Practice Book

3 Practice and Apply

Use Practice Book pp. 197–198

Assignment Guide	
Decelerated	1–8, 13–20, 30–31
Average	2–28 Even, 30–31
Accelerated	9–12, 21–31

■ Before assigning the exercises on Practice Book pages 197–198, work through the examples in the teaching display. Stress the importance of checking by multiplying the factors.

■ When students complete exercises 1–12, remind them of the FOIL method of checking their answers.

Errors Commonly Made
Some students may have difficulty when the leading coefficient is negative. Suggest that they write it as $-1ax^2$ and then consider -1 as a common factor.

■ Suggest that students begin by writing the polynomial in the form $ax^2 + bx + c$ in exercises 13–20 when the terms of a polynomial are not arranged with exponents in descending order.

Note that exercises 25–27 have two variables in the expressions. Tell students that the process is the same as if the expressions had only one variable. For example, in exercise 25, students need to find two factors of $-32b^2$ with a sum of $14b$.

■ Observe that exercise 28 gives one of the factors of the trinomial. To solve, students need to find the other factor. In exercise 29, the two binomial factors must be the same, because the area of a square is the square of the length of a side.

SPIRAL REVIEW

■ If necessary for exercise 31, direct students to Lesson 7-6 to review multiplying polynomials.

8-2 Factor Trinomials $ax^2 + bx + c$ with $a = 1$

Name _____ Date _____

Factor: $x^2 + 14x + 24$

Think
$b = 14$, $c = 24$.
What factors have a product of 24 and a sum of 14?

Factors of 24	Sum of 14
1, 24	25
2, 12	14 ←
3, 8	11
4, 6	10

The factors of 24 whose sum is 14 are 2 and 12.

So in factored form,
$x^2 + 14x + 24 = (x + 12)(x + 2)$.

Multiply to check:
$(x + 12)(x + 2) = x^2 + 2x + 12x + 24$
$= x^2 + 14x + 24$ ✓

Factor $x^2 - 18xy - 40y^2$.

Think
$b = -18y$, $c = -40y^2$.
What factors have a product of $-40y^2$ and a sum of $-18y$?

Factors of $-40y^2$	Sum of $-18y$
$y, -40y$	$-39y$
$2y, -20y$	$-18y$ ←
$4y, -10y$	$-6y$
$5y, -8y$	$-3y$

The factors of $-40y^2$ whose sum is $-18y$ are $2y$ and $-20y$.

So in factored form,
$x^2 - 18xy - 40y^2 = (x + 2y)(x - 20y)$.

Multiply to check:
$(x + 2y)(x - 20y) = x^2 - 20xy + 2xy - 40y^2$
$= x^2 - 18xy - 40y^2$ ✓

Factor each trinomial. Check by multiplying the factors. If the polynomial cannot be factored, write *prime*. Check students' work.

1. $x^2 + 5x + 4$
1, 4: sum 5
2, 2: sum 4
$(x + 4)(x + 1)$
Check: $(x + 4)(x + 1)$
$= x^2 + x + 4x + 4$
$= x^2 + 5x + 4$

2. $x^2 + 7x + 6$
1, 6: sum 7
$(x + 1)(x + 6)$

3. $y^2 - 6y + 8$
$-2, -4$: sum -6
$(y - 2)(y - 4)$

4. $m^2 - 9m + 8$
$-1, -8$: sum -9
$(m - 1)(m - 8)$

5. $x^2 + 5x - 14$
$-2, 7$: sum 5
$(x - 2)(x + 7)$

6. $p^2 + p - 30$
$-5, 6$: sum 1
$(p - 5)(p + 6)$

7. $r^2 - 3r - 54$
$6, -9$: sum -3
$(r - 9)(r + 6)$

8. $x^2 - 21x - 100$
$4, -25$: sum -21
$(x - 25)(x + 4)$

9. $b^2 - 12b + 32$
$-4, -8$: sum -12
$(b - 4)(b - 8)$

10. $w^2 - 23w + 60$
$-3, -20$: sum -23
$(w - 3)(w - 20)$

11. $g^2 + 20g - 36$
$-1, 36$: sum 35
$-2, 18$: sum 16
$-3, 12$: sum 9
$-4, 9$: sum 5
$-6, 6$: sum 0
prime

12. $c^2 + 14c - 24$
$-1, 24$: sum 23
$-2, 12$: sum 10
$-3, 8$: sum 5
$-4, 6$: sum 2
prime

Use with SOURCEBOOK Lesson 8-2, pages 202–205.

Answers for Algebra I, Practice Book Lesson 8-2, page 198.

28.
$A = \ell w$, where $A = x^2 + 30x + 161$, and $\ell = x + 23$
So $x^2 + 30x + 161 = (x + 23)w$; however, because $30 - 23 = 7$ and $7 \cdot 23 = 161$; the trinomial can be factored as $(x + 23)(x + 7)$. So the measure of the width, w, is $(x + 7)$.

29.
$A = s^2 = ss$, where $A = x^2 + x + \frac{1}{4}$; So $x^2 + x + \frac{1}{4} = ss$
Try factoring the trinomial: factors of $\frac{1}{4}$ — 1 and $\frac{1}{4}$ sum to $\frac{5}{4}$ ($\neq 1$); $\frac{1}{2}$ and $\frac{1}{2}$ sum to 1.
$x^2 + x + \frac{1}{4} = \left(x + \frac{1}{2}\right)\left(x + \frac{1}{2}\right) = ss$; $s = \left(x + \frac{1}{2}\right)$
So $\left(x + \frac{1}{2}\right)$ represents the measure of one side.

