

Introduction To Flowcharting

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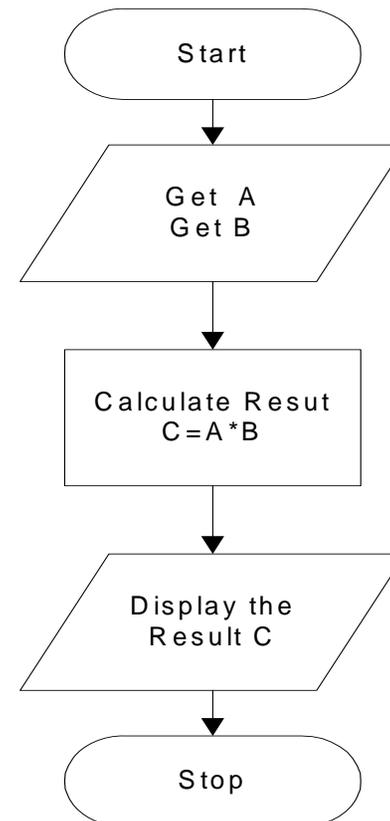
Today's Topics

- Flowchart Symbols
- Modular Flowcharting
- Control Structures
- Some examples

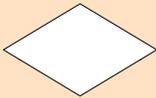
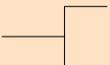
Flowchart:

Represents an algorithm in graphical symbols

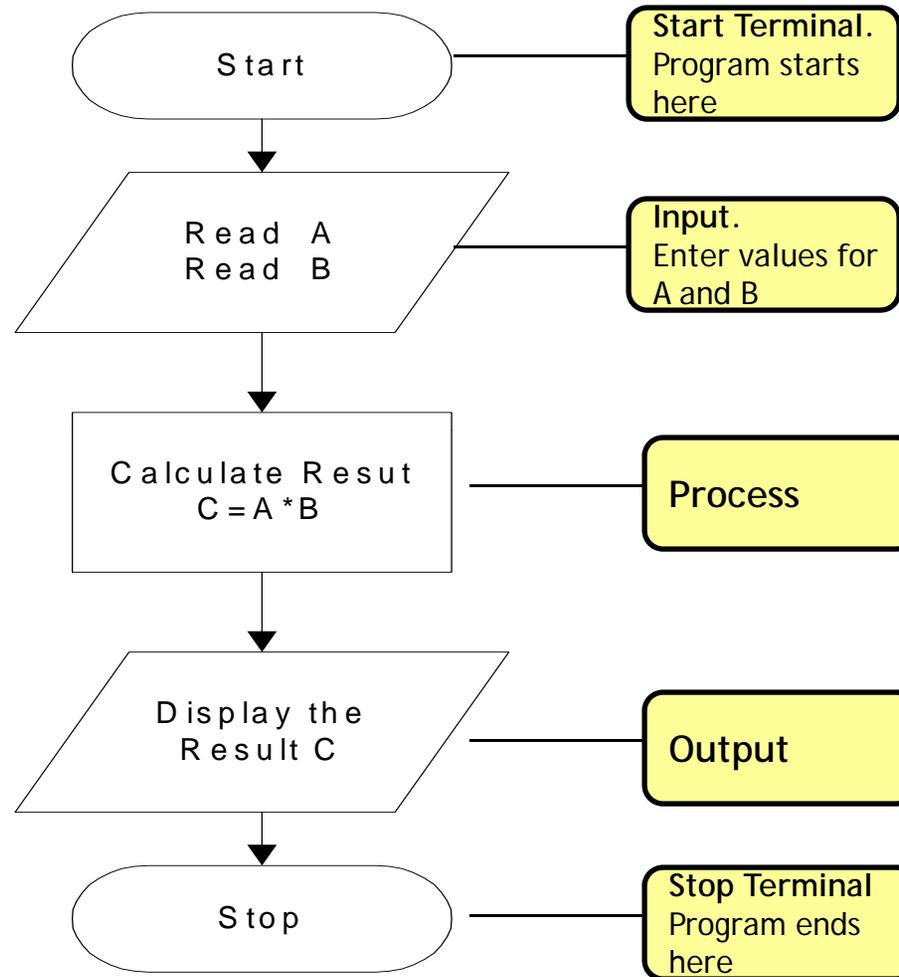
Example: Algorithm for multiplying two numbers



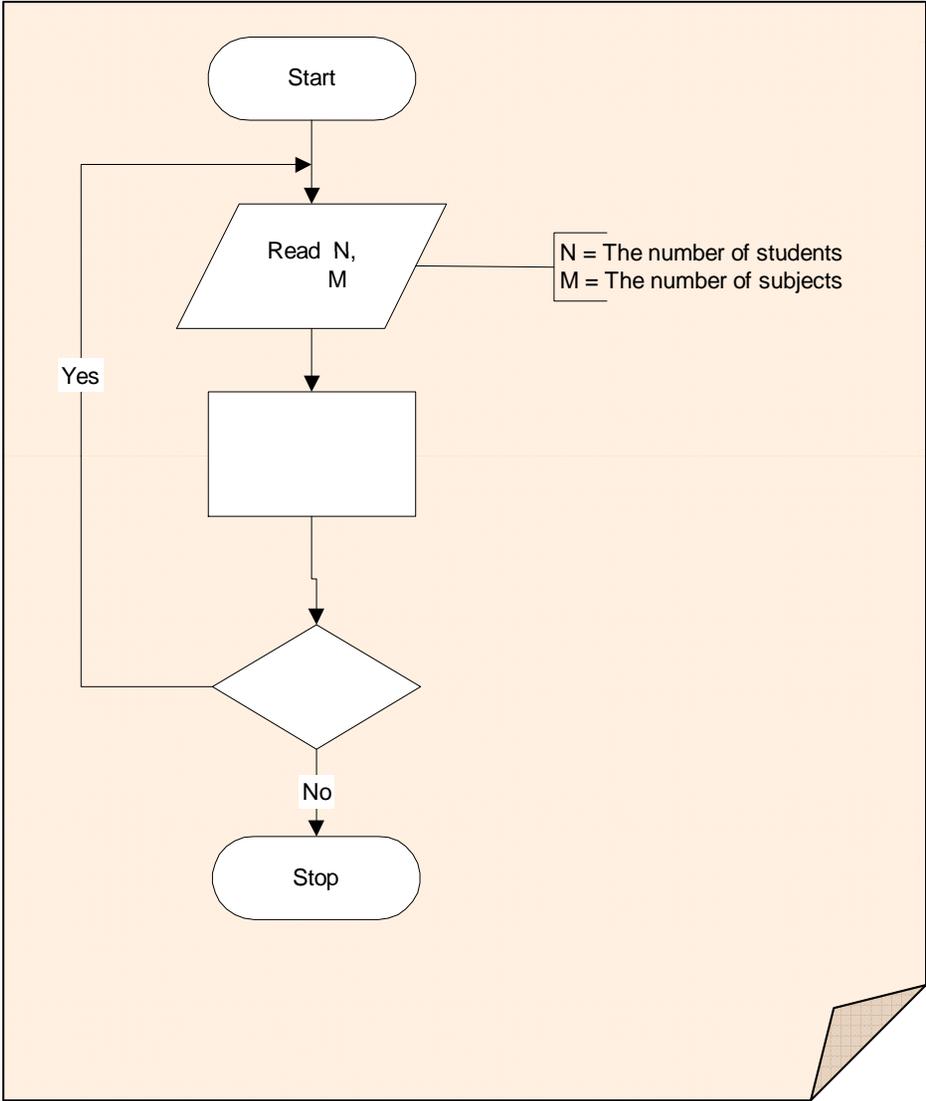
Flowchart Symbols

	Terminal: To indicate the start and end of a flowchart. Single flow line. Only one "Start" and "Stop" terminal for each program. The end terminal for function/subroutine must use "Return" instead of "Stop".
	Process: Used whenever data is being manipulated. One flow line enters and one flow line exits.
	Input/Output: Used whenever data is entered (input) or displayed (output). One flow line enters and one flow line exits.
	Decision: To represent operations in which there are two possible selections. One flow line enters and two flow lines (labeled as "Yes/True" and "No/False") exit.
	Function / Subroutine: To identify an operation in a separate flowchart segment (module). One flow line enters and one flow line exits.
	On-page Connector: To connect remote flowchart portion on the same page. One flow line enters and one flow line exits.
	Off-page Connector: To connect remote flowchart portion on different pages. One flow line enters and one flow line exits.
	Comment: Used to add descriptions or clarification.
	Flow line: Used to indicate the direction of flow of control.

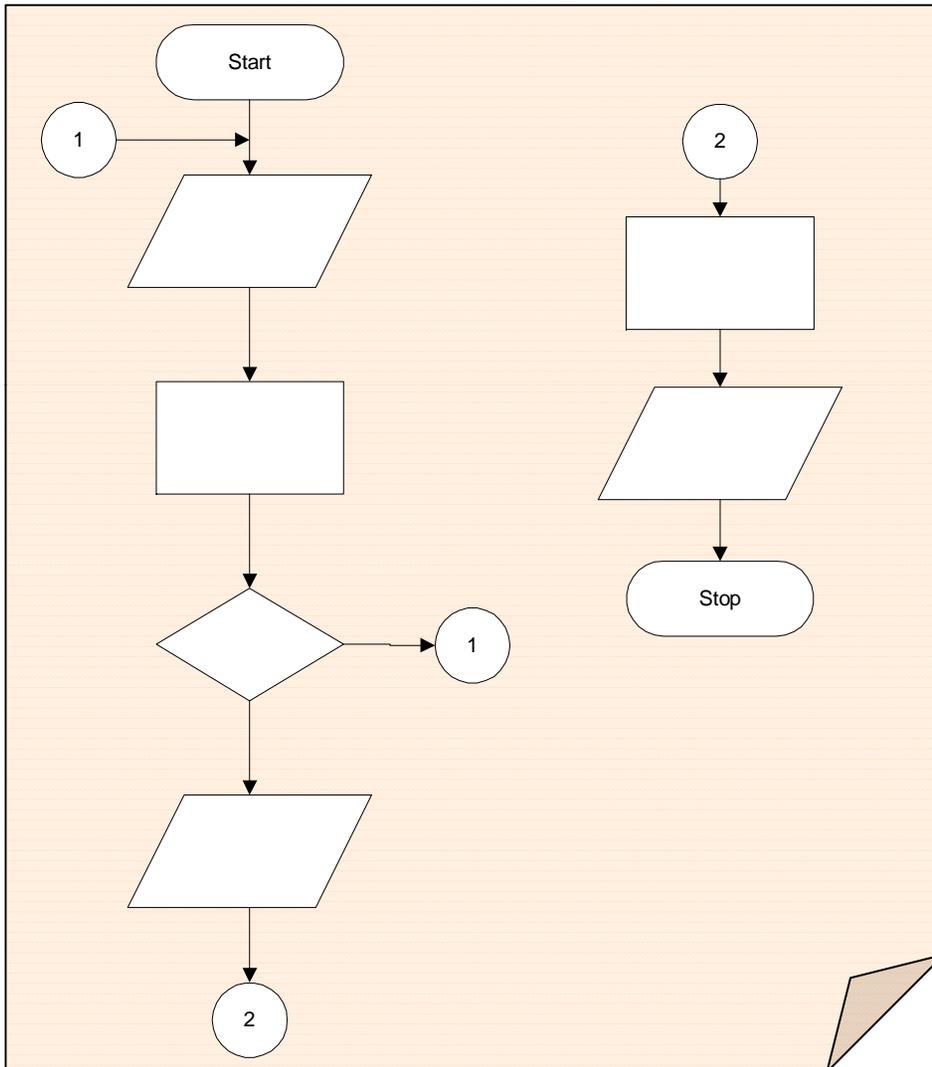
Example:



