Parabolas **Name: _____**

A parabola is a curved line which follows the rule $\mathbf{y = x^2}$. A parabola has many interesting properties, one of the most important of which is its ability to focus light rays. Satellite dishes are parabolic. Where else might you find them?

A. Fill in the tables below.

$y = x^2$											
x	-5	-4	-3	-2	-1	0	1	2	3	4	5
y											

$y = \frac{1}{4} x^2$											
x	-5	-4	-3	-2	-1	0	1	2	3	4	5
y											

$y = \frac{1}{10} x^2$											
x	-5	-4	-3	-2	-1	0	1	2	3	4	5
y											

B. Graph the results on a sheet of graph paper on the same set of axes. Join the dots with a smooth curve. All of these curves are parabolas. Use three different colour pencils and label each line.

C. If the equation for a parabola is $y = \frac{1}{z} x^2$, where "z" can be any value like 10, 4, or 1, then the focal point of the parabola is z/4.
For example, if a parabola has the equation $y = \frac{1}{20} x^2$, and you draw the graph in centimetres, then the focal point of the parabola is 20/4 cm, that is, 5cm from the vertex of the parabola. This distance is called the focal length.
Calculate the focal point of the parabolas you have drawn.

Parabola's Equation	Focal Length of Parabola
$y = \frac{1}{10} x^2$	
$y = \frac{1}{4} x^2$	
$y = x^2$	

D. In the next activity you will construct a parabolic solar reflector with the equation $y = \frac{1}{40} x^2$.
What will the parabolic reflector's focal point be?

Parabola's Equation	Focal Length
$y = \frac{1}{40} x^2$	

E. Expressing a parabola with the equation $y = \frac{1}{z} x^2$ is somewhat limiting. Mathematicians and scientists use the equation $y = a x^2$ to represent a parabola, where the "a" can be any number. If the parabola is written in this way, it's focal length = $\frac{1}{4a}$.

If $y = a x^2$, focal length = $\frac{1}{4a}$

Calculate the focal point of the parabolas below.

Parabola's Equation	Focal Length of Parabola ($f = \frac{1}{4a}$)
$y = 0.2 x^2$	
$y = \frac{3}{10} x^2$	
$y = 0.01 x^2$	