Factor each trinomial. Check by multiplying the factors. If the polynomial cannot be factored, write *prime*. Check students' work.

13. $-16 - x^2 - 10x$
$-x^2 - 10x - 16$
$-(x^2 + 10x + 16)$
1 and 16: sum 17
4 and 4: sum 8
8 and 2: sum 10
$-(x + 8)(x + 2)$

14. $-12 - y^2 - 8y$
$-(y^2 + 8y + 12)$
6 and 2: sum 8
$-(y + 6)(y + 2)$

15. $14d - 45 - d^2$
$-(d^2 - 14d + 45)$
-9 and -5: sum -14
$-(d - 9)(d - 5)$

16. $14z - 33 - z^2$
$-(z^2 - 14z + 33)$
-11 and -3: sum -14
$-(z - 11)(z - 3)$

17. $-7x + 2 - x^2$
$-(x^2 + 7x - 2)$
-1 and 2: sum 1
prime

18. $-5y + 3 - y^2$
$-(y^2 + 5y - 3)$
-1 and 3: sum 2
prime

19. $-7\ell + 60 - \ell^2$
$-(\ell^2 + 7\ell - 60)$
-5 and 12: sum 7
$-(\ell - 5)(\ell + 12)$

20. $-2k + 63 - k^2$
$-(k^2 + 2k - 63)$
-7 and 9: sum 2
$-(k - 7)(k + 9)$

21. $-h^2 - 2h + 143$
$-(h^2 + 2h - 143)$
-11 and 13: sum 2
$-(h - 11)(h + 13)$

22. $-n^2 - 5n + 300$
$-(n^2 + 5n - 300)$
-15 and 20: sum 5
$-(n - 15)(n + 20)$

23. $-s^2 + 4s + 396$
$-(s^2 - 4s - 396)$
-22 and 18: sum -4
$-(s - 22)(s + 18)$

24. $-w^2 + 17w + 480$
$-(w^2 - 17w - 480)$
-32 and 15: sum -17
$-(w - 32)(w + 15)$

25. $a^2 + 14ab - 32b^2$
$16b$ and $-2b$: sum $14b$
$(a + 16b)(a - 2b)$

26. $-f^2 + 13fg - 42g^2$
$-(f^2 - 13fg + 42g^2)$
$-6g$ and $-7g$: sum $-13g$
$-(f - 6g)(f - 7g)$

27. $70y^2 - x^2 - 9xy$
$-x^2 - 9xy + 70y^2)$
$-(x^2 + 9xy - 70y^2)$
$14y$ and $-5y$: sum $9y$
$-(x + 14y)(x - 5y)$

Solve. Show your work.

28. The trinomial $x^2 + 30x + 161$ represents the area of a rectangle. If $x + 23$ represents the length of the rectangle, what binomial represents the width?

29. The trinomial $x^2 + x + \frac{1}{4}$ represents the area of a square. What binomial represents the measure of one side?

SPIRAL REVIEW

30. Factor the binomial by finding the greatest common monomial factor.
$24y^6 + 8y^4$
GCF: $8y^4$
$8y^4(3y^2) + 8y^4(1)$
$8y^4(3y^2 + 1)$

31. Write the product in simplest form.
$(3a + 1)(4a^2 + 7a - 2)$
$3a(4a^2) + 3a(7a) - 3a(2) + 4a^2 + 7a - 2$
$12a^3 + 21a^2 - 6a + 4a^2 + 7a - 2$
$12a^3 + 25a^2 + a - 2$

Additional Resources

ONLINE www.progressinmathematics.com
- Meeting Individual Needs Activities
- Alternative Teaching Models
- Vocabulary Activities
- Audio Glossary
- Virtual Manipulatives

Meeting Individual Needs
See page 199F.

4 Summarize/Assess

Conceptual Thinking

- To assess whether students have conceptualized the lesson concepts, have them explain how to factor trinomials of the form $x^2 + bx + c$. Elicit that if the factored form is $(x + m)(x + n)$, then $m + n = b$ and $mn = c$.

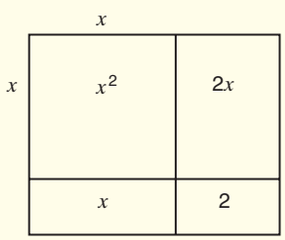
MATH JOURNAL In their *Math Journals*, have students explain how the signs of b and c determine the signs of m and n, when $x^2 + bx + c$ is factored as $(x + m)(x + n)$. Have them factor an example of each case, such as $x^2 + 3x + 2$, $x^2 + x - 2$, $x^2 - x - 2$, and $x^2 - 3x + 2$. $(x + 1)(x + 2)$; $(x - 1)(x + 2)$; $(x + 1)(x - 2)$; $(x - 1)(x - 2)$

5 Follow-Up

Reteaching

ONLINE **Virtual Manipulatives: Algebra Tiles**

- Have students use the Algebra Tiles Virtual Manipulative to practice factoring trinomials of the form $x^2 + bx + c$.
- Draw the following figure on the board, and have students write the polynomial that represents the total area. $x^2 + 3x + 2$



Invite volunteers to find the unknown side lengths of the smaller rectangles. Elicit that $x^2 + 3x + 2 = (x + 1)(x + 2)$.

Have students work in pairs and take turns. One partner draws a figure similar to the example, and the partner factors the trinomial representing the total area.

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

End of Lesson