

Quadratic Word Problem.

At its lowest level, the Willamette River is 48 feet below the Hawthorne Bridge. During the last snowstorm, Mr. Maurer threw a snowball off the bridge into the river. His calculations told him the equation of his snowball is:

$$y = -16x^2 + 32x + 48.$$

a) When does the snowball reach its max height?

$$\begin{aligned} y &= -16x^2 + 32x + 48 \\ y &= -16(x^2 - 2x - 3) \\ &= -16(x-3)(x+1) \end{aligned}$$

OR

Complete the Square

$$\begin{aligned} y &= -16x^2 + 32x + 48 \\ &= -16(x^2 - 2x - 3) \\ &= -16((x-1)^2 - 4) \\ &= -16(x-1)^2 + 64 \end{aligned}$$

$x = 3, x = -1$

$$h = \frac{3 + (-1)}{2} = \frac{2}{2} = 1. \text{ (1 second)}$$

b) What is the max height?

Plug in h to find k .

$$\begin{aligned} y &= -16(1-3)(1+1) \\ y &= -16(-2)(2) \\ &= -16(-4) = 64 \end{aligned}$$

64 feet

OR

$k = 64$

c) When does it hit the water?

$x = 3$
3 seconds

Ignore $x = -1$ because that is back in time

OR

$$\begin{aligned} -16(x-1)^2 + 64 &= 0 \\ -64 &= -64 \\ -16(x-1)^2 &= -64 \\ \frac{-16(x-1)^2}{-16} &= \frac{-64}{-16} \\ \sqrt{(x-1)^2} &= 4 \\ x-1 &= 2 \\ x &= 3 \end{aligned}$$