
Iteration:

For and While Loops

(and the increment statement)

Week 4

IST 256

Application Programming for Information Systems

Why do we need Loops?

- Loops allow us to repeat the instructions in a section of code many times
 - In order to compute some quantity that is defined by repetition
 - Examples: interest on a savings account, the factorial function
 - In order to apply the same computation to every item of data
 - Examples: a company wants to compute the salary for every employee in its database, ...
 - We'll do these types of loops after we have data structures, such as arrays, to hold the data
 - Loops introduce another type of instruction sequencing

Increment Statement

- A very common assignment statement is to add 1 to a variable, e.g. to count how many times a loop is executed:

```
int count = 0; ...  
count = count + 1; ...
```

- The increment statement uses an operation written as ++ to abbreviate adding 1 to a variable

Equivalent:

```
int count = 0; ...  
count ++;
```

- There is also an operator consisting of two minus signs that can be used to subtract 1 from a variable

```
count --;
```

Iteration – For Loop

- Sometimes we want to repeat an operation a number of times

Sum of: $1 + 2 + 3 + 4 + 5 + 6 + \dots + 100$

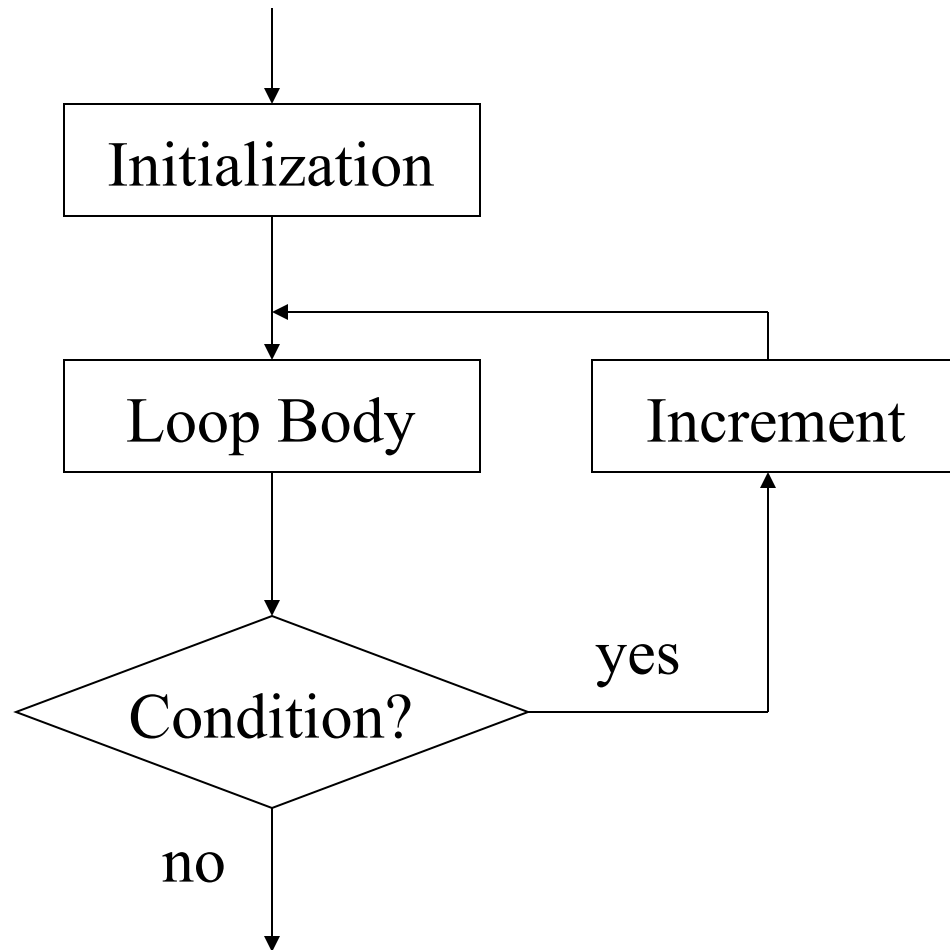
- Find a pattern of statements that can be repeated

