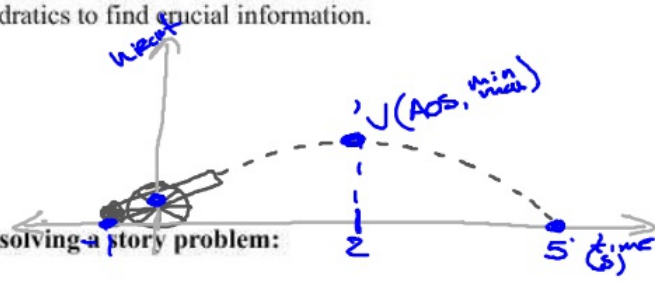
Day 3: Solving Real World Problems

Date_____

1) There are MANY real world situations that use quadratics to find crucial information.

For example:

Throwing a ball, missile, arrow, or stone
Finding profit on the sales of an item
Studying lenses and curved mirrors
And MANY more...



Answer parts A and B for each phrase below, when solving a story problem:

A) what are you solving for? (ex: *x*-value of vertex, *y*-value of vertex, etc)

B) how can you solve for it? (ex: factoring, quadratic formula, etc)

2) "What time does an object hit the ground?" or "An object hits the ground after how many seconds?"

A) x int.

B) Find zeors (Std → Factored) - quadratic Formula.

3) "What is the starting height of the object?"

A) y int

B) "c" or plug in 0 for x

4) "How long does it take an object to reach the maximum height?" or "How many _____ does it take to get the maximum?"

A) AOS.

B) $\frac{-b}{2a}$

5) "What is the height after _____ seconds?"

A) Plug it in and solve

B)

6) "What is the maximum height?" or "What is the maximum _____ for an object?"

A) Max/min

B) Vertex.

A ball is thrown into the air. The path of the ball is represented by the equation $h = -t^2 + 8t$ where h represents height in feet and t represents time in seconds.

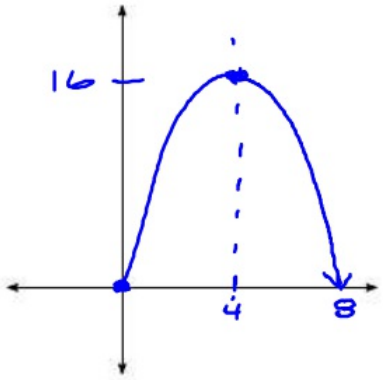
$y = -x^2 + 8x + 0$ (A B C)

$\frac{y}{-x} = \frac{-x^2}{-x} + \frac{8x}{-x}$

$-x(x - 8)$

$x = 0, 8$

7) Make a graph of the situation.



1) x-int: (0,0) (8,0)

2) AOS: $x = 4$

$\frac{-b}{2a} = \frac{-8}{2(-1)} = \frac{-8}{-2} = 4$

3) Vertex (4,16)

$h = -(4)^2 + 8(4)$

$-16 + 32 = 16$

4) y-int (0,0)

5) max min $y = 16$

8) What is the starting height of the ball before it is thrown into the air?

0 feet — y-int.

9) How long does it take the ball to reach the maximum height?

AOS 4 sec.

10) What is the ball's maximum height?

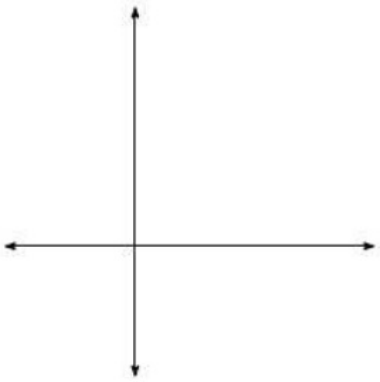
Vertex (AOS. min/max) 16 feet.

11) How long before the ball hits the ground?

x-int 8 sec.

A bakery makes its profit in wedding cakes. The profit, P in thousands of dollars, $P = -5x^2 + 2500x - 3000$, where x is the number of wedding cakes sold.

12) Make a graph of the situation.



13) How many cakes does the bakery need to sell to earn their maximum profit?

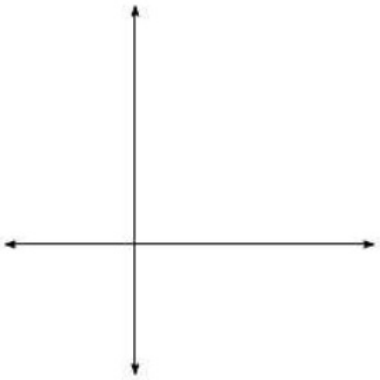
14) What is the maximum profit that the bakery earns with their wedding cakes?

15) How many cakes would the bakery sell for a profit of zero dollars?

16) What is the profit for the bakery when they sell 175 wedding cakes?

A rock is thrown from the top of a tall building. The distance in feet, d, between the rock and the ground t seconds after it is thrown is given by $d = -16t^2 - 4t + 382$.

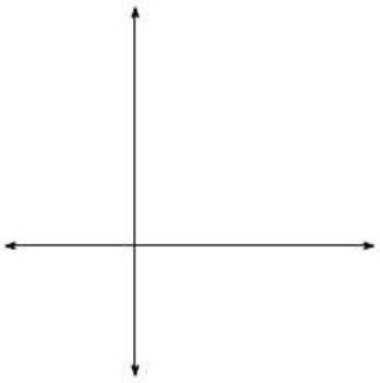
17) Make a graph of the situation.



18) How long after the rock is thrown is it 370 feet off the ground?

A ball is tossed in the air from ground level. After t seconds it reaches a height of h in feet given by the equation $h = 144t - 16t^2$.

19) Make a graph of the situation.



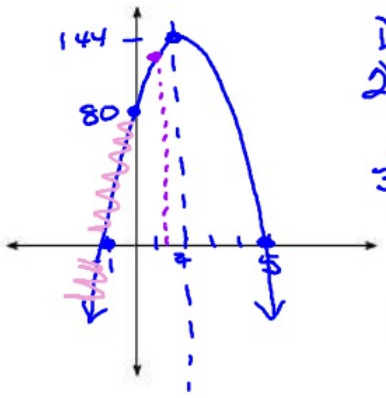
20) What is the height of the ball after 3 seconds?

21) What is the maximum height the ball will reach?

22) After how many seconds will the ball hit the ground?

A rocket carrying fireworks is launched from a hill 80 meters above the lake. The rocket will fall into the lake after exploding at its maximum height. The rockets height in meters above the surface is given by $h = -16t^2 + 64t + 80$, where t is time in seconds.

23) Make a graph of the situation.



$h = \frac{-16t^2}{-16} + \frac{64t}{-16} + \frac{80}{-16}$

$-16(t^2 - 4t - 5)$

$-16(t+1)(t-5)$

1) x-int $(-1, 0)$ $(5, 0)$

2) AOS $x = 2$

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

3) Vertex $(2, 144)$

$h = -16(2)^2 + 64(2) + 80$

$-64 + 128 + 80$

144

4) y-int $(0, 80)$

5) min (max) $y = 144$

24) At what height does the rocket start before it is launched?

y-int 80 m.

25) How high is the rocket after 1.5 seconds?

$h(1.5) = -16(1.5)^2 + 64(1.5) + 80$

$= 140$ m

26) At what height will the rocket explode?

Vertex 144 m.

27) After how many seconds will the rocket hit the lake?

x-int 5 sec.