Chapter 8
Polynomials and Factoring

8.1
Add and Subtract Polynomials

Monomial

- A _____.
- _____
  - EX:
- Degree of a monomial – the _____ of all of the _____ of the _____
  - EX: $4x^2y$

Polynomial

- A _____ or _____
  - EX:

- Degree of a polynomial – the _____ _____ of its terms
  - EX: $2x^2 + 5x + 7$

- Leading coefficient – the coefficient of the _____ when the polynomial is written in _____
  - EX: $2x^2 + 5x + 7$

EX:

- Write the polynomial so that the exponents decrease from left to right. Identify the degree and the leading coefficient.
- $7 - 5y^3$

- $-5 + 2x^2 + x^3 - 7x$

- Binomial – a polynomial with _____
  - EX:

- Trinomial – a polynomial with _____
  - EX:

To add polynomials -

- Add _____
  - REMEMBER: You can only add if the _____ AND the _____ are the same.
- EX: Find the sum.
- $(6a^2 - 4) + (2a^2 - 9)$

- EX: Find the sum.
- $(5x^3 + 4x - 2x) + (4x^2 + 3x^3 - 6)$

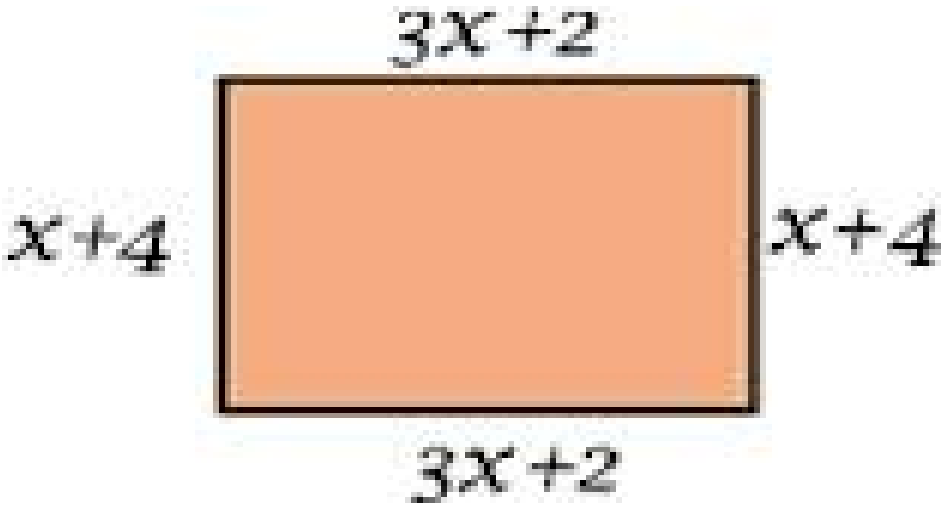
To subtract polynomials -

- Distribute the _____ then _____ _____.
  - Make sure to _____ when distributing the negative.
- EX: Find the difference.
- $(4n^2 + 5) - (-2n^2 + 2n - 4)$

- EX: Find the difference.
- $(4x^2 - 7x) - (5x^2 + 4x - 9)$

EX:

- Write a polynomial that represents the perimeter of the figure.
  - All sides added up.



EX:

- Major League Baseball teams are divided into two leagues. During the period 1995-2001, the attendance (in thousands) at National (N) and American (A) games can be modeled by:
  - $N = -488t^2 + 5430t + 24{,}700$
  - $A = -318t^2 + 3040t + 25{,}600$
- Where *t* is the number of years since 1995. About how many total people attended games in 2001?

8.2
Multiplying Polynomials

To multiply polynomials:

- _____ everything in the _____ to everything in the _____.
  - REMEMBER: When you _____like bases, _____ the exponents.

EX: Find the product.

