

7.6 Factoring $ax^2 + bx + c$

Do now: Write the following trinomial in factored form.

$$x^2 - 9x - 36$$

Example 1: Factoring out the GCF

Factor $5x^2 + 15x + 10$

What have you realized about every factoring problem until now?

Example 2: Factoring $ax^2 + bx + c$ when $a \neq 1$

a) $4x^2 + 13x + 3$

b) $3x^2 - 7x + 2$

Example 2 (Remastered!)

Berry Method

a) $4x^2 + 13x + 3$

b) $3x^2 - 7x + 2$

Example 3: Factor $2x^2 - 5x - 7$

Example 4: Factor $-4x^2 - 8x + 5$

Example 5: Solving a Real-Life Problem

The length of a rectangular game reserve is 1 mile longer than twice the width. The area of the reserve is 55 square miles. What is the width of the reserve?



Homework

3, 7, 9, 12, 17, 20, 25, 27, 29, 32, 34, 40, 44

7.6 Exercises

Dynamic Solutions available at BigIdeasMath.com

Vocabulary and Core Concept Check

- REASONING** What is the greatest common factor of the terms of $3y^2 - 21y + 36$?
- WRITING** Compare factoring $6x^2 - x - 2$ with factoring $x^2 - x - 2$.

Monitoring Progress and Modeling with Mathematics

In Exercises 3–8, factor the polynomial. (See Example 1.)

3. $3x^2 + 3x - 6$

4. $8v^2 + 8v - 48$

5. $4k^2 + 28k + 48$

6. $6y^2 - 24y + 18$

7. $7b^2 - 63b + 140$

8. $9r^2 - 36r - 45$

In Exercises 9–16, factor the polynomial.

(See Examples 2 and 3.)

9. $3h^2 + 11h + 6$

10. $8m^2 + 30m + 7$

11. $6x^2 - 5x + 1$

12. $10w^2 - 31w + 15$

13. $3n^2 + 5n - 2$

14. $4z^2 + 4z - 3$

15. $8g^2 - 10g - 12$

16. $18v^2 - 15v - 18$

In Exercises 17–22, factor the polynomial.

(See Example 4.)

17. $-3t^2 + 11t - 6$

18. $-7v^2 - 25v - 12$

19. $-4c^2 + 19c + 5$

20. $-8h^2 - 13h + 6$

21. $-15w^2 - w + 28$

22. $-22d^2 + 29d - 9$

ERROR ANALYSIS In Exercises 23 and 24, describe and correct the error in factoring the polynomial.

23.



$$2x^2 - 2x - 24 = 2(x^2 - 2x - 24) \\ = 2(x - 6)(x + 4)$$

24.



$$6x^2 - 7x - 3 = (3x - 3)(2x + 1)$$

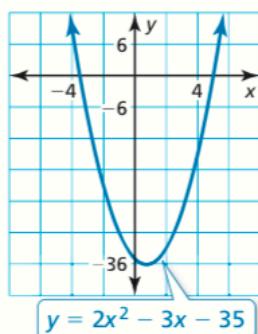
In Exercises 25–28, solve the equation.

25. $5x^2 - 5x - 30 = 0$ 26. $2k^2 - 5k - 18 = 0$

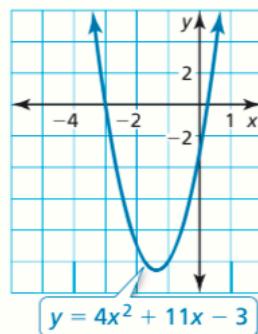
27. $-12n^2 - 11n = -15$ 28. $14b^2 - 2 = -3b$

In Exercises 29–32, find the x -coordinates of the points where the graph crosses the x -axis.

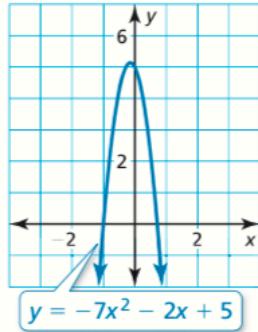
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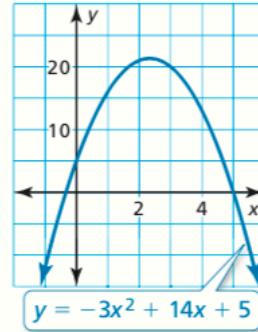
30.



31.



32.



33. **MODELING WITH MATHEMATICS** The area (in square feet) of the school sign can be represented by $15x^2 - x - 2$.

- Write an expression that represents the length of the sign.
- Describe two ways to find the area of the sign when $x = 3$.



34. MODELING WITH MATHEMATICS The height h (in feet) above the water of a cliff diver is modeled by $h = -16t^2 + 8t + 80$, where t is the time (in seconds). How long is the diver in the air?

35. MODELING WITH MATHEMATICS The Parthenon in Athens, Greece, is an ancient structure that has a rectangular base. The length of the base of the Parthenon is 8 meters more than twice its width. The area of the base is about 2170 square meters. Find the length and width of the base. (See Example 5.)

36. MODELING WITH MATHEMATICS The length of a rectangular birthday party invitation is 1 inch less than twice its width. The area of the invitation is 15 square inches. Will the invitation fit in the envelope shown without being folded? Explain.

37. OPEN-ENDED Write a binomial whose terms have a GCF of $3x$.

38. HOW DO YOU SEE IT? Without factoring, determine which of the graphs represents the function $g(x) = 21x^2 + 37x + 12$ and which represents the function $h(x) = 21x^2 - 37x + 12$. Explain your reasoning.

39. REASONING When is it not possible to factor $ax^2 + bx + c$, where $a \neq 1$? Give an example.

40. MAKING AN ARGUMENT Your friend says that to solve the equation $5x^2 + x - 4 = 2$, you should start by factoring the left side as $(5x - 4)(x + 1)$. Is your friend correct? Explain.

41. REASONING For what values of t can $2x^2 + tx + 10$ be written as the product of two binomials?

42. THOUGHT PROVOKING Use algebra tiles to factor each polynomial modeled by the tiles. Show your work.

a.

b.

43. MATHEMATICAL CONNECTIONS The length of a rectangle is 1 inch more than twice its width. The value of the area of the rectangle (in square inches) is 5 more than the value of the perimeter of the rectangle (in inches). Find the width.

44. PROBLEM SOLVING A rectangular swimming pool is bordered by a concrete patio. The width of the patio is the same on every side. The area of the surface of the pool is equal to the area of the patio. What is the width of the patio?

In Exercises 45–48, factor the polynomial.

45. $4k^2 + 7jk - 2j^2$ 46. $6x^2 + 5xy - 4y^2$
 47. $-6a^2 + 19ab - 14b^2$ 48. $18m^3 + 39m^2n - 15mn^2$

Maintaining Mathematical Proficiency

Reviewing what you learned in previous grades and lessons

Find the square root(s). (Skills Review Handbook)

49. $\pm\sqrt{64}$

50. $\sqrt{4}$

51. $-\sqrt{225}$

52. $\pm\sqrt{81}$

Solve the system of linear equations by substitution. Check your solution. (Section 5.2)

53. $y = 3 + 7x$
 $y - x = -3$

54. $2x = y + 2$
 $-x + 3y = 14$

55. $5x - 2y = 14$
 $-7 = -2x + y$

56. $-x - 8 = -y$
 $9y - 12 + 3x = 0$