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8-8 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. $(c + 3)^2$
$c^2 + 6c + 9$ | 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. $(\frac{1}{3}x + 3)^2$
$\frac{1}{9}x^2 + 2x + 9$ |
| 19. $(x - 4y^2)^2$
$x^2 - 8xy^2 + 16y^4$ | 20. $(2p + 4q)^2$
$4p^2 + 16pq + 16q^2$ | 21. $(\frac{2}{3}x - 2)^2$
$\frac{4}{9}x^2 - \frac{8}{3}x + 4$ |

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8-8 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	$(a + b)(a - b) = a^2 - b^2$
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Example Find $(5x + 3y)(5x - 3y)$.

$$(a + b)(a - b) = a^2 - b^2 \quad \text{Product of a Sum and a Difference}$$

$$(5x + 3y)(5x - 3y) = (5x)^2 - (3y)^2 \quad a = 5x \text{ and } b = 3y$$

$$= 25x^2 - 9y^2 \quad \text{Simplify.}$$

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. $(2c - 3)(2c + 3)$
$4c^2 - 9$ | 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. $(\frac{1}{3}x + 2)(\frac{1}{3}x - 2)$
$\frac{1}{9}x^2 - 4$ |
| 19. $(3x - 2y^2)(3x + 2y^2)$
$9x^2 - 4y^4$ | 20. $(2p - 5s)(2p + 5s)$
$4p^2 - 25s^2$ | 21. $(\frac{4}{3}x - 2y)(\frac{4}{3}x + 2y)$
$\frac{16}{9}x^2 - 4y^2$ |

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8-8 Skills Practice Special Products

Find each product.

- | | |
|---|--|
| 1. $(n + 3)^2$
$n^2 + 6n + 9$ | 2. $(x + 4)(x + 4)$
$x^2 + 8x + 16$ |
| 3. $(y - 7)^2$
$y^2 - 14y + 49$ | 4. $(t - 3)(t - 3)$
$t^2 - 6t + 9$ |
| 5. $(b + 1)(b - 1)$
$b^2 - 1$ | 6. $(a - 5)(a + 5)$
$a^2 - 25$ |
| 7. $(p - 4)^2$
$p^2 - 8p + 16$ | 8. $(z + 3)(z - 3)$
$z^2 - 9$ |
| 9. $(t + 2)(t + 2)$
$t^2 + 4t + 4$ | 10. $(r - 1)(r - 1)$
$r^2 - 2r + 1$ |
| 11. $(3g + 2)(3g - 2)$
$9g^2 - 4$ | 12. $(2m - 3)(2m + 3)$
$4m^2 - 9$ |
| 13. $(6 + u)^2$
$36 + 12u + u^2$ | 14. $(r + s)^2$
$r^2 + 2rs + s^2$ |
| 15. $(3q + 1)(3q - 1)$
$9q^2 - 1$ | 16. $(c - e)^2$
$c^2 - 2ce + e^2$ |
| 17. $(2k - 2)^2$
$4k^2 - 8k + 4$ | 18. $(w + 3h)^2$
$w^2 + 6wh + 9h^2$ |
| 19. $(3p - 4)(3p + 4)$
$9p^2 - 16$ | 20. $(t + 2n)^2$
$t^2 + 4tn + 4n^2$ |
| 21. $(x - 4y)^2$
$x^2 - 8xy + 16y^2$ | 22. $(3b + 7)(3b - 7)$
$9b^2 - 49$ |
| 23. $(3y - 3g)(3y + 3g)$
$9y^2 - 9g^2$ | 24. $(s^2 + r^2)^2$
$s^4 + 2s^2r^2 + r^4$ |
| 25. $(2k + m)^2$
$4k^2 + 4km + m^2$ | 26. $(3m^2 - n)^2$
$9m^4 - 6m^2n + n^2$ |
27. **GEOMETRY** The length of a rectangle is the sum of two whole numbers. The width of the rectangle is the difference of the same two whole numbers. Using these facts, write a verbal expression for the area of the rectangle. The area is the square of the larger number minus the square of the smaller number.

