

1 المتغيرات Variables:-

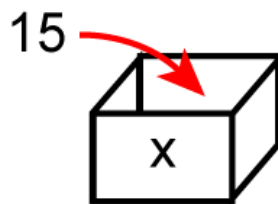
المتغيرات هي أماكن خزن في الذاكرة.

A variable is a location in memory, which has been specifically reserved for holding data.i.e. A variable is a 'data box'. A variable thus binds the stored data to a name. Which enables convenient access at a later time. Variables can be assigned values, via 'assignment': Such an assignment operation takes the form: *variable_name = value* Here, '=' is the assignment operator (NOT the 'equality' operator) Examples:

Example1:

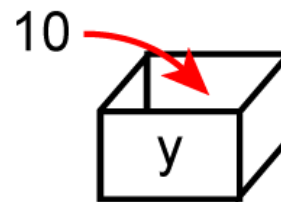
'Assign 15 to x

x = 15



'Assign 10 to y

y = 10



2 Variables Declaration and assignment

Prior to use, in VB variables must first be declared...This reserves (creates) a place in your computer's memory.The VB syntax for a local variable declaration:

Dim variable_name As data_type

Dim is a VB keyword for declaring a variable;**variable_name** is the name of the variable; **As** is a VB keyword for specifying the **data_type**... the type of data the variable will hold. Example of variable use: Adding 10 + 15...

Example2

'Declare integer variables x, y, and z

Dim x, y, z As Integer

'Assign 15 to x

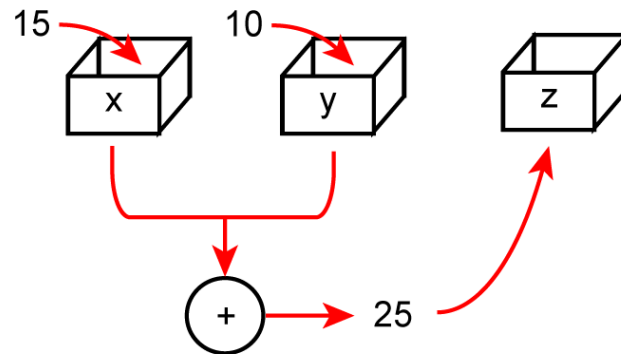
x = 15

'Assign 10 to y

y = 10

'Add x to y; assign the result to z

z = x + y



For a constant, both memory location and the stored value are fixed.

The VB syntax for declaring a constant is:

Const const_name As Data_Type = value

Const is a keyword declaring the constant; **const_name** and value are the name and value of the constant; **Data_Type** is the type of constant.

Note: variables can also be given initial values...In both cases, this is called 'initialization'.

Example4 : Const x As Integer = 10

Example 5: Const PI As Double = 3.14

3 قواعد كتابة المتغير Rules for naming variables in Visual Basic

1. Unique within scope
2. <= 255 characters (other languages may have different length restrictions)

3. Begin with a letter
4. No embedded spaces or many special characters (. , “ - \$ # * and others).
The underscore _ is a valid character.
5. Cannot be a reserved word like **messagebox**
6. Use upper and lower case with purpose. Once a variable is declared you do not have to be concerned with upper/lower case. The editor recognizes words that are the same except for case and makes them all the same for you. (use of upper and lower case differ between languages)
7. It is always good programming practice to use names that are descriptive or mnemonic.

Exercise1: Fill the blanks with suitable answer

Variable Name	Valid?	Invalid?	Good Variables Name? If not why?
GPA			
Count#1			
\$grosspay			
GradePointAverage			
Attempted.Hours			
Attempted-Hours			
Interest Rate			
A2			
2A			
End			
Printitout			
MONEYAFTERALLTAXES			

