Practice Book

3 Practice and Apply

Use Practice Book pp. 201–202

Assignment Guide	
Decelerated	1–12, 16–21, 30–31
Average	2–28 Even, 30–31
Accelerated	13–15, 22–31

■ Before assigning the exercises on Practice Book pages 201–202, work through the examples in the teaching display. Have students use the Remember box to explain how to determine if a trinomial is a perfect square.

Errors Commonly Made
When squaring a binomial, some students may forget to double the product of its terms. Suggest that they check their work by writing the square as a product and using the FOIL method.

■ Preview exercises 1–15, and discuss how to determine what the middle term of the perfect-square trinomial will be.

■ In exercises 16–27, remind students that the sign of the middle term of the trinomial determines whether the binomial will be a sum or difference. Point out that students are not expected to factor the trinomials that are not perfect squares.

■ Students should recognize that each side of the square in exercise 28 is one of the two equal factors of the given trinomial. They should also understand that the area of the square in exercise 29 is the square of the binomial.

TEST PREPARATION

■ Discuss exercises 30 and 31, having students suggest answer choices that can be easily eliminated.

8-4 Special Product and Factoring: $(a \pm b)^2 = a^2 \pm 2ab + b^2$

Name _____ Date _____

Evaluate: $(3m + 8)^2$

Square the first term. Twice the product of the terms Square the last term.

$(3m)^2 + 2(3m)(8) + (8)^2$

$9m^2 + 48m + 64$

So $(3m + 8)^2 = 9m^2 + 48m + 64$.

Remember:
The square of a binomial is the *square of the first term*, plus or minus *twice* the *product of both its terms*, plus the *square of the last term.*

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

Determine if $49q^2 - 28q + 16$ is a perfect square trinomial.

$49q^2 - 28q + 16$

$7q \bullet 7q - 2(7q)(4) + 4 \bullet 4$ ← Write the trinomial in the form $a^2 - 2ab + b^2$, where $a = 7q$, and $b = 4$.

Think
$-2(7q)(4) \stackrel{?}{=} -28q$
$-56q = -28q$ **False**

So $49q^2 - 28q + 16$ is *not* a perfect square trinomial.

Square each binomial.

1. $(x + 15)^2$
$(x)^2 + 2(x)(15) + (15)^2$
$x^2 + 30x + 225$

2. $(r + 20)^2$
$(r)^2 + 2(r)(20) + (20)^2$
$r^2 + 40r + 400$

3. $(t - 14)^2$
$(t)^2 - 2(t)(14) + (14)^2$
$t^2 - 28t + 196$

4. $(y - 25)^2$
$(y)^2 - 2(y)(25) + (25)^2$
$y^2 - 50y + 625$

5. $(2x - 11)^2$
$(2x)^2 - 2(2x)(11) + (11)^2$
$4x^2 - 44x + 121$

6. $(3h - 2)^2$
$(3h)^2 - 2(3h)(2) + (2)^2$
$9h^2 - 12h + 4$

7. $(7b + 5)^2$
$(7b)^2 + 2(7b)(5) + (5)^2$
$49b^2 + 70b + 25$

8. $(8g + 3)^2$
$(8g)^2 + 2(8g)(3) + (3)^2$
$64g^2 + 48g + 9$

9. $(5x + 9y)^2$
$(5x)^2 + 2(5x)(9y) + (9y)^2$
$25x^2 + 90xy + 81y^2$

10. $(7u + 3v)^2$
$(7u)^2 + 2(7u)(3v) + (3v)^2$
$49u^2 + 42uv + 9v^2$

11. $(11r - 7s)^2$
$(11r)^2 - 2(11r)(7s) + (7s)^2$
$121r^2 - 154rs + 49s^2$

12. $(12a - 5b)^2$
$(12a)^2 - 2(12a)(5b) + (5b)^2$
$144a^2 - 120ab + 25b^2$

13. $(0.2x - 0.3y)^2$
$(0.2x)^2 - 2(0.2x)(0.3y) + (0.3y)^2$
$0.04x^2 - 0.12xy + 0.09y^2$

