7 Chapter Review

Check It Out
Vocabulary Help
BigIdeasMath.com

Review Key Vocabulary

monomial, *p. 330*
degree of a monomial, *p. 330*
polynomial, *p. 331*
binomial, *p. 331*
trinomial, *p. 331*
degree of a polynomial, *p. 331*
FOIL Method, *p. 343*
factored form, *p. 358*
Zero-Product Property, *p. 358*
root, *p. 358*
factoring by grouping, *p. 388*
prime polynomial, *p. 389*
factored completely, *p. 389*

Review Examples and Exercises

7.1 Polynomials *(pp. 328–333)*

a. Find the degree of $4x^2y$.

The exponent of x is 2 and the exponent of y is 1.
The sum of the exponents is $2 + 1 = 3$.

∴ So, the degree of the monomial is 3.

b. Write $x + 1 + 2x^3$ in standard form. Identify the degree and classify the polynomial by the number of terms.

Polynomial	*Standard Form*	*Degree*	*Type of Polynomial*
$x + 1 + 2x^3$	$2x^3 + x + 1$	3	trinomial

Exercises

Write the polynomial in standard form. Identify the degree and classify the polynomial by the number of terms.

1. $2w^3 + 3 - 4w$ **2.** $-6y^2$ **3.** $-6.2 + 3t^5$

7.2 Adding and Subtracting Polynomials *(pp. 334–339)*

a. $(2d^2 - 3) + (4d^2 + 2)$

$$(2d^2 - 3) + (4d^2 + 2) = (2d^2 + 4d^2) + (-3 + 2)$$
$$= 6d^2 - 1$$

b. $(c^2 + 5c + 1) - (c^2 - 2)$

$$(c^2 + 5c + 1) - (c^2 - 2) = (c^2 + 5c + 1) + (-c^2 + 2)$$
$$= [c^2 + (-c^2)] + 5c + (1 + 2) = 5c + 3$$

Exercises

Find the sum or difference.

4. $(3a + 7) + (a - 1)$ **5.** $(x^2 + 4x - 2) + (6x^2 + 6)$

6. $(-y^2 + y + 2) - (y^2 - 5y - 2)$ **7.** $(p - 9) - (-8p^2 + 7)$

7.3 Multiplying Polynomials *(pp. 340–347)*

Find $(x + 1)(x - 4)$.

First Outer Inner Last

$(x + 1)(x - 4) = x(x) + x(-4) + (1)(x) + (1)(-4)$ Use the FOIL Method.

$= x^2 + (-4x) + (x) + (-4)$ Multiply.

$= x^2 - 3x - 4$ Combine like terms.

Exercises

Find the product.

8. $(y + 4)(y - 2)$ **9.** $(q - 3)(2q + 7)$ **10.** $(-3v + 1)(v^2 - v - 2)$

7.4 Special Products of Polynomials *(pp. 348–353)*

Find each product.

a. $(x + 3)(x - 3)$

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

$(x + 3)(x - 3) = x^2 - 3^2$ Use pattern.

$= x^2 - 9$ Simplify.

b. $(y + 2)^2$

$(a + b)^2 = a^2 + 2ab + b^2$ Square of a Binomial Pattern

$(y + 2)^2 = y^2 + 2(y)(2) + 2^2$ Use pattern.

$= y^2 + 4y + 4$ Simplify.

Exercises

Find the product.

11. $(y + 9)(y - 9)$ **12.** $(2x + 4)(2x - 4)$

13. $(h + 4)^2$ **14.** $(-1 + 2d)^2$

7.5 Solving Polynomial Equations in Factored Form *(pp. 356–361)*

Solve $(x + 4)(x - 3) = 0$.

$(x + 4)(x - 3) = 0$ Write equation.

$x + 4 = 0$ *or* $x - 3 = 0$ Use Zero-Product Property.

$x = -4$ *or* $x = 3$ Solve for x.

∴ The roots are $x = -4$ and $x = 3$.

Exercises

Solve the equation.

15. $x(x + 2) = 0$

16. $(t - 3)(t - 8) = 0$

17. $(a + 10)^2 = 0$

18. $2s(s + 1)(s - 4) = 0$

7.6 Factoring Polynomials Using the GCF *(pp. 362–367)*

Factor $4z^2 + 32$.

Step 1: Find the GCF of the terms.

$$4z^2 = 2 \cdot 2 \cdot z \cdot z$$
$$32 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$$

The GCF is $2 \cdot 2 = 4$.

Step 2: Write the polynomial as a product of the GCF and its remaining factors.

$$4z^2 + 32 = 4(z^2) + 4(8) \qquad \text{Factor out GCF.}$$
$$= 4(z^2 + 8) \qquad \text{Distributive Property}$$

Exercises

Factor the polynomial.

19. $6t^2 + 36$

20. $2x^2 - 20x$

21. $15y^3 + 3y^2$

7.7 Factoring $x^2 + bx + c$ *(pp. 368–375)*

Factor $x^2 + 12x + 27$.