Comments or description



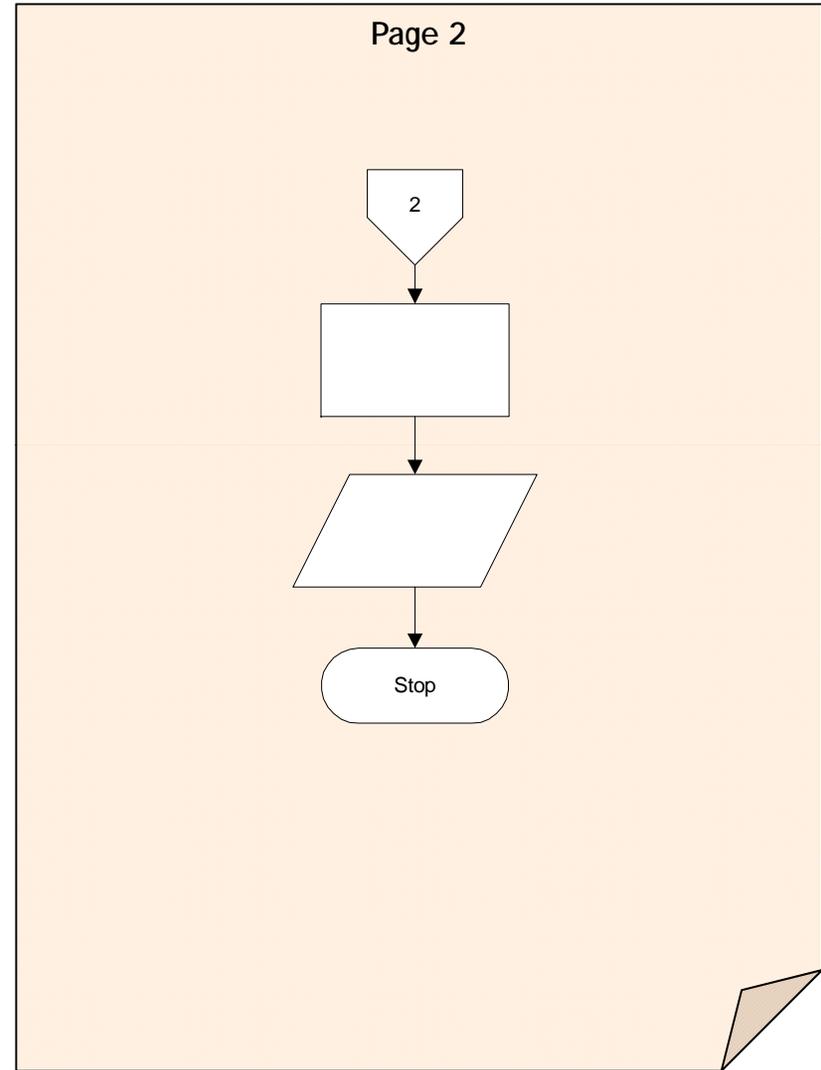
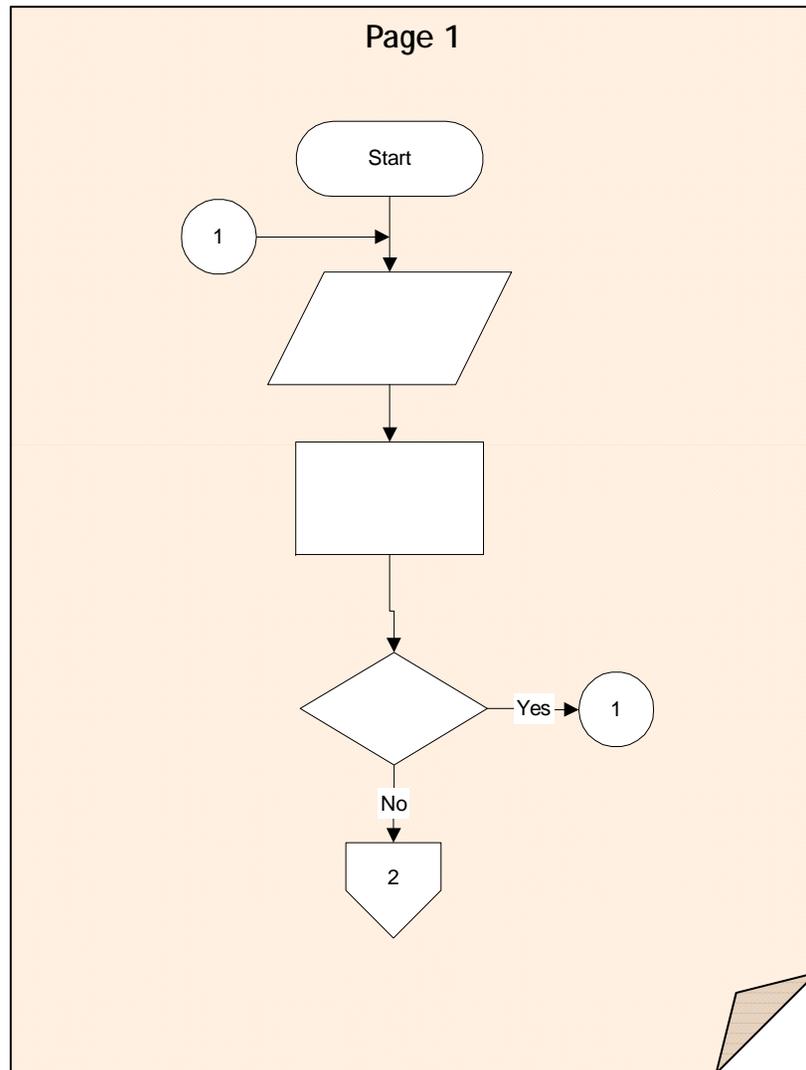
Connectors on the same page



1- connection on the same flowchart portion

2- connection on the different flowchart portion

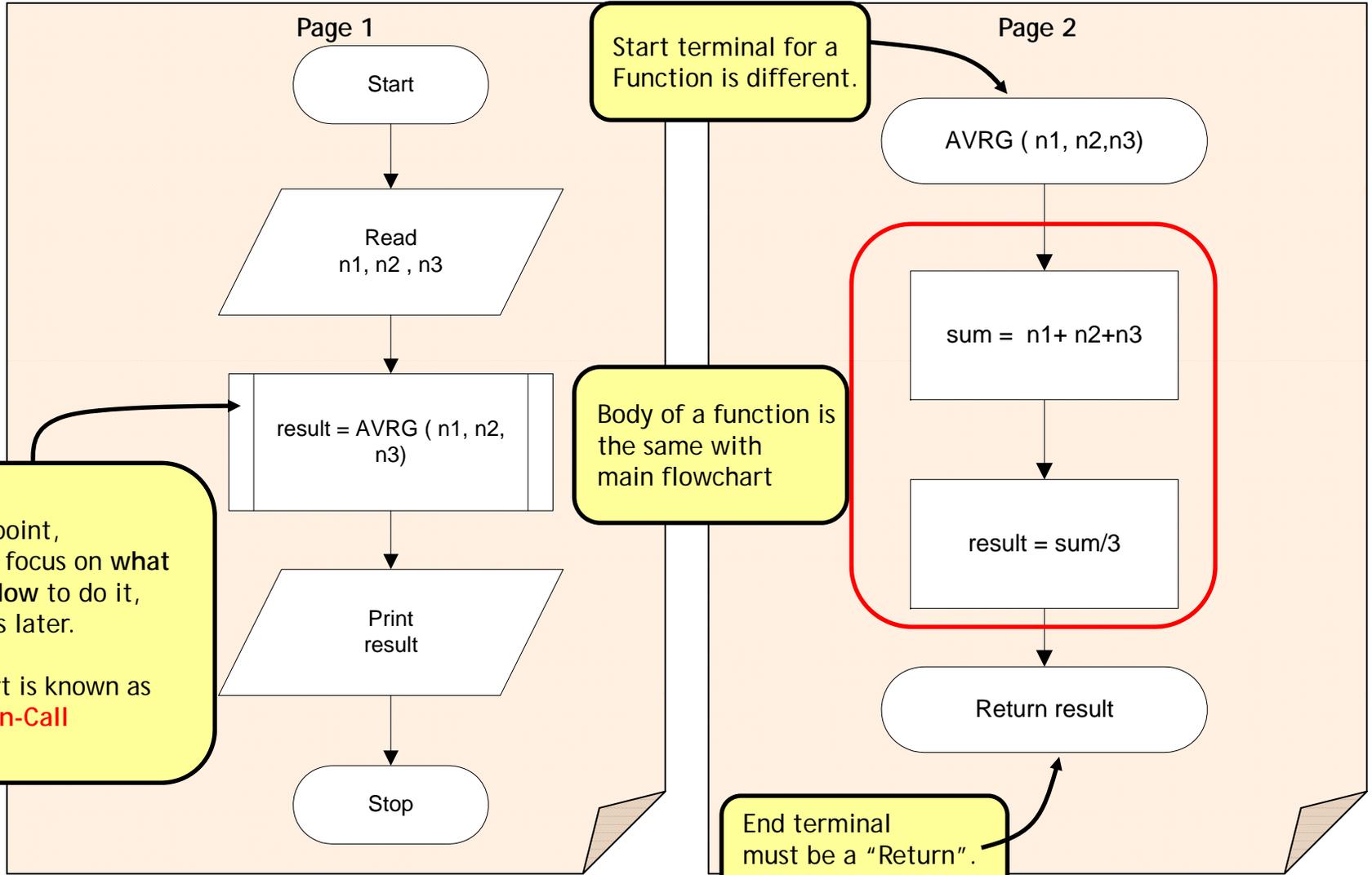
Connectors on a different page



Function

Problem: *To average three numbers*

The detail of how the function works is put in another flowchart.
This is known as **Function-Definition**

