

Lesson 6: Quadratics: Squares, Squaring and Parabolas

Objective:

Evaluate expressions and solve for variables using absolute value, squaring and square root. Graph quadratic functions to describe the characteristics of a parabola.

Connections
to Prior
Learning

Functions that involve **Squaring** are similar to **Absolute Value Functions** because in most cases, both functions will result in two solutions.

For example:

$$|x| = 4, x = +4 \text{ and } -4$$

$$x^2 = 4, x = 2 \text{ and } -2.$$

The opposite of squaring a number is taking a **Square Root**. The symbol for a **Square Root** is $\sqrt{\quad}$. Just like subtraction "undoes" addition, taking a **square root** "undoes" **squaring**.

Solve the following equations, show your work and check your solutions.

Practice

a. $x^2 = 81$

$$\sqrt{x^2} = \sqrt{81}$$

$$x = \pm 9$$

b. $7r^2 = 700$

$$\frac{7r^2}{7} = \frac{700}{7}$$

$$r^2 = 100$$

$$\sqrt{r^2} = \sqrt{100}$$

$$r = \pm 10$$

c. $4n^2 - 1 = 399$

$$\begin{array}{r} +1 \quad +1 \\ \hline 4n^2 - 1 = 399 \\ \hline 4n^2 = 400 \\ \hline \frac{4n^2}{4} = \frac{400}{4} \\ n^2 = 100 \\ \hline \sqrt{n^2} = \sqrt{100} \\ n = \pm 10 \end{array}$$

Graphs of a
Quadratic
Function
Investigation

In this investigation you will explore the graph of the relationship $y = x^2$. Pay attention to patterns, characteristics and any noticing's that you have about this relationship and its graph.

Step 1: Complete the table below for the values of x from -6 to 6

x	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
x^2	36	25	16	9	4	1	0	1	4	9	16	25	36

