Review

1. Circle the operators in each trinomial.

\[ x^2 - 2 \cdot x - 3 \quad k + 2 \cdot q - 7 \quad a^3 - a^2 + 9a \quad 4 \cdot w + d + 1 \]

Write an algebraic expression for each sum.

2. \( m \) increased by 4

3. \( c \) more than 7

4. 16 greater than \( x^2 \)

5. 8 added to \( w^2 - 4w \)

Vocabulary Builder

- **case** (noun) *kayz*

  Related Words: special case

  **Definition:** A case is a specific type of an event.

  **Examples:** A trinomial is one case of a polynomial. A perfect-square trinomial is a special case of a trinomial.

Use Your Vocabulary

6. Draw a line from each event in Column A to a corresponding special case of the event in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a sport</td>
<td>math class</td>
</tr>
<tr>
<td>a meal</td>
<td>the Science Museum</td>
</tr>
<tr>
<td>a field trip</td>
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<tr>
<td>course</td>
<td>a term paper</td>
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<tr>
<td>a book</td>
<td>dinner</td>
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</tbody>
</table>
Any trinomial of the form \(a^2 + 2ab + b^2\) or \(a^2 - 2ab + b^2\) is a **perfect-square trinomial** because it is the result of squaring a binomial.

### Key Concept  Factoring Perfect-Square Trinomials

**Algebra**

For every real number \(a\) and \(b\),

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

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

**Examples**

\[
x^2 + 8x + 16 = (x + 4)(x + 4) = (x + 4)^2
\]

\[
4n^2 - 12n + 9 = (2n - 3)(2n - 3) = (2n - 3)^2
\]

Complete.

7. \(4^2 - 2(2)(4) + 2^2 = (4 - \square)^2\)

8. \(25 + 30 + 9 = (5 + \square)^2\)

### Problem 1  Factoring a Perfect-Square Trinomial

**Got It?** What is the factored form of \(x^2 + 6x + 9\)?

9. Circle the form your answer will have.

   \[(a + b)^2 \quad (a - b)^2\]

10. Use the justifications below to factor the expression.

   \[
x^2 + \square \cdot x + \square
   \]

   Write the original expression.

   \[
x^2 + \square \cdot x + \square^2
   \]

   Write the third term as a perfect square.

   \[
x^2 + 2(\square)(\square)x + \square^2
   \]

   Write the middle term as \(2(a)(b)x\).

   \[
(x \square \square)^2
   \]

   Write the expression as the square of a binomial.

Circle the factored form of each trinomial.

11. \(64t^2 - 144t + 81\)

   \[
(64t - 9)^2 \quad (32t - 9)^2 \quad (8t + 9)^2 \quad (8t - 9)^2 \quad (4t - 3)^2
   \]

12. \(36h^2 + 60h + 25\)

   \[
(3h + 5)^2 \quad (6h + 5)^2 \quad (6h - 25)^2 \quad (18h + 5)^2 \quad (36h + 25)^2
   \]

### Problem 2  Factoring to Find a Length

**Got It?** You are building a square patio. The area of the patio is \(16m^2 - 72m + 81\). What is the length of one side of the patio?

13. Use the information in the problem to complete the problem-solving model below.

   **Know**

   **Need**

   **Plan**
14. Circle the form of the trinomial.

\[ a^2 + 2ab + b^2 \quad a^2 - 2ab + b^2 \]

15. Circle the form the factored expression will have.

\[(a + b)^2 \quad (a - b)^2 \]

16. Write the first and last terms of the polynomial as squares.

16m^2 - 72m + 81

\[ (\square)^2 \quad (\square)^2 \]

17. Verify that 72m = 2ab.

18. Now write the polynomial as the square of a binomial.

19. The length of one side of the patio is .

**Key Concept**  Factoring a Difference of Two Squares

<table>
<thead>
<tr>
<th>Algebra</th>
<th>For all real numbers ( a ) and ( b ), [ a^2 - b^2 = (a + b)(a - b) ]</th>
<th>Examples</th>
<th>[ x^2 - 16 = (x + 4)(x - 4) ]</th>
</tr>
</thead>
</table>

**Problem 3**  Factoring a Difference of Two Squares

**Got It?** What is the factored form of \( v^2 - 100 \)?

20. Underline the correct word or words to complete each sentence.

The expression is a **monomial** / **binomial** / **trinomial**.

The expression is a **difference** / **sum**.

Both terms **are** / **are not** perfect squares.

I can use the **perfect-square trinomial** / **difference of two squares** rule.

21. Now factor \( v^2 - 100 \).

**Problem 4**  Factoring a Difference of Two Squares

**Got It?** What is the factored form of \( 25d^2 - 64 \)?

22. Is each term of the expression a perfect square?  **Yes / No**
23. Circle the expression that has both terms written as perfect squares.

- \(5d - 8\)
- \(5d^2 - 8^2\)
- \((5d)^2 - 8^2\)
- \(25d^2 - 8\)
- \(25d^2 - 64\)

24. Circle the factored form of the expression.

- \((5d - 8)^2\)
- \((5d + 8)^2\)
- \((5d + 8)(5d - 8)\)
- \((25d - 64)^2\)

Problem 5 Factoring Out a Common Factor

Got It? What is the factored form of \(12t^2 - 48\)?

25. Circle the GCF of 12 and 48.

- 3
- 4
- 6
- 12
- 48

26. Use the justifications at the right to factor the expression.

- \(12t^2 - 48\)
- Write the original expression.
- \(t^2 - 2\)
- Factor out the GCF.
- \(t^2 - 2\)
- Write the difference as \(a^2 - b^2\).
- \((t + 2)(t - 2)\)
- Use the difference of two squares rule.

Lesson Check • Do you UNDERSTAND?

Identify the rule you would use to factor \(81r^2 - 90r + 25\).

27. Identify \(a, b,\) and \(2ab\) in the expression.

- \(a = 9\)
- \(b = \) \(r\)
- \(2ab = \) \(r\)

28. Use your answers to Exercise 27 to rewrite the expression.

- \(81r^2 - 90r + 25 = (9\) \(r\)^2 \(- 2\) \(r\) \(+ 25\)

29. Circle the rule you would use to factor the expression.

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

Math Success

Check off the vocabulary words that you understand.

- perfect square trinomial
- difference of two squares
- perfect square

Rate how well you can factor perfect square trinomials and differences of two squares.