

Name: _____

Blk: _____ Date: _____

16

KEY

Precalc Math 11

6.5 QE Word Problems (part 2)

1) At a local golf course, DJ whacked a golf ball which followed the path of a parabola given by the function $h(t) = -5t^2 + 25t + 0.05$ where t is the number of seconds after he hit the ball and $h(t)$ is the height, in metres, of the ball above the ground after t seconds.

a) Write the equation in vertex form.

$$\begin{aligned} &= -5t^2 + 25t + 0.05 \\ &= -5(t^2 - 5t) + 0.05 \\ &= -5\left(t^2 - 5t + \frac{25}{4} - \frac{25}{4}\right) + 0.05 \\ &= -5\left(t - \frac{5}{2}\right)^2 + \frac{313}{10} \\ &= -5(t - 2.5)^2 + 31.3 \end{aligned}$$

b) What's the height of the ball 2 seconds after it is hit? $h = ?$ when $t = 2$

$$\begin{aligned} h(t) &= -5t^2 + 25t + 0.05 \\ h(2) &= -5(2)^2 + 25(2) + 0.05 \\ &= 30.05 \text{ m} \end{aligned}$$

c) Find the maximum height reached by the golf ball.

$$\begin{aligned} \text{max height} &= 31.3 \text{ m} \\ &(\text{from vertex}) \end{aligned}$$

d) How many seconds did it take for the ball to reach its max height?

$$\begin{aligned} &2.5 \text{ s} \\ &(\text{from vertex}) \end{aligned}$$

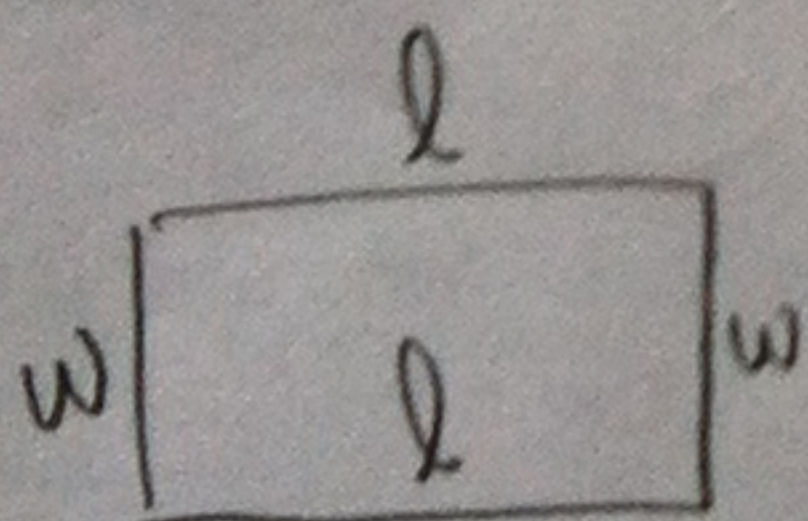
e) How high, in cm, did DJ tee up his golf ball before he hit it? $h = ?$ when $t = 0$

$$\begin{aligned} h(t) &= -5t^2 + 25t + 0.05 \\ h(0) &= -5(0)^2 + 25(0) + 0.05 = 0.05 \text{ m} \end{aligned}$$

f) How long, to the nearest tenth of a second, did it take for the golf ball to hit the ground? if $h = 0$ then $t = ?$

$$\begin{aligned} 0 &= -5t^2 + 25t + 0.05 \\ -25 \pm \sqrt{25^2 - 4(-5)0.05} &= \frac{-25 \pm \sqrt{626}}{2(-5)} \\ &= \frac{-25 \pm 25.01999201}{-10} \rightarrow -0.001999 \text{ reject} \\ &\rightarrow \boxed{5.0 \text{ s}} \end{aligned}$$

2) The perimeter of a rectangle is 84 m. Its area is 320 m². What is the length and width of this rectangle?



