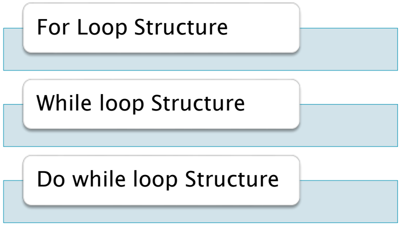
SWE 1301: Introduction to Problem Solving and Software Development

Lecture 16: While Loop Structures
Time: 2-4pm
Presented by M. I. Mukhtar

Recap: Types of Looping Structure


For Loop Structure

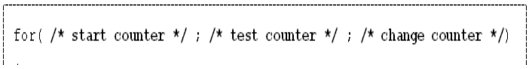
While loop Structure

Do while loop Structure

- This lecture will cover While Loop

Recap: For Loop Structure

- For loop is used if we wish to repeat a section of code a **fixed number of times**.
- The **for** loop is usually used in conjunction with a **counter** to keep track of how many times we have been through the loop so far.



```
for( /* start counter */ ; /* test counter */ ; /* change counter */)
```

- For loops are a **pre-test loop**, meaning they check their condition before execution.

The For loop Limitation

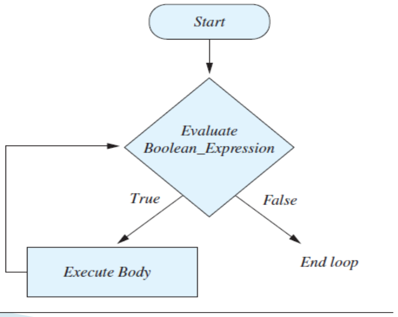
- The **for** loop is an often used construct to implement fixed repetitions.
- Sometimes, however, a repetition is required that is not fixed:
  - a password checking program that does not let a user into an application until he or she enters the right password.
  - a grading system that keep on computing grades until a user enters an invalid marks

While Loop

- The **while** loop offers one type of non-fixed iteration.
- Does not need a counter to keep track of the number of repetitions.
- While loops are a also pre-test loop, meaning they check their condition before execution.
- While loop is often used for input validation;
  - checking input data for errors.
- While loop body is sometimes never executed

While Loop Flowchart

```
while (Boolean_Expression)
    Body
```



While Loop Algorithm

```
While (loop condition)
    Body
```

- The while loop executes as follow:
  - Step 1: The loop expression/condition is evaluated. If it is TRUE, the loop body
  - Step 2: Repeat step (2) until the loop condition evaluates to FALSE.

Example 1

Create an algorithm and a flowchart for a password checking program that does not let a user into an application until he or she enters the right password. The program should display login successful when user enter the correct password.

Given that : right password is 1234

Example 1: Algorithm Solution

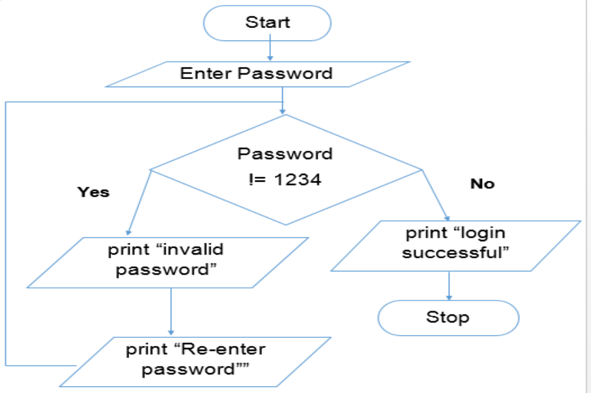
```
Step 1 : Enter Password

Step 2:
  While(password!=1234)
  print   "incorrect password"
  print "re-enter password"

Step 3 : print "login successful"

Step 4 : Stop
```

Example 1: Flowchart Solution



Start

Enter Password

Password != 1234

Yes

No

print "invalid password"

print "Re-enter password""

print "login successful"

Stop

Example 2

Write a program that asks the user to enter an exam mark and display pass if marks is greater than 40. Otherwise the program should display fail. However the mark entered should never be greater than 100 or less than 0.

