** $(g^3 + 7h^2)(g^3 - 7h^2)$

50. $(2a^2 + b)(2a^2 - b)$ **51.** $(11x - y^3)(11x + y^3)$ **52.** $(4k - 3h^2)(4k + 3h^2)$

Challenge

53. Write the expression $(a + b + c)^2$ in standard form. $a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$

54. Games Suppose you play a game by tossing 3 coins. You can find the probabilities by simplifying $\left(\frac{1}{2}H + \frac{1}{2}T\right)^3$.

a. Simplify the expression. $\frac{1}{8}H^3 + \frac{3}{8}H^2T + \frac{3}{8}HT^2 + \frac{1}{8}T^3$

b. Use the answer you found in part (a) to find the probability of getting a head and two tails (HT^2). $\frac{3}{8}$

55. Number Theory You can use factoring to show that the sum of two multiples of 3 is also a multiple of 3. a–b. See margin p. 517.

If m and n are integers, then $3n$ and $3m$ are multiples of three.
$3m + 3n = 3(m + n)$
Since $(m + n)$ is an integer, $3(m + n)$ is a multiple of three.

a. Show that if a number is one more than a multiple of 3, then its square is also one more than a multiple of 3.

b. Reasoning If a number is two more than a multiple of 3, is its square also two more than a multiple of 3? Explain.

56. The formula $V = \frac{4}{3}\pi r^3$ gives the volume of a sphere. Find the formula for the volume of a sphere that has a radius 3 more than r. Write your answer in standard form. $V = \frac{4}{3}\pi r^3 + 12\pi r^2 + 36\pi r + 36\pi$

41a.

$4^2 = 16$	$3 \cdot 5 = 15$
$5^2 = 25$	$4 \cdot 6 = 24$
$6^2 = 36$	$5 \cdot 7 = 35$
$7^2 = 49$	$6 \cdot 8 = 48$

b. n^2 is one more than the product $(n - 1)(n + 1)$.

c. The product $(n - 1)(n + 1)$ is $n^2 - 1$.

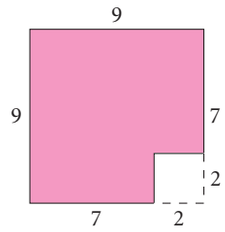
43. No; $\left(3\frac{1}{2}\right)^2 = \left(3 + \frac{1}{2}\right)^2 = \left(3 + \frac{1}{2}\right)\left(3 + \frac{1}{2}\right) = 3^2 + 2(3)\left(\frac{1}{2}\right) + \left(\frac{1}{2}\right)^2 = 9 + 3 + \frac{1}{4} = 12\frac{1}{4} \neq 9\frac{1}{4}$.

57. The area of the shaded region in the diagram is $9^2 - 2^2$.

a. Copy the figure. Make a single cut across the shaded region and reassemble it to show that $9^2 - 2^2 = (9 - 2)(9 + 2)$.

b. Draw your reassembled figure. Include its dimensions.

a–b. See back of book.



Test Prep

Multiple Choice

58. Which value of a makes $(9x - 1)^2 = ax^2 - 18x + 1$ true? **D**

A. 9 **B.** 18 **C.** 64 **D.** 81

59. Which value of n makes $(b^7 + 2)^2 = b^n + 4b^7 + 4$ true? **F**

F. 14 **G.** 28 **H.** 42 **J.** 49

60. Simplify $(x - 1)^2 + (x + 1)^2$. **C**

A. $2x$ **B.** $-2x$ **C.** $2x^2 + 2$ **D.** $2x^2$

61. Find the product of $(2x - 3)$, $(4x^2 + 9)$, and $(2x + 3)$. **H**

F. $16x^2 + 18$ **G.** $16x^4 + 18$
H. $16x^4 - 81$ **J.** $64x^4 - 81$

62. Which of the following correctly shows how to use the Difference of Squares rule to multiply 17 and 23? **B**

A. $17 \cdot 23 = (16 + 1)(16 + 7)$
$= 16^2 + (1 \cdot 7)$
$= 256 + 7$
$= 263$

B. $17 \cdot 23 = (20 - 3)(20 + 3)$
$= 20^2 - 9$
$= 400 - 9$
$= 391$

C. $17 \cdot 23 = (19 - 2)(19 + 4)$
$= 19^2 - (2 \cdot 4)$
$= 361 - 8$
$= 353$

D. $17 \cdot 23 = (18 - 1)(22 + 1)$
$= 18 \cdot 22 - 1^2$
$= 396 - 1$
$= 395$

Short Response

63. Explain how to compute the xy term of the product $(3x - 4y)^2$. **See left.**

63. [2] The xy term is twice the product of the first and last terms; $2(3x)(-4y) = -24xy$.

[1] incorrect explanation

Mixed Review

Lesson 9-3

Find each product. **64–72. See margin.**

64. $(k + 7)(k - 9)$ **65.** $(2x - 11)(x - 6)$ **66.** $(5p + 4)(3p - 1)$

67. $(3y + 1)(y + 1)$ **68.** $(4h - 2)(6h + 1)$ **69.** $(9b + 7)(8b + 2)$

70. $(2w^2 + 5)(w + 8)$ **71.** $(r - 7)(r^2 + 3r - 9)$ **72.** $(5m^2 - 2)(6m^3 + 4m)$

Lesson 8-2

Write each number in scientific notation.

73. 8713 **8.713 × 10^3** **74.** 0.031 **3.1 × 10^{-2}** **75.** 68,952 **6.8952 × 10^4** **76.** 1.2 million **1.2 × 10^6**

77. 11 **1.1 × 10^1** **78.** 523 **5.23 × 10^2** **79.** 6 billion **6 × 10^9** **80.** 0.72 **7.2 × 10^{-1}**

44. $9y^2 - 25w^2$
45. $p^2 - 81q^2$
46. $4d^2 - 49g^2$
47. $49b^2 - 64c^2$
48. $g^2 - 49h^2$
49. $g^6 - 49h^4$
50. $4a^4 - b^2$
51. $121x^2 - y^6$
52. $16k^2 - 9h^4$

Test Prep

Resources

For additional practice with a variety of test item formats:

- Standardized Test Prep, p. 545
- Test-Taking Strategies, p. 540
- Test-Taking Strategies with Transparencies

Exercise 59 You may wish to review the Multiplication Properties of Exponents in Lessons 8-3 and 8-4.

55a. $(3n + 1)(3n + 1) = 9n^2 + 6n + 1 = 3(3n^2 + 2n) + 1$; since $3n^2 + 2n$ is an integer, then $3(3n^2 + 2n)$ is a multiple of three and $3(3n^2 + 2n) + 1$ is one more than a multiple of three.

b. No; its square is one more than a multiple of three.

64. $k^2 - 2k - 63$
65. $2x^2 - 23x + 66$
66. $15p^2 + 7p - 4$
67. $3y^2 + 4y + 1$
68. $24h^2 - 8h - 2$
69. $72b^2 + 74b + 14$
70. $2w^3 + 16w^2 + 5w + 40$
71. $r^3 - 4r^2 - 30r + 63$
72. $30m^5 + 8m^3 - 8m$