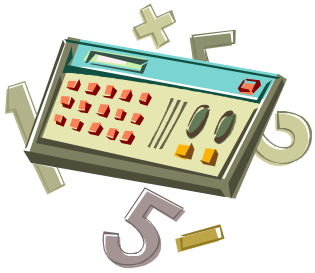
# Algebra/Geometry Institute Summer 2004



## Lesson Plan Three

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**City: Indianola, MS**
**Grade Level: 10th grade Algebra II**

## 1 Teaching objective(s)

A. Investigate and apply real number solutions to quadratic equations algebraically and graphically.
B. Use technology to solve quadratic equations.

## 2 Instructional Activities

This lesson is to be taught as a review and reinforcement of algebraic methods of solving quadratic equations, therefore; class will begin with a review of some of the various methods that have been used to solve quadratic equations. The factoring method of solving quadratic equations will be briefly discussed with the following example given as a review:

Solving quadratic equations by factoring:

$x^2 + 3x - 10 = 0$ Since this equation is factorable it can be solved by simply factoring.

$(x - 2)(x + 5) = 0$

$x - 2 = 0$ or $x + 5 = 0$
$x = 2$ $x = -5$

The quadratic formula method of solving quadratic equations will be reviewed as a possible alternative method of solving non-factorable quadratic equations. The following equation will be used as a review example:

$x^2 + 7x = 10$ Rearrange the equation equal so that it fits the form of $ax^2 + bx + c = 0$.

$x^2 + 7x - 10 = 0$ Use the formula with the given coefficients.

$a = 1, \quad b = 7, \quad c = -10$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-7 \pm \sqrt{7^2 - 4(1)(-10)}}{2(1)} = \frac{-7 \pm \sqrt{89}}{2}$$

$$\therefore \textit{the solution set is } \{ \frac{-7 \pm \sqrt{89}}{2}, \frac{7 \pm \sqrt{89}}{2} \}.$$

(20 minutes)

The remainder of the class period will be used to explore the use of graphing calculators to solve quadratic equations. Since most students are familiar with using calculators to graph equations, the graphing method will be explored first. **Students must clearly understand that if a quadratic equation is viewed as a function, then finding the roots of the equation is the same as finding the zeros of the function**. A few examples will be needed to illustrate the connection between the roots of the equation and the zeros of the function. The example problem from earlier will be used to show the method of finding the zeros (roots). The following instructions will be given to students on a handout:

Use the calculator to find quadratic roots:

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

Step 1. Press the Y= button.
Step 2. Type the equation (function) with y replacing the zero.
Step 3. Press the GRAPH button, then press the TRACE button.
Step 4. Find the point(s) where the function intersects the x-axis.
Step 5. Press $2^{nd}$ and then GRAPH to get the table.
Step 6. Find the zero value(s) of the y-variable.
Step 7. Record the corresponding x-value(s) as your root(s).
( If the entire curve cannot be seen, it may be necessary to expand your domain by increasing your Xmin and Xmax by pressing WINDOW and increasing the values).

The handout will also contain the following quadratic formula program for the calculator :

(This program was adapted to work on the TI-73 graphing calculator, but a similar program on the TI-81, TI-82 or higher model calculator can be found in: *Glencoe Mathematics Graphing Calculators in the Mathematics Classroom.* )

Step 1. To enter the program, press the PRGM button.
Step 2. Move the cursor over to NEW.
Step 3. Name the program QUADRATC.
Step 4. Press the PRGM button again to access all program commands.
Step 5. Type the following program:

**:Disp "ENTER A, B, C FOR"**
**:Disp "$AX^2 + BX + C = 0$"**
**:Input A**
**:Input B**
**:Input C**
**:$(B^2 - 4AC) \rightarrow D$**
**:If D>0**
**:Then**
**:Disp "TWO ROOTS"**
**:Disp $(-B+\sqrt{D})/(2A)$**
**:Disp $(-B-\sqrt{D})/(2A)$**
**:Pause**
**:Else**
**:If D=0**
**:Disp "DOUBLE ROOT"**
**:Disp -B/(2A)**
**:Pause**
**:End**
**:If D<0**
**:Then**
**:Disp "IMAGINARY"**
**:Disp "M+NI AND M–NI"**
**:Disp "PRESS ENTER"**
**:Disp "TO SEE M AND N"**
**:Pause**
**:Disp "M="**
**:Disp -B/(2A)**
**:Disp "N="**
**:Disp $\sqrt{}$(abs(D))/(2A)**
**:Pause**
**:End**
**:Stop**

**To run the program return to the home screen using 2nd QUIT, press PRGM, and then press ENTER on the program named QUADRATC. Enter three values for a, b, and c respectively. Be sure to press ENTER until the screen reads "program done".**
(20 minutes)

Students will receive the teacher's assistance and numerous examples of how to enter and execute each of these calculator methods of finding quadratic roots. Class will then be closed with the assigning of the following problems written on the board:
(10 minutes)

Homework:

Factor each of the following equations. Then use a calculator to view and draw the graph of the function represented by the equation. Then use the table to find the roots of the equation.

1. $x^2 + 10x + 25 = 0$
2. $2x^2 - 4x - 30 = 0$
3. $x^2 + 5x + 6 = 0$

Find the roots of the following quadratic equations using the program QUADRATC on your calculator.

4. $3x^2 + 12x - 25 = 0$
5. $6x^2 - 3x = 18$
6. $x^2 + 15x + 35 = 0$

## 3 Materials and Resources

- **Paper**
- **Pencils**
- **Handout –Calculator instructions**
- **A classroom set of TI-73 calculators (that can be checked out)**
- **Glencoe/McGraw-Hill, *Glencoe Mathematics Graphing Calculators in the Mathematics Classroom* 1997**
- **Houghton Mifflin, *Algebra and Trigonometry Structure and Method* 1986**

## 4 Assessment

- **Observation of Students**
- **Graded Homework**