

Chapter Review

Vocabulary

binomial (p. 457)
degree of a monomial (p. 457)
degree of a polynomial (p. 457)

factor by grouping (p. 496)
monomial (p. 456)
perfect-square trinomial (p. 490)

polynomial (p. 457)
standard form of a polynomial (p. 457)
trinomial (p. 457)



Reading Math Understanding Vocabulary

Match the vocabulary term in the column on the left with the most accurate description in the column on the right.

- | | |
|----------------------------------|--|
| 1. binomial | A. a polynomial with two terms |
| 2. degree of a monomial | B. a polynomial in which the terms decrease in degree from left to right and there are no like terms |
| 3. monomial | C. a polynomial with two identical binomial factors |
| 4. perfect-square trinomial | D. the sum of the exponents of the variables |
| 5. standard form of a polynomial | E. an expression that is a number, a variable, or a product of a number and one or more variables |



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Skills and Concepts

9-1 Objectives

- ▼ To describe polynomials (p. 456)
- ▼ To add and subtract polynomials (p. 458)

The degree of a term with one variable is the exponent of the variable. A **polynomial** is one monomial or the sum or difference of two or more monomials. The **degree of a polynomial** is the same as the degree of the term with the highest degree. A polynomial can be named by its degree or by the number of its terms. You can simplify polynomials by adding the coefficients of like terms.

Write each polynomial in standard form. Then name each polynomial based on its degree and number of terms.

- | | | |
|----------------------------------|---------------|---------------------------|
| 6. $5y + 2 - 6y^2 + 3y$ | 7. $1 + 9h^2$ | 8. $k^3 + 3k^5 + k - k^3$ |
| 9. $6t^3 + 9 + 8t + 7t^2 - 6t^3$ | 10. x^2y^2 | 11. $5 + x^2 + x^3$ |

12. **Open-Ended** Write a polynomial using the variable z . What is the degree of your polynomial?

Simplify. Write each answer in standard form.

13. $(-4b^5 + 3b^3 - b + 10) + (3b^5 - b^3 + b - 4)$
 14. $(3g^4 + 5g^2 + 5) + (5g^4 - 10g^2 + 11g)$
 15. $(3x^3 + 8x^2 + 2x + 9) - (-4x^3 + 5x - 3)$
 16. $(2t^3 - 4t^2 + 9t - 7) - (t^3 + t^2 - 3t + 1)$
 17. $(6y^2 + 3y + 5) - (2y^2 + 1)$
 18. $(7w^5 - 7w^3 + 3w) - (5w^4 - w^2 + 3)$

9-2 Objectives

- ▼ To multiply a polynomial by a monomial (p. 462)
- ▼ To factor a monomial from a polynomial (p. 463)

You can multiply a monomial and a polynomial using the Distributive Property. You can factor a polynomial by finding the greatest common factor (GCF) of the terms of the polynomial.

Simplify each product. Write in standard form.

19. $8x(2 - 5x)$ 20. $5g(3g + 7g^2 - 9)$ 21. $8t^2(3t - 4 - 5t^2)$
22. $5m(3m + m^2)$ 23. $-2w^2(4w - 10 + 3w^2)$ 24. $b(10 + 5b - 3b^2)$

Find the GCF of the terms of each polynomial. Then factor the polynomial.

25. $9x^4 + 12x^3 + 6x$ 26. $4t^5 - 12t^3 + 8t^2$ 27. $40n^5 + 70n^4 - 30n^3$
28. $2k^4 + 4k^3 - 6k - 8$ 29. $3d^2 - 6d$ 30. $10m^4 - 12m^3 + 4m^2$
31. $10v - 5$ 32. $12w^3 + 8w^2 + 20w$ 33. $18d^5 + 6d^4 + 9d^3$

34. **Critical Thinking** The GCF of two numbers x and y is 3. Can you predict the GCF of $4x$ and $4y$? Explain your answer.
35. **Critical Thinking** Amanda says the GCF of $8m^2n$ and $4mn$ is 4. Kris says the GCF is $4n$. Kim says the GCF is $4mn$. Which student is correct? Explain your answer.

9-3 and 9-4 Objectives

- ▼ To multiply binomials using FOIL (p. 467)
- ▼ To multiply trinomials by binomials (p. 469)
- ▼ To find the square of a binomial (p. 474)
- ▼ To find the difference of squares (p. 476)

You can use tiles or the Distributive Property to multiply polynomials. You can use the FOIL method (First, Outer, Inner, Last) to multiply two binomials.

Simplify each product. Write in standard form.

