**MBF 3C1** Name: _____

# Changing Quadratic Relations: The Values of 'h' and 'k'

## Investigate $y = x^2 + k$

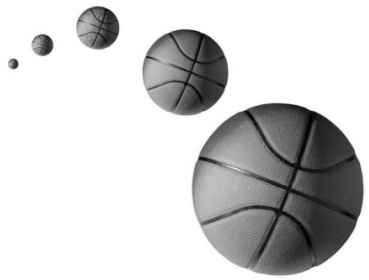
| Function | Value of $k$ in $y = x^2 + k$ | Direction of Opening | Vertex | Axis of Symmetry | Same shape as $y = x^2$? |
|---|---|---|---|---|---|
| a. $y = x^2$ | 0 | up | (0, 0) | $x = 0$ | |
| b. $y = x^2 + 2$ | | | | | |
| c. $y = x^2 + 4$ | | | | | |
| d. $y = x^2 - 1$ | | | | | |
| e. $y = x^2 - 3$ | | | | | |

**How does the value of *k* affect the basic parabola?**

- when *k* is greater than 0, the parabola shifts _____
- when *k* is less than 0, the parabola shifts _____

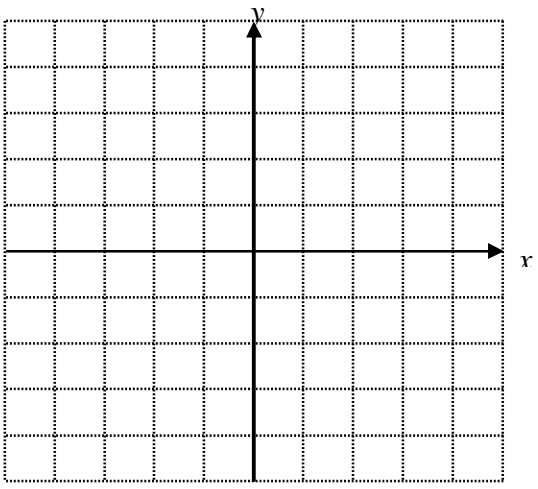
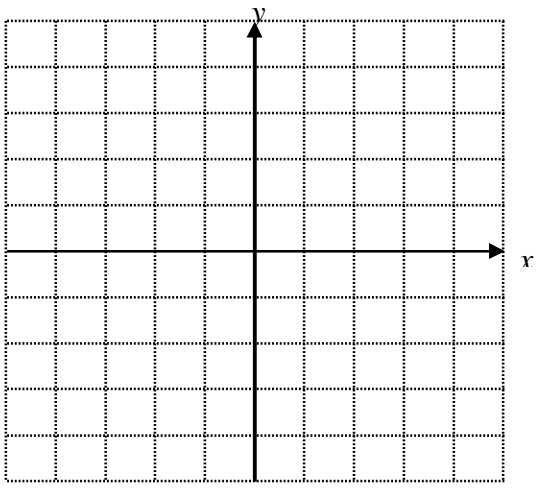
The value of *k* describes the _____ of the parabola.

It is known as the _____ or _____



**Example 1**

For each of the following, (i) state the transformations, and (ii) graph the parabola.

| | $y = x^2 + 3$ | $y = x^2 - 2$ |
|---|---|---|
| (I) TRANSFORMATIONS | | |
| (II) GRAPH |  |  |

**MBF 3C1** Name: _____

# Investigate $y = (x - h)^2$

✷ **To determine the value of *h*, remove it from the brackets by setting the expression equal to zero and solving.** ✷

| Function | Value of *h* in $y = (x - h)^2$ | Direction of Opening | Vertex | Axis of Symmetry | Same shape as $y = x^2$? |
|---|---|---|---|---|---|
| a. $y = x^2$ | 0 | up | (0, 0) | $x = 0$ | |
| b. $y = (x - 2)^2$ | $x - 2 = 0$<br>$x = 2$ | | | | |
| c. $y = (x - 4)^2$ | | | | | |
| d. $y = (x + 1)^2$ | | | | | |
| e. $y = (x + 3)^2$ | | | | | |

**How does the value of *h* affect the basic parabola?**

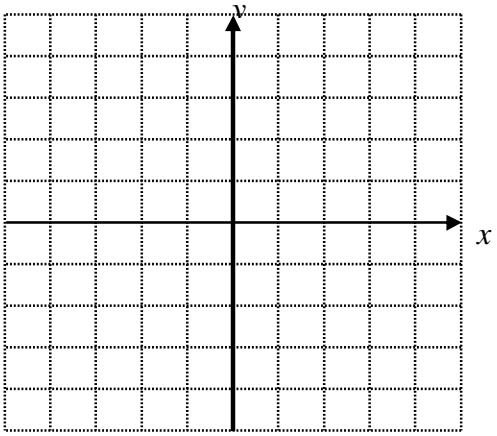
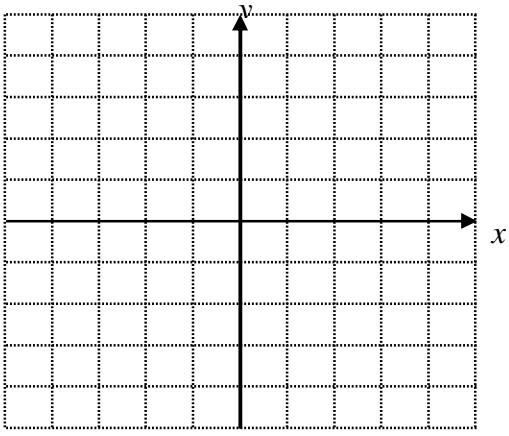
- when *h* is greater than 0, the parabola shifts _____
- when *h* is less than 0, the parabola shifts _____

The value of *h* describes the _____ of the parabola.

It provides the value for the _____ and is the _____.

**Example 2**

For each of the following, (i) state the transformations, and (ii) graph the parabola.

| | $y = (x + 2)^2 - 3$ | $y = (x - 3)^2 + 1$ |
|---|---|---|
| (I) TRANSFORMATIONS | | |
| (II) GRAPH |  |  |