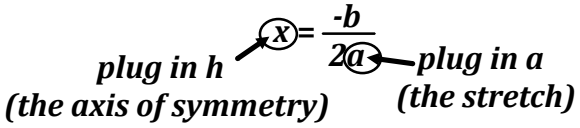
Name: _____

Using the Axis of Symmetry to Determine b

Most of the parts of our 3 quadratic equation forms are available directly from a graph – all except for b in the standard form equation. This does not mean, however, that we cannot determine b from the graph. It only means that you have to solve for it, because it is not given.

The **standard form** equation to find the **axis of symmetry** is $x = \frac{-b}{2a}$. If you have the axis of symmetry (the "middle x", which is the x-value of the vertex, also known as h), and you have the stretch (also known as a), then you can plug that information into the formula and solve for b.



EXAMPLE

Determine the value of b if the axis of symmetry is at $h = 7$, and the stretch is $a = 3$.

$$x = \frac{-b}{2a}$$

Since the axis of symmetry (h) is our x-value, we will plug $h = 7$ in for x. We will also plug in $a = 3$.

$$(7) = \frac{-b}{2(3)}$$

Simplify 2(3)

$$7 = \frac{-b}{6}$$

Multiply both sides by 6.

$$6 \cdot 7 = \frac{-b}{\cancel{6}} \cdot \cancel{6}$$

$$42 = -b$$

Divide both sides by -1.

$$42 \div -1 = -b \div -1$$

$$-42 = b$$

$$\boxed{b = -42}$$

EXAMPLE

Determine the value of b if the axis of symmetry is at $h = 0$, and the stretch is $a = 5$.

$$x = \frac{-b}{2a}$$

Since the axis of symmetry (h) is our x-value, we will plug $h = 0$ in for x. We will also plug in $a = 5$.

$$(0) = \frac{-b}{2(5)}$$

Simplify 2(5)

$$0 = \frac{-b}{10}$$

Multiply both sides by 10.

$$10 \cdot 0 = \frac{-b}{\cancel{10}} \cdot \cancel{10}$$

$$0 = -b$$

Divide both sides by -1.

$$0 \div -1 = -b \div -1$$

$$0 = b$$

$$\boxed{b = 0}$$

EXAMPLE

Determine the value of b if the axis of symmetry is at $h = -3$, and the stretch is $a = -4$.

$$x = \frac{-b}{2a}$$

Since the axis of symmetry (h) is our x-value, we will plug $h = -3$ in for x. We will also plug in $a = -4$.

$$(-3) = \frac{-b}{2(-4)}$$

Simplify 2(-4)

$$-3 = \frac{-b}{-8}$$

Simplify $\frac{-b}{-8}$ by canceling the negative.

$$-3 = \frac{b}{8}$$

Multiply both sides by 8.

$$8 \cdot -3 = \frac{b}{\cancel{8}} \cdot \cancel{8}$$

$$-24 = b$$

$$\boxed{b = -24}$$

1. Determine the value of b if the axis of symmetry is at $h = -3$, and the stretch is $a = -1$.

2. Determine the value of b if the axis of symmetry is at $h = 0$, and the stretch is $a = -3$.

3. Determine the value of b if the axis of symmetry is at $h = -2$, and the stretch is $a = 2$.

4. Determine the value of b if the axis of symmetry is at $h = -1$, and the stretch is $a = -2$.	5. Determine the value of b if the axis of symmetry is at $h = -1$, and the stretch is $a = 1$.	6. Determine the value of b if the axis of symmetry is at $h = 1$, and the stretch is $a = 3$.
7. Determine the value of b if the axis of symmetry is at $h = 0$, and the stretch is $a = -1$.	8. Determine the value of b if the axis of symmetry is at $h = 0$, and the stretch is $a = 2$.	9. Determine the value of b if the axis of symmetry is at $h = 3$, and the stretch is $a = 2$.