Name: _____ Date: _____

Solving Quadratic Equations Using Square Roots

UNIT QUESTION: How are real life scenarios represented by quadratic functions?

Solving Quadratic Equations Using Square Roots

1. Get x^2 by itself.
2. Take the square root of both sides of the equation.
3. There will ALWAYS be a positive answer and a negative answer.
4. Check your answers!!!

Solve each equation.

1. $x^2 - 4 = 0$

$+4 \quad +4$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

WHEN x^2 IS BY ITSELF, TAKE THE SQUARE ROOT OF BOTH SIDES

THIS MEANS X CAN BE POSITIVE OR NEGATIVE 2

2. $\frac{2x^2}{2} = \frac{32}{2}$

$\sqrt{x^2} = \sqrt{16}$

$x = \pm 4$

3. $16x^2 + 8 = 200$

$-8 \quad -8$

$\frac{16x^2}{16} = \frac{192}{16}$

$\sqrt{x^2} = \sqrt{12}$ ← THIS WILL NOT BE A PERFECT SQUARE. YOU CAN WRITE AS ROUNDED DECIMAL (USE CALCULATOR!)

$x \approx \pm 3.5$ OR $x = \pm\sqrt{12}$

USE $\approx$ INSTEAD OF $=$ TO REPRESENT ROUNDING

4. $5x^2 - 25 = 0$

$+25 \quad +25$

$\frac{5x^2}{5} = \frac{25}{5}$

$\sqrt{x^2} = \sqrt{5}$

$x = \pm\sqrt{5}$ OR $x \approx 2.2$

5. $\frac{4(x+5)^2}{4} = \frac{64}{4}$

$\sqrt{(x+5)^2} = \sqrt{16}$

$x + 5 = \pm 4$

$-5 \quad -5$

$x = \pm 4 - 5$ OR $x = -5 \pm 4$

CAN'T DISTRIBUTE THE 4 BECAUSE THE ( ) IS SQUARED. INSTEAD, DIVIDE!

TAKE SQUARE ROOT OF ENTIRE ( )

LAST STEP IS TO MOVE (SUBTRACT) 5

6. $\frac{5(x-3)^2}{5} = \frac{20}{5}$

$\sqrt{(x-3)^2} = \sqrt{4}$

$x - 3 = \pm 2$

$x = \pm 2 + 3$

THIS MEANS one positive and one negative

$2 + 3 = 5$

$-2 + 3 = 1$

5 AND 1 ARE SOLUTIONS!

7. $2(x-4)^2 - 3 = 37$

$+3 \quad +3$

$\frac{2(x-4)^2}{2} = \frac{40}{2}$

$\sqrt{(x-4)^2} = \sqrt{20}$

$x - 4 = \pm 2\sqrt{5}$

$+4 \quad +4$

$x = \pm 2\sqrt{5} + 4$

OR $4 \pm 2\sqrt{5}$

Remember we can simplify radicals

$\sqrt{20}$: $4 \cdot 5$; $2 \cdot 2$; $\sqrt{2 \cdot 2} \cdot 5$; $2\sqrt{5}$

NOW FINISH SOLVING FOR X

8. $2(x-1)^2 - 6 = 30$

$+6 \quad +6$

$\frac{2(x-1)^2}{2} = \frac{36}{2}$

$\sqrt{(x-1)^2} = \sqrt{18}$

$x - 1 = \pm 3\sqrt{2}$

$+1 \quad +1$

$x = \pm 3\sqrt{2} + 1$

OR

$1 \pm 3\sqrt{2}$

$\sqrt{18}$: $9 \cdot 2$; $3 \cdot 3$; $3\sqrt{2}$

Falling Objects: Real World Application!!!!

The formula below is used to model the height and time it takes for an object to fall

$$h = -16t^2 + h_0$$

h_0 is the initial height.
h is the ending height.
t represents time

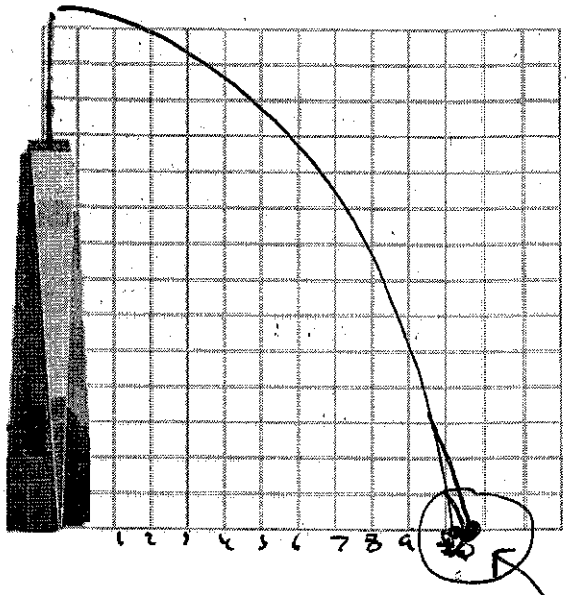
9. The tallest building in the USA is the One World Trade Center in New York which measures 1,776 feet (built to this height to represent the year the declaration of independence was signed!) Write a formula that would model the time it would take for an object to hit the ground if it was dropped from the top of the tower.

$h = -16t^2 + 1776$

THIS WILL BE ZERO SINCE THE ENDING HEIGHT IS THE GROUND

$0 = -16t^2 + 1776$

10. Sketch what the graph of this quadratic might look like



11. If you dropped a penny from the top of the tower, how long would it take to hit the ground?

HOW LONG MEANS TIME SO SOLVE FOR t!

$0 = -16t^2 + 1776$
$-1776 \quad -1776$

$\frac{-1776}{-16} = \frac{-16t^2}{-16}$

$\sqrt{111} = \sqrt{t^2}$

$\pm 10.5 \approx t$

SINCE WE CAN'T HAVE NEGATIVE TIME, WE SAY THAT IT WOULD TAKE ABOUT 10.5 SECONDS FOR THE PENNY TO DROP.

☆ THE TIME IT TAKES REPRESENTS THE ZERO OR SOLUTION TO THE QUADRATIC