

Special Factors (Pages 445–449)

Products of the form $(a + b)^2$ and $(a - b)^2$ are called perfect squares, and their expressions are called **perfect square trinomials**. A polynomial written in the form $a^2 - b^2$ is called the **difference of squares**.

Perfect Square Trinomials	$a^2 + 2ab + b^2 = (a + b)^2$ $a^2 - 2ab + b^2 = (a - b)^2$
Factoring a Perfect Square Trinomial	<p>A trinomial is a perfect square trinomial when the following conditions are satisfied.</p> <ul style="list-style-type: none"> • The first term is a perfect square. • The last term is a perfect square. • The middle term is either 2 or -2 times the product of the square root of the first term and the square root of the last term.
Difference of Squares	$a^2 - b^2 = (a - b)(a + b)$

EXAMPLES

A Determine whether $4x^2 + 12x + 9$ is a perfect square trinomial. If so, factor it.

Check each of the following.

- Is the first term a perfect square? $4x^2 \stackrel{?}{=} (2x)^2$
yes
- Is the last term a perfect square? $9 \stackrel{?}{=} (3)^2$ yes
- Is the middle term twice the product of $2x$ and 3 ?
 $12x \stackrel{?}{=} 2(2x)(3)$ yes

So, $4x^2 + 12x + 9$ is a perfect square trinomial.

$$4x^2 + 12x + 9 = (2x)^2 + 2(2x)(3) + (3)^2 \\ = (2x + 3)^2$$

B Determine whether $2x^2 - 8$ is the difference of squares. If so, factor it.

First, look for a GCF.

$$2x^2 - 8 = 2(x^2 - 4) \quad \text{The GCF is 2.}$$

x^2 and 4 are both perfect squares, and $x^2 - 4$ is a difference.

$$2(x^2 - 4) = 2[(x)^2 - (2)^2] \\ = 2(x - 2)(x + 2)$$

$$\text{So, } 2x^2 - 8 = 2(x - 2)(x + 2).$$

PRACTICE

Determine whether each trinomial is a perfect square trinomial. If so, factor it.

- $m^2 - 6m + 9$
- $x^2 + 10x + 25$
- $t^2 - 14t + 49$
- $x^2 + 3x + 4$
- $y^2 - 12y + 36$
- $k^2 - 22k + 121$

Determine whether each binomial is the difference of squares. If so, factor it.

- $b^2 - 49$
- $a^2 - 144$
- $81y^2 - 25$
- $9b^2 - 25$
- $y^2 + 16$
- $4z^2 - 16$

Factor each polynomial. If the polynomial cannot be factored, write prime.

- $x^2 + 16x + 64$
- $100h^2 - 9$
- $x^2 + 3x + 9$
- $64k^2 - 24$
- $4z^3 - 16z^2 + 16z$
- $4m^2 + 20m + 25$



19. Standardized Test Practice Factor the trinomial $5a^2 + 30a + 45$.

- A** $5(a + 3)^2$ **B** $5(a + 3)$ **C** $(a + 3)^2$ **D** $5(a + 3)^2$

Answers: 1. $(m - 3)^2$ 2. $(x + 5)^2$ 3. $(t - 7)^2$ 4. no 5. $(v - 6)^2$ 6. $(k - 1)^2$ 7. $(b - 7)(b + 7)$ 8. $(a - 12)(a + 12)$ 9. $(9y - 5)(9y + 5)$ 10. $(3b - 5)(3b + 5)$ 11. no 12. $4(z - 2)(z + 2)$ 13. $(x + 8)^2$ 14. $(10h - 3)(10h + 3)$ 15. prime 16. prime 17. $4z(z - 2)^2$ 18. $(2m + 5)^2$ 19. D