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8-8 Practice (Average) Special Products

Find each product.

- | | | |
|---|--|--|
| 1. $(n + 9)^2$
$n^2 + 18n + 81$ | 2. $(g + 8)^2$
$g^2 + 16g + 64$ | 3. $(t - 10)^2$
$t^2 - 20t + 100$ |
| 4. $(r - 11)^2$
$r^2 - 22r + 121$ | 5. $(p + 7)^2$
$p^2 + 14p + 49$ | 6. $(b + 8)(b - 6)$
$b^2 - 36$ |
| 7. $(z + 13)(z - 13)$
$z^2 - 169$ | 8. $(4e + 2)^2$
$16e^2 + 16e + 4$ | 9. $(5w - 4)^2$
$25w^2 - 40w + 16$ |
| 10. $(6h - 1)^2$
$36h^2 - 12h + 1$ | 11. $(3s + 4)^2$
$9s^2 + 24s + 16$ | 12. $(7v - 2)^2$
$49v^2 - 28v + 4$ |
| 13. $(7k + 3)(7k - 3)$
$49k^2 - 9$ | 14. $(4d - 7)(4d + 7)$
$16d^2 - 49$ | 15. $(3g + 9h)(3g - 9h)$
$9g^2 - 81h^2$ |
| 16. $(4q + 5t)(4q - 5t)$
$16q^2 - 25t^2$ | 17. $(a + 6u)^2$
$a^2 + 12au + 36u^2$ | 18. $(5r + s)^2$
$25r^2 + 10rs + s^2$ |
| 19. $(6c - m)^2$
$36c^2 - 12cm + m^2$ | 20. $(k - 6y)^2$
$k^2 - 12ky + 36y^2$ | 21. $(u - 7p)^2$
$u^2 - 14up + 49p^2$ |
| 22. $(4b - 7v)^2$
$16b^2 - 56bv + 49v^2$ | 23. $(6n + 4p)^2$
$36n^2 + 48np + 16p^2$ | 24. $(5q + 6s)^2$
$25q^2 + 60qs + 36s^2$ |
| 25. $(6a - 7b)(6a + 7b)$
$36a^2 - 49b^2$ | 26. $(8h + 3d)(8h - 3d)$
$64h^2 - 9d^2$ | 27. $(9x + 2y)^2$
$81x^2 + 36xy + 4y^2$ |
| 28. $(3p^2 + 2m)^2$
$9p^4 + 12p^2m + 4m^2$ | 29. $(5a^2 - 2b)^2$
$25a^4 - 20a^2b + 4b^2$ | 30. $(4m^3 - 2t)^2$
$16m^6 - 16m^3t + 4t^2$ |
| 31. $(6e^3 - c)^2$
$36e^6 - 12e^3c + c^2$ | 32. $(2b^2 - g)(2b^2 + g)$
$4b^4 - g^2$ | 33. $(2v^2 + 3e^2)(2v^2 + 3e^2)$
$4v^4 + 12v^2e^2 + 9e^4$ |
34. **GEOMETRY** Janelle wants to enlarge a square graph that she has made so that a side of the new graph will be 1 inch more than twice the original side s . What trinomial represents the area of the enlarged graph? $4s^2 + 4s + 1$
- GENETICS** For Exercises 35 and 36, use the following information.
In a guinea pig, pure black hair coloring B is dominant over pure white coloring b . Suppose two hybrid Bb guinea pigs, with black hair coloring, are bred.
35. Find an expression for the genetic make-up of the guinea pig offspring.
 $0.25BB + 0.50Bb + 0.25bb$
36. What is the probability that two hybrid guinea pigs with black hair coloring will produce a guinea pig with white hair coloring? 25%

Answers (Lesson 8-8)