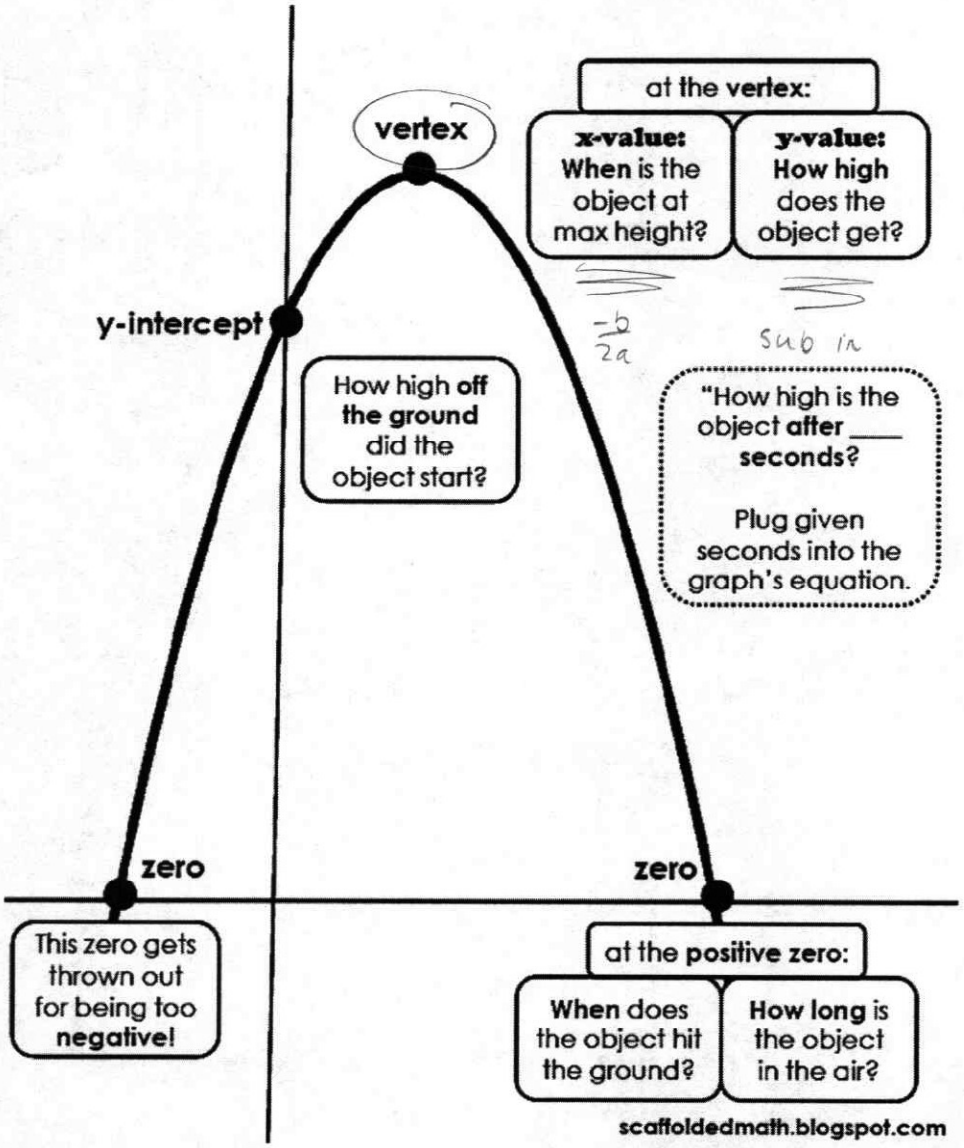
Quadratic Keywords



Day 11 – Applications of the Vertex

Words that Indicate Finding Vertex	Quadratic Equations
• Minimum/Maximum • Minimize/Maximize • Least/Greatest • Smallest/Largest	Standard Form: $y = ax^2 + bx + c$ y-int: (0, c) Vertex Form: $y = a(x - h)^2 + k$ vertex: (h, k) Factored Form: $y = a(x - p)(x - q)$ x-int: (p, 0) & (q, 0) Vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