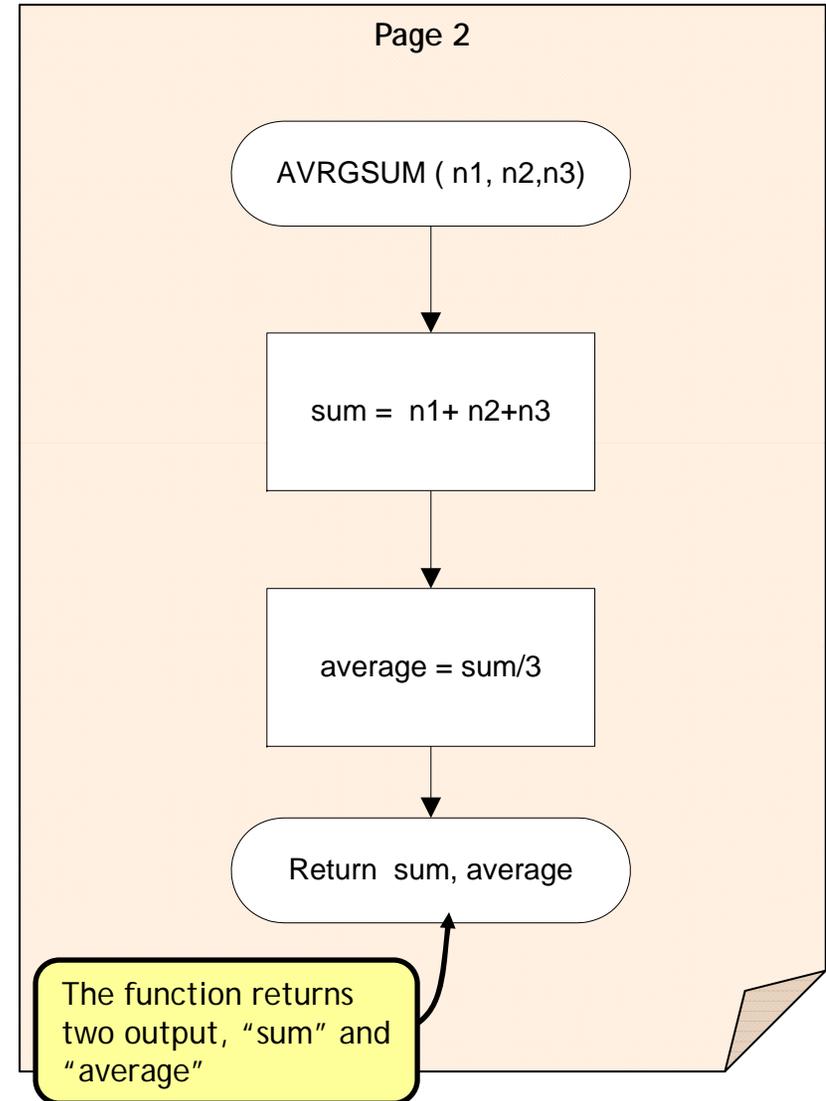
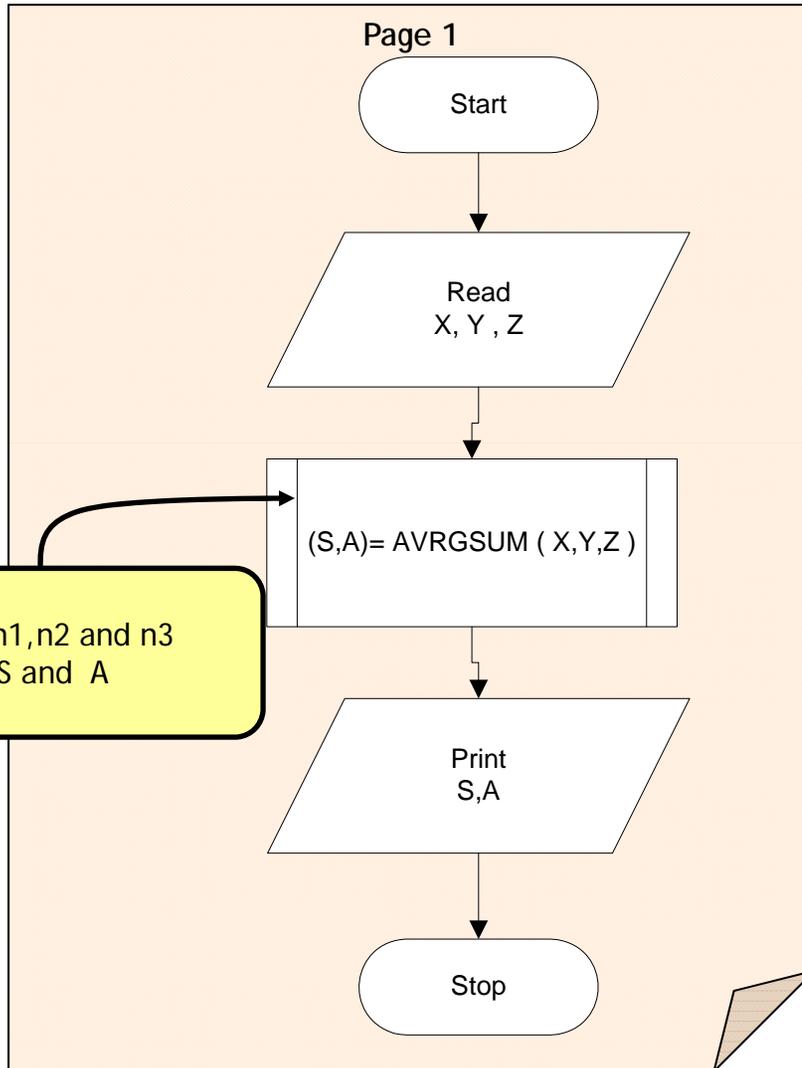


At this point, we only focus on *what* to do. *How* to do it, it comes later.
This part is known as **Function-Call**

End terminal must be a "Return". "result" is the output

Flowchart AVRГ calculates the average of three numbers

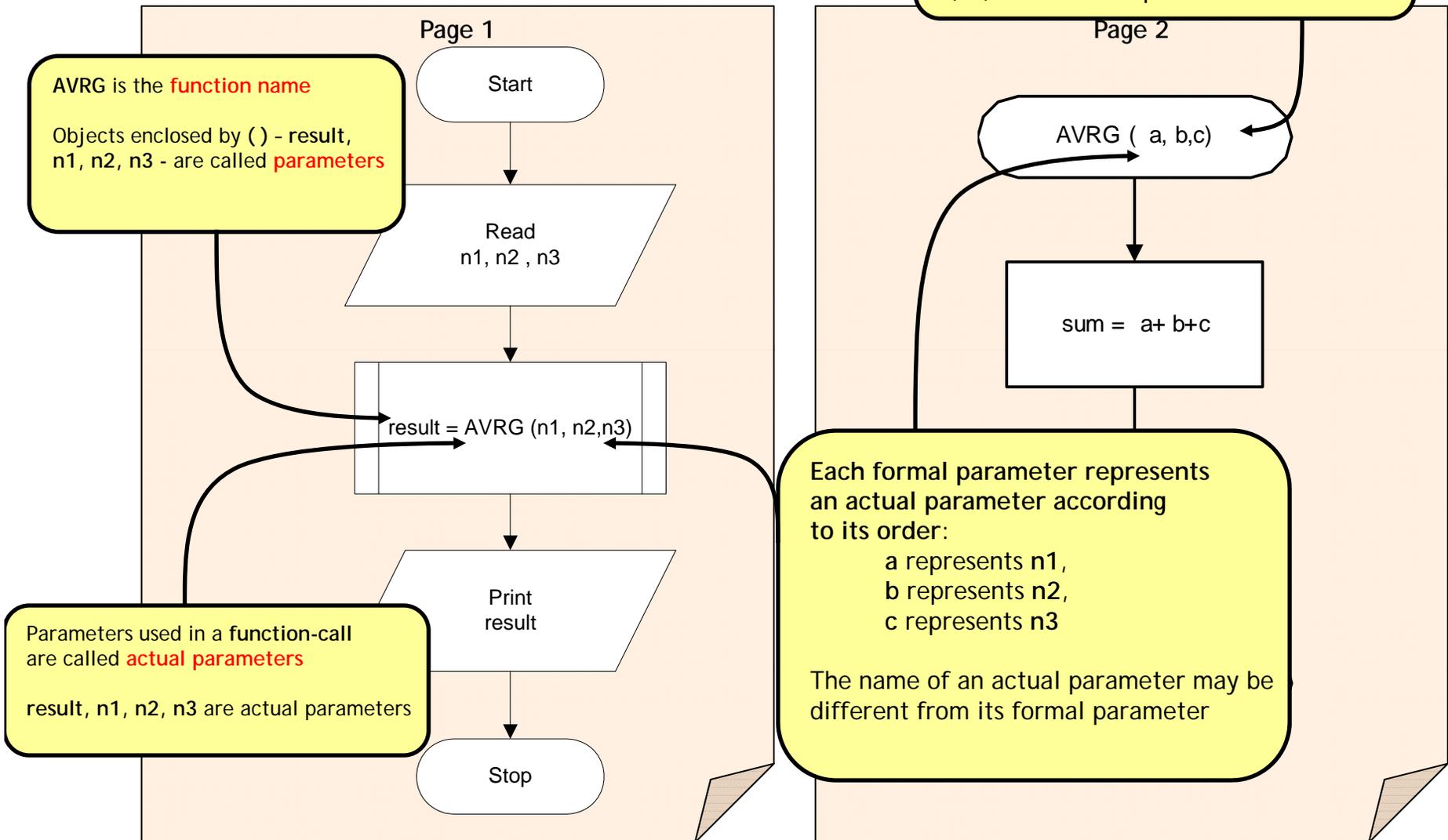
Problem: *To sum and average three numbers*



