19.) $y = \frac{1}{2}(x-5)^2 - 100$

$0 = \frac{1}{2}(x-5)^2 - 100$

$100 = \frac{1}{2}(x-5)^2$

$200 = (x-5)^2$

18.) $5(2x-3)^2 + 4 = -56$

$-4 \quad -4$

$\sqrt{(2x-3)^2} = \sqrt{-12}$

$2x-3 = \pm 2i\sqrt{3}$

$2x = \frac{3 \pm 2i\sqrt{3}}{2} = \frac{3}{2} \pm i\sqrt{3}$

16.) $-3x^2 - 10x + 8 = 0$

$-1(3x^2 + 10x - 8) = 0$

$-1(3x - 2)(x + 4) = 0$

$x = 2/3, -4$

12.) $12x^2 - 4x = 5$

$12x^2 - 4x - 5 = 0$

$(2x + 1)(6x - 5)$ 20

discriminant

0 or perfect square

factorable

$(-4)^2 - 4(12)(-5)$

$16 + 240$

256

Quadratic Word Problems

Consecutive Integers

$$x, x+1, x+2, x+3, \ldots$$

Consecutive odd integers

$$x, x+2, x+4, x+6, \ldots$$

consecutive even integers

$$x, x+2, x+4, x+6, \ldots$$

1)Find the largest possible three consecutive integers such that the product of the first and the second is equal to the product of -6 and the third.

$x, x+1, x+2$

$x(x+1) = -6(x+2)$

$x^2 + x = -6x - 12$

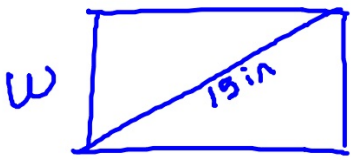
$x^2 + 7x + 12 = 0$

$(x+3)(x+4) = 0$

$x = -3, -4$

$-3, -2, -1$

2) The length of a rectangle is 3 inches more than its width. If the length of the diagonal is 15 inches, find the dimensions of the rectangle



$L = 3 + w$

$(3+w)(3+w)$

$9 + 3w + 3w + w^2$

9in, 12in

Pythagorean Theorem: $a^2 + b^2 = c^2$

$w^2 + (3+w)^2 = 15^2$

$w^2 + 9 + 6w + w^2 = 225$

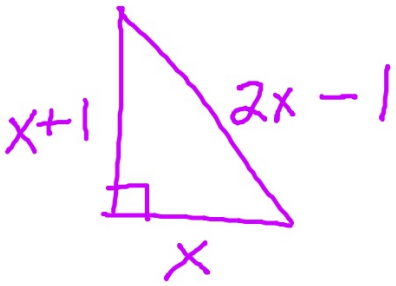
$2w^2 + 6w - 216 = 0$

$2(w^2 + 3w - 108) = 0$

$2(w+12)(w-9) = 0$

$w = 9$

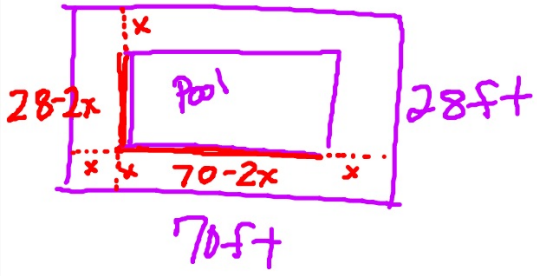
4) Suppose that one leg of a right triangle is 1 more than the other leg; and the hypotenuse is 1 less than 2 times the shorter leg. Find the length of all the sides



$$x^2 + (x+1)^2 = (2x-1)^2$$

$$\underline{\qquad\qquad\qquad\qquad} = 0$$

6) A rectangular pool in a water-purification plant requires a surface area of 1240 square feet. If the pool is situated in a room with dimensions 70 ft by 28 ft and the distance from the pool edge to the room wall is uniform, find the dimensions of the pool.



Border : 4 ft

62ft, 20ft

$(70-2x)(28-2x)=1240$

$1960-140x-56x+4x^2=1240$

$\frac{4x^2}{4}-\frac{196x}{4}+\frac{1960}{4}=\frac{1240}{4}$

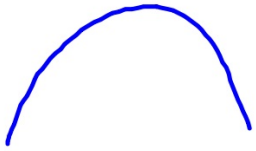
$x^2-49x+490=310$

$x^2-49x+180=0$

$(x-45)(x-4)=0$

$x=4, \cancel{45}$

7) The equation for an object's height s at time t seconds after launch is $s(t) = -4.9t^2 + 19.6t + 58.8$, where s is in meters.



a) When does the object strike the ground?

$$0 = -4.9t^2 + 19.6t + 58.8$$
$$= -4.9(t^2 - 4t - 12)$$

b) At what time does the object reach its maximum height?

X-value of vertex; $x = \frac{-b}{2a} = \frac{-(-4)}{2(1)} = 2$ sec

c) What is the maximum height of the object?

$$s(2) = -4.9(2)^2 + 19.6(2) + 58.8$$
$$= 78.4 \text{ meters}$$

12) The product of two consecutive positive odd integers is 1 less than four times their sum. Find the two integers.

x

$x+2$

Sum: $2x+2$

$$x(x+2) = 4(2x+2) - 1$$

$$x^2 + 2x = 8x + 8 - 1$$

$$x^2 - 6x - 7 = 0$$

$$(x-7)(x+1) = 0$$

$x = 7$ $x = -1$ (x)

7, 9