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10-5

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	$a^2 + 2ab + b^2 = (a + b)^2$ $\quad a^2 - 2ab + b^2 = (a - b)^2$
Factoring a Perfect Square Trinomial	A trinomial is a perfect square trinomial when the following conditions are satisfied. • 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.

$2x^2 - 8 = 2(x^2 - 4)$ *The GCF is 2.*

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

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

So, $2x^2 - 8 = 2(x - 2)(x + 2)$.

PRACTICE

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

1. $m^2 - 6m + 9$ **2.** $x^2 + 10x + 25$ **3.** $t^2 - 14t + 49$

4. $x^2 + 3x + 4$ **5.** $y^2 - 12y + 36$ **6.** $k^2 - 22k + 121$

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

7. $b^2 - 49$ **8.** $a^2 - 144$ **9.** $81y^2 - 25$

10. $9b^2 - 25$ **11.** $y^2 + 16$ **12.** $4z^2 - 16$

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

13. $x^2 + 16x + 64$ **14.** $100h^2 - 9$ **15.** $x^2 + 3x + 9$

16. $64k^2 - 24$ **17.** $4z^3 - 16z^2 + 16z$ **18.** $4m^2 + 20m + 25$

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

A $(5a + 3)^2$ **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.** $(y - 6)^2$ **6.** $(k - 11)^2$ **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