

## Assignment # 5

Due: Feb. 25, 2006 (submit before 11:59 pm)

This programming assignment will help you learn to use IF statements.

Solutions to the quadratic equation  $Ax^2 + Bx + C = 0$  may be calculated using the quadratic formulas:

$$x = \frac{-B + \sqrt{B^2 - 4AC}}{2A} \quad \text{or} \quad x = \frac{-B - \sqrt{B^2 - 4AC}}{2A} \quad \text{discriminant}$$

These formulas may be used, of course, only if the leading coefficient, A, is not zero. The number and type of solutions is determined by the value of the expression under the radical sign,  $B^2 - 4AC$ , known as the discriminant:

Value of discriminant	Number of solutions	Kind of solutions
Positive	2	Real
Zero	1	Real
Negative	2	Imaginary

Your job is to write a program, which will read the coefficients of a quadratic equation and, if the leading coefficient is non-zero, calculate and report the solutions. Since programming languages do not provide the *imaginary* type, you'll have to take appropriate steps to give imaginary results in the form shown. Just remember that every imaginary number is really determined by a pair of real numbers.

Several sample runs appear on the next page; user input appears in **bold type**. The "*I*" which appears in the output is simply written where necessary; the actual calculations involve only real results. You are required to duplicate this output, but the format could be in scientific notation (3.455000 E+001) or fixed format (34.55).

Requirements: Must use minimum 4 functions and main, more is OK,

1. Read\_data() to read data from keyboard and use pointers,
2. Print\_Report, to write to the screen the results as shown below
3. Find\_Results, to find the appropriate value for x
4. Introduction, to print the introduction at the beginning (same as last assignment)
5. Main to use the above functions and complete the task

Your output, for running the program several times, may appear something like this.

This program will provide solutions for an equation of the form  
 $Ax^2 + Bx + C = 0$ ,  
 where A, B and C are integers, and A is not equal to zero.  
 Enter A, B and C : **2 -5 -3**  
 The two real solutions are  $x = 3.0000E+000$   
 and  $x = -5.0000E-001$

This program will provide solutions for an equation of the form  
 $Ax^2 + Bx + C = 0$ ,  
 where A, B and C are integers, and A is not equal to zero.  
 Enter A, B and C : **2 -5 4**  
 The two imaginary solutions are  $x = 1.2500E+000 + (6.6144E-001)*I$   
 and  $x = 1.2500E+000 - (6.6144E-001)*I$

This program will provide solutions for an equation of the form  
 $Ax^2 + Bx + C = 0$ ,  
 where A, B and C are integers, and A is not equal to zero.  
 Enter A, B and C : **1 -8 16**  
 The one real solution is  $x = 4.0000E+000$

This program will provide solutions for an equation of the form  
 $Ax^2 + Bx + C = 0$ ,  
 where A, B and C are integers, and A is not equal to zero.  
 Enter A, B and C : **0 3 8**  
 No solutions will be calculated for a leading coefficient of 0!

Leading Coeff = 0  
 Discrim = 0  
 Discrim = 16  
 Discrim = -1

$\frac{5 \pm \sqrt{25-32}}{4}$   
 $\frac{5 \pm i\sqrt{7}}{4}$   
 Imaginary