Standard Form of Quadratic: $y = ax^2 + bx + c$

Unit 7: Quadratics- Families of Parabolas
Classwork

Name: Key
Date: _____ Per: _____

Use a graphing calculator to explore the relationship for each of the following groups of parabolas.

I. Exploring effects of changing the coefficient (a) in $y = ax^2 + c$

1. Which of the following parabolas is the narrowest (most vertically stretched).

A. $y = x^2$ B. $y = 2x^2$ C. $y = 3x^2$ D. $y = 4x^2$

2. Which of the following parabolas is the narrowest (most vertically stretched).

A. $y = x^2$ B. $y = \frac{1}{2}x^2$ C. $y = \frac{1}{3}x^2$ D. $y = \frac{1}{4}x^2$

'a'

Now, explain what you discovered about the effects of changing the coefficient of x^2?

The greater the coefficient of x^2, 'a', the narrower the parabola
The smaller the 'a' the wider the parabola

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3. Which of the following parabolas opens up? A, B positive 'a'

4. Which of the following parabolas opens down? C, D negative 'a'

A. $y = x^2$ B. $y = 3x^2$ C. $y = -2x^2$ D. $y = -\frac{1}{4}x^2$

*Now explain what you discovered about the effect of changing the **sign** of the coefficient of x^2?*

If coefficient of x^2 is positive the parabola opens up
If coefficient of x^2 is negative the parabola opens down.

II. Exploring the effect of changing the constant (c) in $y = ax^2 + c$

5. Give the **minimum** value **for y** (y-value of the vertex) for each function.

A. $y = x^2$	B. $y = x^2 + 1$	C. $y = 2x^2 + 3$	D. $y = \frac{1}{4}x^2 - 4$
min 0	min 1	min 3	min -4

6. Give the **maximum** value **for y** (y-value of the vertex) for each function.

A. $y = -x^2$	B. $y = -x^2 + 1$	C. $y = -2x^2 + 3$	D. $y = -\frac{1}{4}x^2 - 4$
max 0	max 1	max 3	max -4

Now explain what you discovered about the vertex (minimum or maximum) of the graph of a quadratic function? The minimum or maximum was the value of 'c'

7. How can you tell if it is a minimum or maximum?
It's a minimum if the coefficient of x^2 is positive
It's a maximum if the coefficient of x^2 is negative

8. **Without** a calculator, determine the vertex for each graph and state if it is gives a maximum or minimum value for y. Then use a graphing calculator to check your answers.

A. $y = 4x^2$	B. $y = -x^2 + 3$	C. $y = x^2 - 5$	D. $y = -6x^2 + 8$
Vertex: (0,0)	Vertex: (0,3)	Vertex: (0,-5)	Vertex: (0,8)
min/max: min	min/max: max	min/max: min	min/max: max

Summary: fill in the blanks describing the effects that *a* and *c* have on the graph $y = ax^2 + c$

If a is greater than 1 the graph gets narrower

If a is less than 1 the graph gets wider

If c is positive then the graph shifts up

If c is negative then the graph shifts down