4 أنواع البيانات Data types

Data Type	Name	Memory	Range
Byte	Byte	1 byte	0 ~ 255
Short	Short Integer	2 bytes	-32,768 ~ 32,768
Integer	Integer	4 bytes	-2,147,483,648 ~ 2,147,483,648
Long	Long Integer	8 bytes	-9,223,372,036,854,775,808 ~ 9,223,372,036,854,775,808
Single	Single Precision Floating point	4 bytes	-3.4028235 E38 ~ 3.4028235 E38
Double	Double-precision Floating point	8 bytes	-1.7976931348623157 E308 ~ 1.7976931348623157 E308
Decimal	Fixed point decimal	16 bytes	-7.9228162514264337593543950335 E28 ~ 7.9228162514264337593543950335 E28
Char	Character	2 bytes	1 char (0 ~ 65535, Unicode)
String	Char string	2 bytes/char	Max, 2 billion characters
Date	Date	8 bytes	AD Jan 1, 0001 - AD Dec 31, 9999
Boolean	Boolean	2 byte	True or False
Object	Object	4 byte	Arbitrary data type reference

5 Data type example

```

Public Class Form1
    Dim b As Byte
    Dim n As Integer
    Dim si As Single
    Dim d As Double
    Dim da As Date
    Dim c As Char
    Dim s As String
    Dim bl As Boolean

    Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click

    End Sub

    Private Sub Button2_Click(sender As Object, e As EventArgs) Handles Button2.Click

    End Sub
End Class

```

6 نطاق المتغيرات Scope of variables

يعني ان هناك اماكن معينة لوضع تعريف المتغيرات او الثوابت . فهناك متغيرات محلية ومتغيرات عالمية.

7 Datatype conversation

النوع الذي ياخذ حيزا قليل من الخزن يمكن ان يحول الى نوع اكبر حيزا في الخزن . ولكن العكس غير صحيح يعطي نتائج وقيم خاطئة.

فيمكن تحويل النوع byte الى integer

ولكن العكس غير صحيح لان byte يشغل حيزا اقل من integer

7.1 Datatype conversation implicit conversation التحويل من نوع الى اخر التحويل الضمني

يتم من خلال الاحلال assignment

علامة ال "="

Example 6:

Dim as byte =4

Dim y as integer= x

7.2 Datatype conversation explicit conversation التحويل من نوع الى اخر التحويل الغير ضمني

يتم من خلال استخدام دوال جاهزة للتحويل من نوع الى اخر .

Example 7:

Dim first_num as string ="12"

Dim second_num as string ="15"

Dim sum as integer =Cint(first_num)+ Cint(second_num)

Txt1.text=first_num +second_num

لو تم طباعة sum فان النتيجة تكون 27

لكن ماذا لو تم طباعة القيمة في Txt1.text ؟

8 العمليات الرياضية Arithmetic (Math)operation

Operator	Meaning	Example
+	addition	$6 + 5 = 11$
-	subtraction	$6 - 5 = 1$
*	multiplication	$6 \times 5 = 30$
/	division	$6 / 5 = 1.2$
\ (or ¥)	quotient (int. division)	$6 \setminus 5 = 1$
Mod	remainder	$6 \text{ Mod } 5 = 1$
^	exponential	$6^5 = 7776$

9 Math statement

Question: what does the statement, 'x = x + 1' do'? Thinking in terms of algebra, this is a nonsense statement. Since '=' is defined as equality... But x is never equal to x + 1! However, if we instead think in VB, it makes perfect sense! Remember... here, '=' is the assignment operator. Thus, 'x = x + 1' tells the computer to: First, get the value stored in variable x. Then, add 1 to this value.

Lastly, store the result in variable x. For example, assume x starts out as 10:

```
Dim x As Integer = 10
```

```
x = x + 1
```

During run-time, the right side is first evaluated to yield 11.

Then, this result (11) is passed to the left side (x).

So, the overall result is to set:

$x = 11$.

More generally, a math statement takes the form:

left_side = right_side

Where, 'left_side' is a variable...

While 'right_side' is a mathematical expression. At run-time, the right_side is evaluated... And then passed to the left_side. For instance, as a result of the statement: $z = 2 * 3$

First, the right side is evaluated (yielding 6).

Then, the result is passed to z (setting z equal to 6).

What about a compound statement (several math ops):

$x = 3 * 2 + 1 ?$

If we perform the multiplication first, we get :

$x = 6 + 1 = 7$.

