

## Chapter 9: Polynomials and Factoring Study Guide

### 9.1: Add and subtract polynomials:

- Be able to identify an expression as a polynomial or not. If it is, be able to classify it by the number of terms, find the degree and write it so it is in descending order.

Expression	Polynomial ?	Type	Degree	Descending Order
$-\frac{1}{2}$	Y	Mono	0	$-\frac{1}{2}$
$x^3y^5z$	Y	Mono	9	$x^3y^5z$
$3x + \frac{1}{x}$	N	-	-	-
$7bc^3 + 4b^4c$	Y	Bi	5	$4b^4c + 7bc^3$
$5ab^3c^5 - 4a^2bc^2 + 3a^3b^3c$	Y	Tri	9	$3a^3b^3c - 4a^2bc^2 + 5ab^3c^5$
$5z + 2z^3 - z^2 + 3z^4$	Y	Poly	4	$3z^4 + 2z^3 - z^2 + 5z$
$-8rs^2 + 3r^2s - 4r^2s^2 + 9r - 3s$	Y	Poly	4	$-4r^2s^2 + 3r^2s - 8rs^2 + 9r - 3s$

- Be able to add and subtract polynomials:

**Ex:**  $(9x + 6x^3 - 8x^2) + (-5x^3 + 6x)$

$$x^3 - 8x^2 + 15x$$

**Ex:**  $(2s^3 + 8) - (-3s^3 + 7s - 5)$

$$5s^3 - 7s + 13$$

### 9.2 – 9.3: Multiply Polynomials/Special Products Formulas:

- Be able to distribute, FOIL and multiply polynomials

**Ex:**  $(-3d + 10)(2d - 1)$

$$-6d^2 + 23d - 10$$

**Ex:**  $(2s + 5)(s^2 + 3s - 1)$

$$2s^3 + 11s^2 + 13s - 5$$

**Ex:**  $(m + 7)(m - 3) - (m - 4)(m + 5)$

$$3m - 1$$

- Be able to apply special products formulas

**Ex:**  $(3m - 7n)^2$

$$9m^2 - 42mn + 49n^2$$

**Ex:**  $(3x + 8y)^2$

$$9x^2 + 48xy + 64y^2$$

**Ex:**  $(2a - 5b)(2a + 5b)$

$$4a^2 - 25b^2$$

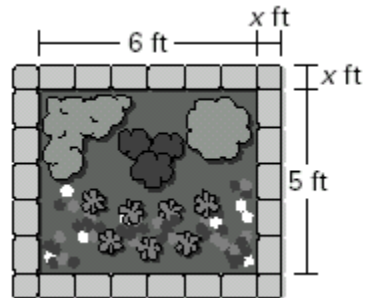
**Ex:** You are designing a rectangular flower bed that you will border using brick pavers. The width of the border around the bed will be the same on every side, as shown.

- a. Write a polynomial that represents the total area of the flower bed and the border.

$$4x^2 + 22x + 30$$

- b. Find the total area of the flower bed and border when the width of the border is 1.5 feet.

$$72 \text{ ft}^2$$



#### 9.4: Factor Using the GCF:

- Be able to identify the GCF of a quadratic expression and factor using this method.

**Ex:**  $2x^2 - 4x$

$$2x(x - 2)$$

**Ex:**  $-4y + 16y^2$

$$-4y(1 - 4y)$$

**Ex:**  $3xy + 8xy^2$

$$xy(3 + 8y)$$

- Be able to solve a quadratic equation in factored form.

**Ex:**  $(3x - 1)(x + 2) = 0$

$$x = \frac{1}{3} \quad x = -2$$

**Ex:**  $x(2x - 5) = 0$

$$x = 0 \quad x = \frac{5}{2}$$

**Ex:**  $x(3x - 7)(4x - 1) = 0$

$$x = 0 \quad x = \frac{7}{3} \quad x = \frac{1}{4}$$

- Be able to solve a quadratic equation by factoring using the GCF first!

