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8-4 Study Guide and Intervention

Special Products

Squares of Sums and Differences Some pairs of binomials have products that follow specific patterns. One such pattern is called the *square of a sum*. Another is called the *square of a difference*.

Square of a Sum	$(a + b)^2 = (a + b)(a + b) = a^2 + 2ab + b^2$
Square of a Difference	$(a - b)^2 = (a - b)(a - b) = a^2 - 2ab + b^2$

Example 1 **Find $(3a + 4)(3a + 4)$.**

Use the square of a sum pattern, with $a = 3a$ and $b = 4$.

$$(3a + 4)(3a + 4) = (3a)^2 + 2(3a)(4) + (4)^2$$
$$= 9a^2 + 24a + 16$$

The product is $9a^2 + 24a + 16$.

Example 2 **Find $(2z - 9)(2z - 9)$.**

Use the square of a difference pattern with $a = 2z$ and $b = 9$.

$$(2z - 9)(2z - 9) = (2z)^2 - 2(2z)(9) + (9)(9)$$
$$= 4z^2 - 36z + 81$$

The product is $4z^2 - 36z + 81$.

Exercises

Find each product.

1. $(x - 6)^2$
$x^2 - 12x + 36$

2. $(3p + 4)^2$
$9p^2 + 24p + 16$

3. $(4x - 5)^2$
$16x^2 - 40x + 25$

4. $(2x - 1)^2$
$4x^2 - 4x + 1$

5. $(2h + 3)^2$
$4h^2 + 12h + 9$

6. $(m + 5)^2$
$m^2 + 10m + 25$

7. $(a + 3)^2$
$a^2 + 6a + 9$

8. $(3 - p)^2$
$9 - 6p + p^2$

9. $(x - 5y)^2$
$x^2 - 10xy + 25y^2$

10. $(8y + 4)^2$
$64y^2 + 64y + 16$

11. $(8 + x)^2$
$64 + 16x + x^2$

12. $(3a - 2b)^2$
$9a^2 - 12ab + 4b^2$

13. $(2x - 8)^2$
$4x^2 - 32x + 64$

14. $(x^2 + 1)^2$
$x^4 + 2x^2 + 1$

15. $(m^2 - 2)^2$
$m^4 - 4m^2 + 4$

16. $(x^3 - 1)^2$
$x^6 - 2x^3 + 1$

17. $(2h^2 - k^2)^2$
$4h^4 - 4h^2k^2 + k^4$

18. $\left(\frac{1}{4}x + 3\right)^2$
$\frac{1}{16}x^2 + \frac{3}{2}x + 9$

19. $(x - 4y^2)^2$
$x^2 - 8xy^2 + 16y^4$

20. $(2p + 4r)^2$
$4p^2 + 16pr + 16r^2$

21. $\left(\frac{2}{3}x - 2\right)^2$
$\frac{4}{9}x^2 - \frac{8}{3}x + 4$

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8-4 Study Guide and Intervention *(continued)*

Special Products

Product of a Sum and a Difference There is also a pattern for the product of a sum and a difference of the same two terms, $(a + b)(a - b)$. The product is called the **difference of squares**.

Product of a Sum and a Difference	$(a + b)(a - b) = a^2 - b^2$

Example **Find $(5x + 3y)(5x - 3y)$.**

$(a + b)(a - b) = a^2 - b^2$ Product of a Sum and a Difference

$(5x + 3y)(5x - 3y) = (5x)^2 - (3y)^2$ $a = 5x$ and $b = 3y$

$= 25x^2 - 9y^2$ Simplify.

The product is $25x^2 - 9y^2$.

Exercises

Find each product.

1. $(x - 4)(x + 4)$
$x^2 - 16$

2. $(p + 2)(p - 2)$
$p^2 - 4$

3. $(4x - 5)(4x + 5)$
$16x^2 - 25$

4. $(2x - 1)(2x + 1)$
$4x^2 - 1$

5. $(h + 7)(h - 7)$
$h^2 - 49$

6. $(m - 5)(m + 5)$
$m^2 - 25$

7. $(2d - 3)(2d + 3)$
$4d^2 - 9$

8. $(3 - 5q)(3 + 5q)$
$9 - 25q^2$

9. $(x - y)(x + y)$
$x^2 - y^2$

10. $(y - 4x)(y + 4x)$
$y^2 - 16x^2$

11. $(8 + 4x)(8 - 4x)$
$64 - 16x^2$

12. $(3a - 2b)(3a + 2b)$
$9a^2 - 4b^2$

13. $(3y - 8)(3y + 8)$
$9y^2 - 64$

14. $(x^2 - 1)(x^2 + 1)$
$x^4 - 1$

15. $(m^2 - 5)(m^2 + 5)$
$m^4 - 25$

16. $(x^3 - 2)(x^3 + 2)$
$x^6 - 4$

17. $(h^2 - k^2)(h^2 + k^2)$
$h^4 - k^4$

18. $\left(\frac{1}{4}x + 2\right)\left(\frac{1}{4}x - 2\right)$
$\frac{1}{16}x^2 - 4$

19. $(3x - 2y^2)(3x + 2y^2)$
$9x^2 - 4y^4$

20. $(2p - 5r)(2p + 5r)$
$4p^2 - 25r^2$

21. $\left(\frac{4}{3}x - 2y\right)\left(\frac{4}{3}x + 2y\right)$
$\frac{16}{9}x^2 - 4y^2$