Use Loops – to draw pictures
Review – Loops with Counters/LCV

- 3 Steps in Loops with Loop Control Variables
- Initialize LCV before the loop starts
- Test Condition using LCV
- Update LCV in body of the loop
While Loop (increment by 1)

- Begin
- Counter = 1
- Counter <= 10
- True
- Output: Counter
- $\$
- Counter = Counter + 1
- False
- Output: "Out of the Loop"
- "Counter is " & Counter
- $\$
- End

Out of the Loop
Counter is 11
While - For Loop (increment by 1)

1
2
3
4
5
6
7
8
9
10

Out of the Loop
Counter is 11

Begin

Counter 1 to 10

Output:
"Out of the Loop"
"Counter is " & Counter

End

Output: Counter
$
While Loop - increment more than 1

Begin

Counter = 1

Counter <= 10

True

Output: Counter

Output: "Out of the Loop" "Counter is " & Counter

End

False

Counter = Counter + 2

Out of the Loop
Counter is 11
While - For Loop - increment more than 1

Begin
Counter = 1
Counter <= 10
True
Output: Counter $
Counter = Counter + 2
End

Begin
Counter 1 to 10 by 2
Output: Counter $

Begin
Output: "Out of the Loop" "Counter is " & Counter $
End
For Loop - increment more than 1

Begin
Counter 1 to 10 by 2

Output: Counter
$

Output: "Out of the Loop" "Counter is " & Counter
$

End

Out of the Loop
Counter is 11
For Loops

- **For loops** are used to automate the initialize, test and update process.
- In Visual Logic, the For loop flowchart element is a *six-sided figure* with a loop variable, a **start** (initial) value, an **end** (final) value, an **update** (step) value and two arrows (one loops back, the other exits out of the loop).
For Loops – Positive Step

- When executed, the first action in the loop is to initialize the loop variable to the start value.
- If the step is positive: the body of the loop executes as long as the value of the loop variable does not exceed the final value. (i.e. loop variable <= final value)
- After the body of the loop executes, the loop variable is updated by the step value and the process is repeated.
- Can the step be negative: ???
While Loop - Decrement

Begin

Counter = 10

Counter >= 1

True

Output: Counter

§

Counter = Counter - 1

False

Output: "Out of the Loop"
"Counter is " & Counter

§

End

Out of the Loop
Counter is 0
While – For Loop - Decrement

Begin
Counter = 10
Counter >= 1
True
Output: Counter
§
Counter = Counter - 1
Output: "Out of the Loop" "Counter is " & Counter
§
End

Begin
Counter 10 to 1 by -1
Output: Counter
§
End
For Loop - Decrement

Begin

Counter 10 to 1 by -1

Output: Counter

Output: "Out of the Loop" "Counter is " & Counter

End

Out of the Loop
Counter is 0
For Loops – Negative Step

• If the step is negative, the body of the loop executes as long as the value of the loop variable is greater than or equal to the final value.

• After the body of the loop executes, the loop variable is updated by the step value and the process is repeated.
Upcoming: Use Loops – to draw pictures
Review – For Loop

What is the Initial Value?
What is the Final Value?
What is the Step?

Output:

```
Count is 1
Count is 2
Count is 3
Count is 4
Count is 5
Loop Finished
```
Counting: Initial, Final and Step as inputs

The initial, final and step values in a for loop can be variables.
Nested Loops

• First we will look at several examples and understand Nested Loops

• Later we will learn to recognize a program that needs Nested Loops and how to write the nested loops
I Love Counting with for loops! (demo)
Nested Loop – Example 1

Begin
Outer = 1
Outer <= 3
True
End

While Loop

Outer = Outer + 1

For Loop

Output: "**********Outer is " & Outer & "***************"

Inner 1 to 5

Output: "Inner " & Inner

False
Nested Loop – Example 1 - Output

Begin

Outer = 1

Outer <= 3

True

Output:

"**********Outer is " & Outer & "**********"

§

Inner 1 to 5

Outer = Outer + 1

End

**********Outer is 1**********
Inner 1
Inner 2
Inner 3
Inner 4
Inner 5

**********Outer is 2**********
Inner 1
Inner 2
Inner 3
Inner 4
Inner 5

**********Outer is 3**********
Inner 1
Inner 2
Inner 3
Inner 4
Inner 5
Nested Loop

- Any valid statements can occur inside the body of a loop, including input, assignment, output, conditions and even other loops.

- A nested loop refers to a loop that appears inside the body of another loop.
Nested Loop Example – (Figure 4-9 (a))

Begin

Outer = 1

Outer <= 3

True

Output: "Outer loop is now " & Outer $

False

Outer = Outer + 1

While Loop

For Loop

Output: Outer & " and " & Inner $

Outer loop is now 1
1 and 1
1 and 2
1 and 3
1 and 4
Outer loop is now 2
2 and 1
2 and 2
2 and 3
2 and 4
Outer loop is now 3
3 and 1
3 and 2
3 and 3
3 and 4

End
Fig: 4-9 (b)

A Guide to Working with Visual Logic
"Hello .. Hello "  (Figure 4 – 11 a, b)
“Hello” ??? times (Figure 4 – 11 c)
Using Nested Loops to draw pictures
Nested Loops – Triangle Problem
Nested Loops

• Is there repetition in this output?
• Many lines
• **Within each line** there are many stars
• How many lines?
• Lines: 1 .. 10
• Each line has many stars.
• Line 1 has 1 star…
• Line 2 has 2 stars…. 
• Line 10 has 10 stars
• For each LineCount from 1 to 10
  • Output Many stars – How many?
Pseudo-code – Triangle Problem

For LineCount from 1 to 10 do
  For StarCount from 1 to LineCount do
    Output “*”
  EndFor
  Output (NewLine)
EndFor