Example 2: Algorithm Solution

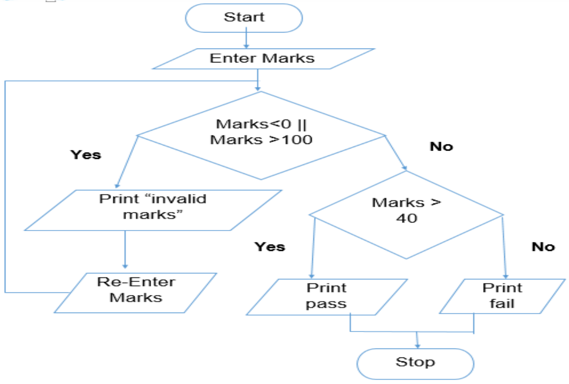
```
Step 1: Enter Marks

Step 2 : While ( Marks < 0 || Marks > 100)
              print " invalid mark"
               print "re-enter mark between 1-100"

Step 3 : if (marks > = 40) then:
             print "Pass"
           else
             print "fail"

Step 4: Stop
```

Example 2: Flowchart Solution



Example 3

- Write an algorithm and draw a flowchart to print the first five integers
- While loop can also be used for **fixed iteration**.

Example 3: Algorithm Solution

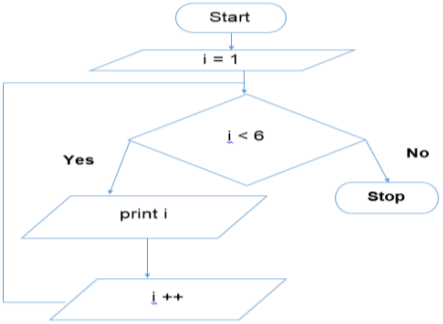
```
i= 1
While (i< 6)
    print i
    i++
```

Step 1: Assign i = 1
Step 2 : (i <6) Repeat steps 2,3,4
Step 3: print i
Step 4: Compute i = i +1
Step 5: End

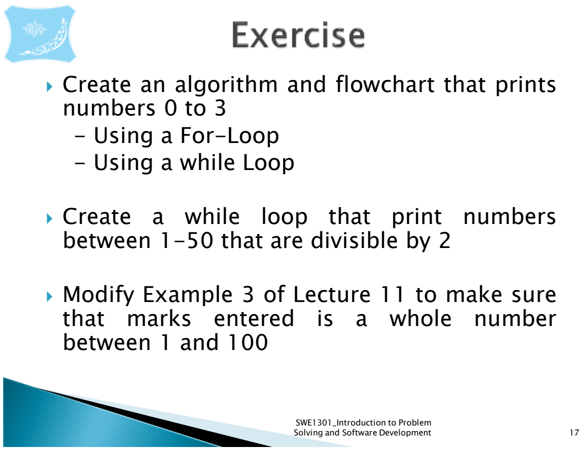
The output will be: 1 2 3 4 5

Same as that of For Loop

Example 3: Flowchart Solution

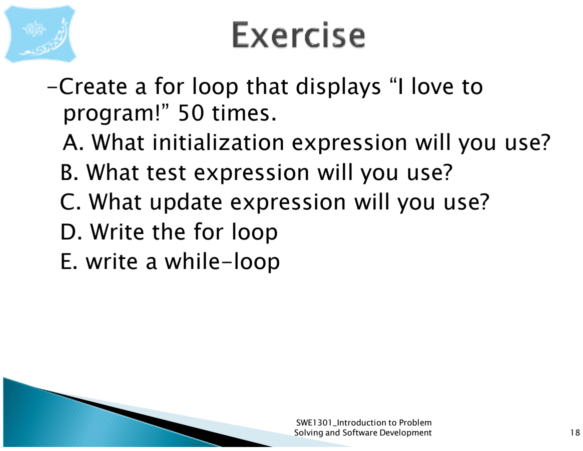


Same as that of For Loop



Exercise

- Create an algorithm and flowchart that prints numbers 0 to 3
  - Using a For-Loop
  - Using a while Loop
- Create a while loop that print numbers between 1-50 that are divisible by 2
- Modify Example 3 of Lecture 11 to make sure that marks entered is a whole number between 1 and 100



Exercise

-Create a for loop that displays “I love to program!” 50 times.

A. What initialization expression will you use?

B. What test expression will you use?

C. What update expression will you use?

D. Write the for loop

E. write a while-loop

Questions !!!