$$\begin{aligned} 2l + 2w &= 84 \\ l + w &= 42 \\ w &= 42 - l \end{aligned}$$

$$\begin{aligned} A &= l \cdot w \\ 320 &= l(42 - l) \\ 0 &= -l^2 + 42l - 320 \\ l &= \frac{-42 \pm \sqrt{42^2 - 4(320)}}{2(-1)} \end{aligned}$$

$$\begin{aligned} &= \frac{-42 \pm 22}{-2} \rightarrow 10 \\ &\rightarrow 32 \end{aligned}$$

reject \rightarrow
b/c technically $l > w$

$$\begin{aligned} \text{Case 1:} \\ l &= 10 \\ w &= 42 - l \\ &= 42 - 10 \\ &= 32 \end{aligned}$$

$$\begin{aligned} \text{Case 2:} \\ l &= 32 \\ w &= 42 - l \\ &= 42 - 32 \\ &= 10 \end{aligned}$$

$$\boxed{10 \text{ m \& } 32 \text{ m}}$$

8

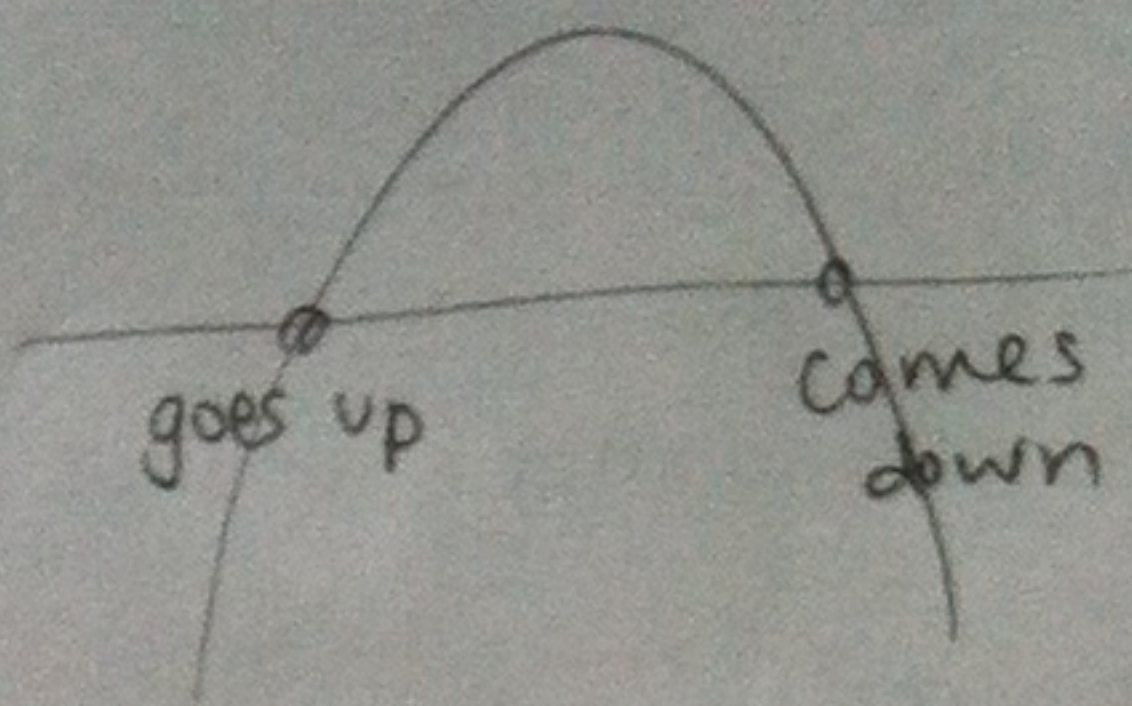
- 3) Sanjit threw his iPhone 4 vertically upward at a speed of 22 m/s. Its height, h , is given by the function $h(t) = 22t - 5t^2$. When is the ~~stone~~ ^{phone} 15 m up and explain why there are 2 answers.

$$15 = 22t - 5t^2$$

$$0 = -5t^2 + 22t - 15$$

$$t = \frac{-22 \pm \sqrt{22^2 - 4(-5)(-15)}}{2(-5)} = \frac{-22 \pm \sqrt{184}}{-10}$$

$$= \frac{-22 \pm 13.56}{-10} \rightarrow \boxed{3.56 \text{ s}} \\ \rightarrow \boxed{0.84 \text{ s}}$$



