1. A model rocket is launched from a platform in a field. The path of the rocket followed the equation $p(t) = -16(t-2)^2 + 70$, where t represents time after igniting the rocket's engine and $p(t)$ represents the rocket's height in feet. Use the equation to:

   a. Determine the height of the platform. → $t = 0$

   $p(0) = -16(0-2)^2 + 70$ → $-16(-2)^2 + 70$ → $-16(4) + 70$ → $-64 + 70 = 6$.

   The platform was 6 feet high

   b. Determine the maximum height the rocket reached.

   $p(t) = -16(t-2)^2 + 70$ ← y-value of vertex = Max height.

   The maximum height was 70 feet

   c. A low cloud settled over the field at 50 feet obscuring the rocket during its flight. Write and solve an equation to determine the amount of time the rocket was hidden by the cloud.

   $50 = -16(t-2)^2 + 70$

   $-70 \quad -70$

   $\frac{-20}{-16} = \frac{-16(t-2)^2}{-16}$

   $1.25 = (t-2)^2$

   $t - 2 = 1.11$ $\quad$ $t - 2 = -1.11$

   $t = 3.11$ $\quad$ $t = .89$

   Rocket was hidden from $t = .89$ to $t = 3.11$ so for 2.22 secs!

2. For her birthday, Beatrice received the Bam 3-Person Water Balloon Launcher. She immediately took it to the Cleveland football field to test it out. On the initial flight, the launched water balloon followed a path represented by the equation $y = -(x-12)^2 + 100$, where x = the horizontal location of the water balloon in yards and y = the height of the balloon above the ground in feet.

   a. How far along the ground did the water balloon travel? Show how you found your answer.

   $y = 0$

   $0 = -(x-12)^2 + 100$

   $-100 \quad -100$

   $\frac{-100}{-1} = \frac{-(x-12)^2}{-1}$

   $100 = (x-12)^2$

   $10 = x - 12$ $\quad$ $-10 = x - 12$

   $22 = x$ $\quad$ $2 = x$

   Balloon traveled 20 yards

   b. What was the greatest height the balloon traveled? Explain how you know.

   $-(x-12)^2 + 100$

   greatest height was 100 feet

5. During a recent tennis match, Will hit what he thought was the perfect lob (a lob is a high shot designed to go over your opponent). The path of the tennis ball can be represented by the quadratic equation $b(x) = -\frac{1}{10}(x-10)^2 + 14.4$, where x is the distance in meters that the ball travels horizontally, and $b(x)$ is the height the tennis ball above the ground in feet.

The ball was 4.4 feet above the ground when Will hit it.

a. What is $b(0)$? What does it represent about the ball?

$b(0) = -\frac{1}{10}(0-10)^2 + 14.4 = -\frac{1}{10}(-10)^2 + 14.4 = -\frac{1}{10}(100) + 14.4$

$= -10 + 14.4 = 4.4$

b. A standard tennis court is 23.8 meters long. If Will is standing right on the baseline when he hits the ball, does it land in the court? Show all of your work.

Option 1

Court $\rightarrow y = 0$

$0 = -\frac{1}{10}(x-10)^2 + 14.4$

$-14.4 \qquad -14.4$

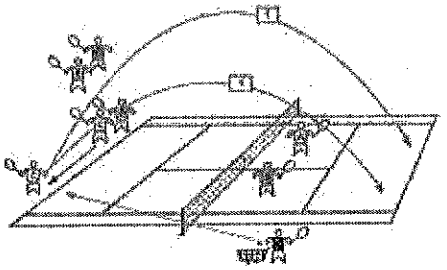
$-10\left(-14.4 = -\frac{1}{10}(x-10)^2\right)-10$

$144 = (x-10)^2$

$12 = x-10 \qquad -12 = x-10$

$22 = x \qquad -2 \neq x$

yes the ball lands in the court b/c $22 < 23.8$



Option 2

Plug in $x = 23.8$

$b(23.8) = -\frac{1}{10}(23.8-10)^2 + 14.4$

$b(23.8) = -4.644$

Because the y-value is negative (underground), the ball must have hit the court before 23.8. Hence, it lands in.