Iteration -- Once Is Not Enough

Though people don’t like to repeat themselves, repetition is a valuable facility that a computer can provide. If program instructions are to be performed more than once, as in Alphabetize CDs, repetition is needed.

Two Additional Control Statements

❖ The conditional statement (If-Then-Else) is the only way (so far) to control which statements are executed
❖ We will introduce two more:
  • ElseIf -- a variation on the If-Then-Else for long sequences of tests
  • Do While -- a control facility allowing statements to be repeated as long as some condition is true

Programming languages have other control statements, but these are enough to do any programming.

ElseIf
❖ ElseIf solves the problem of testing a long sequence of alternatives

If <T/F condition> Then
<statement list>
Stmts for 1st cond
ElseIf <T/F condition> Then
<statement list>
Stmts for 2nd cond
ElseIf <T/F condition> Then
<statement list>
Stmts for 3rd cond
ElseIf <T/F condition> Then
<statement list>
Stmts for 4th cond
...
Else
<statement list>
Stmts for otherwise
EndIf

Example

If txtNum.Text = 1 Then
MsgBox("John")
ElseIf txtNum.Text = 2 Then
MsgBox("Paul")
ElseIf txtNum.Text = 3 Then
MsgBox("George")
ElseIf txtNum.Text = 4 Then
MsgBox("Ringo")
Else
MsgBox("Who?")
EndIf

Executed if Text = 1
Executed if Text ≠ 1 and Text = 2
Executed if Text ≠ 1 or 2 and Text = 3
Executed if Text ≠ 1 or 2 or 3 and Text = 4

Mini-Exercise #1

What does this print?

Dim x As Integer
x = 10
If x = 1 Then
Print "octopus"
ElseIf x = 2 Then
Print "squid"
Else
Print "clam"
EndIf
Print "mollusc"

Mini-Exercise #1 -- Answer

What does this print?

Dim x As Integer
x = 10
If x = 1 Then
Print "octopus"
ElseIf x = 2 Then
Print "squid"
Else
Print "clam"
EndIf
Print "mollusc"
Contrast Elseif With Nested If

- ElseIf is not a nested test as seen before, though it is similar.
- If `txtNum.Text = 1` Then MsgBox("John")
- ElseIf `txtNum.Text = 2` Then MsgBox("Paul")
- ElseIf `txtNum.Text = 3` Then MsgBox("George")
- ElseIf `txtNum.Text = 4` Then MsgBox("Ringo")
- Else MsgBox("Who?")
- End If

An If statement that uses ElseIf passes through all of the previous cases before reaching a given test ... think about the consequences.
- If `someVar < 20` Then MsgBox("Less than 20")
- ElseIf `someVar < 10` Then MsgBox("Less than 10")
- Else MsgBox("Who?")
- End If

Caution With Else If

- An If statement that uses ElseIf passes through all of the previous cases before reaching a given test ... think about the consequences.
- If `someVar < 20` Then MsgBox("Less than 20")
- ElseIf `someVar < 10` Then MsgBox("Less than 10")
- Else MsgBox("Who?")
- End If

Repeating Terms

- Iteration is the repeated execution of a series of statements in programming.
- To perform iteration, programming languages include special statements often called iteration statements.
- There are two crucial components of all iterations:
  - The statements that will be repeated -- called the loop body.
  - A test specifying when to repetition stops -- termination test.
- Additionally, loops typically have at least one variable that is explicitly changed "inside" the loop -- this is called the iteration variable.

- Some value must change between consecutive iterations, or else the loop will never terminate ... it is an infinite loop.

General Form Of VB6 Iteration

- VB6, like most languages, has several iteration statements. We'll just use one in CSE/IMT 100:
- `Do While <termination condition>
  <statements>
  Loop
- End If`
Mini-Exercise #2

What does this code print?

```vba
Dim i As Integer
i = 2
Do While i <= 4
    Print i
    i = i + 1
loop
```

Mini-Exercise #2 -- Answer

What does this code print?

```vba
Dim i As Integer
i = 2
Do While i <= 4
    Print i
    i = i + 1
loop
```

2
3
4

Mini-Exercise #3

What does this code print?

```vba
Dim i As Integer
i = 10
Do While i <= 4
    Print i
    i = i + 1
loop
```

Mini-Exercise #3 -- Answer

What does this code print?

```vba
Dim i As Integer
i = 10
Do While i <= 4
    Print i
    i = i + 1
loop
```

It doesn't print anything!

Mini-Exercise #4

What does this code print?

```vba
Dim i As Integer
i = 1
Do While i >= 1
    Print i
    i = i + 1
loop
```

Mini-Exercise #4 -- Answer

What does this code print?

```vba
Dim i As Integer
i = 1
Do While i >= 1
    Print i
    i = i + 1
loop
```

1
2
3
4
5
6
...

This is an infinite loop!
To get out of an infinite loop:

In Visual Basic, type control-break

Then you are in the debugger, and can see where you are stuck. Select “continue” to proceed.

If a program (any program) gets stuck in Windows, you can also type control-alt-delete and get a task manager. Select the offending task and end it.

Caution: you’ll lose any changes for that program since the last save.

Mini-Exercise #5

❖ Suppose we have a procedure “squid” that takes a single integer argument. The argument is only read by squid, not changed. Write a loop that calls a “squid” with 2, 4, 6, 8, 10.

Dim i As Integer
i = 2
Do While i <= 10
    Call squid(i)
    i = i + 2
loop