- 4) Benny jumped off a diving board. His height $h(t)$ in metres, above the water, is given by $h(t) = -5t^2 + 8t + 4$ where t is the number of seconds after he jumped. How long does it take for him to splash clumsily into the water? $h=0$ $t=?$

$$0 = -5t^2 + 8t + 4$$

$$t = \frac{-8 \pm \sqrt{8^2 - 4(-5)(4)}}{2(-5)} = \frac{-8 \pm 12}{-10}$$

$$\rightarrow \boxed{2 \text{ s}} \quad \text{reject } -0.4$$

- 5) One positive integer is 3 greater than 4 times another positive integer. If the product of these two integers is 76, what is the sum of these two integers?

Let 1st #: x

Let 2nd #: $4x+3$

$$x(4x+3) = 76$$

$$4x^2 + 3x - 76 = 0$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(4)(-76)}}{2(4)} = \frac{-3 \pm 35}{8} \rightarrow 4$$

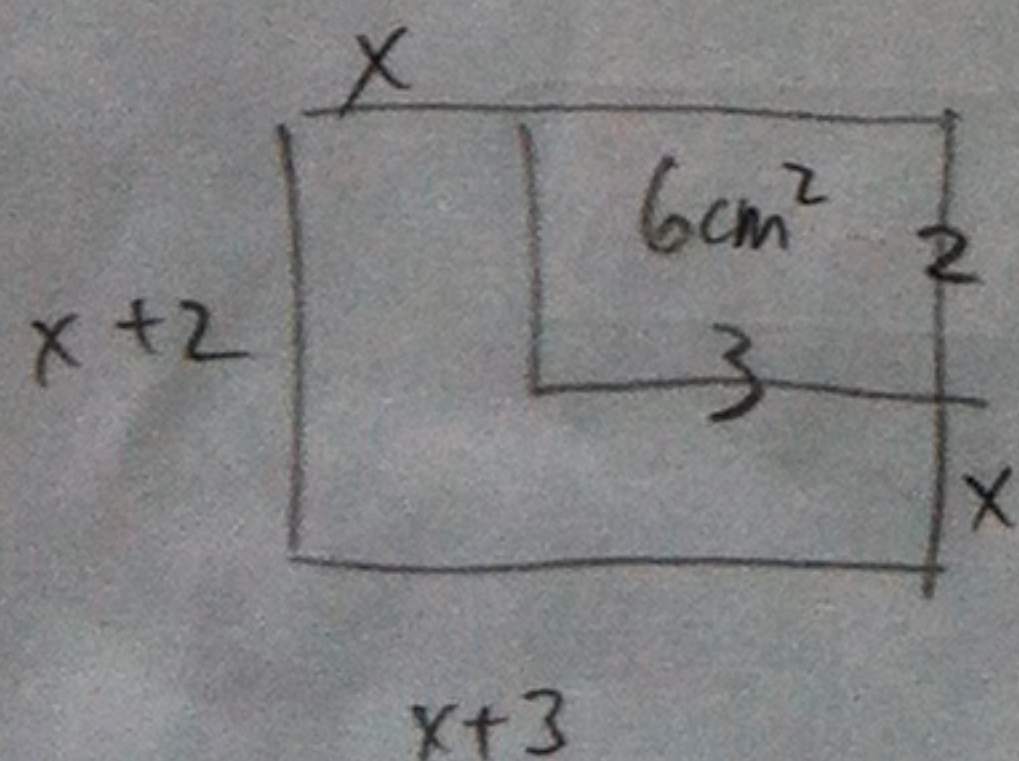
$$x = 4$$

$$4x+3 = 4(4)+3 = 19$$

$$\text{So } 19+4 = \boxed{23}$$

2

- 6) A photo of dimensions 2 cm by 3 cm has its length and width increased by the same amount. The new dimensions now create an area 26 times greater than the original. What is the new length and width?



$$6(26) = (x+2)(x+3)$$

$$156 = x^2 + 5x + 6$$

$$0 = x^2 + 5x - 150$$

$$= (x-10)(x+15)$$

$$x = 10 \text{ or } -15$$

reject

$$\boxed{12 \text{ cm}} \\ \boxed{13 \text{ cm}}$$

2