LECTURE 03
PROGRAM DESIGN

Flowcharts - Repetition

Lecture Overview

- Re-cap on Flowcharts
- Repetition Structure
- While, do-While and For loop structures.
- Flowcharts for different Repetition structures

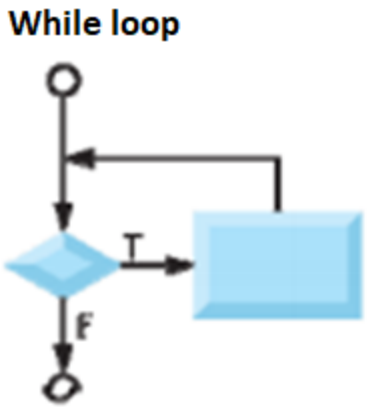
Repetition

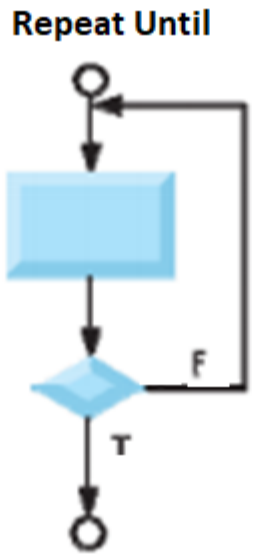
- Most practical algorithms require a group of operations to be carried out several times
- The repetition structure is a looping structure in which specified condition determines the number of times the group of operations will be carried out.
- The constructs for repetition are:
  - While loop
  - Repeat until
  - For loop

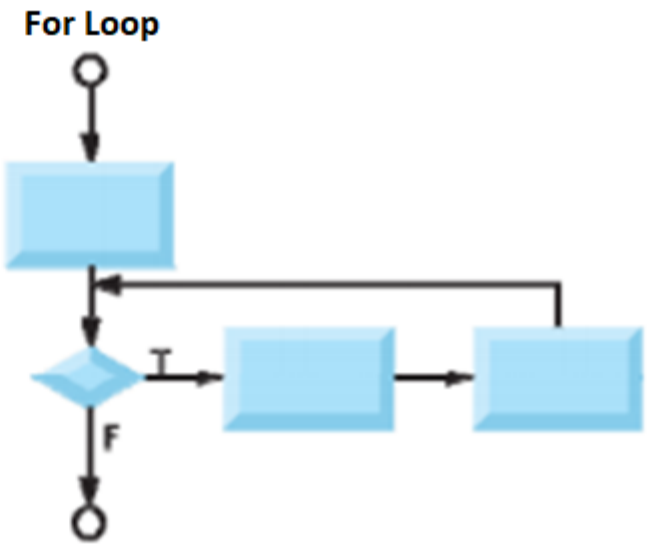
Repetition Structures

- Repetition Structures

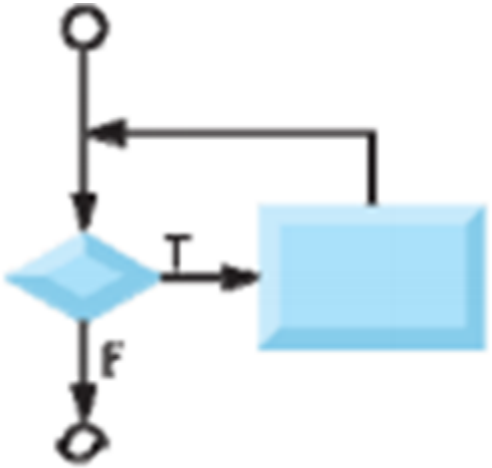
  The different repetition structures which exists are as follows.





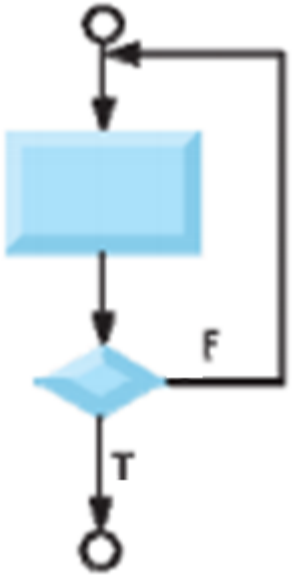


- While loop



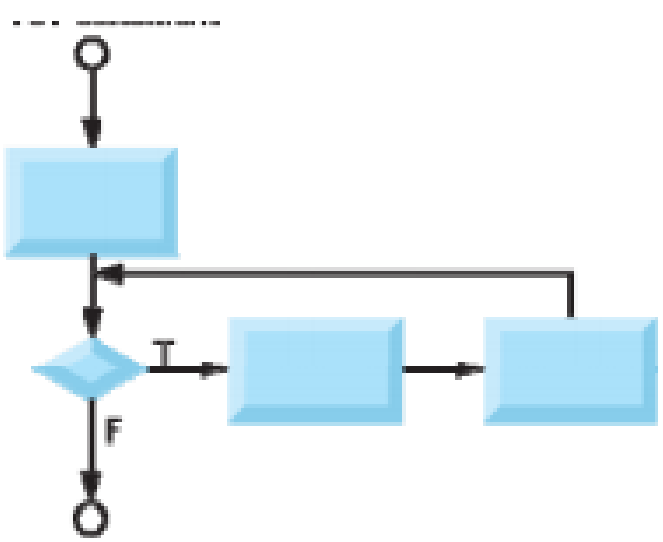
- The condition will be evaluated prior to executing the statements.

- Repeat Until loop



- The statements will be executed at least once before the condition is evaluated.

- For loop



- This is used to execute the statement a known number of times.

While loop is used to repeat a set of instructions a known number of times

- The number of times that the loop is carried out is normally a finite number of times.
- A counter variable has the purpose of storing the number of times the statement repeats (iterations)
- The counter variable must be:
  - ✓ Initilized to a given value
  - ✓ Should be incremented each time the loop executes

Example 1 – Temperature Conversion

Everyday, a weather station receives 15 temperatures expressed in degrees Fahrenheit.

A program is to be written that will accept each Fahrenheit temperature, convert it to Celsius and display the converted temperature to the screen.

After 15 temperatures have been processed output "All temperatures processed" message on the screen.

Accumulators

- An accumulator variable will store partial results of repeated modifications(additions/subtractions/multiplications/divisions) to it.

Example 2 – Employee Increments

A company is to give salary increases to its employees.

The salary increase is 4.5% of the salary, for those with a salary greater than $45,000; otherwise the salary increase is 5%.

The program should also calculate the number of employees with a salary greater than $45,000 and the total amount of salary increase.

Assume there are 500 employees in the company.

Looping until sentinel value is reached

- In certain programs it is expected to repeat a program block, until a “sentinel value” is read/input by the user.
- “Sentinel value” must clearly be distinguishable between the other data to be processed

Example 3 – Processing Age

Design an algorithm that will accept person's name, age in years and months (eg: 25 years 6 months) and to calculate and display the age in months.

If the calculated months figure is more than 500, three asterisks should also appear beside the month figure.

The program should end when the user inputs 9999 as the persons age in years.