Computer Science 227
Introduction to Programming

Iowa State University

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Loops—Repetitive Tasks

Suppose you are asked to find the sum of all numbers in a list. Here is what you would do:

- Initially, you haven’t seen any number. So \( \text{Sum} \) is zero.
- Is there a number to read? if So, then do the next two steps
  - Read the number from the list.
  - Add the number to the sum - Update the sum.
- You *repeat* these two steps till you reach end of the list.
Problem: Ask the user to enter a list of numbers. Find the sum of all the numbers that the user has entered. When the user enters a non-number, it indicates the end of the list.

Two variables: CurrentSum and CurrentNumber.

Set CurrentSum to zero.

Repeat the following task as long as there is a number to read

- Read the number into variable CurrentNumber
- CurrentSum = CurrentSum + CurrentNumber
The **while loop**

```
CurrentSum = 0;
//While Loop
while (stdin.hasNextDouble()) {
    //Body of the While Loop
    CurrentNumber = stdin.nextDouble();
    CurrentSum = CurrentSum + CurrentNumber;
}
System.out.println("Sum is " + CurrentSum);
```
Tracing the Loop

Initially CurrentSum = 0. Suppose the user enters 1. at this time.

Now the program enters the while loop. It checks if the boolean expression hasNextDouble() is true. Since user entered a valid number it is true. So the program executes the body of the while loop.

It read the number, and it makes currentNumber equals 1 and currentSum equal to 1. This the end of the body of the loop.

Now the program again checks the condition hasNextDouble(). Suppose user enters 20 at this time. This expression evaluates to true and so the body of the loop is performed.

This makes currentSum to 21

Now the program again checks the condition hasNextDouble(). Suppose the user enters 22.2. This is a valid number. So the body of the loop is performed.

This makes currentSum 43.2.

At this time the program goes back and checks if hasNextDouble() is true. Suppose the user enters done at this time. This not a number. So the condition hasNextDouble() is false.

Now the program does not execute the body of the while loop. This is the end of the while loop. The program executes the statement after the while loop.

So the program outputs The Sum is 43.2
While Loop

while (BooleanExpression) {
Stmt1;
Stmt2;
Stmt3;
...}

If the BooleanExpression is true, then execute all statements in the body of the loop. Check again if the TestExpression is true. If true, then again execute all statements in the body of the loop...
If the TestExpression is false, then exit the loop.
- Write a program that asks the user to enter two passwords and checks they are the same. The program repeatedly prompts the user until (s)he enter the same passwords.

- Write a program that gets a (positive) integer as input and tells if it is a prime number or not.
Practice Problems

- Write a program that takes a list of integers from the user and computes the sum of the integers. When the user enters zero, it indicates the end of the list.
- Ask the user to enter a positive integer. Output all positive even integers up to that number.
- Ask the user to enter a sentence. Replace all occurrences of “bad” with “good” and output the new sentence formed. Do not use “replace” method from the class String.
- Ask the user to enter a string and check if the string is a palindrome. A string is a palindrome if the reversal of the string is the same as the string itself. For example, “madam”, “abba” are palindromes.
- Compute the GCD of two integers.
- Ask the user to enter a positive integer, output all the positive prime numbers up to that integer.