

Week9: First Tutorial

- VBA operators
- Branching: IF, IF-THEN
- Logic and branching
- Branching: Multiple IFs and IF-ELSEIF
- While loops
 - Simple counting loops

Basic VBA Operators

Operation	Symbol used in VBA	Example
(Same as Excel)		
Addition	+	2 + 2
Subtraction	-	3 - 2
Multiplication	*	10 * 10
Division	/	81 / 9
Exponent	^	2 ^ 3
(Different operator)		
Concatenation	&	"hi" & "there"

Author: James Tam

Common VBA Operators

4operators.docm

Sub operators

' Part I

```
doubleNum1 = 2 + 2
```

```
MsgBox (doubleNum1)
```

```
doubleNum1 = 7 * 13
```

```
MsgBox (doubleNum1)
```

```
doubleNum1 = 15 / 2
```

```
MsgBox (doubleNum1)
```

```
doubleNum1 = 2 ^ 4
```

```
MsgBox (doubleNum1)
```

```
aString = "the" & "cat" + " in" & "- hat"
```

```
MsgBox (aString)
```

Author: James Tam

Common VBA Operators (2)

' Part II

```
doubleNum1 = 2
```

```
doubleNum2 = 3
```

```
doubleNum3 = doubleNum1 ^ 3
```

```
doubleNum1 = doubleNum1 * doubleNum2
```

```
doubleNum2 = doubleNum1 + doubleNum3
```

```
MsgBox ("doubleNum1=" & doubleNum1 & "-" &
```

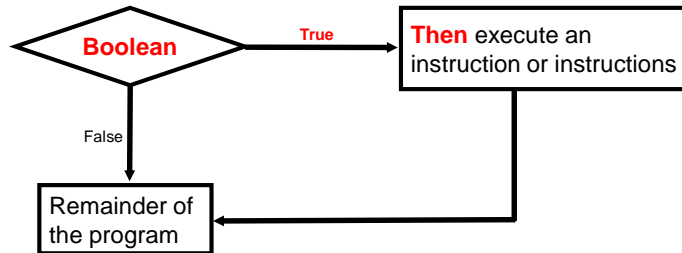
```
  "doubleNum2=" & doubleNum2 & "-" & "doubleNum3=" &
```

```
  doubleNum3)
```

```
End Sub
```

Author: James Tam

Decision Making With 'If-Then'



Author: James Tam

Branching: IF Example

- **5branchingLogic.docm**

– All versions of Part I: program displays an error message if age is not in range from 0 – 114 years.

```
Sub fiveBranchingLogic()  
    Dim age As Long  
    Dim userInput As String
```

Author: James Tam

Branching: IF Example (2)

' Part I:

```
age = InputBox("Age (0 - 114)?")
If ((age < 0) Or (age > 114)) Then
    MsgBox ("Age is outside allowable range of 0 - 114")
End If
If ((age >= 0) And (age <= 114)) Then
    MsgBox ("Age of " & age & " is OK")
End If
```

Author: James Tam

Branching: IF Example (2)

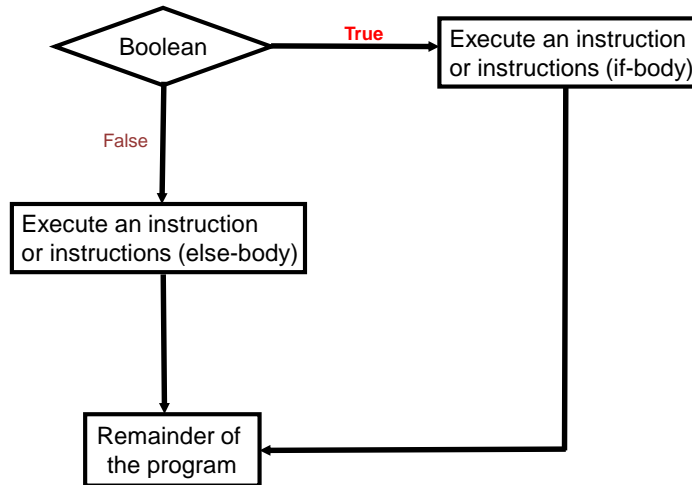
' Part II: Using negation (NOT)

```
userInput = InputBox("Password?")
If Not (userInput = "password") Then
    MsgBox ("Password incorrect")
End If

End Sub
```

