Practice - Polynomial Operations and Factoring
Math 10 · Mr. Merrick · October 22, 2025

1. Review of Exponents

1. Simplify each expression using exponent laws.

   a) $x^3 \cdot x^5$

   b) $(a^4)^3$

   c) $\dfrac{y^7}{y^2}$

   d) $(2x^3)^2$

   e) $\dfrac{3x^5 y^3}{9x^2 y}$

2. Evaluate for $x = 2$.

   a) $2x^3 - x^2$

   b) $5x^2 - 3x + 4$

2. Understanding Polynomials

1. State the degree, number of terms, and leading coefficient.

   a) $4x^3 - 2x^2 + 7$

   b) $-3y^5 + y^4 - 2y$

   c) 6

2. Classify each as monomial, binomial, or trinomial.

   a) $5x^2$

   b) $2a + 9$

   c) $3x^2 - x + 4$

3. Write each in standard form.

   a) $7x - 4x^3 + 3x^2$

   b) $5a^2 - 9 + 8a^3$

3. Evaluating Polynomials

1. Evaluate each polynomial for $x = 2$.

   a) $x^2 + 3x - 4$

   b) $2x^3 - x + 5$

   c) $x^4 - 5x^2 + 2$

2. Evaluate for $a = -3$.

   a) $a^2 + 4a - 1$

   b) $-2a^3 + a^2 - 5$

4. Adding and Subtracting Polynomials

1. Simplify.

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

   b) $(5a^3 - 2a + 7) - (3a^3 + 4a - 5)$

   c) $(6m^2 + m - 2) + (3m^2 - 4m + 7)$

2. Combine like terms and simplify.

   a) $4x^3 + 3x^2 - x + 8 + 2x^3 - 7x^2 + 4$

   b) $(x^2 + 5x - 6) - (2x^2 - x + 3)$

3. Application: The area of one rectangle is $(3x + 2)$ m by $(x + 4)$ m, and another rectangle has area $(2x + 3)(x + 1)$ m^2. Find the total area of both rectangles.

5. Multiplying by a Monomial

1. Expand and simplify.
   a) $3x(x^2 + 5x - 2)$
   b) $-2a(4a^2 - 3a + 6)$
   c) $5y^2(y - 4)$

2. Expand and collect like terms.
   a) $4x(x^2 - x + 2) + 2x(x^2 + 3)$
   b) $-3a(2a^2 - 5) + 2a(a^2 + 4)$

6. Multiplying Binomials and Trinomials

1. Expand each.
   a) $(x + 4)(x + 3)$
   b) $(2a - 5)(a + 1)$
   c) $(y - 6)(y + 2)$

2. Expand.
   a) $(x + 2)(x^2 + 3x + 4)$
   b) $(2a - 3)(a^2 + 4a + 1)$

3. Simplify and collect like terms.
   a) $(x + 2)(x + 3) - (x + 1)(x + 4)$
   b) $(a - 5)(a + 2) - (a - 3)(a + 4)$

7. Special Products

1. Expand and simplify.
   a) $(x + 5)^2$
   b) $(3y - 4)^2$
   c) $(2a + 7)(2a - 7)$
   d) $(5x - 1)(5x + 1)$

2. Simplify and write in standard form.
   a) $(x - 4)^2 - (x - 2)^2$
   b) $(2a + 3)^2 - (a + 5)^2$

8. Applications: Area and Perimeter Models

1. A rectangle has length $(3x + 2)$ and width $(x + 4)$. Find its area and perimeter.
2. The side of a square is $(x + 5)$ cm. Find the area and perimeter.
3. The length of a rectangle is $(2x + 3)$ and width is $(x - 1)$. The area is increased by adding a border 1 m wide all around. Write an expression for the new total area.

9. Factoring Out a Common Factor

1. Factor each expression completely.
   a) $8x^3 + 12x^2 - 4x$
   b) $15a^4 - 10a^3 + 20a^2$
   c) $-9y^3 + 6y^2 - 3y$

2. Factor each polynomial with a numerical GCF.
   a) $24x^2 + 36x$
   b) $18a^3 - 27a^2 + 9a$

10. Factoring Simple Trinomials $(a = 1)$

1. Factor completely.
   a) $x^2 + 8x + 15$
   b) $x^2 - 7x + 12$
   c) $a^2 + 9a + 20$
   d) $m^2 + 2m - 15$

2. Application: The area of a rectangle is $x^2 + 9x + 20$. Factor to find two possible expressions for its length and width.

11. Factoring Complex Trinomials $(a \neq 1)$

1. Factor completely.
    a) $2x^2 + 7x + 3$
    b) $3a^2 - 5a - 2$
    c) $4y^2 + 12y + 5$
    d) $5m^2 - 13m - 6$

12. Factoring by Grouping and Special Forms

1. Factor by grouping.
    a) $3x^3 + 6x^2 + x + 2$
    b) $2a^3 - 4a^2 + 3a - 6$

2. Factor as a difference of squares.
    a) $x^2 - 9$
    b) $4a^2 - 25$
    c) $9y^2 - 16$

3. Factor as a perfect square trinomial.
    a) $x^2 + 10x + 25$
    b) $9a^2 - 24a + 16$

13. Applications of Factoring

1. The area of a rectangle is given by $A = x^2 + 7x + 10$. Factor to find expressions for its dimensions.

2. The area of a garden is $6x^2 + 9x$. Factor to determine one possible set of dimensions.

3. The area of a square tile is $x^2 + 10x + 25$. Find the side length.

4. The product of two consecutive integers is 72. Write and solve a polynomial equation.

14. Mixed Review – Practice Test

1. Simplify: $(2x^2 + 5x - 3) - (x^2 - 4x + 7)$
2. Expand: $(3x - 2)(x + 5)$
3. Expand: $(x + 4)^2$
4. Factor: $x^2 + 7x + 10$
5. Factor: $4x^2 - 25$
6. Expand: $(x - 3)(x^2 + 4x - 1)$
7. Factor: $3x^3 - 12x$
8. $(2x + 3)^2 - (x + 5)^2$
9. Factor: $x^2 - 6x + 9$
10. $(x - 2)(x + 3) + (x + 1)(x - 4)$