

Factoring Special Products

Algebra 1 • Section 8.4

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Quick Review and Helpful Hints

Polynomial work is pattern work. Keep like terms together, apply exponent rules only when the bases match, and check factoring by multiplying the factors back together.

▷ **Example:** Factor $x^2 + 9x + 20$.

Work: Look for two numbers that multiply to 20 and add to 9. The numbers are 4 and 5.

★ **Answer:** $(x + 4)(x + 5)$

◆ Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Factor $x^2 - 36$. _____

6. Factor $16m^2 + 40m + 25$. _____

2. Factor $4x^2 - 81$. _____

7. Factor $49p^2 - 64$. _____

3. Factor $x^2 + 12x + 36$. _____

8. Factor $x^2 - 18x + 81$. _____

4. Factor $9a^2 - 24a + 16$. _____

9. Factor $36r^2 + 12r + 1$. _____

5. Factor $25y^2 - 1$. _____

10. Is $x^2 + 25$ factorable over the real numbers? _____

◆ Word Problems

11. A square area is $x^2 + 14x + 49$. Factor to find side length. _____

12. A border area uses $y^2 - 100$. Factor it. _____



Answer Keys

- | | |
|-----------------------|--------------------------------|
| 1. $(x - 6)(x + 6)$ | 7. $(7p - 8)(7p + 8)$ |
| 2. $(2x - 9)(2x + 9)$ | 8. $(x - 9)^2$ |
| 3. $(x + 6)^2$ | 9. $(6r + 1)^2$ |
| 4. $(3a - 4)^2$ | 10. No |
| 5. $(5y - 1)(5y + 1)$ | 11. $(x + 7)^2$; side $x + 7$ |
| 6. $(4m + 5)^2$ | 12. $(y - 10)(y + 10)$ |

Step-by-Step Explanations

- Two squares with a subtraction sign means split into a sum and difference.
- Both $4x^2$ and 81 are perfect squares, so the difference-of-squares pattern fits.
- The ends square nicely and $12x$ is twice x times 6 — that makes it a perfect square.
- Since $9a^2$ and 16 are squares and $-24a$ is twice their product, fold it into a square.
- This is $(5y)^2 - 1^2$, so the difference of squares splits it apart.
- It lines up with $(a + b)^2$: $4m$ and 5 squared, with $40m$ as twice their product.
- Recognize $(7p)^2 - 8^2$ and let the difference-of-squares rule do the work.
- Check the middle: twice x times -9 is $-18x$, confirming a perfect-square trinomial.
- Both ends are squares and $12r$ equals $2(6r)(1)$, so it collapses to one square.
- This is a sum of squares, and that pattern simply doesn't factor with real numbers.
- The trinomial is a perfect square, so the side length is just $x + 7$.
- Spot $y^2 - 10^2$ and apply the difference-of-squares pattern directly.



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