Flowchart AVRGSUM calculates the total and average of three numbers

Related terms and concepts

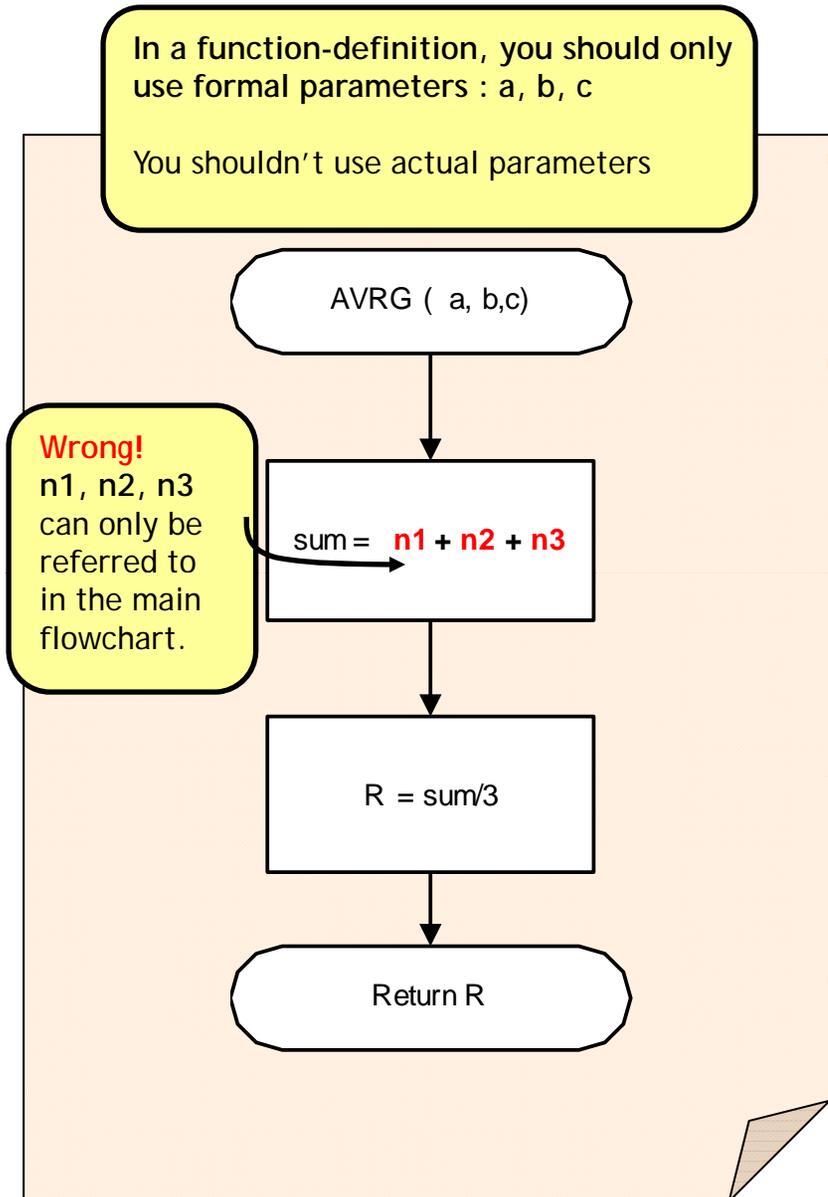
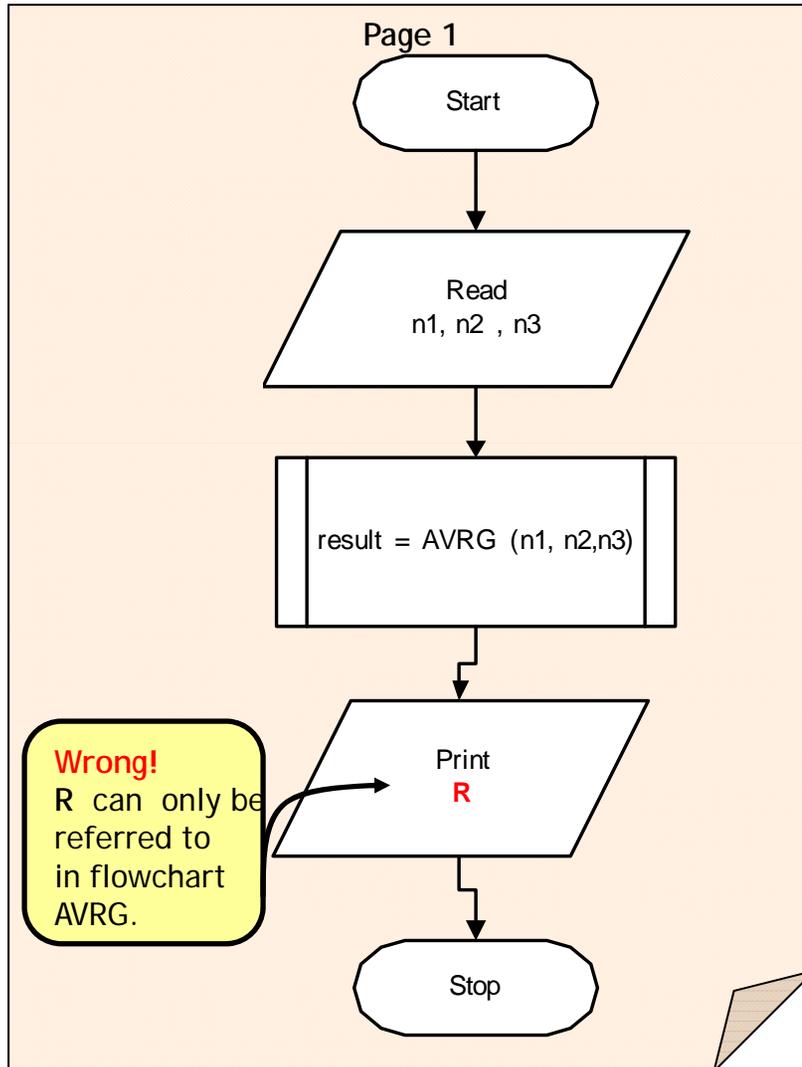
Actual and Formal Parameters



Flowchart AVRG calculates the average of three numbers

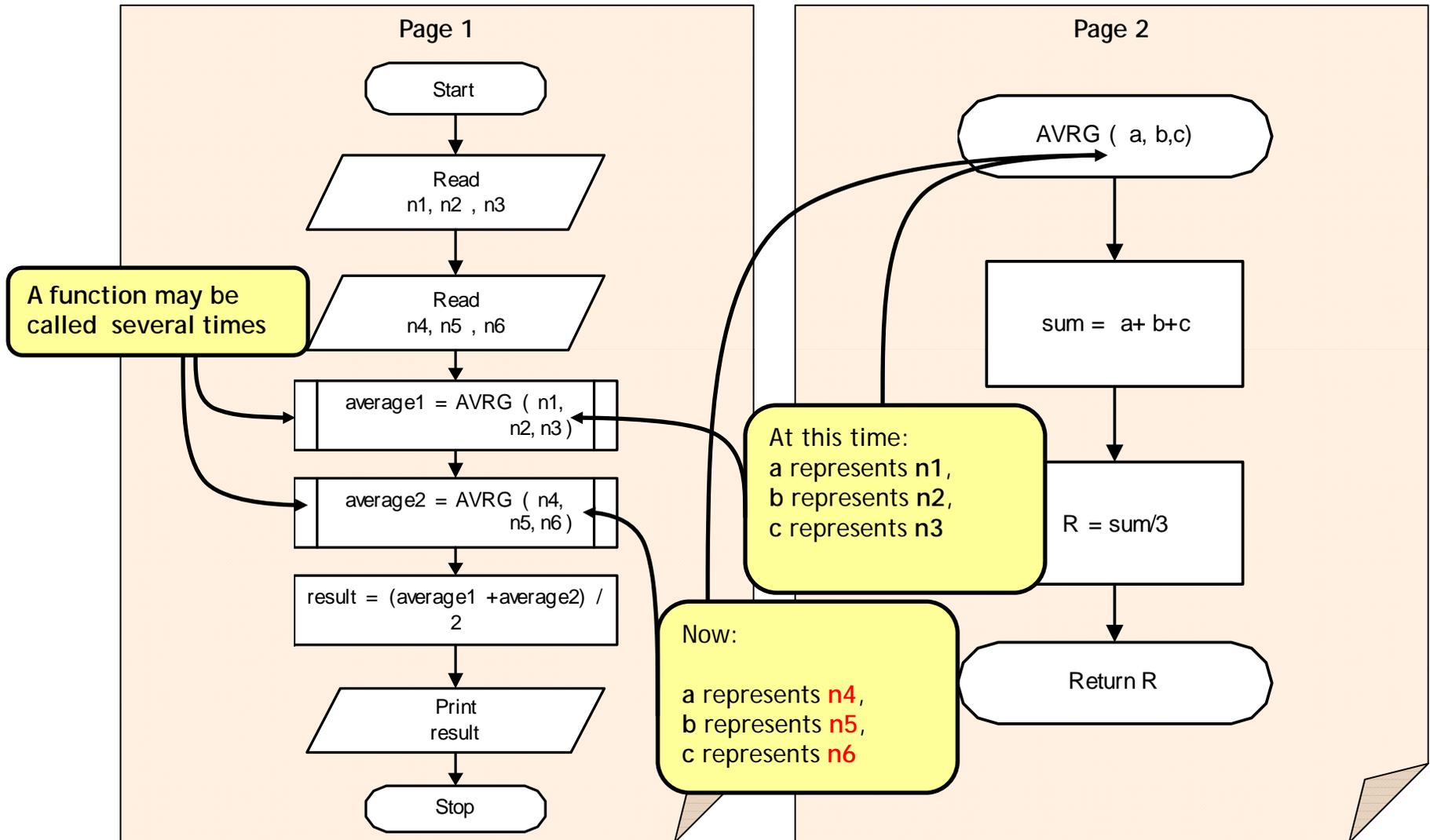
Related terms and concepts (cont.)