14. $(0.5q - 0.4r)^2$
$(0.5q)^2 - 2(0.5q)(0.4r) + (0.4r)^2$
$0.25q^2 - 0.4qr + 0.16r^2$

15. $\left(\frac{1}{3}d + \frac{1}{5}e\right)^2$
$\left(\frac{1}{3}d\right)^2 + 2\left(\frac{1}{3}d\right)\left(\frac{1}{5}e\right) + \left(\frac{1}{5}e\right)^2$
$\frac{1}{9}d^2 + \frac{2}{15}de + \frac{1}{25}e^2$

Use with SOURCEBOOK Lesson 8-4, pages 210–211.

Determine if each trinomial is a perfect square. If so, factor it. If not, explain why not.

16. $121b^2 + 22b + 1$

$11b \cdot 11b + 2(11b)(1) + 1 \cdot 1$
$2(11b)(1) \stackrel{?}{=} 22b$
$22b = 22b$ True
$(11b + 1)^2$

17. $64x^2 + 16x + 1$

$8x \cdot 8x + 2(8x)(1) + 1 \cdot 1$
$2(8x)(1) \stackrel{?}{=} 16x$
$16x = 16x$ True
$(8x + 1)^2$

18. $36c^2 + 30c + 25$

$6c \cdot 6c + 2(6c)(5) + 5 \cdot 5$
$2(6c)(5) \stackrel{?}{=} 30c$
$60c = 30c$ False
not a perfect square

19. $49g^2 + 56g + 64$

$7g \cdot 7g + 2(7g)(8) + 8 \cdot 8$
$2(7g)(8) \stackrel{?}{=} 56g$
$112g = 56g$ False
not a perfect square

20. $16t^2 - 40t + 25$

$4t \cdot 4t - 2(4t)(5) + 5 \cdot 5$
$-2(4t)(5) \stackrel{?}{=} -40t$
$-40t = -40t$ True
$(4t - 5)^2$

21. $36r^2 - 84r + 49$

$6r \cdot 6r - 2(6r)(7) + 7 \cdot 7$
$-2(6r)(7) \stackrel{?}{=} -84r$
$-84r = -84r$ True
$(6r - 7)^2$

22. $25x^2 - 110xy + 121y^2$

$5x \cdot 5x - 2(5x)(11y) + 11y \cdot 11y$
$-2(5x)(11y) \stackrel{?}{=} -110xy$
$-110xy = -110xy$ True
$(5x - 11y)^2$

23. $81v^2 - 90vw + 25w^2$

$9v \cdot 9v - 2(9v)(5w) + 5w \cdot 5w$
$-2(9v)(5w) \stackrel{?}{=} -90vw$
$-90vw = -90vw$ True
$(9v - 5w)^2$

24. $m^2 - m + 0.25$

$m \cdot m - 2(m)(0.5) + 0.5 \cdot 0.5$
$-2(m)(0.5) \stackrel{?}{=} -m$
$-m = -m$ True
$(m - 0.5)^2$

25. $y^2 - 1.2y + 0.36$

$y \cdot y - 2(y)(0.6) + 0.6 \cdot 0.6$
$-2(y)(0.6) \stackrel{?}{=} -1.2y$
$-1.2y = -1.2y$ True
$(y - 0.6)^2$

26. $q^2 - \frac{3}{2}q + \frac{9}{16}$

$q \cdot q - 2(q)\left(\frac{3}{4}\right) + \left(\frac{3}{4}\right) \cdot \left(\frac{3}{4}\right)$
$-2(q)\left(\frac{3}{4}\right) \stackrel{?}{=} -\frac{3}{2}q$
$-\frac{3}{2}q = -\frac{3}{2}q$ True
$\left(q - \frac{3}{4}\right)^2$