$result = 0; result = result + 1; result = result + 2; \dots$

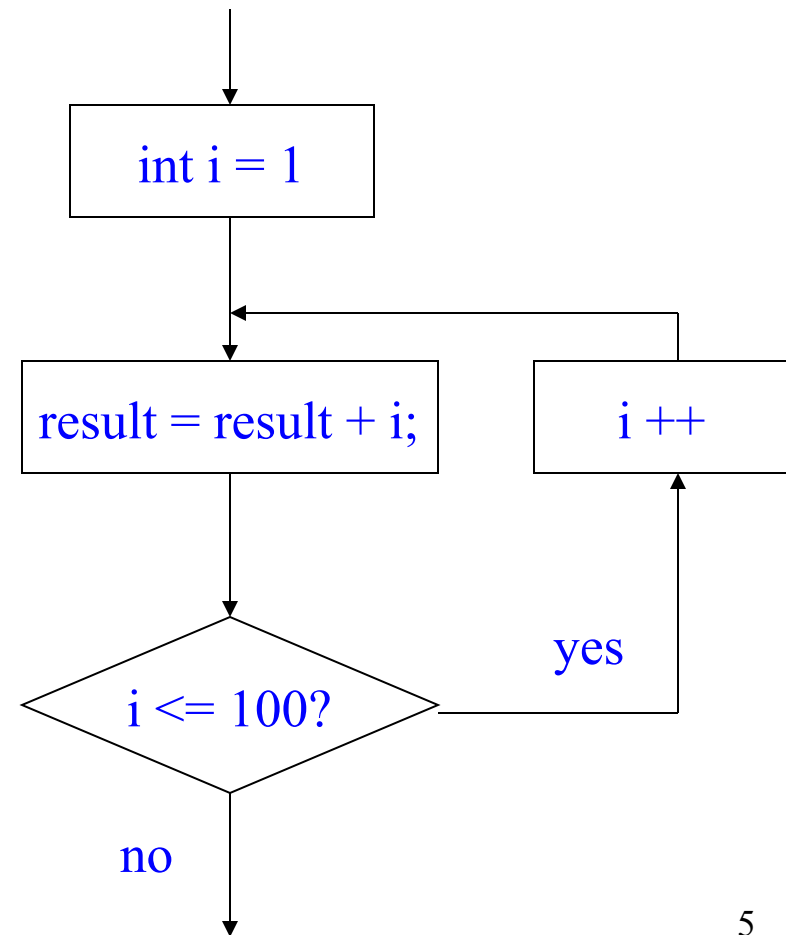
- Put these in a For loop

```
int result;  
result = 0;  
for (int i = 1; i <= 100; i++) {  
    result = result + i;  
}  
System.out.println("Sum is: " + result);
```

How the For Loop is computed



Example



Iteration – While Loop

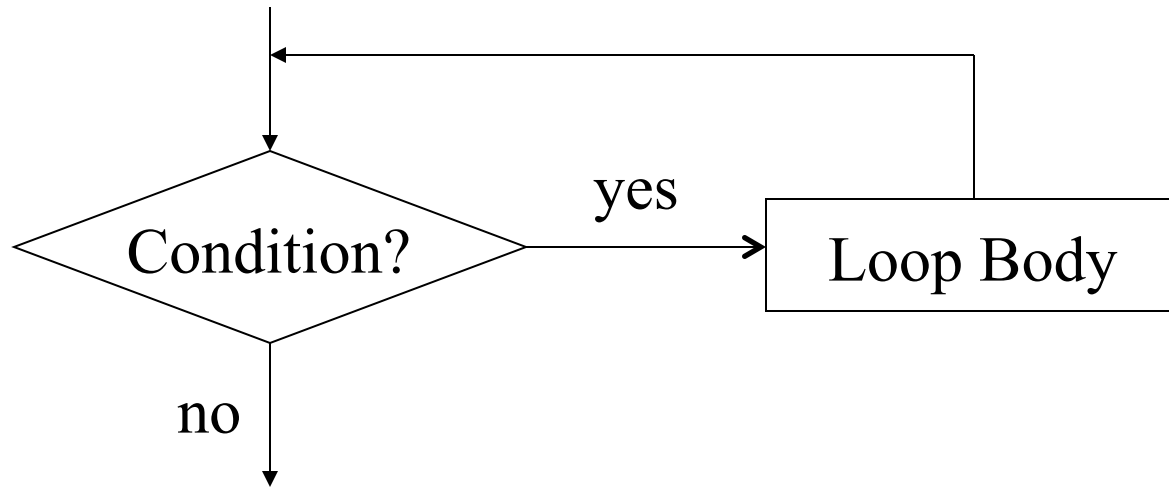
- But suppose that we don't know how many times to repeat the operation; we may want to achieve some goal:

Sum of: $1 + 2 + 3 + 4 + 5 + 6 + \dots \dots \dots ??$ How many times
to add up to 1000?

- The same pattern of statements can be repeated until we achieve a goal by using a While loop

```
int result = 0;
int count = 1;
while (result < 1000) {
    result = result + count;
    count = count + 1;
}
System.out.println("number of times: " + count);
```

How the While Loop is computed



Example