Only refer to variables that exist in the current chart



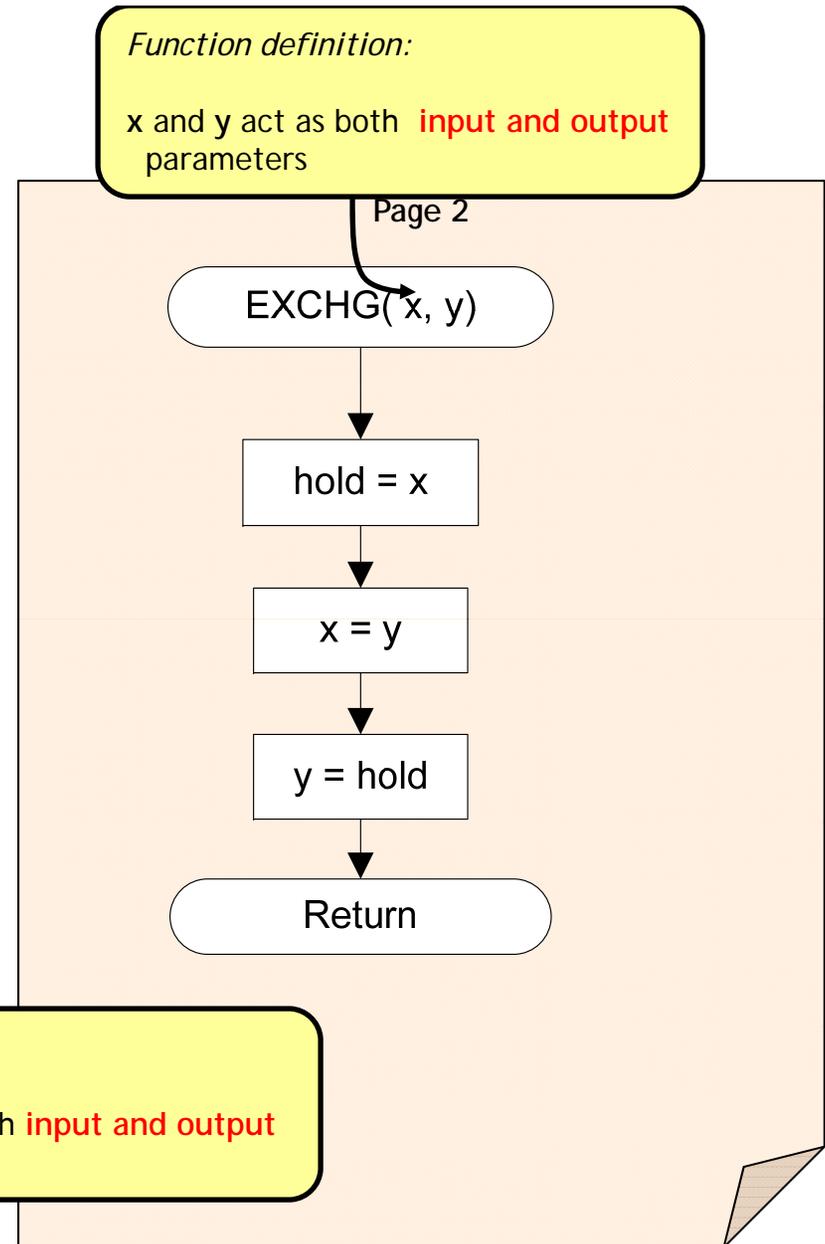
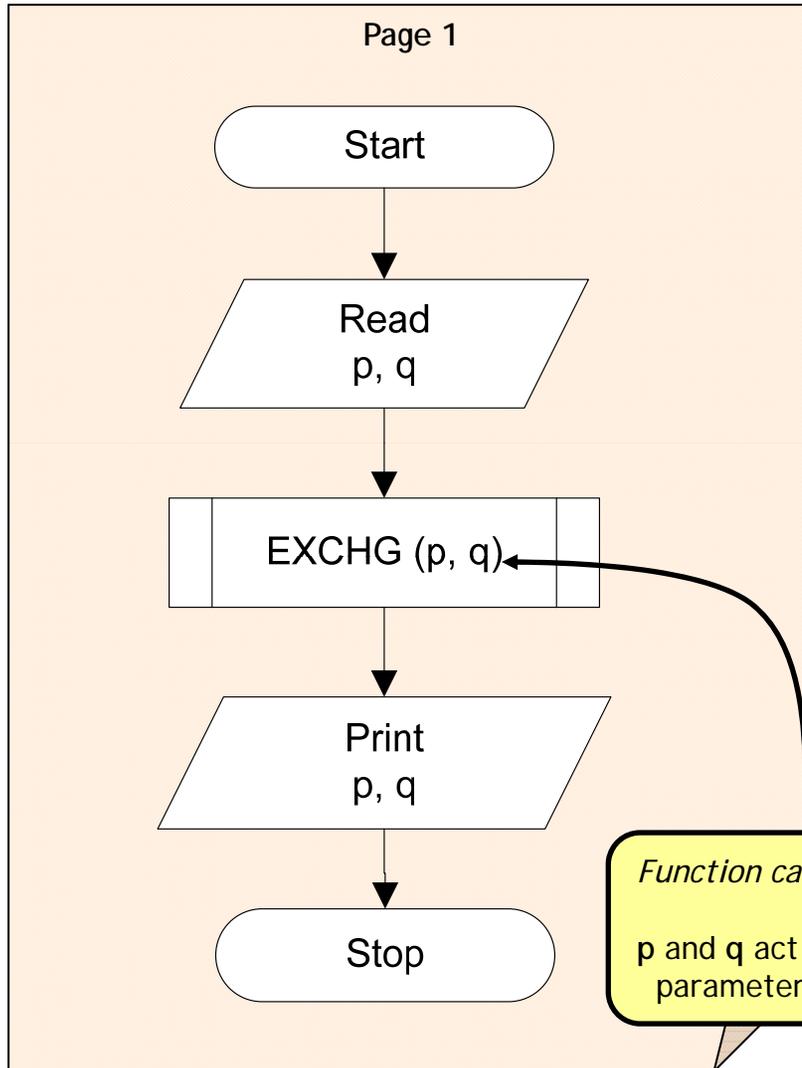
Related terms and concepts (cont.)

A function may be called several times



Related terms and concepts (cont.)

An input parameter may also be an output



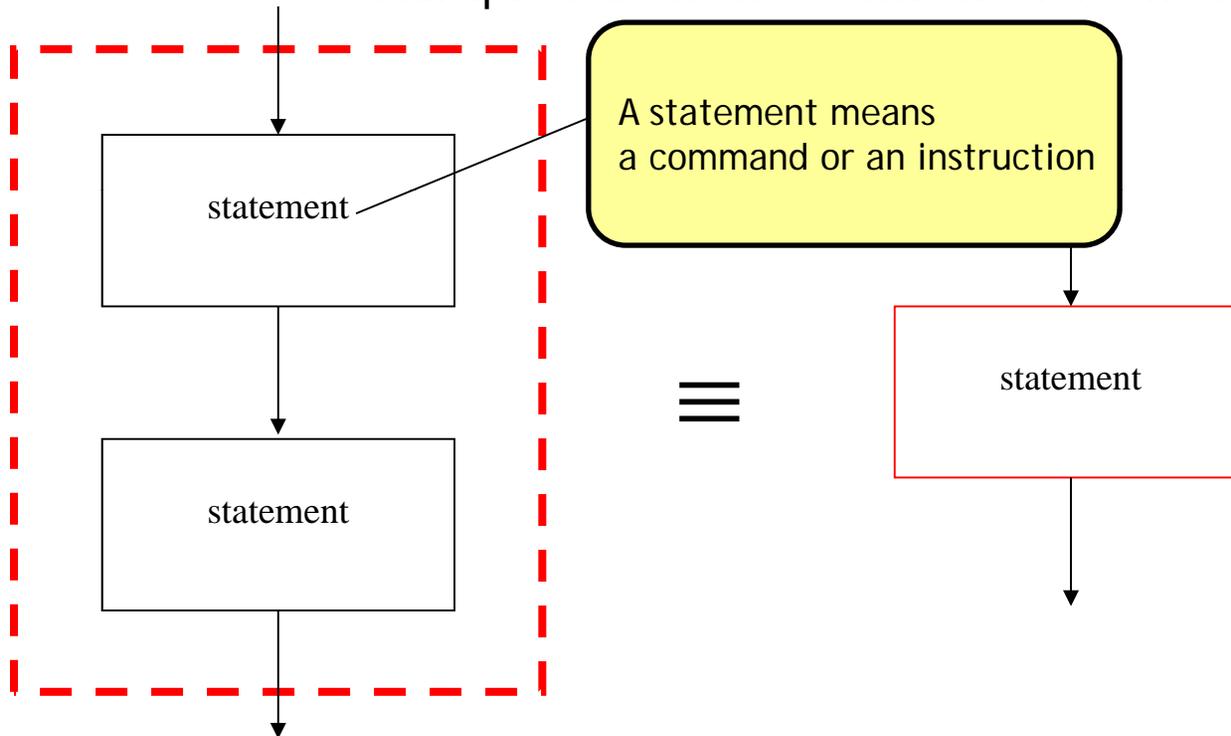
Flowchart EXCHG exchanges or swaps the value of x and y each other

Control Structure

- Describe the flow of execution.
- In flowcharts, **flow** of execution is represented by the **arrow line**.
- Types of control structure:
 - Sequential
 - Selection
 - Repetition

Sequential Structure

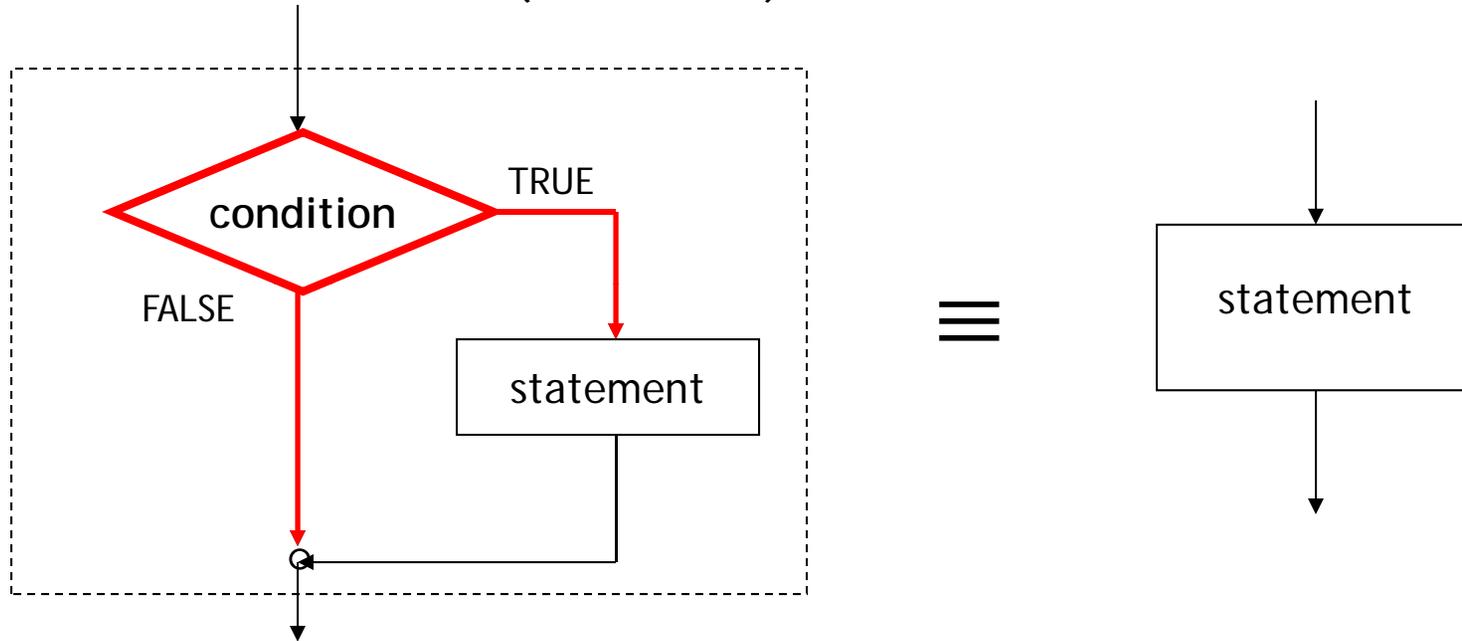
Multiple statements considered as one statement