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

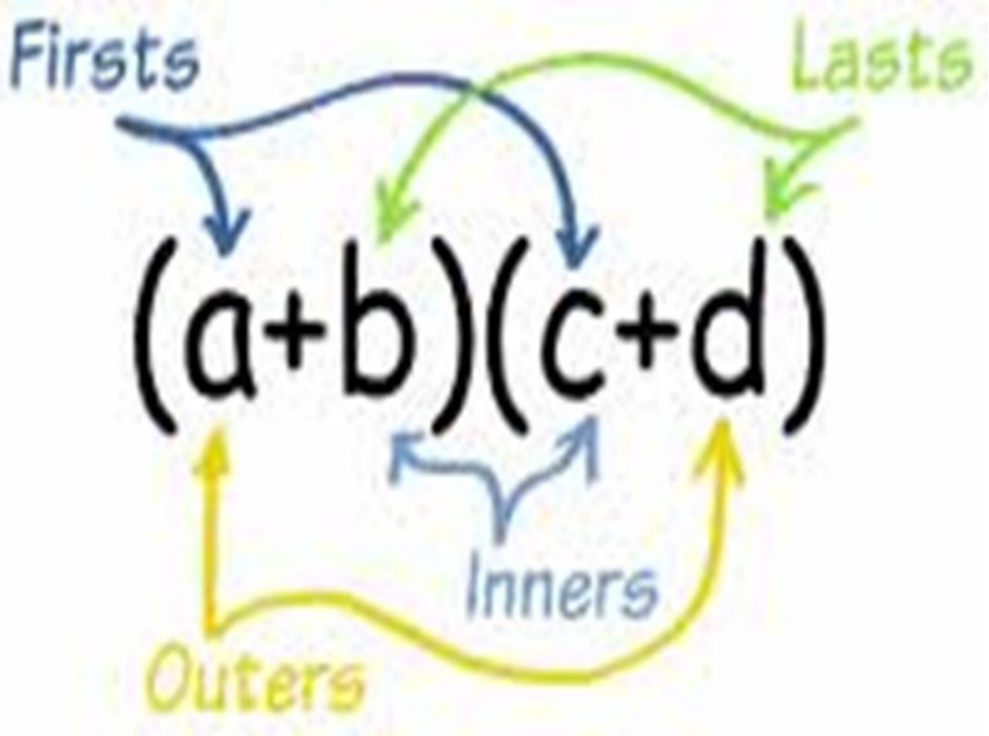
- $(x - 2)(x^2 + 2x + 1)$

- $(3y^2 - y + 5)(2y - 3)$

FOIL Method

- When multiplying _____, you can use the FOIL Method.
- The FOIL Method is the _____ but in a _____.
- Multiply:
  - Firsts
  - Outers
  - Inners
  - Lasts

FOIL Method



EX: Find the product.

- $(4b - 5)(b - 2)$

- $(6n - 1)(n + 5)$

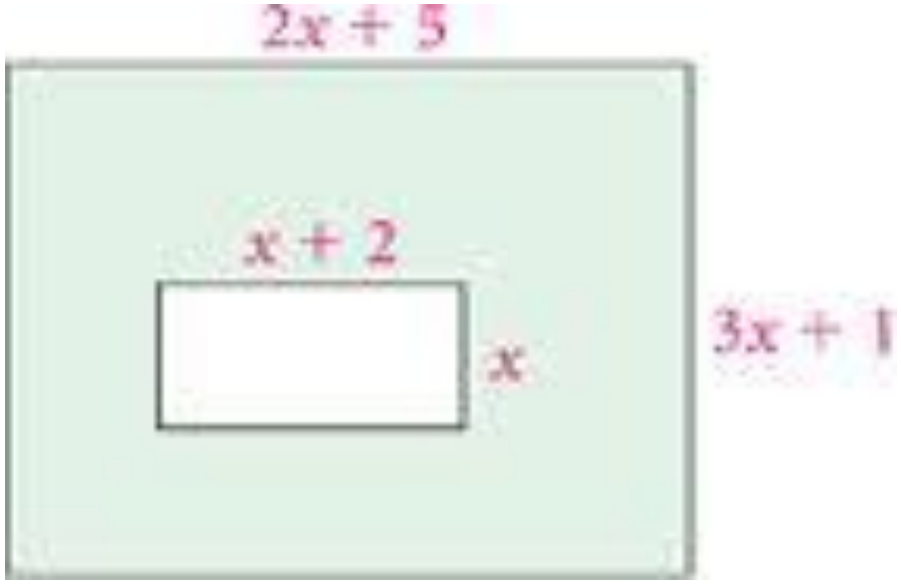
- $(2x + 3y)^2$

EX: Simplify the expression.

