

SM3-A Lesson 11-9 (Review Quadratics)

Multiplying Binomials

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

$$x^2 + x - 12$$

The "Box Method"

	x	4
x	x^2	$4x$
-3	$-3x$	-12

Standard Form
Quadratic Expression

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

$$(x + 2)(x + 6)$$

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

$$(x+2)(x+3) \quad \underline{\text{multiply}}$$

x^2 “left times left is the left term”

$$(x+2)(x+3) \quad \text{“right times right is the right term”}$$

$$x^2 \quad + 6$$

$$(x+2)(x+3) \quad \text{“inner”}$$


$$x^2 + 2x \quad + 6$$

$$(x+2)(x+3) \quad \text{“outer”}$$

$$x^2 + 2x + 3x + 6 = x^2 + (2+3)x + (2*3)$$

$$x^2 + 5x + 6$$

Left times left is left


$$(\underline{\quad} + \underline{\quad})(\underline{\quad} + \underline{\quad})$$

$$(x + \underline{\quad})(x + \underline{\quad})$$

Right times right is right


$$(x + \underline{\quad})(x + \underline{\quad})$$

Right plus right is middle

$$(x + 2)(x + 3)$$

**What are the factors of 6
that add up to 5?**

Try the following:

$$x^2 - 3x - 4 = (x - 4)(x + 1)$$

$$(x + \underline{\quad})(x + \underline{\quad})$$

Right times right is right


$$(x + \underline{\quad})(x + \underline{\quad})$$

Right plus right is middle

$$(-4)(1) = -4$$

$$(-4) + (1) = -3$$

**What are the factors of -4
that add up to -3?**

Try the following:

$$x^2 + 8x + 15 = (x + 3)(x + 5)$$

$$(x + \underline{\quad})(x + \underline{\quad})$$

Right times right is right


$$(x + \underline{\quad})(x + \underline{\quad})$$

Right plus right is middle

$$(3)(5) = 15$$

**What are the factors of 15
that add up to 8?**

$$3 + 5 = 8$$

Factor

$$x^2 + 10x + 21$$

$$x^2 - 6x - 16$$

$$x^2 - 9x + 18$$

$$2x^2 + 4x + 2$$

$$6x^2 + 24x + 18$$

Conjugate pair (of binomials)

two binomials whose terms are exactly the same except +/- for one pair of terms

$$(x - 1)(x + 1) \quad x^2 - 1 \quad \text{“the difference of two squares”}$$

$$x^2 - 9 \quad (x - 3)(x + 3)$$

$$4x^2 - 9 \quad (2x - 3)(2x + 3)$$

$$16x^2 - 25 \quad (4x - 5)(4x + 5)$$

$$36x^4 - 49x^2 \quad (6x^2 - 7x)(6x^2 + 7x)$$

$$2 * 15 = 30$$

$$2x^2 + 13x + 15$$

$$10 + 3 = 13$$

$$30 = 10 * 3$$

Are there any other factors of 30 that add up to 13?

This tells us to break 13x into 10x + 3x

$$2x^2 + 13x + 15$$

$$2x^2 + 10x + 3x + 15$$

These are all of the terms in “the box”


	x	5
2x	2x ²	10x
3	3x	15

$$2x^2 + 13x + 15$$

$$\rightarrow (2x + 3)(x + 5)$$

Factor


$$5 * 4 = \underline{\quad}$$

$$5x^2 + 12x + 4$$


$$\underline{\quad} * \underline{\quad} = \underline{\quad}$$

$$\underline{\quad} + \underline{\quad} = 12$$

$$11 * (-9) = \underline{\quad}$$

$$11x^2 + 2x - 9$$


$$\underline{\quad} * \underline{\quad} = \underline{\quad}$$

$$\underline{\quad} + \underline{\quad} = 2$$

Factor


$$9 \cdot 10 = \underline{\quad}$$


$$9x^2 - 13x - 10$$

$$\underline{\quad} * \underline{\quad} = \underline{\quad}$$

$$\underline{\quad} + \underline{\quad} = -13$$

$$12 \cdot 5 = \underline{\quad}$$


$$12x^2 - 16x + 5$$

$$\underline{\quad} * \underline{\quad} = \underline{\quad}$$

$$\underline{\quad} + \underline{\quad} = -16$$

Find the X-intercepts from the Vertex Form Equations

$$y = -2(x - 3)^2 + 4 \quad \text{Set } y = 0 \text{ (y-value of an x-int. is 0)}$$

$$0 = 4(x - 5)^2 - 8 \quad \text{Add 8 (left/right)}$$

$$8 = 4(x - 5)^2 \quad \text{Divide by 4 (left/right)}$$

$$2 = (x - 5)^2$$

$$2 = (\underline{\quad})^2 \quad \text{What number, squared, equals 2?}$$

$$2 = (\sqrt{2})^2 \quad 2 = (-\sqrt{2})^2$$

$$\pm\sqrt{2} = x - 5 \quad \text{Add 5 (left/right)}$$

$$x = 5 \pm \sqrt{2}$$

Find the X-intercepts from the Vertex Form Equations

$$y = (x - 5)^2$$

$$y = -2(x - 3)^2 + 4$$

$$y = -(x + 2)^2 + 5$$

What is the vertex form equation?

$$y = 2x^2 + 16x + 24$$

$$a = 2$$

$$b = 16$$

$$\text{Vertex: } (-4, f(-4))$$

$$\text{x-coord. of vertex} = \frac{-b}{2a}$$

$$\frac{-b}{2a} = \frac{-16}{2(2)} = -4$$

What is the y-coordinate of the vertex?

$$f(-4) = 2(-4)^2 + 16(-4) + 24$$

$$f(-4) = -8$$

$$\text{Vertex: } (-4, -8)$$

What is the Vertex form equation?

$$\text{VSF} = 2, \text{ vertex} = (-4, -8)$$

$$y = 2(x + 4)^2 - 8$$

What is the vertex form equation?

$$y = x^2 - 6x + 13$$

$$a = 1$$

$$b = -6$$

Vertex: $(3, f(3))$

$$\text{x-coord. of vertex} = \frac{-b}{2a}$$

$$\frac{-b}{2a} = \frac{-(-6)}{2(1)} = 3$$

What is the y-coordinate of the vertex?

$$f(3) = (3)^2 - 6(3) + 13$$

$$f(3) = 4$$

Vertex: $(3, 4)$

What is the Vertex form equation?

VSF = 1, vertex = $(3, 5)$

$$y = (x - 3)^2 + 4$$

Convert the following non-factorable standard form equations into vertex form. Find the x-intercepts.

$$y = x^2 - 2x - 12$$

$$y = x^2 + 20x + 99$$

$$y = x^2 - 14x + 50$$