Selection Structure

If

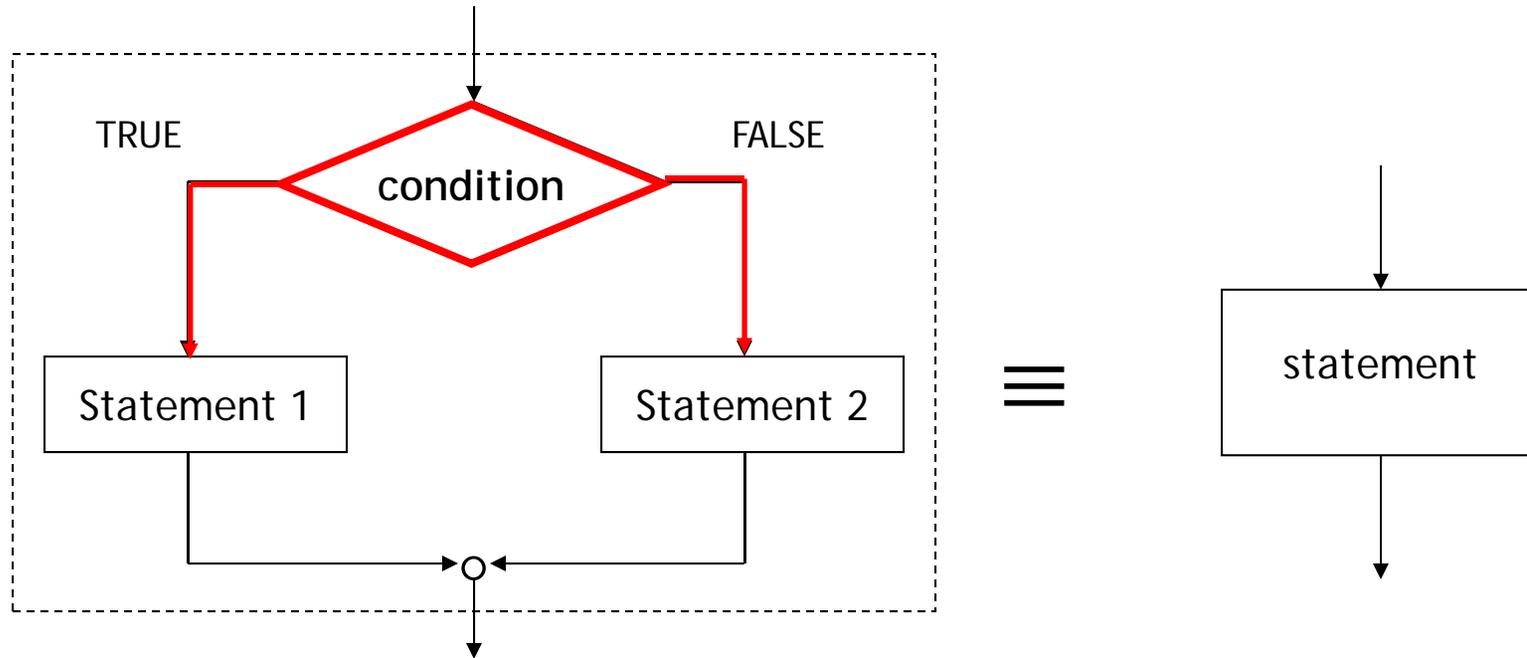
(one-choice)



If set condition is true, execute the statement, else do nothing

Selection Structure (*cont.*)

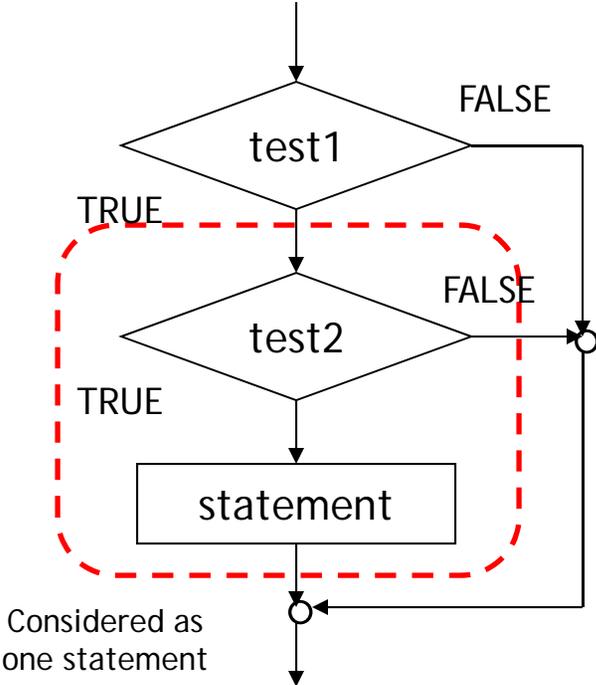
If-else
(two-choices)



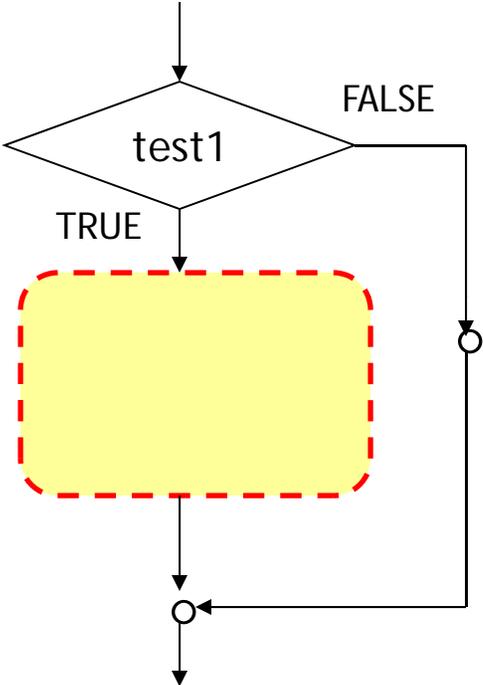
If set condition is true, execute the first statement, else execute second statement

Selection Structure (cont..)

Nested if
(if within if)



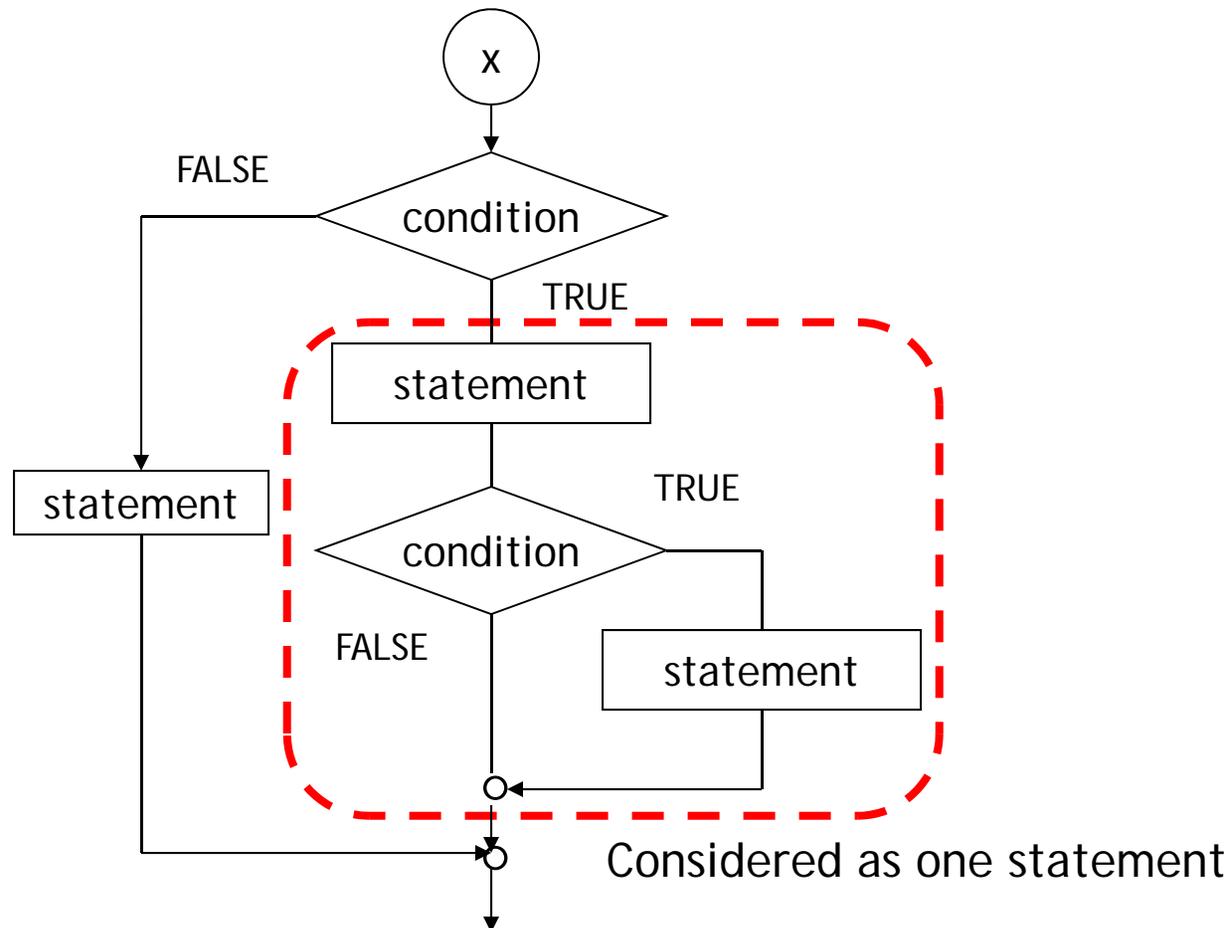
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it is an "one-choice" if

Selection Structure (*cont..*)