**Ex:**  $7x^2 + 21x = 0$

$$x = 0 \quad x = -3$$

**Ex:**  $8x^2 - 16x = 0$

$$x = 0 \quad x = 2$$

**Ex:**  $2x^2 = -7x$

$$x = 0 \quad x = -\frac{7}{2}$$

- Be able to use the vertical motion model to solve problems involving a problem's height and time. ( $h = -16t^2 + vt + s$ )

**Ex:** An object is launched from the ground with an initial vertical velocity of 32 feet per second. How long before the object reaches the ground?

$$t = 2 \text{ seconds}$$

### **9.5: Factor Quadratics in the Form $y = x^2 + bx + c$ :**

- Be able to factor trinomials in the form  $x^2 + bx + c$  by factoring into two binomials in the form:  $(x + p)(x + q)$

**Ex:**  $x^2 - 7x + 12$

$$(x - 4)(x - 3)$$

**Ex.**  $x^2 - 2x - 24$

$$(x - 6)(x + 4)$$

**Ex:**  $-x^2 - 9x - 18$

$$-1(x + 6)(x + 3)$$

- Be able to solve quadratic equations by factoring first.

**Ex:**  $x^2 - 7x + 12 = 0$

$$x = 4 \quad x = 3$$

**Ex:**  $x^2 - 17x + 60 = 0$

$$x = 12 \quad x = 5$$

**Ex:**  $x^2 + 8x = -12$

$$x = -6 \quad x = -2$$

- Be able to use the vertical motion model to solve problems involving a problem's height and time. ( $h = -16t^2 + vt + s$ )

**Ex:** An object is launched from a height of 48 feet with an initial vertical velocity of 32 feet per second. How long before the object reaches the ground?

$$t = 3 \text{ seconds}$$

### **9.6: Factor Quadratics in the Form $y = ax^2 + bx + c$ :**

- Be able to factor quadratics in the form  $y = ax^2 + bx + c$  into two binomials either using the  $ax^2 + mx + nx + c$  method or number combinations method.

**Ex:**  $3x^2 + x - 2$

$$(3x - 2)(x + 1)$$

**Ex:**  $5x^2 - 6x + 1$

$$(5x - 1)(x - 1)$$

**Ex:**  $3x^2 + 13x + 4$

$$(3x + 1)(x + 4)$$

- Be able to solve quadratics in the form  $y = ax^2 + bx + c$  by factoring first.

**Ex:**  $3x^2 + x - 2 = 0$

$$\boxed{x = \frac{2}{3} \quad x = -1}$$

**Ex:**  $2x^2 - 3x - 35 = 0$

$$\boxed{x = -\frac{7}{2} \quad x = 5}$$

**Ex:**  $4x^2 + 11x = 3$

$$\boxed{x = \frac{1}{4} \quad x = -3}$$

### **9.7: Factor Special Products:**

- Be able to factor difference of two squares

**Ex:**  $x^2 - 25$

$(x + 5)(x - 5)$

**Ex:**  $4x^2 - 169$

$(2x - 13)(2x + 13)$

**Ex:**  $2x^2 - 50$

$2(x + 5)(x - 5)$

- Be able to factor perfect square trinomials

**Ex:**  $4x^2 + 20x + 25$

$(2x + 5)^2$

**Ex:**  $3x^2 - 24x + 48$

$3(x - 4)^2$

### **9.8: Factor Polynomials Completely:**

- Be able to factor out a common binomial

**Ex:**  $x(x - 8) + (x - 8)$

$(x + 1)(x - 8)$

**Ex:**  $5y(y + 3) - 2(y + 3)$

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

**Ex:**  $6z(z - 4) + 5(4 - z)$

$(6z - 5)(z - 4)$

- Be able to factor by grouping

**Ex:**  $5n^3 - 4n^2 + 25n - 20$

$(n^2 + 5)(5n - 4)$

**Ex:**  $y^2 + 5x + 5xy + y$

$(y + 5x)(y + 1)$

- Be able to factor polynomials completely

**Ex:**  $7a^3b^3 - 63ab^3$

$$\boxed{7ab^3(a - 3)(a + 3)}$$

**Ex:**  $-4s^3t^3 + 24s^2t^2 - 36st$

$$\boxed{-4st(st - 3)^2}$$

**Ex:**  $6g^3 - 24g^2 + 24g$

$6g(g - 2)^2$

**Ex:**  $3n^5 - 48n^3$

$3n^3(n + 4)(n - 4)$