Objectives

**Program Purpose**
- To sort a list of 10 random numbers into either ascending or descending order

**Learning Goals**
- Use of Control Arrays and Variable Arrays
- Sorting
- Loops within loops (nested loops)
- Use of Boolean variables to simplify code
- Use of parameter variables

Design Notes

Set the properties for one label, then copy and paste it. When pasting, create a control array.

The interface used here is very similar to the one used in the last project. The only additions are the two option buttons, placed in a new frame. There is, however, quite a difference in the code. The sorting event has been moved to the general section. A Boolean variable is passed to this sort procedure, controlling whether the program sorts **Up** (ascending) or **Down** (descending).

Interface

Create the interface as shown.
Use 2 command buttons, 1 form, 1 frame, 2 option buttons and 2 control arrays of 10 labels.
Names of Objects

<table>
<thead>
<tr>
<th>Type of Object</th>
<th>Number</th>
<th>Names of Objects</th>
<th>Simple Initial Properties of Objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>1</td>
<td>Form1</td>
<td>Caption - &quot;Arrays &amp; Sorting 2&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Startup Position - 2 (Centre Screen)</td>
</tr>
<tr>
<td>Labels</td>
<td>20</td>
<td>2 control Arrays of 10 labels in each</td>
<td>Font - Bold, 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lblNum(0) to lblNum(9)</td>
<td>Align - Centre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lblSortedNum(0) to lblSortedNum(9)</td>
<td>BorderStyle - Fixed Single</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Font - Bold, 12</td>
<td>BackStyle - Opaque</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Align - Centre</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BorderStyle - Fixed Single</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BackStyle - Opaque</td>
<td></td>
</tr>
<tr>
<td>Command Buttons</td>
<td>2</td>
<td>cmdGenerate</td>
<td>Font - Bold, 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Caption - as per Interface</td>
</tr>
<tr>
<td>Frame</td>
<td>1</td>
<td>None</td>
<td>Caption - &quot;Sort Order&quot;</td>
</tr>
<tr>
<td>Option Buttons</td>
<td>2</td>
<td>optAsc, optDesc</td>
<td>Font - Bold, 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Caption - Ascending, Descending</td>
</tr>
</tbody>
</table>

Code

**GENERAL SECTION**

Dim SortedNums(9) As Integer 'used for storing the numbers and sorting

Sub Wait(x As Single)

Dim s As Single
s = Timer

While s + x > Timer
DoEvents
Wend

End Sub

**EVENTS**

Private Sub cmdGenerate_Click()

Randomize

For z = 0 To 9

lblSortedNum(z).Caption = "" 'clear sorted list
lblNum(z).Caption = Int(Rnd() * 100) + 1 'randomly generate an integer between 1 and 100
SortedNums(z) = lblNum(z).Caption 'store the number in the array for sorting

Next z

End Sub

Private Sub optAsc_Click()

Sort (True)

End Sub

Private Sub optDesc_Click()

Sort (False)

End Sub
Sub Sort(Up As Boolean)

Dim x, y As Integer  'loop variables
Dim smallest As Integer, biggest As Integer  'the smallest in the list
Dim temp As Integer  'for swapping values

If Up Then
    For x = 0 To 9
        smallest = SortedNums(x)  'assume the first is the smallest
        For y = x + 1 To 9
            If SortedNums(y) < smallest Then
                smallest = SortedNums(y)  'record new smallest
                temp = SortedNums(y)
                SortedNums(y) = SortedNums(x)
                SortedNums(x) = temp
            End If
        Next y
    Next x
    'Look at the next number
    'redisplay the correct sorted number
    lblSortedNum(x).Caption = SortedNums(x)
    Wait 0.15  'for effect

Else
    For x = 0 To 9
        biggest = SortedNums(x)  'assume the first is the biggest
        For y = x + 1 To 9
            If SortedNums(y) > biggest Then
                biggest = SortedNums(y)  'record new biggest
                temp = SortedNums(y)
                SortedNums(y) = SortedNums(x)
                SortedNums(x) = temp
            End If
        Next y
    Next x
    'Look at the next number
    'redisplay the correct sorted number
    lblSortedNum(x).Caption = SortedNums(x)
    Wait 0.15  'for effect

End If

End Sub

Questions

1. Name the two possible values of a Boolean variable?
2. Compared with Program Example 19, what additional variables have been used in this project?
3. What is the essential difference between the two sections of the Sort procedure?
4. Much of the code has been duplicated. How could we simplify the Sort procedure?
5. Explain in plain English the function of the line 'Sort(False)'.
6. Modify the program to generate random decimal numbers between 1 and 100, rather than integer values.