week4

January 31, 2018

1 Operators

- Used to construct represent operations on variables and data
- Examples include mathematical and logical
- Typically on the right side of the assignment operator **=**

2 Examples of Expressions With Operators

```
x = 5 + y
lblOut.Text = 2 * 3.15 * radius ^ 2
isWorking = isOpen or isReading
textMessage = "hello " & name & " your birthday is on " & birthDay
```

2.0.1 Notice that an operator can combine multiple values together, and usually on the right of an assignment operator

3 Expressions

- Can include multiple variables, expressions, data, and sub/functions
- Each one is called a term, e.g.:`x+5+y`
- VB will attempt to convert the type of every term to match the first one
- Will throw an error if it cannot convert it
- Some programming languages prefer to give an error without conversion
- VB is designed for windows development where lots of conversion to/from strings is done, so convertion is done automatically

4 Operators In VB Ordered by Precedence

Operator	Description
^	Exponentiation
+,-	Unary identity and negation
,/	Multiplication and floating-point division
\	Integer division
Mod	Modulus arithmetic
+,-	Addition and subtraction, string concatenation

Operator	Description
&	String concatenation
>,<,<>,<=,>=,=	Comparisons **(result is True or False)**
=	Assignment **(No result, but changes the variable on the left side)**

5 Operator Precedence

```
x + y
x + y - z
x + y * z
(x+y) * z you can modify precedence using ( )
x / y * z evaluated from left to right
x / (y * z)
```

6 Exercise

Create a program that performs the following tasks - Convert the temprature (supplied by the user) from F to C and from C to F - Conversion formula is: F = 9/5*C + 32 - Name the project: tempconvert

7 Challenge

- Use a single textBox and single output

8 Another Exercise

Create a program that perform the following tasks - Calculate the Body Mass Index - $BMI = \frac{kg}{m^2}$, where KG is weight in KG, and m is the length in meters - Based on BMI, tell the user whether he/she is: - Underweight: $BMI < 18.5$ - Healthy: $18.5 \leq BMI \leq 25$ - Overweight: $BMI > 25$

9 Problem

- How can we get the computer to make a decision based on a value?
- From last exercise, the computer should decide based on BMI whether user is underweight, healthy, or overweight
- **Solution:** Conditionals
- Also known as the if statement

10 The If Statement

- A Conditional, meaning, it contains a condition
- Condition is based on BMI
- Executes a code block **only if the condition is true**
- A code block is a section of the program containing statements

11 If Syntax

```
If condition then
    ' expressions here
    ' can be multiple lines
    ' can be anything you learned so far
    ' even another if statement!
End If
```

12 Condition Can Be

- Variables
- Expressions with comparison operators (logical or mathimatical)
- Function that returns a value

13 The Condition is False if

- Expression, variable or Function results in:
- False value
- 0 if Numeric value
- Empty string
  - Then it is considered **False condition**
  - Otherwise it is a True **condition**

14 BMI Solution

```
If lblBMI.text < 18.5 then
    MsgBox("You are underweight!")
End If
```

14.0.1 Can you write the other conditions?

15 Overweight Condition

```
If lblBMI.text > 25 then
    MsgBox("You are overweight!")
End If
```

16 Healthy Condition

- This one is a challenge because it contains 2 condition:
- bmi >= 18.5 and
- bmi <= 25
- Conditions are logical expressions
- We can combine logical expressions using logic operators **And**, **Or**

17 And Logical Operator

- Both terms must be true for the result to be true
- **True And True = True**
- True And False = False
- False And True = False
- False And False = False

18 Or Logical Operator

- If any term is true, then the result is true
- True And True = True
- True And False = True
- False And True = True
- **False And False = False**

19 Healthy Condition Solution

How do we combine the conditions?

```
If lblBMI.text >= 18.5 And lblBMI.text <= 25 Then
    MsgBox("You are healthy!")
End If
```

20 Exercise

- Create a program that asks the user for height and width of a rectangular shape.
- If the height is equal to the width, then the program should notify the user that this is a square
- If not, then the program should tell the user that the shape is a rectangle

21 Challenge

- Improve the program to display the area of the shape using the appropriate formula
- Square area = $Width^2$
- Rectangular area = $Width * Height$