36. $(x + 3)(x + 5)$ 37. $(5v + 2)(3v - 7)$ 38. $(2b + 5)(3b - 2)$
39. $(k - 1)(-k + 4)$ 40. $(p + 2)(p^2 + p + 1)$ 41. $(4a - 1)(a - 5)$
42. $(y - 4)(y^2 - 5y - 2)$ 43. $(3x + 4)(x + 2)$ 44. $(-2h^2 + h - 1)(h - 5)$
45. $(q - 4)(q - 4)$ 46. $(2k^3 + 5)^2$ 47. $(8 - 3t^2)(8 + 3t^2)$
48. $(2m^2 + 5)(2m^2 - 5)$ 49. $(w - 4)(w + 4)$ 50. $(4g^2 - 5h^4)(4g^2 + 5h^4)$

51. **Geometry** A rectangle has dimensions $2x + 1$ and $x + 4$. Write an expression for the area of the rectangle as a product and as a polynomial in standard form.
52. **Error Analysis** Suppose a classmate claims that the difference between $(x^2 - y^2)$ and $(x - y)^2$ must be 0. Is your classmate correct? Explain your answer.

9-5 and 9-6 Objectives

- ▼ To factor trinomials (p. 481)
- ▼ To factor trinomials of the type $ax^2 + bx + c$ (p. 486)

Some quadratic trinomials are the product of two binomial factors. You can factor trinomials using tiles or by using FOIL. Factor any common monomial factors first.

Factor each expression.

53. $x^2 + 3x + 2$ 54. $y^2 - 9y + 14$ 55. $x^2 - 2x - 15$
56. $2w^2 - w - 3$ 57. $b^2 - 7b + 12$ 58. $2t^2 + 3t - 2$
59. $x^2 + 5x - 6$ 60. $6x^2 + 10x + 4$ 61. $21x^2 - 22x - 8$
62. $3x^2 + x - 2$ 63. $15y^2 + 16y + 1$ 64. $15y^2 - 16y + 1$

9-7 Objectives

- ▼ To factor perfect-square trinomials (p. 490)
- ▼ To factor the difference of squares (p. 492)

When you factor a **perfect-square trinomial**, the two binomial factors are the same.

$$a^2 + 2ab + b^2 = (a + b)(a + b) = (a + b)^2 \text{ and}$$

$$a^2 - 2ab + b^2 = (a - b)(a - b) = (a - b)^2$$

When you factor the difference of squares of two terms, the two binomial factors are the sum and the difference of the two terms.

$$a^2 - b^2 = (a + b)(a - b)$$

Factor each expression.

65. $q^2 + 2q + 1$

66. $b^2 - 16$

67. $x^2 - 4x + 4$

68. $4t^2 - 12t$

69. $4d^2 - 20d + 25$

70. $9c^2 + 6c + 1$

71. $9k^2 - 25$

72. $x^2 + 6x + 9$

73. $24y^2 - 6$

74. **Geometry** Find the length of a side of the square with an area of $\frac{1}{4}d^2 + d + 1$.

75. **Critical Thinking** Suppose you are using tiles to factor a quadratic trinomial. What do you know about the factors of the trinomial if the tiles form a square?

76. The area of a rectangle is $25u^2 + 65u + 36$. If the dimensions of the rectangle are factors of $25u^2 + 65u + 36$, could the rectangle be a square? Explain.

9-8 Objectives

- ▼ To factor polynomials with four terms (p. 496)
- ▼ To factor trinomials by grouping (p. 497)

To factor a polynomial, first see if you can factor out the GCF. If the polynomial has four or more terms, you can group the terms and look for a common binomial factor. Then you can use the Distributive Property to factor the polynomial. If you do not quickly recognize the binomial factors of a polynomial of the form $ax^2 + bx + c$, grouping the terms may help you factor the polynomial.

Find the GCF of the first two terms and the GCF of the last two terms for each polynomial.

77. $16x^3 + 12x^2 - 8x - 6$

78. $9k^3 + 15k^2 - 6k - 10$

79. $72y^3 + 24y^2 - 12y - 4$

80. $20n^4 - 10n^3 + 14n - 7$

Factor completely.

81. $6x^3 + 3x^2 + 8x + 4$

82. $20y^4 - 45y^2$

83. $9g^2 + 15g - 6$

84. $6c^2 - 5cd + d^2$

85. $11k^2 + 23k + 2$

86. $3u^2 + 21u + 18$

87. $15p^2 + 14p + 3$

88. $3u^2 - 21u + 18$

89. $15h^3 + 11h^2 - 45h - 33$

90. $30x^3 + 42x^2 - 5x - 7$

91. $12s^4t + 20s^3t - 8s^2t$

92. $2x^3 + 7x^2 + 4x + 14$

93. **Geometry** The volume of the rectangular prism is $6p^3 + 38p^2 + 40p$. Find expressions for the possible dimensions of the prism.

