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Infinite Loops

- CONCEPT: If you don't properly change your iteration variable – so that the conditional eventually evaluates to false – then you will never exit the loop
- We call that situation an *infinite loop*
- The only of breaking out of an infinite loop is by "stopping" the program from outside of the program itself
- In VB6, press the CTRL + BREAK keys to end an infinite loop

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Summary Of Iteration

- Iteration is useful when you want the program to repeat a sequence of steps
- Iteration requires:
  - Loop Body – the steps to be repeated
  - Stop Condition – a way to exit the loop
- When the loop ends, execution continues with the regular sequence of program statements
- VB6, like most languages, has several iteration statements – we have introduced you to one,

  the Do-While
- CONCEPT: Although other control structures exist, with *conditionals* (If-Then-Else) and *iteration* (Do-While) you can do any programming!!

Random Numbers and Procedure Review

Random numbers allow computers to avoid doing the same boring thing every time.

But how can a computer do something randomly?

Recall Procedure Structure ...

- Parts of a procedure specification
  - ❏ Name
  - ❏ Definition
  - ❏ Parameters
  - ❏ Declaration

```
Private Sub spin(choices As Integer, result As Integer)
   result = choices * Rnd - 0.5
End Sub
```

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Random Numbers

- CONCEPT: Random numbers are numbers that are independent or unrelated to each other
  - Coin flipping can produce random bits … heads (0), tails (1)
  - Rolling a die can produce random digits … 1 through 6
  - Drawing cards from a shuffled deck can produce
    - Random bits … red or black
    - Random digits … 1 through 4 (Suit)
    - Random digits … 1 through 13 (Value)
- Rnd is VB6’s random number generator

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Using Rnd

- Rnd gives a double between 0 and 1, e.g., 0.410592664
- To chose randomly among an integral number of things, say x, multiply Rnd by x and truncate … the result is a random integer between 0 and x-1
  - Pick among 6 things:
    - Rnd * 6 ➔ 0.410592664 * 6 ➔ 2.463555984 ➔ 2
    - Rnd * 6 ➔ 0.092154388 * 6 ➔ 0.552926328 ➔ 0

To truncate a number x in VB Write, Int(x)

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Randomness? Really?

- What is randomness?
- Computers are deterministic – they exactly follow instructions and do exactly what is asked … how can they do something random?

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Randomness? Really?

- What is randomness?
- Computers are deterministic – they exactly follow instructions and do exactly what is asked … how can they do something random?
- CONCEPT: Rnd is “Pseudo-random,” a deterministic computation that produces numbers that appear to be random and pass standard tests for randomness

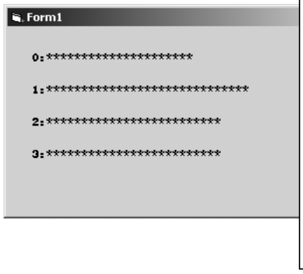
FIT 100 Experimenting with Rnd

```
Private Sub spin(amount As Integer, result As Integer)
  result = Int(amount * Rnd(1))
End Sub

Private Sub Form_Click()
   Call experiment
End Sub
```

```
Private Sub
     experiment()
Dim roll As Integer
Dim outcome0 As String
Dim outcome1 As String
Dim outcome2 As String
Dim outcome3 As String
Dim reps As Integer
Dim result As String
reps = 0
outcome0 = "0: "
outcome1 = "1: "
outcome2 = "2: "
outcome3 = "3: "
```

```
Do While reps < 100
   Call spin(4, roll)
   If roll = 0 Then
      outcome0 = outcome0 & "*"
   ElseIf roll = 1 Then
      outcome1 = outcome1 & "*"
   ElseIf roll = 2 Then
      outcome2 = outcome2 & "*"
   Else
      outcome3 = outcome3 & "*"
   End If
   reps = reps + 1
Loop
lblBar0.Caption = outcome0
lblBar1.Caption = outcome1
lblBar2.Caption = outcome2
lblBar3.Caption = outcome3
End Sub
```



```
0:*********************
1:*****************************
2:*************************
3:*************************
```

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FIT 100 Summary

- Procedures encapsulate a “unit” of computation
- Computers generate random numbers using “pseudo random” techniques
- Random numbers are hand for making computers less boring

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