Geometry Lomac 2015-2016	Date 1/5	due 1/6	Quadratics: Vertex Form	7.2L

Name _____ **Per**_____

LO: I can complete the square to write quadratic equations in vertex form and I can use the vertex form to identify the vertex of the parabola.

emath 8.4

☐ **DO NOW** On the back of this packet

☐ (1) **Quadratics: vertex form**

The turning point of a parabola and its general shape are relatively easy to determine if the quadratic function is written in its **shifted or vertex form**. Review this in the first exercise.

***Exercise* #1:** Given the function $y=(x-3)^2+2$ do the following.

(a) Give the coordinates of the turning point.

(b) Determine the range by drawing a rough sketch.

The question then is how we take a quadratic of the form $y=ax^2+bx+c$ and put it into its shifted form. This procedure is known as **Completing the Square**. But, it needs some additional review.

***Exercise* #2:** Write each of the following as an equivalent trinomial.

(a) $(x+5)^2$ (b) $(x-1)^2$ (c) $(x+4)^2$

***Exercise* #3:** Given each trinomial in Exercise #2 of the form x^2+bx+c, what is true about the relationship between the value of b and the value of c? Illustrate.

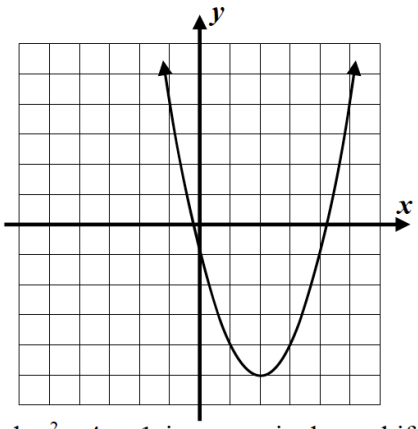
***Exercise* #4:** Each of the following trinomials is a perfect square. Write it in factored (or perfect square) form.

(a) $x^2+20x+100$ (b) x^2-6x+9 (c) x^2+2x+1

☐ (2) **Quadratics: completing the square for vertex form**

We are finally ready to learn the method of **Completing the Square**. This method has many uses, but the one we will work with today is to manipulate equations of quadratics from their **standard form** to their **vertex form**.

***Exercise* #5:** The quadratic $y = x^2 - 4x - 1$ is shown graphed below.



(a) Consider only the binomial $x^2 - 4x$. What would you need to add on to it to create a perfect square trinomial? (See Exercise #3).

(b) In order to add zero to the binomial $x^2 - 4x$, what should we subtract to offset adding 4 to make it a perfect square?

(c) Use the Method of Competing the Square now to rewrite the trinomial $x^2 - 4x - 1$ in an equivalent, shifted form. According to this form, what are the coordinates of the vertex? Verify by examining the graph.

☐ (4) **Completing the square**

This procedure is what is known as an **algorithm**. In other words, we follow a recipe. Here it is:

COMPLETING THE SQUARE

For the quadratic $y = x^2 + bx + c$ (note that $a = 1$).

1. Find half of the value of b, i.e. $\frac{b}{2}$ 2. Square it, i.e. $\left(\frac{b}{2}\right)^2$ 3. Add and subtract it

There is nothing like practice on these.

***Exercise* #6:** Write each quadratic in vertex form by Completing the Square. Then, identify the quadratic's turning point. The last two problems will involve fractions. Stick with it!

(a) $y = x^2 + 6x - 2$ (b) $y = x^2 - 2x + 11$ (c) $y = x^2 - 10x + 27$

(d) $y = x^2 + 8x$ (e) $y = x^2 + 5x + 4$ (f) $y = x^2 - 9x - 2$

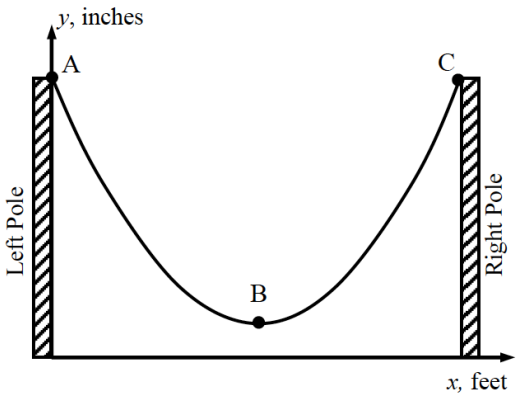
☐ (4) **Vertex form in applications**

APPLICATIONS

4. A cable is attached at the same height from two poles and hangs between them such that its height above the ground, y, in inches, can be modeled using the equation:

$$y = x^2 - 16x + 67$$

where x represents the horizontal distance from the left pole, in feet.



(a) What height is point A above the ground? Show your work and use proper units.

(b) Write the equation in vertex form.

(c) What is the difference in the heights of points A and B? Show your analysis and include units.

(d) What is the horizontal distance that separates points A and C? Explain your reasoning.

☐ (4) **Using vertex form to find and compare minimums**

REASONING

5. Use the vertex form of each of the following quadratic functions to determine which has the lowest y-value.

$y = x^2 - 8x + 6$ $\qquad\qquad$ $y = x^2 + 6x + 1$

6. Two quadratic functions are shown below, $f(x)$ and $g(x)$. Determine which has the lower minimum value. Explain how you arrived at your answer.

$f(x) = x^2 + 10x$

x	3	4	5	6	7	8	9
$g(x)$	−9	−14	−17	−18	−17	−14	−9

☐ (6) **Exit Ticket**

ON THE LAST PAGE

☐ (7) **Homework**
cont.

FLUENCY

1. Find each of the following products in standard form.

(a) $(x+4)^2$ (b) $(x-1)^2$ (c) $(x+8)^2$

(d) $(x-7)^2$ (e) $(x+2)^2$ (f) $(x-10)^2$

2. Each of the following trinomials is a perfect square. Write it in factored form, i.e. $(x+a)^2$ or $(x-a)^2$.

(a) x^2+6x+9 (b) $x^2-22x+121$ (c) $x^2+10x+25$

(d) $x^2+30x+225$ (e) x^2-2x+1 (f) $x^2-18x+81$

3. Place each of the following quadratic functions, written in standard form, into vertex form by completing the square. Then, identify the coordinates of its turning point.

(a) $y=x^2-12x+40$ (b) $y=x^2+4x+14$ (c) $y=x^2-24x+146$

Exit Ticket Name_____ Date _____ _____ Per_ _____ 7.2L

The LO (Learning Outcomes) are written below your name on the front of this packet. Demonstrate your achievement of these outcomes by doing the following:

Complete the square to write the equation below in vertex form.

$$y = x^2 + 16x + 71$$

State the coordinates of the vertex (turning point): _____

DO NOW **Name**_____ **Date** _____ **Per**_____ **7.2L**

(1) Translation to algebra progress. Write one or more algebraic statement(s) to represent this situation. Be sure to write at least one "Let" statement to define any variables.

Tickets for the baseball games were $2.50 for general admission and 50 cents for kids. If there were six times as many general admissions sold as there were kids' tickets, and total receipts were $7750, how many of each type of ticket were sold?