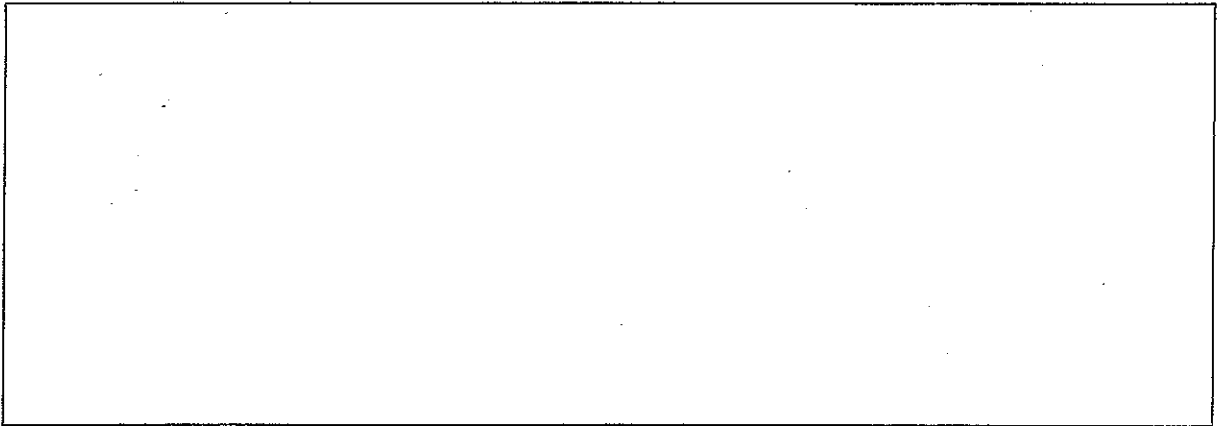
$$-6^2 = -36$$

$$-6 \cdot 6 = -36$$

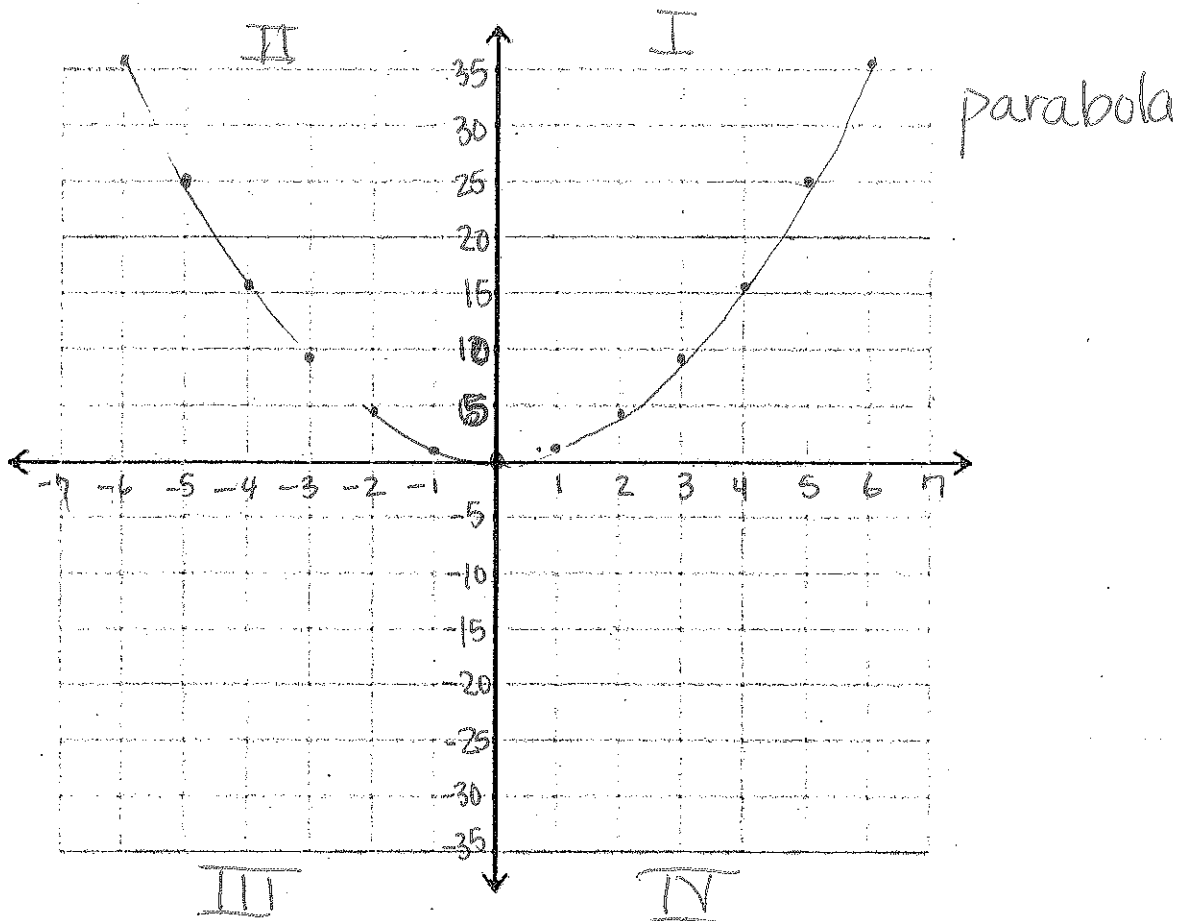
$$(-6)^2 = 36$$

$$-6 \cdot -6 = 36$$

Step 2: How do the squares of numbers and their opposites compare? What is the relationship between the positive numbers and their squares? Between the negative numbers and their squares?



Step 3: Graph the relationship $y = x^2$ on the axis below using the values from your table.



Step 4: What relationship does this graph show? Is it a function? If so, describe the domain and range. *Yes it's a function* $D: (-\infty, \infty)$ $R: [0, \infty)$

Relationship:
(circle one)

Linear

Exponential

Absolute Value

Quadratic

Is this a function?
(circle one)

yes

no

If yes, describe how you know:

It passes the vertical line test

What is the domain and range for this function? (see your notes on domain and range for a reminder)

$D: (-\infty, \infty)$

$R: [0, \infty)$

The graph of $y = x^2$ is called a **parabola**. In later sections you will learn how to create other **parabolas** based on variations of this basic equation.

Step 5: What quadrants do the points for the graph of $y = x^2$ fall in?

Quadrants I, II

Step 6: What makes the point $(0,0)$ on your graph unique? Where is this point on the parabola?

All the other points have the same point in Quadrant I and II. $(0,0)$ is only one point, this is known as the vertex

Step 7: Compare your graph with the graph of the absolute value function (lesson 5). Describe any similarities and differences that you notice.

Similarities	Differences