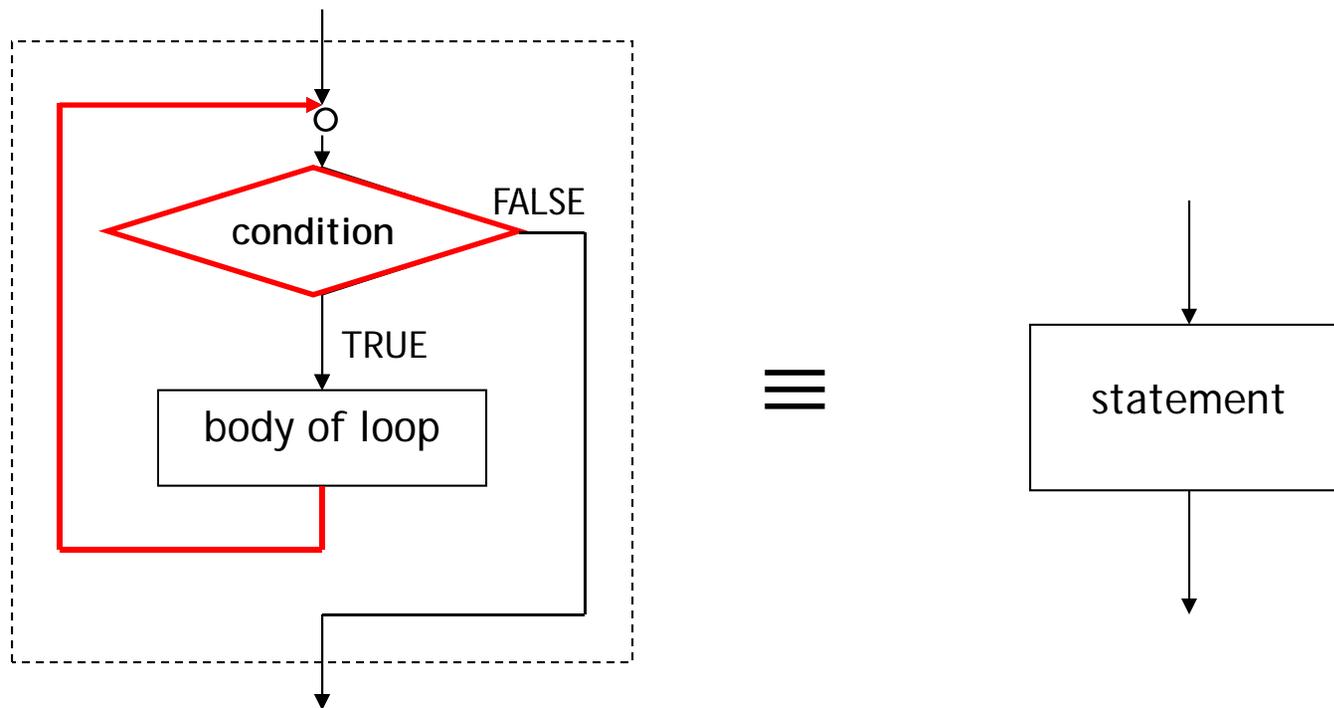
Complex if-else & if Statements



Repetition Structure

while Loop

It is a **pre-test loop**

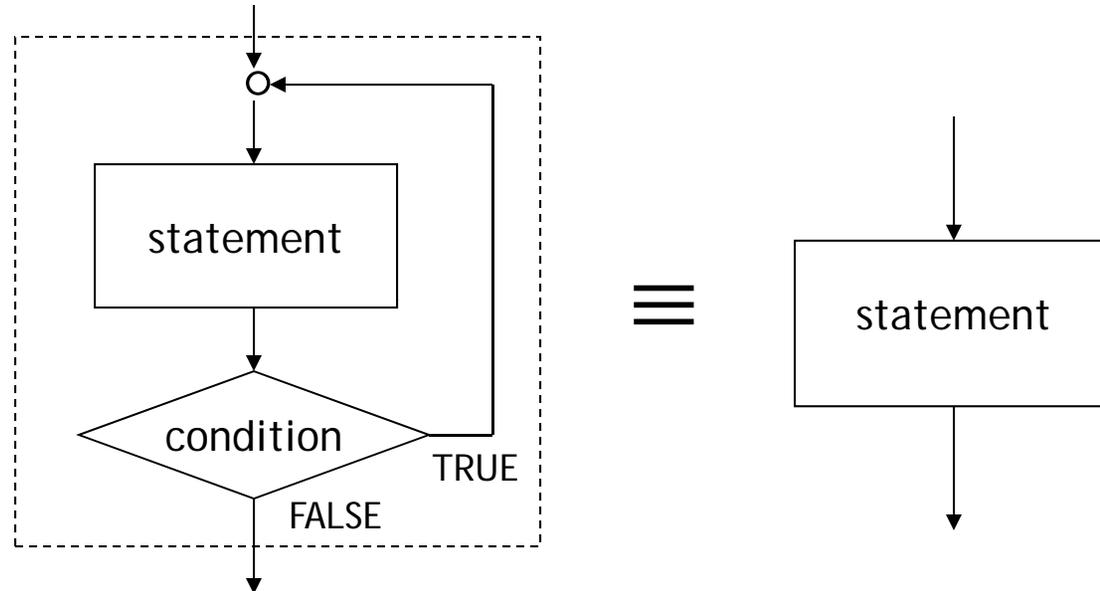


While a set condition is true, repeat statement (body of loop)

Repetition Structure (*cont...*)

do-while Loop

It is a **post-test loop**

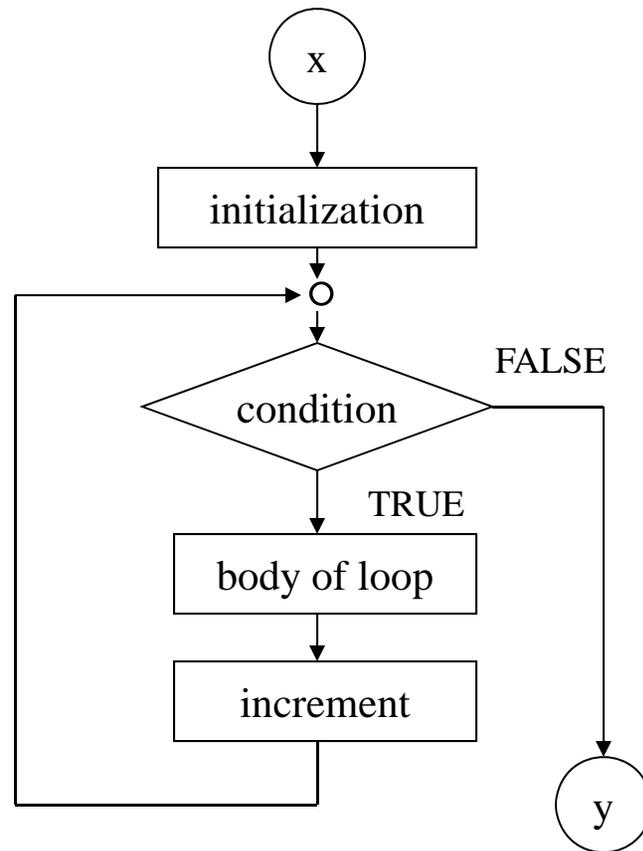


Do the statement (body of loop) while a condition is true

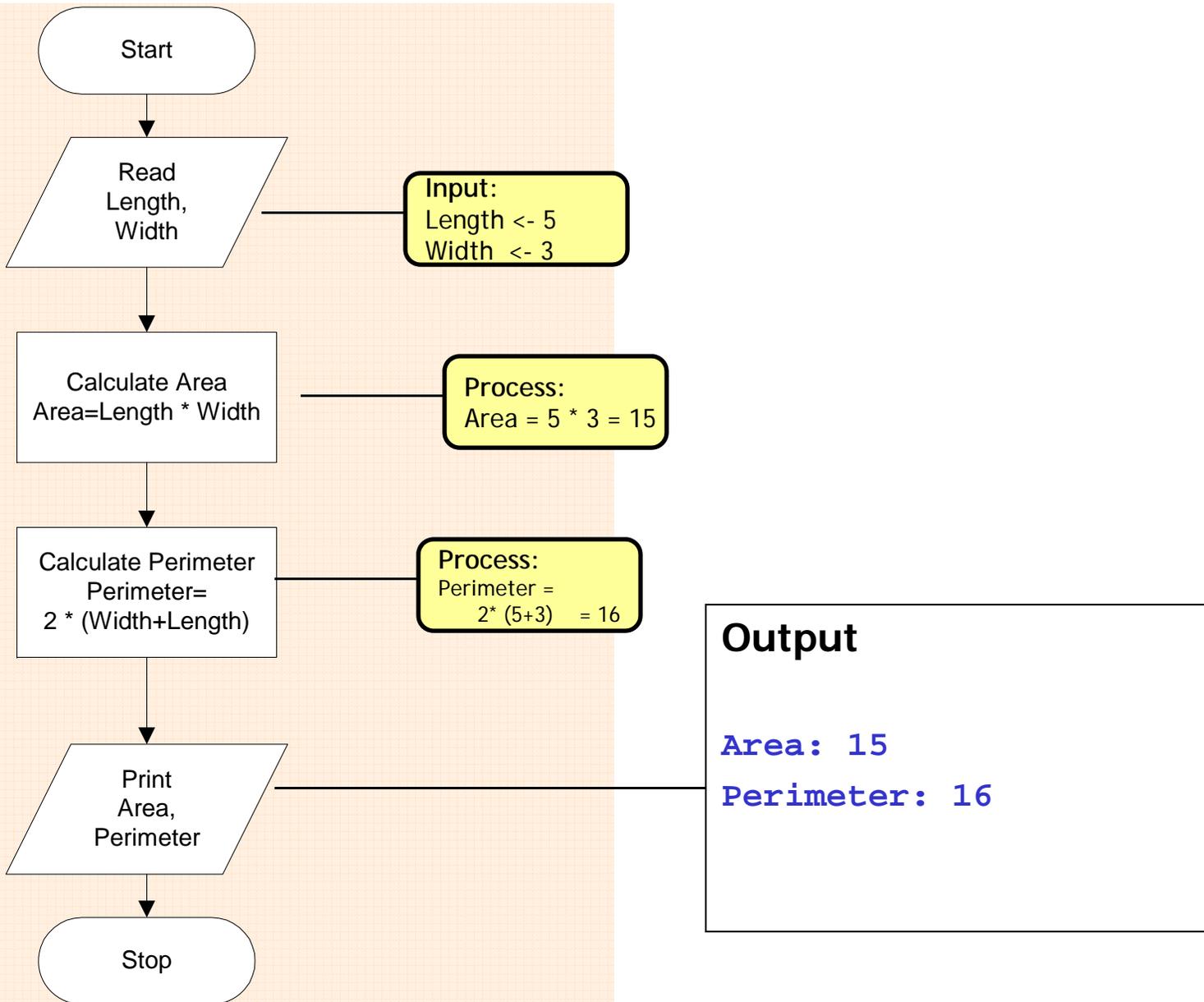
Repetition Control Structure (*cont...*)