- $-3x^2(x+ 11) – (4x – 5)(3x – 2)$

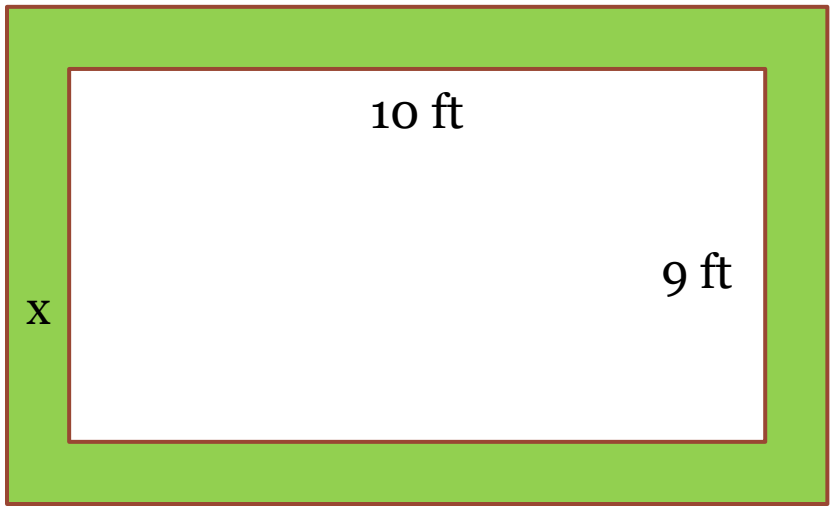
EX:

- Write a polynomial that represents the area of the shaded region.



EX:

- You are planning to build a walkway that surrounds a rectangular garden, as shown. The width of the walkway is the same on every side.
  - Write a polynomial that represents the combined area of the garden and the walkway.
  - Find the combined area when the width of the walkway is 4 feet.



8.4
Solve Polynomial Equations in Factored Form

Factoring

- To **factor** a polynomial – _____
  _____
- **To Factor a Polynomial**:
- Step 1: Look for a _____
  - A monomial that can be _____ of _____ in the polynomial
  - Write the common monomial_____ and _____ by what is left over
    _____

EX: Factor out the greatest common monomial factor.

- $12x + 42y$

- $4x^4 + 24x^3$

- $15n^3 - 25n$

- $8a^2b - 6ab^2 + 4ab$

Zero-Product Property

- If ab = 0, then _____.
- This property is used to solve an equation when _____ and the other side is a _____.
  - EX: (x-3)(2x + 7) = 0

To solve an equation by factoring:

- 1) Put the equation in _____ set equal to _____.
  - EX:

- 2) _____.
- 3) Set each factor _____ and _____.

EX: Solve the equation.

- $(2y + 5)(7y - 5) = 0$

- $a^2 + 5a = 0$

- $-28m^2 = 8m$

Vertical Motion Model

- Models the _____ of a _____
  - An object thrown in the air with only the _____ acting on it.
  - http://phet.colorado.edu/sims/projectile-motion/projectile-motion_en.html

Vertical Motion Model

- **$h = -16t^2 + vt + s$**
  - h = _____of the object (in feet)
  - t = _____ the object is in the air (in seconds)
  - v = _____ (in feet per second)
  - s = _____of the object (in feet)

EX:

- A dolphin jumped out of the water with an initial vertical velocity of 32 feet per second. After how many seconds did the dolphin enter the water?
- After 1 second, how high was the dolphin above the water?

8.5
Factor $x^2 + bx + c$

Review:

- Multiplying _____ results in a _____.
  - EX: $(3x + 2)(x - 4)$

- Therefore, we will _____ _____.

To factor a polynomial:

- Step 1: Look for a _____.
- Step 2: If you have a _____, factor it into _____.
  - The 1st terms in each binomial must_____ to get the 1st term in the trinomial.
  - The 2nd term in each binomial must _____ to get the _____ coefficient in the trinomial and must _____ to get the _____ in the trinomial.
  - NOTE: Pay attention to _____.

NOTEBOOK EXAMPLE #1
EX: Factor the trinomial.

