Chapter 9

Section 9.1: More Quadratic Equations

In this section we will learn some more ways to solve quadratic equations. At this point in our study, you can only solve quadratic equations by factoring. However, many of the quadratic equations that you will encounter in mathematics and in subjects that require mathematics will not be factorable. How then will we solve those types of quadratics? We will learn three new techniques in the next three sections that will give you this ability.

A. Square Root Property for Equations:
   If $a^2 = b$, then $a = \pm\sqrt{b}$
   Using this rule for quadratics, we can solve equations similar to the following.

B. Some sample problems that utilize the "Square Root Property".
   1. $x^2 = 25$

How we would have done #1 before:

   2. $x^2 = 11$

   3. $5x^2 = 100$

   4. $(a + 3)^2 = 16$

   5. $(2x + 5)^2 = 49$

6. $(2x - 3)^2 = 7$

7. $\left(a - \frac{3}{7}\right)^2 = \frac{18}{49}$

8. The square of the sum of twice a number and 3 is 25. Find the number. (Actually, there are two different solutions)

Section 9.2: Solving Quadratic Equations: Completing the Square

In this section we will learn a new method for solving quadratic equations called completing the square. This technique will prove very helpful in other areas of mathematics as well.

Remember that we can solve the following types of equations by simply taking the square root of both sides:

$$(2x+5)^2 = 27$$

When we are faced with solving a quadratic equation that cannot be factored, we can solve it by turning the equation into one that looks very much like the one you see above. Work through the following problems to see how this works. Solve the following:

1. $x^2 + 10x - 4 = 0$

2. $x^2 + 6x + 8 = 0$

3. $x^2 - 10x + 14 = 0$

(Note: When completing the square, the leading coefficient must be equal to one)

4. $3x^2 + 24x - 3 = 0$

Section 9.3 The Quadratic Formula and Applications

In this section we will learn how to solve quadratic equations by using the quadratic formula. The quadratic formula is simply a formula which allows us to solve any quadratic equation, assuming it is in standard form.

Remember that a quadratic equation is in standard form if it looks like the following: $ax^2 + bx + c = 0$, and "a" is a positive number.

The quadratic formula, which you will use shortly, is found by completing the square in the above "standard form" quadratic equation: Do this below.

A. ***The Quadratic Formula***: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ The quadratic formula will help you to solve any quadratic equation you come up against. For any particular equation however, the quadratic formula may be "too much work" and you might find it easier to solve the equation using some of the other techniques we have already discussed. Study each problem carefully before you decide which method to use!

1. Solve the following using the quadratic equation: $5x^2 - 3 = 14x$

2. Solve the following using the quadratic equation: $x^2 - 7x = 8$

3. Solve the following using the quadratic equation: $y^2 + 5y + 3 = 0$

4. Solve the following using the quadratic formula: $x^2 + 6x + 7 = 0$

5. The world record for free-fall to the ground without a parachute by a woman is 175 feet and is held by Kitty O'Neill. Approximately how long did the fall take? Use the following formula for which "t" is the time in seconds and "s" is the distance in feet the person fell. ($s = 16t^2$)

6. The length of a rectangle is 3 meters greater than the width. The area is 70 square meters. Find the length and the width.

THE END
YOU DID IT !
CONGRATULATIONS TO YOU!