Bell Work

Solve each quadratic equation. Show all work.

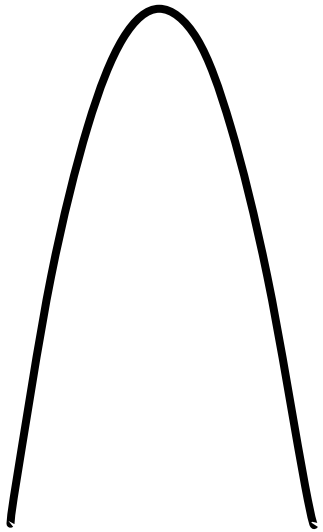
1. $x^2 + 6x - 72 = 0$

2. $x^2 - 4x - 10 = 0$

3. $5x^2 + 9x - 3 = 0$

4. What is the quadratic formula?

1. A ball is thrown up into the air at 35 feet per second at an initial height of 5 feet. When will it hit the ground?



Anything thrown up into the air will make a parabola. Since it makes a parabola, we can find the time it takes to hit the ground, the time to reach its highest point, and how high it can reach.

1. A ball is thrown up into the air at 35 feet per second at an initial height of 5 feet. When will it hit the ground?

$$h(t) = -\frac{1}{2}gt^2 + v_i t + h_i$$

This is the formula that we will use to today.

$h(t)$ is the height of something at t time.

t is time, mostly in seconds.

g is the gravitational pull on an object.

9.8 meters per second^2

32 feet per second^2

g can be either, depending on the units.

v_i is the initial velocity (speed).

h_i is the initial height.

1. A ball is thrown up into the air at 35 feet per second at an initial height of 5 feet. When will it hit the ground?

$$0 = -\frac{1}{2}(32)\,t^2 + 35t + 5 \qquad g = \frac{32\ \text{ft}}{\text{sec}^2}$$

$$h(t) = -\frac{1}{2}gt^2 + v_i t + h_i$$

$$0 = -16t^2 + 35t + 5$$

$$x = \frac{-35 \pm \sqrt{35^2 - (4)(-16)(5)}}{-32} = \frac{-35 \pm \sqrt{1545}}{-32} \approx \frac{-35 \pm 39.31}{-32}$$

The ball will hit the ground in 2.32 seconds.

$$= \frac{-35 - 39.31}{-32} \approx 2.32$$

2. A ball is thrown up at an initial velocity of 15 meters per second at an initial height of 2 meters. When will it hit the ground?

$$0 = -\frac{1}{2}(9.8)t^2 + 15t + 2 \qquad g = \frac{9.8\,\text{m}}{\text{sec}^2}$$

$$h(t) = -\frac{1}{2}gt^2 + v_i t + h_i$$

$$0 = -4.9t^2 + 15t + 2$$

$$x = \frac{-15 \pm \sqrt{15^2 - (4)(-4.9)(2)}}{-9.8} = \frac{-15 \pm \sqrt{264.2}}{-9.8} \approx \frac{-15 \pm 16.25}{-9.8}$$

The ball will hit the ground in 3.19 seconds.

$$= \frac{-15 - 16.25}{-9.8} \approx 3.19$$

3. A person is on the edge of a 100 meter cliff. He or she throws a rock up into the air at a rate of 17.5 meters per second. When will it hit the ground?

$$0 = -\frac{1}{2}(9.8)t^2 + 17.5t + 100 \qquad g = \frac{9.8\,\text{m}}{\text{sec}^2}$$

$$h(t) = -\frac{1}{2}gt^2 + v_i t + h_i$$

$$0 = -4.9t^2 + 17.5t + 100$$

$$x = \frac{-17.5 \pm \sqrt{17.5^2 - (4)(-4.9)(100)}}{-9.8} = \frac{-17.5 \pm \sqrt{2266.25}}{-9.8} \approx \frac{-17.5 \pm 47.61}{-9.8}$$

The rock will hit the ground in 6.64 seconds.

$$= \frac{-17.5 - 47.61}{-9.8} \approx 6.64$$

4. The same person on the same 100 meter cliff then throws a rock **down** at a speed of 12 meters per second. When will that rock hit the ground?

$$0 = -\frac{1}{2}(9.8)t^2 - 12t + 100 \qquad g = \frac{9.8\,\text{m}}{\text{sec}^2} \qquad \boxed{h(t) = -\frac{1}{2}gt^2 + v_i t + h_i}$$

$$0 = -4.9t^2 - 12t + 100$$

$$x = \frac{12 \pm \sqrt{(-12)^2 - (4)(-4.9)(100)}}{-9.8} = \frac{12 \pm \sqrt{2104}}{-9.8} \approx \frac{12 \pm 45.87}{-9.8}$$

The rock will hit the ground in 3.46 seconds.

$$= \frac{12 - 45.87}{-9.8} \approx 3.46$$

5. The same person on the same 100 meter cliff then drops rock. When will that rock hit the ground?

$$0 = -\frac{1}{2}(9.8)t^2 + 0t + 100 \qquad g = \frac{9.8\,\text{m}}{\text{sec}^2} \qquad \boxed{h(t) = -\frac{1}{2}gt^2 + v_i t + h_i}$$

$$0 = -4.9t^2 + 0t + 100$$

$$x = \frac{0 \pm \sqrt{0^2 - (4)(-4.9)(100)}}{-9.8} = \frac{0 \pm \sqrt{1960}}{-9.8} \approx \frac{0 \pm 44.27}{-9.8}$$

$$= \frac{0 - 44.27}{-9.8} \approx 3.46$$

The rock will hit the ground in 4.51 seconds.

Assignment:

Solving Quadratic Equation Word Problems A Worksheet