27. $z^2 - \frac{10}{9}z + \frac{25}{81}$

$z \cdot z - 2(z)\left(\frac{5}{9}\right) + \left(\frac{5}{9}\right) \cdot \left(\frac{5}{9}\right)$
$-2(z)\left(\frac{5}{9}\right) \stackrel{?}{=} -\frac{10}{9}z$
$-\frac{10}{9}z = -\frac{10}{9}z$ True
$\left(z - \frac{5}{9}\right)^2$

Solve. Show your work.

28. The trinomial $4x^2 - 52x + 169$ represents the area of a square. What binomial represents the measure of each side of the square?

$4x^2 - 52x + 169 = s^2$
$4x^2 - 52x + 169 = 2x \cdot 2x - 2(2x)(13) + 13^2$,
if $-2(2x)(13) = -52x$; $-2(2x)(13) = -52x$,
so $2x \cdot 2x - 2(2x)(13) + 13^2 = (2x - 13)^2 = s^2$
$s = (2x - 13)$; The measure of each side of the square is $(2x - 13)$.

29. Nancy is making a square garden with side $23v - 4w$. What trinomial represents the area of the garden?

$A = s^2$; Let $s = 23v - 4w$
so $A = (23v - 4w)^2 = (23v)^2 - 2(23v)(4w) + (4w)^2 = 529v^2 - 184vw + 16w^2$
So the trinomial $529v^2 - 184vw + 16w^2$ represents the area of Nancy's square garden.

TEST PREPARATION

30. Which trinomial is a perfect square?

A. $16x^2 - 150x + 625$
B. $81x^2 - 126x + 49$
C. $100x^2 - 100x + 81$
D. $36x^2 - 25x + 64$

31. Evaluate: $\left(\frac{1}{2}x - \frac{2}{5}y\right)^2$

F. $x^2 + \frac{4}{5}y^2$
G. $x^2 - \frac{4}{5}y^2$
H. $\frac{1}{4}x^2 - \frac{1}{5}xy + \frac{4}{25}y^2$
J. $\frac{1}{4}x^2 - \frac{2}{5}xy + \frac{4}{25}y^2$

Additional Resources

ONLINE www.progressinmathematics.com

- Meeting Individual Needs Activities
- Alternative Teaching Models
- Vocabulary Activities
- Audio Glossary
- Virtual Manipulatives

4 Summarize/Assess

Conceptual Thinking

- To assess whether students have conceptualized the lesson concepts, lead a discussion about perfect square trinomials. Have students square binomials such as $(x - 7)^2$, and then have them determine if polynomials such as $4x^2 - 12x + 9$ and $x^2 - 2x + 3$ are perfect square trinomials. $x^2 - 14x + 49$; yes; no

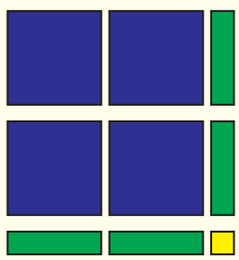
In their *Math Journals*, have students describe the patterns of squares of binomials and provide examples.

5 Follow-Up

Reteaching

ONLINE **Virtual Manipulatives: Algebra Tiles**

- Have students use the Algebra Tiles Virtual Manipulative to practice squaring binomials.
- Draw the following figure on the board, and have students write the polynomial representing the total area. $4x^2 + 4x + 1$



Have students note that the figure is a square. Ask volunteers to state the side lengths of the square. Elicit that $4x^2 + 4x + 1 = (2x + 1)^2$. Discuss how the trinomial and its factored form relate.

Have pairs of students take turns, one partner creating models of perfect square trinomials, the other factoring the trinomial representing the total area. Suggest that pairs first write and multiply a square of a binomial before creating the model.

ONLINE **See Chapter 8 Alternative Teaching Models.**

End of Lesson