1. (5%) Which Visual Basic number type would you use if you needed to do a calculation that involved very large numbers, say exceeding $10^{50}$?

Lecture 2, slide 12: Double precision (8 bytes) can represent up to $2 \times 10^{308}$

2. (5%) What will be shown in the "Message Box" on the screen after the following code segment executes?

```vbnet
Dim var1 As String = "Hello 
Dim var2 As String = "World!"
var1 &= var2
MsgBox(var1 & var2)
```

Contents of "message box" after the last line executes:

"Hello World!World!" (the &= assignment merges the two strings)
3. (8%) What is the decimal value of the following “octal” (base 8) number?

Octal number = 230

Assignment 2, Problem 2: Decimal value = 2x8^2 + 3x8 + 0 = 152

4. (10%) What is the value of variable c at the end of the code segment?

```
Dim i,j,k As Integer
Dim a,b,c As Single
i = 3 : j = 4
a = i : b = j
k = i / j
k = k - a / b
MsgBox(c)
```

Value of c after the last line executes: c = 0.25, k = 3/4 rounded up to 1

5. (10%) What is the value of the variable z at the end of the following code segment? Please explain briefly how came up with your answer.

```
Dim z As Boolean
Dim a,b,c As Integer
a = 3 : b = 2 : c = 2
z = c = a - b ^ 2 + a
MsgBox(z)
```

Value of z after the last line executes: True; see order of operations

6. (10%) What is the value of i after the last line of the segment code below executes? Please explain briefly how you came up with your answer.

```
Dim i As Integer = 4
Dim j As Integer = 2
If i = 2 * j Then
    i = j ^ 3
Else if i > j Then
    i = j + 1
Else
    i = i / j
Endif
MsgBox(i)
```
Write and explain your answer here: \( i = 2 \times j \) initially, so \( i = j^3 = 8 \)

7. (10%) Refer to the following code segment:

```vbnet
Dim A() As Integer = {5, 4, 3, 2}
Dim i As Integer
For i = 1 To A.Length - 1
    A(i) = A(i - 1) * A(i)
Next
MsgBox(A(2))
```

What is the value printed by the MsgBox command? Show the calculations justifying your answer.

\[
A(1) = 5 \times 4 = 20 \text{ after 1st loop}; \ A(2) = 20 \times 3 = 60 \text{ after 2nd loop}; \ \text{no change of} \ A(2) \text{ after 3rd loop}.
\]

8. (12%) Consider the following program and a function procedure "MyProc":

```vbnet
Sub Main()
    Dim i, j As Short
    i = 8 : j = 2
    i = MyProc(i, i, j)
    MsgBox("i = " & i)
    MsgBox("j = " & j)
End Sub

Function MyProc(ByVal A, B, C)
    C = C / 2
    MyProc = A * B * C
End Sub
```

What is the value of \( i \) printed by the "Msgbox" command when it executes? Why? What is the value of \( j \) printed by the "Msgbox" command when it executes? Why?

within function, \( C = 2/2 = 1; \ i = 8 \times 8 \times 1 = 64; \ \text{but} \ j \ \text{is still} \ 2, \ \text{as call is "ByVal"} \)
9. (25% You are asked to write an integer function that returns the \(N\)th "Fibonacci" number, \(F_N\). The Fibonacci numbers are \(F_0 = 0\), \(F_1 = 1\), \(F_2 = 1\), \(F_3 = 2\), \(F_4 = 3\), \(F_5 = 5\), \(F_6 = 8\), \(F_7 = 13\), ... and each is generated by adding the previous two numbers in the sequence (except, of course, \(F_0\) and \(F_1\) which are just assigned the values 0 and 1). Your function should return -1 if the input integer \(N\) is less than 0.

```vba
Function Fibonacci(ByVal N As Integer) As Integer
' write your code in the box below
    If N < 0 Then
        Fibonacci = -1
    Else
        Dim A(N) As Integer
        A(0) = 0
        If (N > 0) Then
            A(1) = 1
            Dim i As Integer
            For i = 2 To N
                A(i) = A(i - 1) + A(i - 2)
            Next i
        End If
        Fibonacci = A(N)
    End If
End Function
```

Also a recursive option (not required):

```vba
Function Fibonacci(ByVal N As Integer) As Integer
    If N < 0 Then Fibonacci = -1
    If N = 0 Then Fibonacci = 0
    If N = 1 Then Fibonacci = 1
    If N > 1 Then
        Fibonacci = Fibonacci(N - 1) + Fibonacci(N - 2)
    End If
End Function
```