Bellwork

Simplify each of the following radicals:

1. $\sqrt{375}$

$= \sqrt{25 \cdot 15}$
$= \sqrt{25} \cdot \sqrt{15}$
$= 5\sqrt{15}$

Factor out 375
1 and 375
3 and 125
5 and 75
Use: 15 and 25

2. $\sqrt{28}$

$= \sqrt{4 \cdot 7}$
$= \sqrt{4} \cdot \sqrt{7}$
$= 2\sqrt{7}$

Factor out 28
1 and 28
2 and 14
Use: 4 and 7

3. $\sqrt{1100}$

$= \sqrt{100 \cdot 11}$
$= \sqrt{100} \cdot \sqrt{11}$
$= 10\sqrt{11}$

Factor out 1100
1 and 1100
2 and 550
4 and 275
5 and 220
10 and 110
Use: 11 and 100
20 and 55
22 and 50
25 and 44

Solving Quadratic Equations

Given:

You will be given an expression that will contain a squared variable.

This will be the highest power given.

Looking for:

The zeros, or roots, of the function.

These are also known as the x-intercepts

Processes in Solving Quadratics

There are several approaches to solving quadratics including:

1. Solving using Square Roots
   This will be the focus of this lesson.
2. Solving by Factoring
3. Solving by Completing the Square
4. Solving by Using the Quadratic Formula

Square Roots Fact

Did you know there is technically 2 answers when you take the square root of a number?

1. The Principle Root:
   This is the root that you are use to. The positive root.

2. The Negative Root:
   If you square a negative number you get a positive number right?

Solving by Square Roots

Procedure:

1. Isolate the term that is squared.
   [NOTE: This could be a term or an expression!]
2. Take the square root of both sides. Remember that this will now become + or - to give us the principle and the negative roots.
   [Simplify the radical if possible.]
3. If there is a square root in the denominator rationalize it by multiplying the top and bottom by the square root that is left.
4. Solve for x.
   [This may including having to add/subtract a number that is subtracted/added to the x term, or multiplying/dividing a number that x is divided by or multiplied by.]
5. Simplify if possible

Example

Solve the following by using square roots:

1. $\frac{12x^2}{12} = \frac{1728}{12}$

$x^2 = 144$

$\sqrt{x^2} = \sqrt{144}$

$\boxed{x = \pm 12}$

2. $7x^2 + 5 = 15$

$-5 \quad -5$

$\frac{7x^2}{7} = \frac{10}{7}$

$x^2 = \frac{10}{7}$

$\sqrt{x^2} = \sqrt{\frac{10}{7}} = \frac{\sqrt{10}}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$

$x = \pm \frac{\sqrt{10 \cdot 7}}{\sqrt{7 \cdot 7}} = \pm \frac{\sqrt{70}}{\sqrt{49}}$

$\boxed{x = \pm \frac{\sqrt{70}}{7}}$

Example

Solve the following by using square roots:

3. $2x^2 + 9 = 105$

$-9 \quad -9$

$\frac{2x^2}{2} = \frac{96}{2}$

$x^2 = 48$

$\sqrt{x^2} = \sqrt{48}$

$x = \pm\sqrt{16 \cdot 3}$

$x = \pm\sqrt{16} \cdot \sqrt{3}$

$\boxed{x = \pm 4\sqrt{3}}$

4. $\frac{3(x-4)^2}{3} = \frac{432}{3}$

$(x-4)^2 = 144$

$\sqrt{(x-4)^2} = \sqrt{144}$

$x - 4 = \pm 12$

$+4 \quad +4$

$x = 4 \pm 12$

$x = 4 + 12$ and $x = 4 - 12$

$\boxed{x = 16 \text{ and } x = -8}$

Example

Solve the following by using square roots:

5. $2(x + 8)^2 + 6 = -36$

$-6 \quad -6$

$\frac{2(x + 8)^2}{2} = \frac{-42}{2}$

$(x + 8)^2 = -21$

$\sqrt{(x + 8)^2} = \sqrt{-21}$

$x + 8 = \pm\sqrt{-21}$

$-8 \quad -8$

$x = -8 \pm \sqrt{-21}$

$\boxed{x = -8 \pm i\sqrt{21}}$