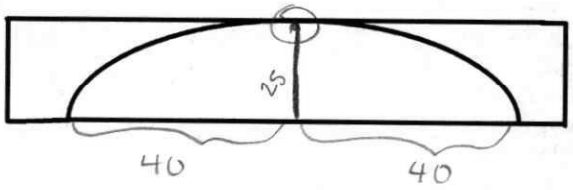
1. *The arch of a bridge forms a parabola modeled by the function $y = -0.2(x - 40)^2 + 25$, where x is the horizontal distance (in feet) from the arch's left end and y is the corresponding vertical distance (in feet) from the base of the arch. How tall is the arch?*

already in vertex form

Vertex : (40, 25)

halfway pt width

height



total length = 80

2. *Suppose the flight of a launched bottle rocket can be modeled by the equation $y = -x^2 + 6x$, where y measures the rocket's height above the ground in meters and x represents the rocket's horizontal distance in meters from the launching spot at x = 0.*

a. How far has the bottle rocket traveled horizontally when it reaches it maximum height? What is the maximum height the bottle rocket reaches?

x

Vertex

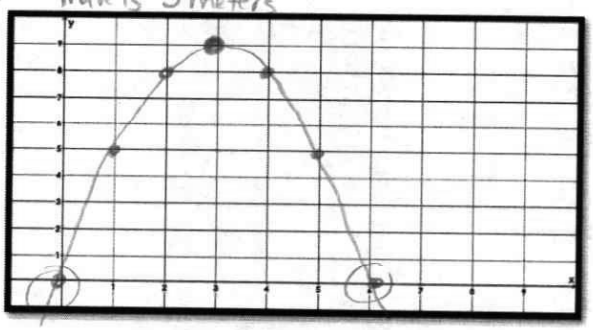
travels 3 meters

$a = -1$
$b = 6$
$c = 0$

$x = \frac{-b}{2a} \rightarrow \frac{-6}{2(-1)} \rightarrow 3$

$-(3)^2 + 6(3) \rightarrow$

$y = 9$



9 meters tall

b. How far does the bottle rocket travel in the horizontal direction from launch to landing?

$6 - 0 \rightarrow$ 6 meters

3. *A frog is about to hop from the bank of a creek. The path of the jump can be modeled by the equation $h(x) = -x^2 + 4x + 1$, where $h(x)$ is the frog's height above the water and x is the number of seconds since the frog jumped. A fly is cruising at a height of 5 feet above the water. Is it possible for the frog to catch the fly, given the equation of the frog's jump?*

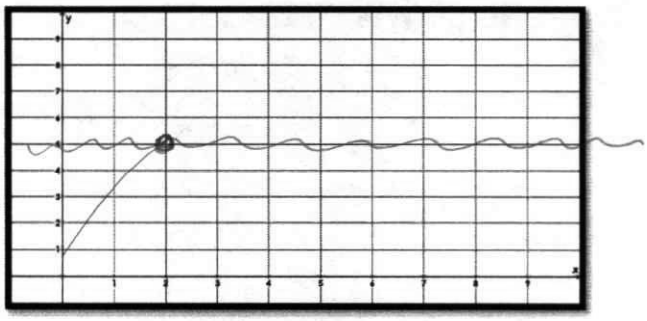
Vertex

$a = -1$
$b = 4$
$c = 1$

$x = \frac{-b}{2a} \rightarrow \frac{-(4)}{2(-1)} \rightarrow 2$

$y = -(2)^2 + 4(2) + 1$
$y = 5$

yes it is possible



4. *A baker has modeled the monthly operating costs for making wedding cakes by the function $y = 0.5x^2 - 12x + 150$, where y is the total costs in dollars and x is the number of cakes prepared.*

a. How many cakes should be prepared each month to yield the minimum operating cost?

b. What is the minimum monthly operating cost?