NAME

Module 11 Simplifying Algebraic Expressions with Polynomials
Lesson 5 Multiplying Polynomials

Find each product. Write answers in simplest form.

1. $(b - 4)(b + 4)$

$b^2 - 16$

2. $(r - 3)^2$

$r^2 - 6r + 9$

3. $(3c + 2)^2$

$9c^2 + 12c + 4$

4. $(q - 5)(q + 5)$

$q^2 - 25$

5. $(3m - n)^2$

$9m^2 - 6mn + n^2$

6. $(8p - 2q)(8p + 2q)$

$64p^2 - 4q^2$

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

$49a^2 + 84a + 36$

8. $(3r - 7s)^2$

$9r^2 - 42rs + 49s^2$

9. $(c - d)(c + d)$

$c^2 - d^2$

10. $(12t + 5u)^2$

$144t^2 + 120tu + 25u^2$

11. $(9a + 8)^2$

$81a^2 + 144a + 64$

12. $(2ab - 1)^2$

$4a^2b^2 - 4ab + 1$

13. $(y + 1)(y^2 - y + 1)$

$y^3 + 1$

14. $(a + 2)(a^2 + 3a - 6)$

$a^3 + 5a^2 - 12$

15. $(2b - 1)(4b^2 - b + 2)$

$8b^3 - 6b^2 + 5b - 2$

16. $(5d - 3)(2d^2 + 3d + 6)$

$10d^3 + 9d^2 + 21d - 18$

17. $(a^2 + 2a + 3)(3a^2 + 4a - 6)$

$3a^4 + 10a^3 + 11a^2 - 18$

18. $(3g^2 - 2g + 8)(g^2 + 4g - 5)$

$3g^4 + 10g^3 - 15g^2 + 42g - 40$

19. $(7j^2 + 2j + 1)(-3j^2 - 5j - 1)$

$-21j^4 - 41j^3 - 20j^2 - 7j - 1$

20. $(q^2 - 3q + 2)(3q^2 + 5q - 4)$

$3q^4 - 4q^3 - 13q^2 + 22q - 8$

21. $x^2 + 3x + 4$
$\times \quad x - 3$

$x^3 - 5x - 12$

22. $4g^2 - 3g + 2$
$\times \quad 8g + 6$

$32g^3 - 2g + 12$

23. $v^2 + 3v + 6$
$\times 2v^2 - 4v - 5$

$2v^4 + 2v^3 - 5v^2 - 39v - 30$

24. $7z^2 - z + 6$
$\times 4z^2 + 5z + 8$

$28z^4 + 31z^3 + 75z^2 + 22z + 48$

Journal

1. Cynthia prefers to multiply polynomials horizontally, and Michael prefers to multiply polynomials vertically. Give some advantages of each method.
2. Find two binomials whose product is $25x^2 - 81$.
3. Explain how to use the pattern for the square of a sum to find the product of two binomials.
4. How is the Distributive Property used in multiplying polynomials?
5. Find a binomial that can be squared to get $16x^2 - 72x + 81$.

Cumulative Review

Simplify. Write answers using positive exponents.

1. $(2x^3y^4)^{-3}$ $\frac{1}{8x^9y^{12}}$

2. $\frac{12x^3y^3}{4xy^5}$ $\frac{3x^2}{y^2}$

Simplify.

3. $(4x^2 + 5x - 3) + (2x^2 + 7x - 1)$

$6x^2 + 12x - 4$

4. $(5m^4 + 3m^2 + 3) + (-2m^4 - 6)$

$3m^4 + 3m^2 - 3$

5. $(8z^3 - 2z^2 + 6) - (2z^3 - 3z + 4)$

$6z^3 - 2z^2 + 3z + 2$

6. $(5a^2 + 10a - 3) - (2a^2 - 5a + 6)$

$3a^2 + 15a - 9$

7. $(6b - 3)(5b + 1)$

$30b^2 - 9b - 3$

8. $(4c - 2d)(2c - 3d)$

$8c^2 - 16cd + 6d^2$

Simplify. Write answers in scientific notation.

9. $(6 \times 10^4)(8 \times 10^3)$ 4.8×10^8

10. $\frac{3.2 \times 10^6}{8 \times 10^3}$ 4×10^2

Possible Journal Answers

1. An advantage of using the horizontal method is that it is not necessary to keep like terms aligned when multiplying. This method also takes less space to write. An advantage of using the vertical method is that when like terms are aligned, it is easier to identify them and combine them. It is also easier to make certain no terms are skipped when multiplying.
2. Using the Product of Conjugates, $25x^2 - 81$ equals $(5x - 9)(5x + 9)$.
3. The pattern for the square of a sum can be used to multiply two identical binomials that are sums, such as $(a + b)(a + b)$, which can be written as $(a + b)^2$. The first term of the square of a sum can be found by squaring the first term of the binomial. The second term can be found by finding the product of the terms of the binomial and doubling the result. The third term can be found by squaring the second term of the binomial. In other words, $(a + b)^2 = a^2 + 2ab + b^2$, for any expressions a and b.
4. The Distributive Property of Equality is used repeatedly when multiplying polynomials. Each term of the first polynomial is distributed over each term of the second polynomial, and the result is simplified.
5. The expression $(4x - 9)^2$ equals $16x^2 - 72x + 81$.