

## M117 SECTION 11.2 THE QUADRATIC FORMULA

In this section we will use the **QUADRATIC FORMULA** to solve quadratic equations. The quadratic formula is a formula that will solve *any* quadratic equation. So why don't we use it all the time?

**THE QUADRATIC FORMULA:** Given the quadratic equation  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , the solution for  $x$  is found by:

$$x =$$

(Note that because of the  $\pm$  symbol, you will end up with 2 solutions for  $x$ .)

Solve:  $x^2 + 10x = 2$  using the Quadratic Formula and see how it works.

1<sup>ST</sup>: Put the quadratic in standard form  $ax^2 + bx + c = 0$

Find  $a =$  \_\_\_\_\_ ,  $b =$  \_\_\_\_\_ , and  $c =$  \_\_\_\_\_

2<sup>ND</sup>: Find  $b^2 - 4ac$  This is called the *discriminant*. Since you will be taking the square root of this number, it cannot be negative. If it is, you can stop and answer that the quadratic equation has **NO REAL ROOTS or ONLY COMPLEX ROOTS.**

3<sup>RD</sup>: Plug the values into the formula and simplify.

EXAMPLES: USE THE QUADRATIC FORMULA TO SOLVE THE FOLLOWING.  
BE SURE TO FIND THE DISCRIMINANT IN EACH CASE FIRST.

$$3x^2 + 16x = -5$$

$$(x + 5)(x - 1) = 2$$

My golden retriever Sunny has a rectangular dog pen that has an area of 400 square feet. If the length of the pen is 10 feet more than the width, what are the dimensions of the pen? Express the dimensions in simplified RADICAL form.



A sheep falls off the top of a 200-foot cliff with a velocity of 12 ft per second. The height  $h$  of the sheep after  $t$  seconds is given by the following equation:

$$h = -16t^2 + 12t + 200$$

How many long will it take till this poor sheep hits the ground?  
Round to the nearest tenth of a second.



## NATURE & NUMBER OF ROOTS

Sometimes it is helpful to know the nature of the roots in order to check our answers. The quadratic formula makes it easy to determine the nature of the roots without completely solving the equation. The number  $b^2 - 4ac$ , which appears under the radical sign in the quadratic formula, is called the *discriminant*. We can use the discriminant in the following manner:

If $b^2 - 4ac > 0$ (POSITIVE)	Then the equation has
If $b^2 - 4ac = 0$ (ZERO)	Then the equation has
If $b^2 - 4ac < 0$ (NEGATIVE)	Then the equation has

DETERMINE THE NUMBER & THE NATURE OF THE ROOTS OF THE FOLLOWING USING THE DISCRIMINANT.

$$x^2 - 3x + 7 = 0$$
$$b^2 - 4ac =$$

$$2x^2 + 5x - 3 = 0$$
$$b^2 - 4ac =$$

$$9x^2 = 12x - 4$$
$$b^2 - 4ac =$$

$$4x^2 = -3$$
$$b^2 - 4ac =$$