Mathematics 10D

Solving Quadratics

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First of all, and most importantly, what is solving?

Solving is to find the value or values of a variable that make the equation true.

Ex1: $3x - 8 = 13$ Ex2: $2x^2 + 3 = 21$

However, how would you solve: $3x^2 - 8x + 4 = 2x + 3$

In the world of quadratics, solving means to find the x-intercepts or the zeros, hence we need to substitute 0 into y, or rewrite the equation so that it equals 0 (which is why I saw to solve for the zeros, meaning find the value(s) of x so that y=0)

Solve!

$$y = 2(x-3)^2 - 18$$

Solve another!

$$y = -5(x+6)^2 + 70$$

The first two were neat and tidy, how about one that isn't!

$$y = -7(x-12)^2 + 19$$

Are there always 2 answers?

$$y = 4(x+8)^2 + 6$$

$$y = -3(x+4)^2$$

Mathematics 10D Q.07 – Solving By Factoring

Factor, then solve!

$$x^2 + 10x + 21 = 0$$

Factor to solve another!

$$20x^2 - 14x - 24 = 0$$

Simplify, then factor to solve.

$$2x^2 - 11x - 4 = 2$$

Whoah! What's this?!?

$$36x^2 - 174x + 18 = -6x^2 - 6$$

Mathematics 10D Q.08 – Solving By Quadratic Formula

The quadratic formula is the formula that solves all. In order to use it, you need to setup the quadratic in standard form. The quadratic formula is derived by completing the square, then solving from the vertex form.

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Let's give it a try.

$$5x^2 + 12x - 32 = 0$$

Give it another go.

$$5x^2 + 5x + 8 = 0$$

Example 3.

$$4x^2 + 8x - 10 = 11$$

Are the answers always neat?

$$11x^2 + 7x - 20 = 6x + 8x^2$$

Mathematics 10D

Q.09 – Quadratic Word Problems

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Mathematics 10D Q.09 – Quadratic Word Problems

Students really dislike word problems, no matter what type they are. Quadratic word problems come with the same disdain. There are two types of word problems: equations given and equations not given. However, no matter the situation, once you have an equation, there are 4 things you can do:

1. You are given an *x* value. Plug it in and work it out.
2. You are asked, in some way, to find the zeros. Solve it by whichever method works.
3. You are given a *y* value. Plug it into the *y*, then bring it over to the other side, then solve it using whichever method works.
4. Find the maximum or minimum. Complete the Square, or if you have the zeros, find the axis of symmetry, then plug that into the original equation.

None of this is new! You just need to apply it the skills you have acquired over the past few weeks!

Let's do 4 examples. Two with equations given, 2 without.

1. An automated hose on a tower sprays water on a forest fire. The height of the water, *h*, in metres, can be modelled by the relation $h = -2.25x^2 + 4.5x + 6.75$, where *x* is the horizontal distance of the water from the hose, in metres.
   a) What is the maximum height of the water?

   b) When will the water hit the ground?

2. A person throws a ball of a roof of a building. The relation $h = -5t^2 + 20t + 12$ models the height of the ball, in metres, and the time, in seconds.
   a) What is the height of the building?

   b) How high will the ball be after one second?

   c) When will the ball hit the ground?

2. A person throws a ball of a roof of a building. The relation $h = -5t^2 + 20t + 12$ models the height of the ball, in metres, and the time, in seconds.
   d) What is maximum height of the ball?

   e) How long will the ball be above 20 metres?

3. The length of a rectangle is one more than two times the width. If the area of the rectangle is 136, what are the dimensions of the rectangle?

4. The sum of product of two consecutive number is 156. Find the numbers (without guess and check!)