If we add first, we get :

$x = 3 * 3 = 9$.

Which is correct?

10 Operator Priority

In VB, the order of evaluation of math operators (ops) is determined by *الاسبقية* precedence.

For arithmetic, the order of evaluation is (first to last):

1. Exponentiation (^)
2. Unary identity and negation (+, -) Such as the '-' in 'x = -6'
3. Multiplication and floating-point division (*, /)
4. Integer division (\)
5. Modulus arithmetic (Mod)
6. Addition and subtraction (+, -)

So, for our earlier example:

$$x = 3 * 2 + 1$$

$$\rightarrow 6 + 1$$

$$\rightarrow 7.$$

What happens when the compiler encounters several successive ops with equal precedence?

The compiler evaluates the ops in order, from left to right.

$$\text{Ex: } x = 6 * 2 / 4 * 3 \rightarrow 12 / 4 * 3 \rightarrow 3 * 3 \rightarrow 9$$

What if we want to do the addition first...?

- VB's default operation order can be over-ridden easily!
 - By simply adding parentheses.

- In particular, operations enclosed by parenthesis are evaluated first...

- Examples:

- Our example, stated as: $z = 3 * (2 + 1) = 3 * 3 = 9$

However, stated as: $y = (3 * 2) + 1 = 6 + 1 = 7$

Thus, parenthesis provide simple program control, during execution.

- This also applies to nested parentheses...

- Parentheses inside of parentheses (expressions with several 'layers')

- The most 'internal' operations are performed first.