Author: James Tam

Decision Making With An 'If, Else'



Author: James Tam

Branching: IF - ELSE Example

- **6ifElse.docm**

- Part I of last example augmented (using Else) to display an alternate message when the input is valid

```
Sub sixBranchingLogic()  
    Dim age As Long  
    Dim userInput As String
```

Author: James Tam

Branching: IF - ELSE Example (2)

' Part I:

```
age = InputBox("Age (0 - 114)?")
If ((age < 0) Or (age > 114)) Then
    MsgBox ("Age is outside allowable range of 0 - 114")
Else
    MsgBox ("Age of " & age & " is OK")
End If
If ((age >= 0) And (age <= 114)) Then
    MsgBox ("Age of " & age & " is OK")
Else
    MsgBox ("Age is outside allowable range of 0 - 114")
End If
```

Author: James Tam

Student Exercise #3

- Ask the user for 'age' and when the value is negative the program displays an error message via MsgBox "Age cannot be less than zero"

Author: James Tam

Student Exercise #4

- Modify the previous program so **in addition to** displaying the previous error message when age is negative the following message will be displayed **when age is not negative**:
 - “age is...” as well as the age
 - E.g. 1: the user enters -1 for age and the message “Age cannot be less than zero” appears
 - E.g. 2: the user enters 114 for age and the message “Age is . . . 114”

Author: James Tam

Multiple ifs: When To Use

- When each condition must be checked (each ‘question’ must always be ‘asked’)
- Example:
 - Q1: Are you an adult?
 - Q2: Are you a Canadian citizen?
 - Q3: Are you currently employed?

Author: James Tam

Multiple Ifs: Example

- **Example name:** 7multipleIfVSIFElseIF.docm
- Part I: Appropriate use of multiple Ifs

```
Dim gradeLevel As Long
Dim age As Long
gradeLevel = InputBox("What is your highest grade level
  completed (13 if taken any post-secondary): ")
age = InputBox("What is your age: ")
If (gradeLevel >= 13) Then
  MsgBox ("College person!")
End If
If (age >= 65) Then
  MsgBox ("Senior citizen")
End If
```

Grade level has no bearing on age (both branching checks must always be made)

Author: James Tam

Multiple Ifs: Example (2)

- Part I: Inappropriate use of multiple Ifs

```
Dim birthCity As String
birthCity = InputBox("City of birth")
If (birthCity = "Calgary") Then
  MsgBox ("You are 'Part of the Energy'")
End If
If (birthCity = "Edmonton") Then
  MsgBox ("From the City of Champions")
End If
If (birthCity = "Dubai") Then
  MsgBox ("Definitely Dubai!")
End If
If (birthCity = " Fargo") Then
  MsgBox ("You're always warm")
End If
```

One can only be born in one city, why bother checking if a match has been found

Author: James Tam

Multiple IFs: Example (3)

```
' Error checking with multiple Ifs: inelegant
If ((birthCity <> "Calgary") And _
    (birthCity <> "Edmonton") And _
    (birthCity <> "Dubai") And _
    (birthCity <> "Fargo")) Then
    MsgBox ("Multiple-IFs: Must be from some other
            miscellaneous place...kidding!")
End If
```

