Algebra 1B **Name**________________________

Modeling Real Situations with Quadratics 6:57

The table and graph illustrate the movement of a ball that was thrown upward, versus time in seconds from the time it was thrown. Answer the follow questions about the graph.

1. From what height was the ball thrown? Explain how you know. 6 ft, when t=0, h=6

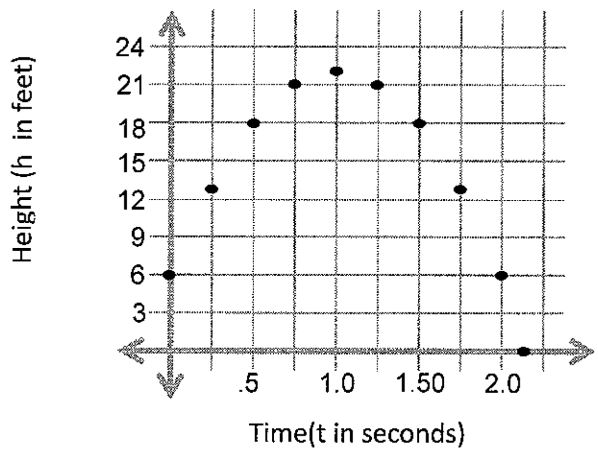
2. After how many seconds did the ball hit its maximum height? Explain how you know. 1 second. This is where the vertex (maximum) occurs.

3. What was the ball's maximum height? Explain how you know. 22 ft, when t=1, h=22. This is the vertex.
(vertex, h)

4. After how many seconds did the ball hit the ground? Explain how you know. 2.17 seconds. This is when h=0
x-int.

5. What type of function would produce this shape of graph? Quadratic

t	0	.25	.5	.75	1.0	1.25	1.5	1.75	2	2.17
h	6	13	18	21	22	21	18	13	6	0



6. If a girl were in a window 10 feet above where the ball was thrown, would she have an opportunity to catch it? Why or why not? Yes. She is at a height of 16 ft. The ball went as high as 22 feet.

Many real situations can be modeled by Quadratic functions. Often times, the vertex, x-int, and y-int of these functions provide key information for real situations!

Practice:

1. Olympic softball gold medalist Michele Smith pitches a curveball with a speed of 64 ft/sec. If she throws the ball straight upward at this speed, the ball's height h (in feet) after t seconds is given by $h = -16t^2 + 64t$.

A. How long would it take for the ball to reach its maximum height? (t, vertex)

$t = \frac{-64}{2(-16)}$ $t = \frac{-64}{-32}$

$t = 2$ seconds

B. How high would the ball reach? (h of vertex)

$h = -16(2)^2 + 64(2)$

$h = 64$ ft.

C. How long would it take for the ball to hit the ground?

$0 = -16t^2 + 64t$

$0 = -16t(t-4)$

$t = 0$ $\boxed{t = 4 \text{ seconds}}$

2. Jaime owns a business making decorative boxes to store jewelry, mementos, and other valuables. The function $y = x^2 + 50x + 1800$ models the profit y that Jaime has made in month x for the first two years of his business.

A. Write an equation representing the month in which Jaime's profit is $2400.

$2400 = x^2 + 50x + 1800$

B. Solve the equation. After how many months did the profit reach $2400?

$0 = x^2 + 50x - 600$

$0 = (x+60)(x-10)$

$0 = x+60 \quad 0 = x-10$

$x = -60 \quad \boxed{x = 10 \text{ months}}$

C. Would this parabola have a minimum or maximum? Minimum

D. Did Jaime's profit hit a minimum or maximum? If so, when was it?

$x = \frac{-50}{2(1)}$

$x = -25$ months

No Minimum, b/c # of months is negative

3. A player hits a baseball into the outfield. The equation $h = -0.005x^2 + x + 3$ gives the path of the ball, where h is the height and x is the horizontal distance (both in ft.) that the ball travels.

A. From the equation, how do we know the ball has a maximum height? It opens down

B. Find the maximum height. vertex → h

$x = \frac{-1}{2(-.005)}$

$x = 100$

$h = -.005(100)^2 + 100 + 3$

$h = 53$

$\boxed{53 \text{ feet}}$

C. An outfielder catches the ball at a height of 3 feet. Write an equation to represent this. At what horizontal distance from the batter did the outfielder catch the ball? h=3

$3 = -0.005x^2 + x + 3$

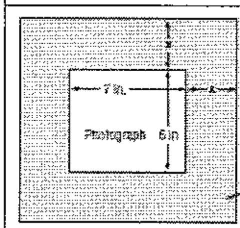
$0 = -0.005x^2 + x$

$0 = x(-.005x + 1)$

$x = 0 \quad -.005x + 1 = 0$

$\boxed{x = 200 \text{ ft}}$

4. A rectangular photograph is 7 inches long and 6 inches wide. The photograph is framed using material x inches wide (See fig. below).



A. In terms of x, what are the length and width of the frame?

$l = 2x + 7$

$w = 2x + 6$

B. What simplified expression represents the area of the photo and frame, together?

$(2x+7)(2x+6)$

$4x^2 + 14x + 12x + 42$

$A = 4x^2 + 26x + 42$

C. If the area of the photo and frame, together is 156 square inches, what is the width of the frame? → A=156

$4x^2 + 26x + 42 = 156$

$4x^2 + 26x - 114 = 0$

$2(2x^2 + 13x - 57) = 0$

a: 2,1 c: -3,19 -1,57

$2(2x + 19)(x - 3)$

$x = \frac{-19}{2} \quad x = 3$

$\boxed{3 \text{ inches}}$