- Example 8: $X = (((2 + 1) * 3) + ((7 + 6) - 4)) * 5$ ← inner layer

- $= ((3 * 3) + (13 - 4)) * 5$ ← middle layer

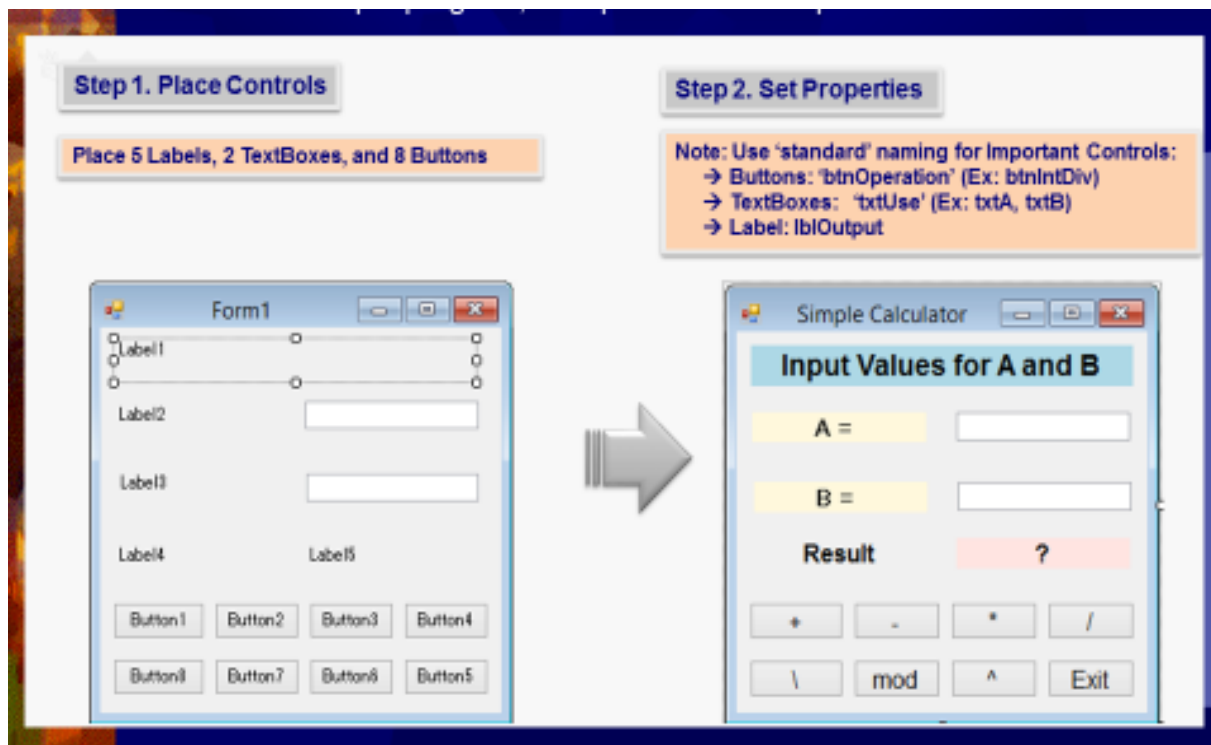
- $= (9 + 9) * 5$ ← outer layer

- $= 18 * 5$

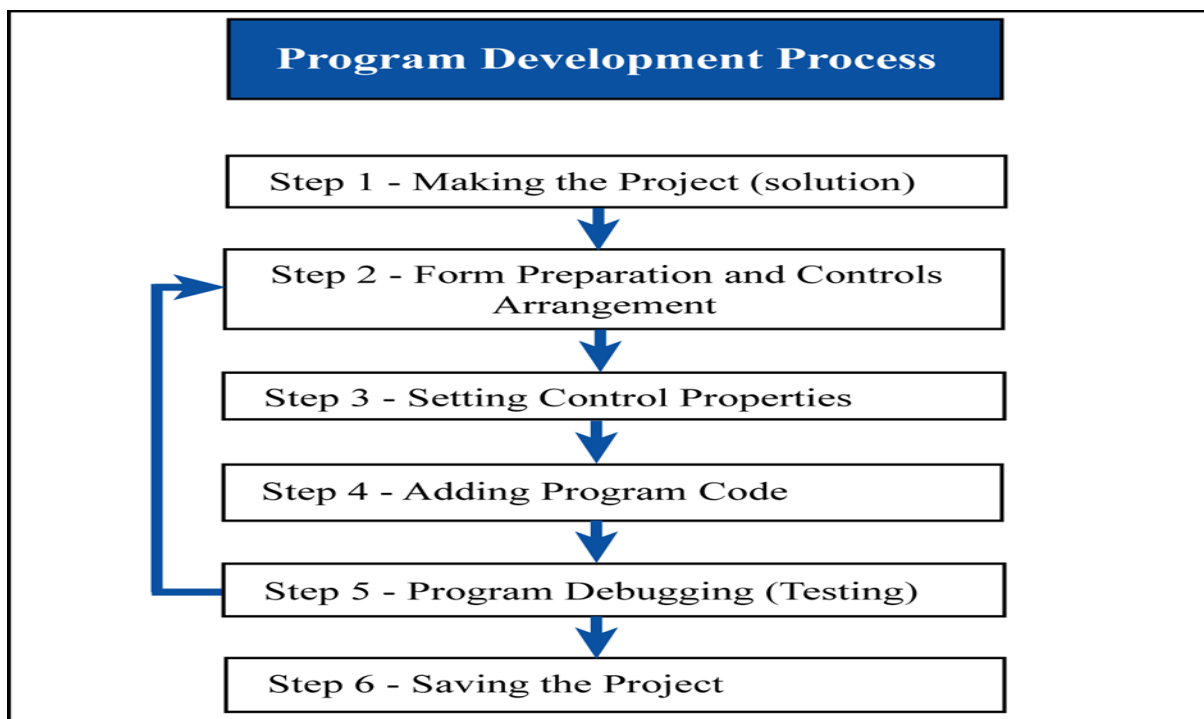
- $= 90.$

11 Work in Lab 2

11.1 Make simple calculator and apply variables constant



Hint Using below steps of PDP (program development Process) in solution.



11.2 Make project to apply and show the scope of variables

11.3 Write and discuss with your friend and TAS (teaching assistant in LAB) a project to find the solution of Z where z equal to

$$R=8$$

$$Z=3*5-8+3\backslash 1/1\text{mod } 2 +R$$

11.4 استكشف المزيد عن الكائنات وخصائص كل كائن والاحداث المرافقة لعمل الكائن