Notice that $b = 12$ and $c = 27$.

- Because c is positive, the factors p and q must have the same sign so that pq is positive.
- Because b is also positive, p and q must each be positive so that $p + q$ is positive.

Find two positive integer factors of 27 whose sum is 12.

Factors of 27	Sum of Factors
1, 27	28
3, 9	12

The values of p and q are 3 and 9.

∴ So, $x^2 + 12x + 27 = (x + 3)(x + 9)$.

Exercises

Factor the polynomial.

22. $p^2 + 2p - 35$ **23.** $b^2 + 9b + 20$ **24.** $z^2 - 4z - 21$

7.8 Factoring $ax^2 + bx + c$ *(pp. 376–381)*

a. Factor $2x^2 + 13x + 15$.

Consider the possible factors of $a = 2$ and $c = 15$.

Factors are 1 and 2. → $2x^2 + 13x + 15$ ← Factors are 1, 3, 5, and 15.

These factors lead to the following possible products.

$(1x + 1)(2x + 15)$ $(1x + 3)(2x + 5)$

$(1x + 15)(2x + 1)$ $(1x + 5)(2x + 3)$

Multiply to find the product that is equal to the original polynomial.

$(x + 1)(2x + 15) = 2x^2 + 17x + 15$ ✗

$(x + 15)(2x + 1) = 2x^2 + 31x + 15$ ✗

$(x + 3)(2x + 5) = 2x^2 + 11x + 15$ ✗

$(x + 5)(2x + 3) = 2x^2 + 13x + 15$ ✓

∴ So, $2x^2 + 13x + 15 = (x + 5)(2x + 3)$.

b. Factor $5x^2 + 4x - 9$.

Consider the possible factors of $a = 5$ and $c = -9$. Because b is positive and c is negative, the factors of c must have different signs.

Factors are 1 and 5. → $5x^2 + 4x - 9$ ← Factors are ± 1, ± 3, and ± 9.

These factors lead to the following possible products.

$(1x + 1)(5x - 9)$ $(1x - 1)(5x + 9)$ $(1x - 3)(5x + 3)$

$(1x + 9)(5x - 1)$ $(1x - 9)(5x + 1)$ $(1x + 3)(5x - 3)$

Multiply to find the product that is equal to the original polynomial.

$(x + 1)(5x - 9) = 5x^2 - 4x - 9$ ✗

$(x + 9)(5x - 1) = 5x^2 + 44x - 9$ ✗

$(x - 1)(5x + 9) = 5x^2 + 4x - 9$ ✓

$(x - 9)(5x + 1) = 5x^2 - 44x - 9$ ✗

$(x - 3)(5x + 3) = 5x^2 - 12x - 9$ ✗

$(x + 3)(5x - 3) = 5x^2 + 12x - 9$ ✗

∴ So, $5x^2 + 4x - 9 = (x - 1)(5x + 9)$.

Exercises

Factor the polynomial.

25. $10a^2 + 11a + 3$

26. $4z^2 + 11z + 6$

27. $2x^2 - 27x - 14$

28. $-2p^2 + 2p + 4$

29. **OUTSIDE PATIO** You are installing new tile on an outside patio. The area (in square feet) of the rectangular patio can be represented by $8x^2 + 33x + 4$. Write the expressions that represent the dimensions of the patio.

7.9 Factoring Special Products *(pp. 382–389)*

Factor each polynomial.

a. $x^2 - 16$

$x^2 - 16 = x^2 - 4^2$ Write as $a^2 - b^2$.

$= (x + 4)(x - 4)$ Difference of Two Squares Pattern

b. $x^2 - 2x + 1$

$x^2 - 2x + 1 = x^2 - 2(x)(1) + 1^2$ Write as $a^2 - 2ab + b^2$.

$= (x - 1)^2$ Perfect Square Trinomial Pattern

c. $x^3 + 4x^2 + 3x + 12$

$x^3 + 4x^2 + 3x + 12 = (x^3 + 4x^2) + (3x + 12)$ Group terms with common factors.

Common binomial factor is $x + 4$. → $= x^2(x + 4) + 3(x + 4)$ Factor out GCF of each pair of terms.

$= (x + 4)(x^2 + 3)$ Factor out $(x + 4)$.

d. $2x^4 - 8x^2$

$2x^4 - 8x^2 = 2x^2(x^2 - 4)$ Factor out $2x^2$.

$= 2x^2(x^2 - 2^2)$ Write as $a^2 - b^2$.

$= 2x^2(x + 2)(x - 2)$ Difference of Two Squares Pattern

Exercises

Factor the polynomial.

30. $x^2 - 9$

31. $y^2 - 100$

32. $z^2 + 6z + 9$

33. $m^2 + 16m + 64$

34. $x^2 - 3x + 4ax - 12a$

35. $n^3 - 9n$