- $x^2 + 3x + 2$
- $t^2 + 9t + 14$
- $x^2 - 4x + 3$
- $t^2 - 8t + 12$
- $m^2 + m - 20$
- $w^2 + 6w - 16$
- $x^2 - 4xy + 4y^2$
- $m^2 - mn - 42n^2$

NOTEBOOK EXAMPLE #2
EX: Solve the equation (by factoring).

- $x^2 - 2x = 24$
- $x^2 - 2x - 8 = 7$
- $s(s + 1) = 72$

EX: Find the dimensions of the rectangle.

- 8.5 Ex #43

EX:

- You are designing a flag for the SMCC football team with the dimensions shown. The flag requires 80 square feet of fabric. Find the width w of the flag.

8.6
Factor $ax^2 + bx + c$

Steps to Factoring:

- 1) Look for a _____.
  - If the leading coefficient is _____, factor out a _____.
- 2) If you have a _____, factor it into _____.

Test to factor a trinomial when the leading coefficient is _____:

- In your two binomials:
  - The 1st terms must _____ to get the _____ in the trinomial.
  - The 2nd terms must _____ to get the _____ in the trinomial.
  - **_____ plus _____ must equal the _____ in the trinomial.**

NOTEBOOK EXAMPLE #3
EX: Factor the trinomial.

- $3x^2 + 8x + 4$
- $4x^2 - 9x + 5$
- $2x^2 + 13x - 7$
- $-2x^2 - 5x - 3$
- $-5m^2 + 6m - 1$
- $-4n^2 - 16n - 15$

NOTEBOOK EXAMPLE #4

EX: Solve the equation (by factoring).

- $8x^2 - 2x = 3$
- $b(20b - 3) = 2$
- $6x^2 - 15x = 99$

EX:

- In a shot put event, an athlete throws the shot put from an initial height of 6 feet and with an initial vertical velocity of 29 feet per second. After how many seconds does the shot put hit the ground?

EX:

- The length of a rectangle is 7 inches more than 5 times its width. The area of the rectangle is 6 square inches. What is the width?

8.7
Factoring Special Products

Steps to Factoring:

- 1) _____.
- 2) Trinomial – into _____.
  - If the two binomials are the _____, its called a _____.
- **3) If you have a _____:**
  - **Factor it into _____ with the _____ but _____.**
  - **EX: $x^2 - 9$**

NOTEBOOK EXAMPLE #5
EX: Factor the polynomial.

- $y^2 - 16$
- $121x^2 - 144$
- $x^2 - 81y^2$
- $8 - 18x^2$
- $-4x^2 + 64$
- $x^2 - 12x + 36$
- $4x^2 + 4xy + y^2$
- $-3y^2 + 36y - 108$

NOTEBOOK EXAMPLE #6
EX: Solve the equation.

- $4x^2 - 36 = 0$
- $-8k^2 = -98$
- $y^2 - \frac{5}{3}y = -\frac{25}{36}$

EX:

- A window washer drops a wet sponge from a height of 64 feet. After how many seconds does the sponge land on the ground?

8.8
Factor Polynomials Completely

Steps to Factoring:

- 1) _____.
- 2) Trinomial – into _____.
- 3) Difference of square – _____.
  - Same _____, different _____.
- 4) If you have a _____, factor by _____:
  - Group the polynomial in _____.
  - Factor out a _____ from each.
  - Factor out a _____ from each pair.

NOTEBOOK EXAMPLE #7
EX: Factor.

- $x(x-2) + (x-2)$
- $6z(z-4) - 7(z-4)$
- $12(z-1) - 5z^2(1-z)$
- $a^3 + 3a^2 + a + 3$
- $a^3 + 13a^2 - 5a - 65$

NOTEBOOK EXAMPLE #8
EX: Factor completely.

- $3x^3 - 12x$
- $2y^3 - 12y^2 + 18y$
- $7a^3b^3 - 63ab^3$

NOTEBOOK EXAMPLE #9
EX: Solve the equation.

- $w^3 - 8w^2 + 16w = 0$
- $x^4 - 25x^2 = 0$
- $4y^3 - 7y^2 = 16y - 28$

EX:

- A terrarium has a volume of 4608 cubic inches. Its length is more than 10 inches. Its dimensions are shown. Find the length, width, and height of the terrarium.