Essential Question  How can you recognize and factor special products?

1 EXPLORATION: Factoring Special Products

Go to BigIdeasMath.com for an interactive tool to investigate this exploration.

Work with a partner. Use algebra tiles to write each polynomial as the product of two binomials. Check your answer by multiplying. State whether the product is a “special product” that you studied in Section 7.3.

- **a.** $4x^2 - 1 = \underline{\phantom{0}}$
- **b.** $4x^2 - 4x + 1 = \underline{\phantom{0}}$

- **c.** $4x^2 + 4x + 1 = \underline{\phantom{0}}$
- **d.** $4x^2 - 6x + 2 = \underline{\phantom{0}}$
7.7 Factoring Special Products (continued)

EXPLORATION: Factoring Special Products

Go to BigIdeasMath.com for an interactive tool to investigate this exploration.

Work with a partner. Use algebra tiles to complete the rectangular arrays in three different ways, so that each way represents a different special product. Write each special product in standard form and in factored form.

Communicate Your Answer

3. How can you recognize and factor special products? Describe a strategy for recognizing which polynomials can be factored as special products.

4. Use the strategy you described in Question 3 to factor each polynomial.

   a. \(25x^2 + 10x + 1\)  
   b. \(25x^2 - 10x + 1\)  
   c. \(25x^2 - 1\)
7.7 Notetaking with Vocabulary
For use after Lesson 7.7

In your own words, write the meaning of each vocabulary term.

polynomial

trinomial

Core Concepts

Difference of Two Squares Pattern

Algebra

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

Example

\( x^2 - 9 = x^2 - 3^2 = (x + 3)(x - 3) \)

Notes:

Perfect Square Trinomial Pattern

Algebra

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

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

Example

\( x^2 + 6x + 9 = x^2 + 2(x)(3) + 3^2 = (x + 3)^2 \)

\( x^2 - 6x + 9 = x^2 - 2(x)(3) + 3^2 = (x - 3)^2 \)

Notes:
Extra Practice

In Exercises 1–6, factor the polynomial.

1. \( s^2 - 49 \)  
2. \( t^2 - 81 \)  
3. \( 16 - x^2 \)

4. \( 4g^2 - 25 \)  
5. \( 36h^2 - 121 \)  
6. \( 81 - 49k^2 \)

In Exercises 7–12, use a special product pattern to evaluate the expression.

7. \( 57^2 - 53^2 \)  
8. \( 38^2 - 32^2 \)  
9. \( 68^2 - 64^2 \)

10. \( 45^2 - 40^2 \)  
11. \( 79^2 - 71^2 \)  
12. \( 86^2 - 84^2 \)
In Exercises 13–18, factor the polynomial.

13. \( x^2 + 16x + 64 \)  
14. \( p^2 + 28p + 196 \)  
15. \( r^2 - 26r + 169 \)

16. \( a^2 - 18a + 81 \)  
17. \( 36c^2 + 84c + 49 \)  
18. \( 100x^2 - 20x + 1 \)

In Exercises 19–24, solve the equation.

19. \( x^2 - 144 = 0 \)  
20. \( 9y^2 = 49 \)  
21. \( c^2 + 14c + 49 = 0 \)

22. \( d^2 - 4d + 4 = 0 \)  
23. \( n^2 + \frac{2}{3}n = -\frac{1}{9} \)  
24. \( -\frac{6}{5}k + \frac{9}{25} = -k^2 \)

25. The dimensions of a rectangular prism are \((x + 1)\) feet by \((x + 2)\) feet by 4 feet. The volume of the prism is \((24x - 1)\) cubic feet. What is the value of \(x\)?