Real Life Situations Modeled by Quadratic Equations – Algebra 8

You can solve most of the problems below with your knowledge of key features of parabolas! Each of the equations that model the situations can be factored. **Show all your work**, and don't forget units.

1. A relief package is released from a helicopter at 1600 feet. The height of the package can be modeled by the equation $h = -16t^2 + 1600$, where h is the height of the package in feet and t is the time in seconds.

   a. What does the number 1600 in the equation represent?

$h = -16t^2 + 1600$

The helicopter is 1600 feet off the ground.

   b. How long it will take for the package to hit the ground?

Height of package when it is on the ground. →

$h = -16t^2 + 1600$

$0 = -16t^2 + 1600$

$+16t^2 \quad +16t^2$

$\frac{16t^2}{16} = \frac{1600}{16}$

$\sqrt{t^2} = \sqrt{100}$

$t = 10$

OR

$h = -16t^2 + 1600$

$0 = -16t^2 + 1600$

$0 = -16(t^2 - 100)$

$0 = -16(t^2 - 10t + 10t - 100)$

$0 = -16(t-10)(t+10)$

$t - 10 = 0 \quad t + 10 = 0$

$+10 \quad +10 \quad -10 \quad -10$

$t = 10 \quad t = -10$

It will take the package 10 seconds to hit the ground.

t	t^2	$-10t$
10	$10t$	-100
	t	-10

2. The height of a flare fired from the deck of a ship in distress can be modeled by $h = -16t^2 + 104t + 56$, where h is the height of the flare above water and t is the time in seconds.

   a. How high above the surface of the water is the deck of the ship?

$h = -16t^2 + 104t + 56$

The deck of the ship is 56 feet above the water.

   b. How long will the flare be in the air?

$0 = -16t^2 + 104t + 56$

$0 = -8(2t^2 - 13t - 7)$

$0 = -8(2t^2 - 14t + t - 7)$

$0 = -8(2t + 1)(t - 7)$

$0 = 2t + 1$

$-1 \quad -1$

$-1 = 2t$

$-0.5 = t$

$0 = t - 7$

$+7 \quad +7$

$7 = t$

The flare will be in the air for 7 sec.

3. Robert threw a rock off a bridge into the river. The distance from the rock to the river is modeled by the equation $h = -16t^2 - 16t + 60$, where h is the height in feet and t is the time in seconds.

   a. How high above the river will the rock be 1 second after Robert throws it?

$h = -16t^2 - 16t + 60$

$h = -16(1)^2 - 16(1) + 60$

$= -16 - 16 + 60$

$= 28 \text{ ft}$

After 1 second the rock will be 28 feet above the river.

   b. How long will it take for the rock to hit the surface of the water?

$h = -4(4t^2 + 4t - 15)$

$= -4(4t^2 + 10t - 6t - 15)$

$= -4(2t - 3)(2t + 5)$

$0 = -4(2t - 3)(2t + 5)$

$2t - 3 = 0$

$+3 \quad +3$

$\frac{2t}{2} = \frac{3}{2}$

$t = 1.5$

$2t + 5 = 0$

$-5 \quad -5$

$\frac{2t}{2} = \frac{-5}{2}$

$t = -2.5$

	$2t$	5
$2t$	$4t^2$	$10t$
-3	$-6t$	-15

It will take 1.5 sec. for the rock to hit the water's surface.