Author: James Tam

Redesign Of Previous Example: IF-ELSEIF Redesign

- **7BIF_ELSEIF_Alternative.docm**

```
Dim birthCity As String
birthCity = InputBox("City of birth")
If (birthCity = "Calgary") Then
    MsgBox ("You are 'Part of the Energy'")
ElseIf (birthCity = "Edmonton") Then
    MsgBox ("From the City of Champions")
ElseIf (birthCity = "Dubai") Then
    MsgBox ("Definitely Dubai!")
ElseIf (birthCity = "Fargo") Then
    MsgBox ("You're always warm")
Else
    MsgBox ("IF-ELSEIFs: Must be from some other
            miscellaneous place...kidding!")
End If
```

Author: James Tam

Loops/Repetition

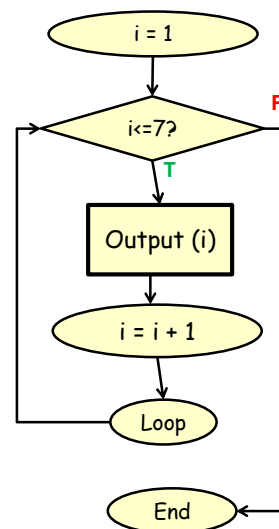
- Getting programs to automatically repeat an instruction or instructions without duplicating parts of the program.
- **New term 'iteration'**: each time that a program repeats using a loop is referred to as an 'iteration'.
- **New term 'loop control'**: a variable that determines if a loop a loop will execute (it 'controls' execution)
 - while (**i** < 10):

Author: James Tam

First Looping Example

- **8loopV1.docm**

```
Sub eightLoopV1()
  Dim i As Long
  i = 1
  Do While (i <= 7)
    MsgBox ("i=" & i)
    i = i + 1
  Loop
End Sub
```



Author: James Tam

Second Looping Example

- **9loopV2.docm**

```
Dim i As Long
i = 0
Do While (i <= 7)
    MsgBox ("i=" & i)
    i = i + 1
Loop
```

Author: James Tam

Student Exercise #5

- Write a loop that it iterates (steps through the numbers) 1 – 100 (1, 2, 3...100)
- A message box will only display the value of the loop control **after** the loop has ended (i.e. once)

Author: James Tam

Student Exercise #5

- Modify this program so that it instead iterates through the sequence 5 – 8 (5, 6, 7, 8)
- This time the message box can appear inside the body of the loop and display the value of the loop control as it takes on the four values in the above sequence.

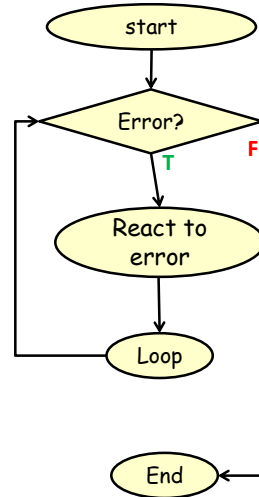
Author: James Tam

Week9: Second Tutorial

- While loops
 - Loops for error handling
- Loops vs. branches
- Nesting
- Student exercises: advanced/complex loops and branches

Error Handling Loops

- Repeat/iterate so long as an error condition occurs



Author: James Tam

NAFTA Countries Only

- Error checking loop: N_AMERICAN country not one of America, Canada, Mexico
- 10errorCheckingLoopCountry.docm**

(Subroutine Version1)

```

Dim country As String
country = InputBox("Enter your North American country")
Do While (country <> "america") And _
    (country <> "canada") And _
    (country <> "mexico")
    country = InputBox("Enter your North American country")
Loop
MsgBox ("Your country: " & country)
  
```

Author: James Tam

NAFTA: A Slightly More Elegant Version

- Doesn't ask user before the loop
- Instead the loop is primed so that it is guaranteed to execute at least once
- (Subroutine Version2)

```
Dim country As String
country = "None of the above"
Do While (country <> "america") And _
    (country <> "canada") And _
    (country <> "mexico")
    country = InputBox("Enter your North American
        country")
Loop
MsgBox ("Your country: " & country)
```

