CCGPS Analytic Geometry: Using Quadratics / Factoring in Word Problems February 11, 2015 (Wed)

A few steps to get you started setting up and solving **word problems:**

1. *Visualize Problem* – Draw a picture or diagram.
2. *Identify Variables* – They are typically the answer to questions asked. Be SURE to include units in the definition of the variable. (i.e. *h* is *hours* Sally drove)
3. *Translate words into math equation(s)* – Each sentence is typically one equation – although not always. Every number & constant in the words should be used in the equation(s).
4. *Solve equations and check.*

Examples: Solve the following word problems.

1. The difference between two numbers is 6 and their product is 72. What are the numbers?

2. The length of a rectangular garden is 5 feet greater than the width. The area of the rectangle is 300 square feet. Find the length and the width.

The vertical motion model is often modeled by the function $h(t) = -16t^2 + v_i t + h_i$ where v_i is initial velocity and h_i is initial height. Acceleration from gravity is 32 ft/sec^2 downward.

3. A projectile is shot straight upward from the ground with a velocity of 64 feet per second. How long will it take to hit the ground?

b. What is the maximum height of the projectile in example #3?

4. A pumpkin cannon launches your jack'o lantern with a vertical velocity of 96 ft/sec.

a. How long will it take for the pumpkin to reach a height of 128 feet?

b. How long will the pumpkin be in the air (total time before it lands)?

c. What is the maximum height of the pumpkin?

Practice

1. The difference between two numbers is 4 and their product is 77. What are the numbers?

2. One number is 2 more than twice another. If the product of the numbers is 2 more than twice their sum, find the numbers.

3. The width of a pool is 12 feet shorter than its length. If its area is 2080 square feet, find the length and the width.

4. An acrobat is shot upward from a cannon at 32 ft/sec from an initial height of 4 ft. How long does it take for an acrobat to land in a safety net that's 20 feet above the ground?

CCGPS Analytic Geometry: Using Quadratics / Factoring in Word Problems **February 11, 2015 (Wed)** Key

A few steps to get you started setting up and solving **word problems:**

1. *Visualize Problem* – Draw a picture or diagram.
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4. *Solve equations and check.*

Examples: Solve the following word problems.

1. The difference between two numbers is 6 and their product is 72. What are the numbers?

$x - y = 6 \qquad x \cdot y = 72$

$(x)(x-6) = 72$

$x^2 - 6x = 72$

$x^2 - 6x - 72 = 0$

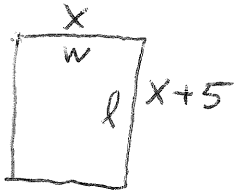
$-12 \cdot 6 = -72 \qquad -12 + 6 = -6$

$(x-12)(x+6) = 0$

$x = 12, \; x = -6$

12 and 6 or −6 and −12

2. The length of a rectangular garden is 5 feet greater than the width. The area of the rectangle is 300 square feet. Find the length and the width.



$x(x+5) = 300$

$x^2 + 5x = 300$

$x^2 + 5x - 300 = 0$

$20 \cdot -15 = -300 \qquad 20 - 15 = 5$

$(x+20)(x-15)$

$x = -20, \; x = 15$

$x = 15$

width = 15 ft
length = 20 ft.

The vertical motion model is often modeled by the function $h(t) = -16t^2 + v_i t + h_i$ where v_i is initial velocity and h_i is initial height. Acceleration from gravity is 32 ft/sec² downward.

3. A projectile is shot straight upward from the ground with a velocity of 64 feet per second. How long will it take to hit the ground?

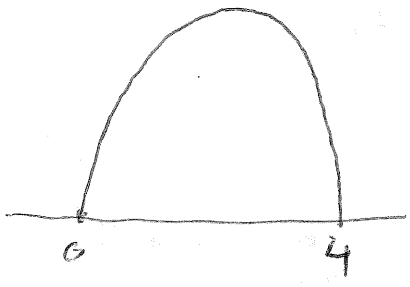
$v_i = 64$ ft/s $\qquad h_i = 0$ ft.

$h(t) = -16t^2 + 64t + 0$

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

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

$t = 0, \; t = 4$ seconds



b. What is the maximum height of the projectile in example #3?

$t = 2 \qquad h(t) = -16t^2 + 64t$

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

$h(2) = 64$ ft.

$h(t) = -16t^2 + v_i t + h_i$

4. A pumpkin cannon launches your jack'o lantern with a vertical velocity of 96 ft/sec.

$v_i = 96 \quad h_i = 0$

a. How long will it take for the pumpkin to reach a height of 128 feet?

$h(t) = 128$

$128 = -16t^2 + 96t + 0$

$0 = -16t^2 + 96t - 128$

$0 = -16(t^2 - 6t + 8)$

$0 = -16(t-2)(t-4)$

-4 | -8/-2

1 | -6 | 1

$t = 2$ sec

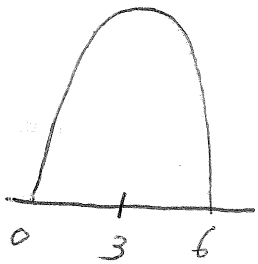
$t = 4$ sec.

b. How long will the pumpkin be in the air (total time before it lands)?

$0 = -16t^2 + 96t + 0$

$0 = -16t(t-6)$

$t = 0, 6$ seconds



c. What is the maximum height of the pumpkin?

at $t = 3$

$h(3) = -16(3)^2 + 96(3)$

$h(3) = 144$ ft.

Practice

1. The difference between two numbers is 4 and their product is 77. What are the numbers?

x and $x-4$

-11 | -77 | 7

1 | -4 | 1

$(x)(x-4) = 77$

$x^2 - 4x = 77$

$x^2 - 4x - 77 = 0$

$(x-11)(x+7) = 0$

$x = 11, x = -7$

11 and 7

-11 and -7

2. One number is 2 more than twice another. If the product of the numbers is 2 more than twice their sum, find the numbers.

x and $2x$

$(x)(2x) = 2 + 2(x + 2x)$

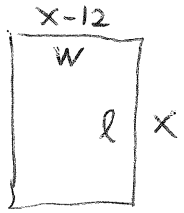
$2x^2 = 2 + 2x + 4x$

$2x^2 = 2 + 6x$

$2x^2 - 6x - 2 = 0$

$2(x^2 - 3x - 1) = 0$

3. The width of a pool is 12 feet shorter than its length. If its area is 2080 square feet, find the length and the width.



$x(x-12) = 2080$

$x^2 - 12x = 2080$

$x^2 - 12x - 2080 = 0$

$(x-52)(x+40) = 0$

$x = 52, x = -40$

4. An acrobat is shot upward from a cannon at 32 ft/sec from an initial height of 4 ft. How long does it take for an acrobat to land in a safety net that's 20 feet above the ground?

$h(t) = -16t^2 + 32t + 4$

$20 = -16t^2 + 32t + 4$

$0 = -16t^2 + 32t - 16$

$0 = -16(t^2 - 2t + 1)$

$0 = -16(t-1)(t-1)$

$t = 1$ second