Homework 7 – Solutions

Problem 6.6. Modify the quadratic formula solver program from Chapter 4, Problem 10. Use subprograms to perform the input, calculations, and output.

Option Explicit

Private Sub cmdSolve_Click()
    Dim a As Double, b As Double, c As Double
    Dim equation As String
    Dim root1 As Double, root2 As Double
    Dim message As String

    Call GetData(a, b, c, equation)
    Call FindRoots(a, b, c, root1, root2, message)
    Call Display(equation, root1, root2, message)

End Sub

Private Sub GetData(a As Double, b As Double, c As Double, equation As String)
' Get the data from the text boxes
    a = Val(txtA.Text)
    b = Val(txtB.Text)
    c = Val(txtC.Text)

    equation = Trim(CStr(a)) & " x^2 + " & Trim(CStr(b)) & " x + " & _
               Trim(CStr(c)) & " = 0"

End Sub

Private Sub FindRoots(a As Double, b As Double, c As Double, root1 As Double, root2 As Double, message As String)
' Find the roots of the quadratic equation
    Dim discriminant As Double
    root1 = 0#
    root2 = 0#
    message = ""
    discriminant = (b ^ 2#) - (4# * a * c)
    If (a = 0) Then
        message = "a=0. This is not a quadratic equation."
    ElseIf (discriminant < 0) Then
        message = "No real roots."
    Else
        root1 = (-b + Sqr(discriminant)) / (2# * a)
        root2 = (-b - Sqr(discriminant)) / (2# * a)
    End If

End Sub
Private Sub Display(equation As String, root1 As Double, root2 As Double, _ message As String)
' Display the roots of the quadratic equation
    picOutput.Cls
    picOutput.Print "Quadratic equation: "; equation
    If message <> "" Then
        picOutput.Print message
    Else
        picOutput.Print "Root 1: "; root1
        picOutput.Print "Root 2: "; root2
    End If
End Sub

Problem 6.7. The gamma function is defined as follows:

\[
\Gamma(x + 1) = x\Gamma(x) \\
\Gamma(n) = (n-1)! \quad \text{for integers } n \\
\Gamma(1/2) = \sqrt{\pi}
\]

Write a program that finds the value of the gamma function for a user-entered value of \( n \), where \( n \) is an integer or an integer plus 0.5 such that \( n \geq 1 \)

Option Explicit

Private Sub cmdCompute_Click()
' Test the Gamma function
    Dim x As Double
    x = Val(txtX.Text)
picOutput.Cls
picOutput.Print "Gamma("; Trim(CStr(x)); "); Gamma(x)"

End Sub

Private Function Gamma(value As Double) As Double

Const PI = 3.14159265358979 ' Define PI
If value < 0.5 Then
    Gamma = 0#
Else
    Gamma = 1#
    Do While (value > 1#)
        value = value - 1#
        Gamma = Gamma * value
    Loop
    If (value = 0.5) Then
        Gamma = Gamma * Sqr(PI)
    End If
End If

End Function