



# Sub Procedures, Part II

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- Passing by Value
- Passing by Reference
- Local Variables
- Class-Level Variables
- Debugging



## ByVal and ByVal

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- Parameters in Sub procedure headers are preceded by ByVal or ByVal
- ByVal stands for By Value
- ByVal stands for By Reference



## Passing by Value

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- When a variable argument is passed to a ByVal parameter, just the value of the argument is passed.
- After the Sub procedure terminates, the variable has its original value.



# Example

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```
Dim n As Double = 4
Triple(n)
txtBox.Text = CStr(n)
End Sub

Sub Triple(ByVal num As Double)
    num = 3 * num
End Sub
```

*Output:* 4



## Same Example: $n \rightarrow \text{num}$

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```
Dim num As Double = 4
Triple(num)
  txtBox.Text = CStr(num)
End Sub

Sub Triple(ByVal num As Double)
  num = 3 * num
End Sub
```

*Output: 4*



## Passing by Reference

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- When a variable argument is passed to a ByRef parameter, the parameter is given the same memory location as the argument.
- After the Sub procedure terminates, the variable has the value of the parameter.