# What is the difference between a factor and a solution?

| Factor | Solution |
| --- | --- |
| | |

# Solving Quadratic Equations

# Solving a Quadratic Equation
# ak.a. Finding the Roots
# a.k.a. Finding the Zeros
# a.k.a. Finding the X-Intercepts

# How to Solve Quadratic Equations by Factoring

STEP 1: Factor

STEP 2: Set each factor equal to 0.

STEP 3: Solve for the variable.

STEP 4: Check your answers.

# Ex. 1: Solve the equation $x^2 + x - 6 = 0$

STEP 1: Factor $(x - 2)(x+3) = 0$

STEP 2: Set each factor equal to 0.

$x-2= 0$ and $x+3 = 0$

STEP 3: Solve for x.

$x-2= 0$ $\quad$ $x+3 = 0$

$\boxed{x = 2}$ $\quad$ $\boxed{x=-3}$

STEP 4: Check your answers.

$x^2 + x - 6 = 0$

$4 + 2 - 6 = 0$

$0 = 0$

$x^2 + x - 6 = 0$

$9 - 3 - 6 = 0$

$0 = 0$

Ex. 2: Solve the equation $x^2 + 10x + 25 = 0$

STEP 1: Factor $(x + 5)(x + 5) = 0$

STEP 2: Set each factor equal to 0.

$x+5 = 0$ and $x+5 = 0$

STEP 3: Solve for x.

$x+5= 0$ $\quad$ $x+5 = 0$

$x = -5$ $\quad$ $x = -5$

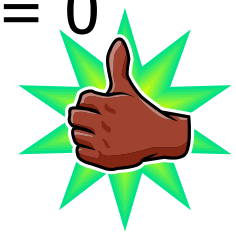
Don't write it twice!!!

STEP 4: Check your answers.

$x^2 + 10x + 25 = 0$

$25 - 50 + 25 = 0$

$0 = 0$



EX 3: $5x^2 + 8x = 0$

STEP 1: Factor $x(5x+8)=0$

STEP 2: Set each factor equal to 0.

$x = 0$ $\qquad$ $5x+8=0$

STEP 3: Solve for x.

$$x = -\frac{8}{5}$$

EX 4: Find the x-intercepts of $2x^2 + 7x = 0.$

STEP 1: Factor $x(2x+7)=0$

STEP 2: Set each factor equal to 0.

$x=0$ $2x+7=0$

STEP 3: Solve for x.

$x=-\frac{7}{2}$

# **Find the x-intercepts**: (Solve)

**1)** $x^2 - 2x - 3 = 0$

x = 3 and x = -1

**2)** $x^2 - 2x = 0$

x = 0 and x = 2

**3)** $x^2 - 8x + 12 = 0$

x = 2 and x = 6

# Standard Form

# of a

# Quadratic Equation

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

**If the Quadratic Equation is NOT in Standard Form PUT THE EQUATION IN STANDARD FORM FIRST.**

EX 5: $x^2 - 1 = 5x - 5$

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

$$(x-4)(x-1) = 0$$

$$x - 4 = 0 \qquad x - 1 = 0$$

$$\boxed{x = 4} \qquad \boxed{x = 1}$$

EX 6: $x^2 - 4 = 2 - x$

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

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

$x = -3$ $x = 2$

# ON YOUR OWN:

**Find the x-intercepts of** $x^2 - 4x + 2 = -1$

$x = 3$ $x = 1$

**Find the x-intercepts of** $x^2 - 4x = -3x + 3$

$x = 3$ $x = -1$

# Solving Quadratic Equations by finding Square Roots

# STEPS:

## Get x squared by itself.

Take the square root of both sides of the equal sign.

There will be a positive answer and a negative answer.

# Let's look at some examples where $x^2$ is already by itself.

**Examples. Solve the equation. Write the solutions as integers if possible. Otherwise, write them as radical expressions.**

1. $x^2 = 4$

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

$x = \pm 2$

2. $n^2 = 5$

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

$n = \pm\sqrt{5}$

**Here, all we have to do is take the square root of both sides.**

ON YOUR OWN:

1. $x^2 = 81$ 2. $y^2 = 11$ 3. $c^2 = 25$ 4. $x^2 = 10$

$x = \pm 9$ $y = \pm\sqrt{11}$ $c = \pm 5$ $x = \pm\sqrt{10}$

**Let's look at some examples where $x^2$ is NOT by itself.**

**We must solve to get $x^2$ by itself 1st!**

$$x^2 + 32 = 96$$

subtract 32

$$x^2 = 64$$

take the square root of both sides

$$x = \pm 8$$

## We must solve to get $x^2$ by itself 1st!

$$3x^2 - 48 = 0$$

add 48

$$3x^2 = 48$$

divide by 3

$$x^2 = 16$$

take the square root of both sides

$$x = \pm 4$$

**ON YOUR OWN:**

$x^2 - 1 = 0$

**$x = \pm 1$**

$2x^2 - 72 = 0$

**$x = \pm 6$**

$x^2 - 79 = 2$

**$x = \pm 9$**

$6x^2 = 150$

**$x = \pm 5$**

# SPECIAL SOLUTIONS

$$1.\ x^2 = 0$$

$$\sqrt{x^2} = \sqrt{0}$$

$$x = \pm 0$$

$$x = 0$$

**The only solution is zero b/c zero is not positive or negative!**

$$2.\ x^2 = -1$$

$$\sqrt{x^2} = \sqrt{-1}$$

**Plug this in your calculator. What do you get?????**

**Therefore, there is NO REAL SOLUTION b/c the square of a number is NEVER negative**