Author: James Tam

Student Exercise #6

- (Subroutine Version3)
 - Changes 'And' to 'Or': what happens? Hand trace it first!
 - **Don't run it if you have other important Word documents open**

```
Dim country As String
country = InputBox("Enter your North American country")
Do While (country <> "america") Or _
    (country <> "canada") Or _
    (country <> "mexico")
    country = InputBox("Enter your North American
        country")
Loop
MsgBox ("Your country: " & country)
```

Author: James Tam

Common Mistake

Try the following g values for the country:

- No Error: canada
- Error in data: USA (and then USA again)

- Using a branching IF instead of a loop (while)
- Remember a loop repeats, a branch just splits execution one way or another

– (Subroutine Version 4)

```
Dim country As String
country = InputBox("Enter your North American country")
If (country <> "america") And _
    (country <> "canada") And _
    (country <> "mexico") Then
    MsgBox ("Your country: " & country)
    country = InputBox("Enter your North American
        country")
End If
```

Author: James Tam

Error Checking Ranges

- **11errorCheckingLoopRange.docm**

– (Program continues prompting for year of birth if not in the range 1985 – 2000).

– Displays birth year after a valid value has been entered

```
Dim birthYear As Long
Const MIN_YEAR = 1985
Const MAX_YEAR = 2000
birthYear = 0
Do While (birthYear < MIN_YEAR) Or (birthYear > MAX_YEAR)
    birthYear = InputBox("Enter your birth year (GenY
        only): ")
Loop
MsgBox ("You were born in the year " & birthYear)
```

Notice the use of
named constants
(good style)

Author: James Tam

Exercise 1

- Write a program that will prompt the user for the two numbers
- It will determine which number is lower and that lower will number will be the start of a sequence.
- The other number will be the end of the sequence increasing the value by 1 each iteration of the loop
 - E.g. the user first enters 15 and then enters 3. The program will then iterate through the sequence 3, 4, 5...15
 - E.g. the user first enters 0 and then enters 5. The program will then iterate through the sequence 0, 1, 2...5

Author: James Tam

Exercise 2

- Modify this program so that it doesn't increase the count by just one. The program will prompt the user by the amount that 'count' should be increased.
 - E.g. the user first enters 15 and then enters 3. As before the first number in the sequence will be 3 and the last number will be 15. The previous version of the program would increase count by 1 and iterate the following sequence: 1, 2, 3...14, 15
 - With this new version using the previous two inputs the user enters 3 for the 'count', then the program will iterate through the sequence 3, 6, 9, 12, 15
 - With this new version using the previous two inputs the user enters 5 for the count, then the program will iterate through the sequence 3, 8, 13. (Since $13 + 5 = 18$ which exceeds the maximum bound in the sequence the last number that the program will count through is 13).

Author: James Tam

Exercise 3

- Write a new program that will prompt the user for the current year and error check the input.
 - The program prompts the user for the current year in the form of a numeric value e.g. 2017.
 - If the year is not one that is within the 21st century (2000 – 2099) then the program will display an appropriate and helpful error message (e.g. “Year must be in the range of 2000-2099”) and set the year to the default year of 2035).
 - The program will then display the current value for the year (either the value entered by the user if the year that was entered was valid or the default value if the year was not valid).

Author: James Tam

Exercise 4

- Modify the previous program (asks the user for the year).
 - It will still prompt the user for a year and display an error message if the year is not within the range of 2000 – 2099.
 - Instead of setting invalid values to the default value the program will instead **repeatedly ask** (using a do-while loop) for the year until a valid value has been entered.
 - E.g.
 - The user enters 1999 for the year. An error message will be displayed and the program again prompt the user for the year.
 - The user then enters 2135 for the year. Again an error message will be displayed and the program re-prompts the user for the year.
 - This time the user enters 2000 for the year. Since this value is within the valid range the program will stop prompting the user for the year and display the year entered.

Author: James Tam