for Loop

It is a pre-test loop

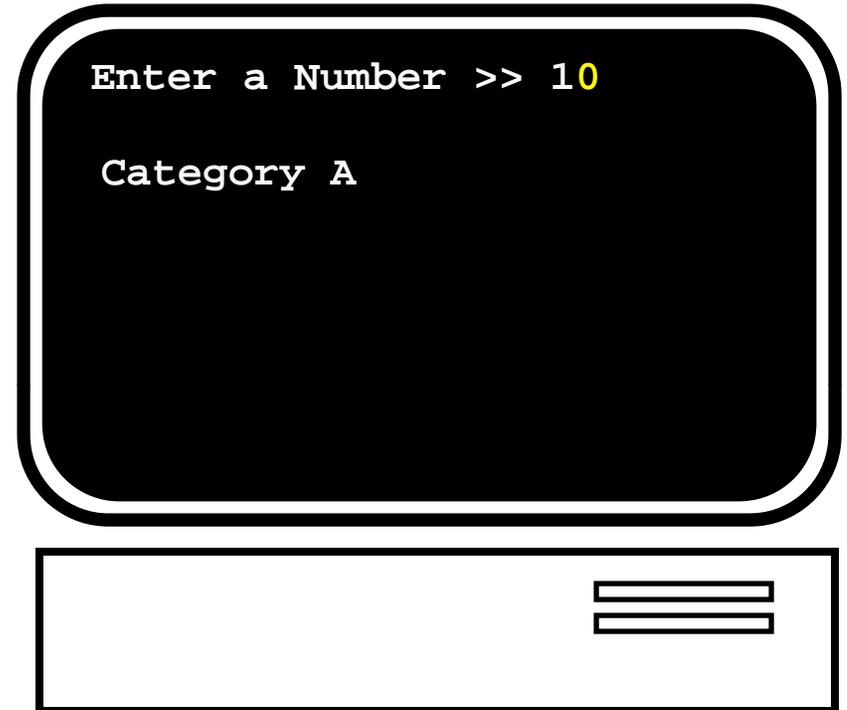
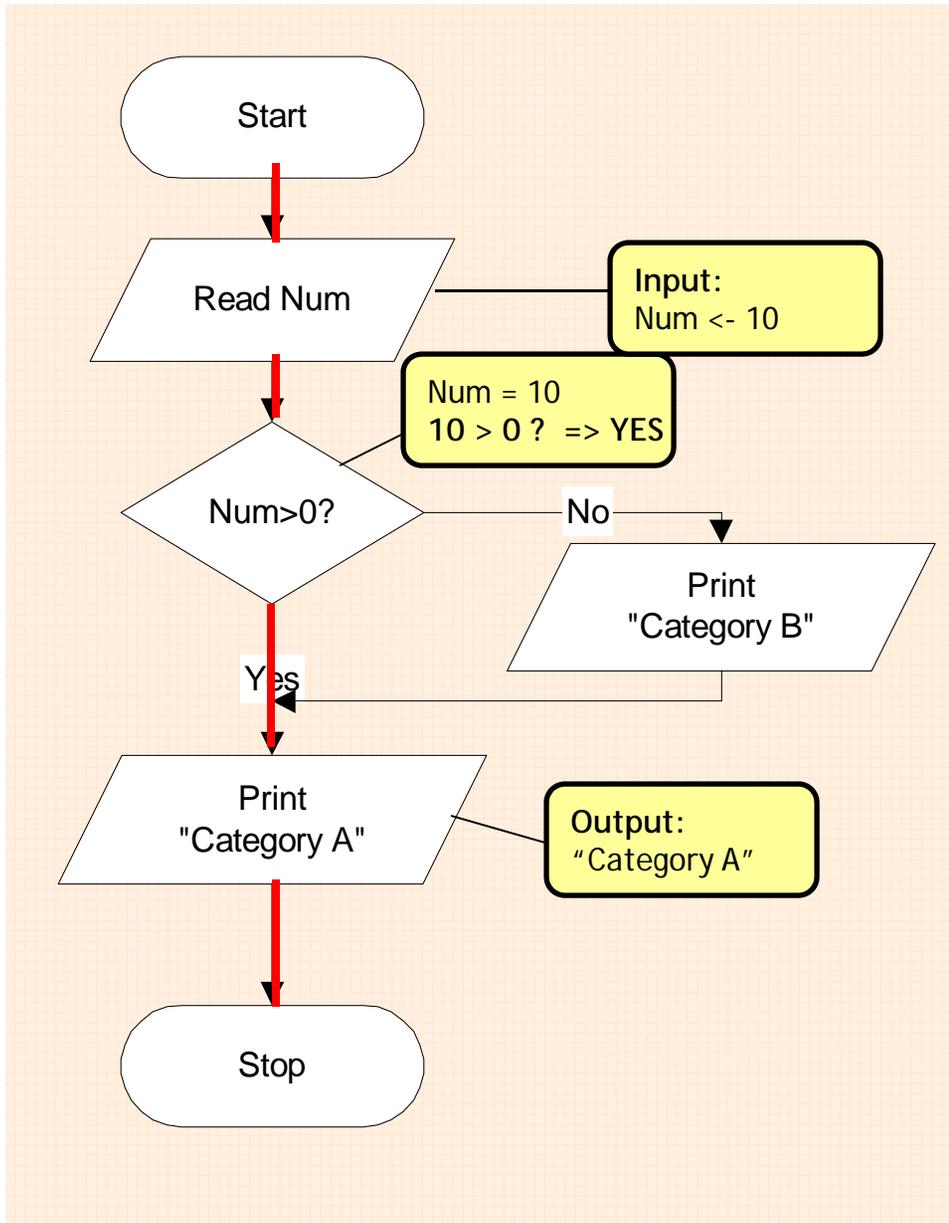


Example:



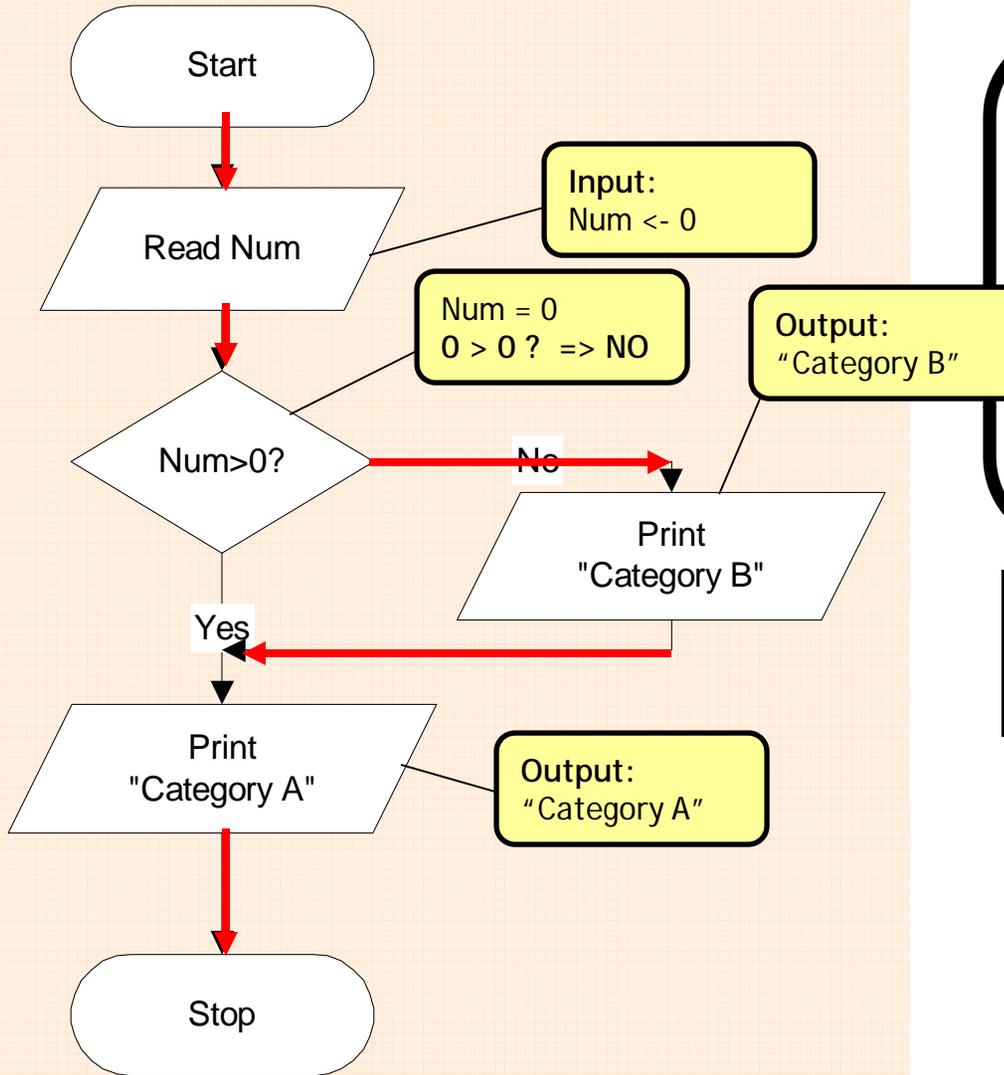
Example:

What is the output of the following flowchart when the input `Num= 10`



Example:

What is the output of the following flowchart when the input is Num= 0



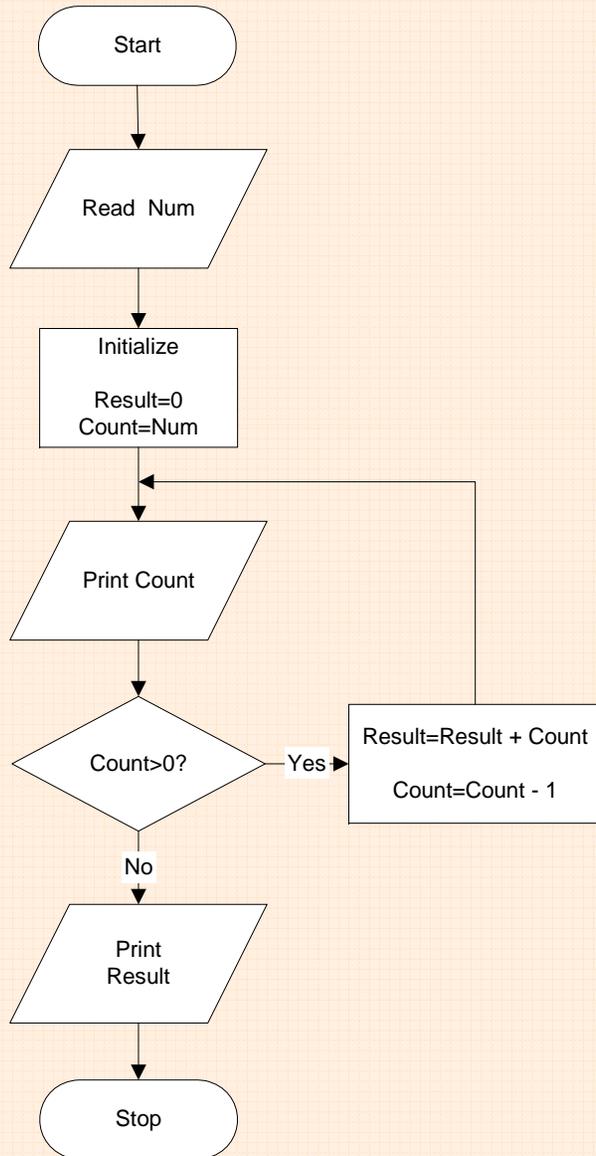
Enter a Number >> 0

Category B
Category A



Example:

What is the output of the following flowchart when the input `Num= 4`



Enter a Number => 4

Count: 4

Count: 3

Count: 2

Count: 1

Count: 0

Result: 10

Example:

What is the output of the following flowchart when the input $N = 6$

