Optional Variables

Private Sub K(optional a As Integer, _
    optional b As integer, _
    optional c As Integer)
    Call K
    Call K(0, 0, 20)
    Call K(1)
    Call K(, 20)

Optional Variables with Defaults

Private Sub K(optional a As Integer = 1, _
    optional b As integer = 2, _
    optional c As integer = 3)
    Call K ' default three arguments
    Call K(0, 0, 20) ' no defaults
    Call K(, 1) ' default first and third arguments
    Call K(, 20) ' default first two arguments

Named Arguments

Call K(, , 20) is equivalent to
Call K(c:=20)

Naming arguments in Call statement allows user to pass arguments in any order:
Private Sub Display(blnflag As Boolean, lngNumber As Long, strMessage as String)
    Call Display(strMessage:="Name", blnFlag = True, _
        lngNumber:= 10000000)
Visual Basic Functions

abs(x)  arctangent, x in radius

atn(x)   trigonometric functions
sin(x)
cos(x)
tan(x)
exp(x)
int(x)
fix(x)
log(x)
round(x)
sgn(x)   sign of x
sqr(x)   square root

Code Modules

• Created to allow form modules to share common codes

Form 1  Form 2  Form 3
Sub 1    Sub 2    Sub 3
Sub 4    Sub 5    Sub 6

Code Modules

• Add with Project/Add Module
• No GUI
• Like forms, has general declarations
  – Option Explicit
  – Enum
• File names end with .bas extension
• Code private to module unless declared as Public
Arrays

- data structure
- declaration
- arrays as arguments
- search
- control arrays
- dynamic arrays
- paramArray
- function Array

Data Structure

Array A of Integer type with a dimension of 5 by 1

<p>| | | | | |</p>
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<thead>
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<tbody>
<tr>
<td>A(0)</td>
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<tr>
<td>A(1)</td>
<td>77</td>
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<td></td>
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<tr>
<td>A(2)</td>
<td>86</td>
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<tr>
<td>A(3)</td>
<td>103</td>
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<tr>
<td>A(4)</td>
<td>56</td>
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</tr>
</tbody>
</table>

- Consecutively located in memory
Declaration of arrays

Dim A(5) As Integer
Dim A(5) As Integer, x(26) As Long, s(14) As String, a@(4)
Dim A(5, 10) As Double, B(100, 1000, 3) As Single

- Initialized to zero by default

Array Index

- Default base index is 0.
- Can specify base index
  
  Option Base 1
  Dim A(50 to 100) As Integer  * 50 rows by 1 column
  Dim A(1 to 100, 5 to 200) As Double  * 100 rows, 195 columns

- Functions LBound and UBound can be used to check the size of an array
  For I = LBound(A) to UBound(A) Step 1
  ...
  Next I

Dynamic Arrays

- Used when you do not know the size of an array until after the program starts (e.g., the size of an array is given by the user at the run-time)
- Avoid wasting memory
  
  Private Sub InputArray()
    Dim Darray() As Double
    'read size of array N, L
    ReDim Darray(1 to 10, 1 to 100)
    'read the value of array
    End Sub
Dynamic Arrays

- An dynamic array may be resized any time
- The existing values may be preserved during resizing

Private Sub InputArray()
    Dim Darray() As Double
    'read size of array N, L
    ReDim Darray(1 to 10, 1 to 100)
    'read the value of array
    'perform operations
    ReDim Preserve Darray(1 to 100, 1 to 100)
    'perform more operations
End Sub

- ReDim cannot change the dimensionality of arrays!

Variable-Length Arguments

- ParamArray can be used to pass variable-length arguments to procedures

Private Sub Form_Load()
    Call AnyNumberArguments
    Call AnyNumberArguments(1)
    Call AnyNumberArguments(1, 2, 10, 13, 89, 43, 12, 56, 1, 0, 98)
End Sub

Private Sub AnyNumberArguments(ParamArray x() As Variant)
    Dim i As Integer
    For i = Lbound(x) to Ubound(x)
        Print x(i) & Space$(4)
    Next I
End Sub

Assignment 5

- create an input form, from which the size of an one-dimensional array will be provided by the user
- randomly generate numbers to fill the array (we will replace this by an input file on Wednesday)
- generate statistics of the numbers including minimum, maximum, medium, mean, frequency (10 intervals), standard deviation, 25 percentile, 75 percentile, skewness
- display the results on an output form