GIFT School of Engineering and Applied Sciences

Spring 2019

CS-124: Introduction to Programming - Lab

Lab-9 Manual

Iterations

v 1.1
5/28/2019

Task #1: Writing a while loop

In this task, you are being asked to write a loop in Java.

Write a program that reads a set of **10** integers and then finds and prints the sum of the even and odd integers.

1. Create a program called **WhileLoops1Lab9.java.**
2. Use a Scanner object for the input.
3. Correctly display appropriate messages.

```
import java.util.Scanner;

public class WhileLoops1Lab9
{
   public static void main (String[] args)
   {
        final int LOOP = 10;

        Scanner input = new Scanner(System.in);
        int sumEven = 0;
        int sumOdd = 0;

        int i = 0;
        while (i < LOOP){
             System.out.print("Enter number " + (i + 1) + ": ");
             int number = input.nextInt();

             if (number % 2 == 0){
                  sumEven += number;
             }
             else{
                  sumOdd += number;
             }//if

             ++i;
        }//while

        System.out.println("Sum of even numbers: " + sumEven);
        System.out.println("Sum of odd numbers: " + sumOdd);

   }//main
}//class
```

Task #2: Writing a while loop

In this task, you are being asked to write a loop in Java.

Write a program that reads a set of **20** integers and then finds and prints the count of the even and odd integers.

1. Create a program called **WhileLoops2Lab9.java.**
2. Create appropriate variables and assign values using a **Scanner** object.
3. Correctly display appropriate messages.

```
import java.util.Scanner;

public class WhileLoops2Lab9
{
   public static void main (String[] args)
   {
        final int LOOP = 20;

        Scanner input = new Scanner(System.in);
        int countEven = 0;
        int countOdd = 0;

        int i = 0;
        while (i < LOOP){
             System.out.print("Enter number " + (i + 1) + ":
");
             int number = input.nextInt();

             if (number % 2 == 0){
                  ++countEven;
             }
             else{
                  ++countOdd;
             }//if

             ++i;
        }//while

        System.out.println("Even numbers: " + countEven);
        System.out.println("Odd numbers: " + countOdd);

   }//main
}//class
```

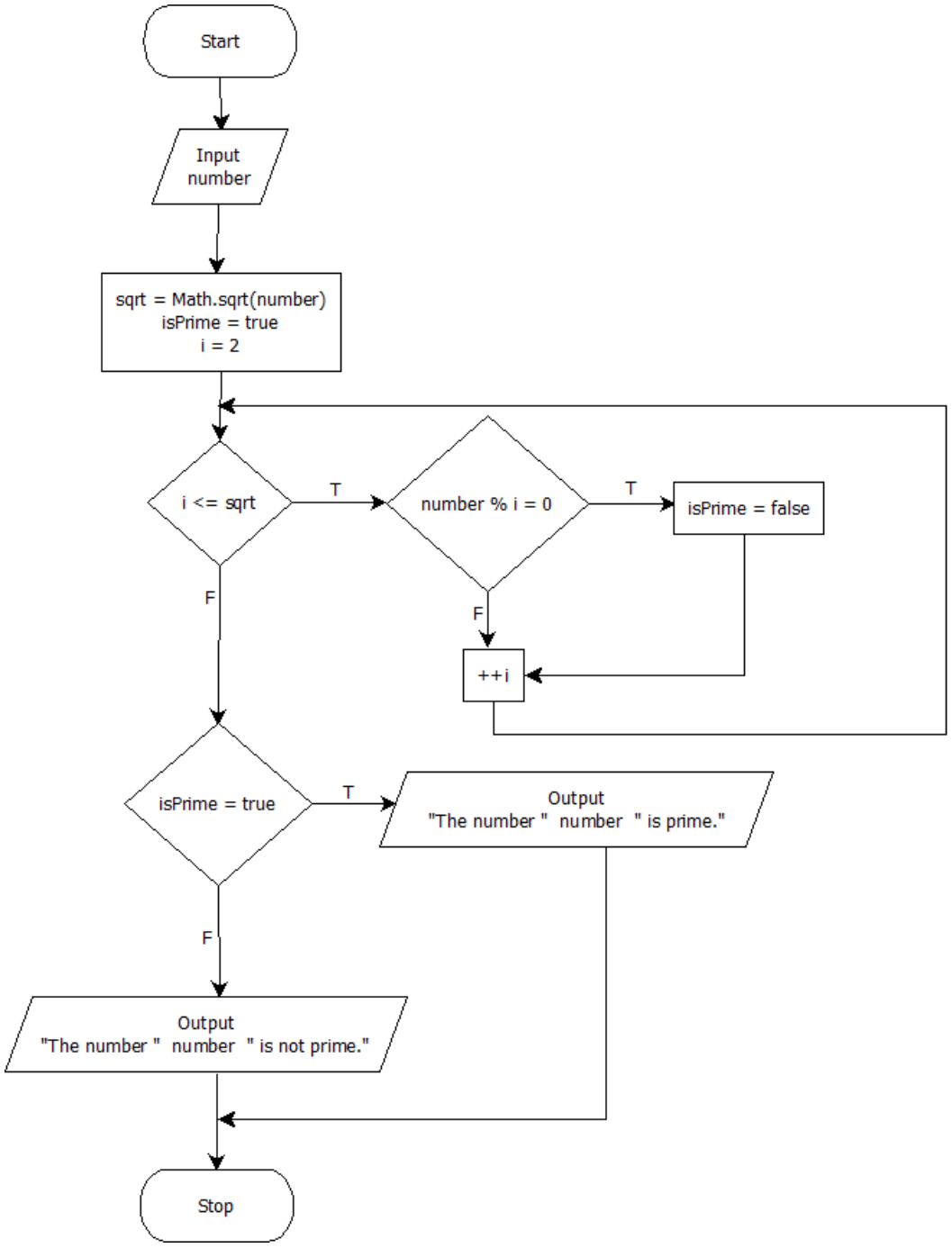
Task #3: Drawing a flowchart and writing a while loop

In this task, you are being asked to draw a flowchart and then write a loop in Java.

Draw a flowchart and write a program that prompts the user to input a positive integer. It should then output a message indicating whether the number is a prime number.

Note: An even number is prime if it is 2. An odd integer is prime if it is not divisible by any odd integer less than or equal to the square root of the number.

1. Create a program called **PrimeNumber1Lab9.java**
2. Create appropriate variables and assign values using a **Scanner** object.
3. Correctly display appropriate messages.


Start
Input number
sqrt = Math.sqrt(number)
isPrime = true
i = 2
i <= sqrt
T
number % i = 0
T
isPrime = false
F
F
++i
isPrime = true
T
Output "The number " number " is prime."
F
Output "The number " number " is not prime."
Stop

```
import java.util.Scanner;

public class PrimeNumber1Lab9
{
   public static void main (String[] args)
   {
        Scanner input = new Scanner(System.in);

        System.out.print("Enter a number: ");
        int number = input.nextInt();
        int sqrt = (int)Math.sqrt(number);
        boolean isPrime = true;

        int i = 2;
        while (i <= sqrt){
             if (number % i == 0){
                  isPrime = false;
             }//if
             ++i;
        }//while

        if (isPrime){
             System.out.println("The number " + number + " is
prime.");
        }
        else{
             System.out.println("The number " + number + " is
not prime.");
        }//if

   }//main
} //class
```

Task #4: Drawing a flowchart and writing a while loop

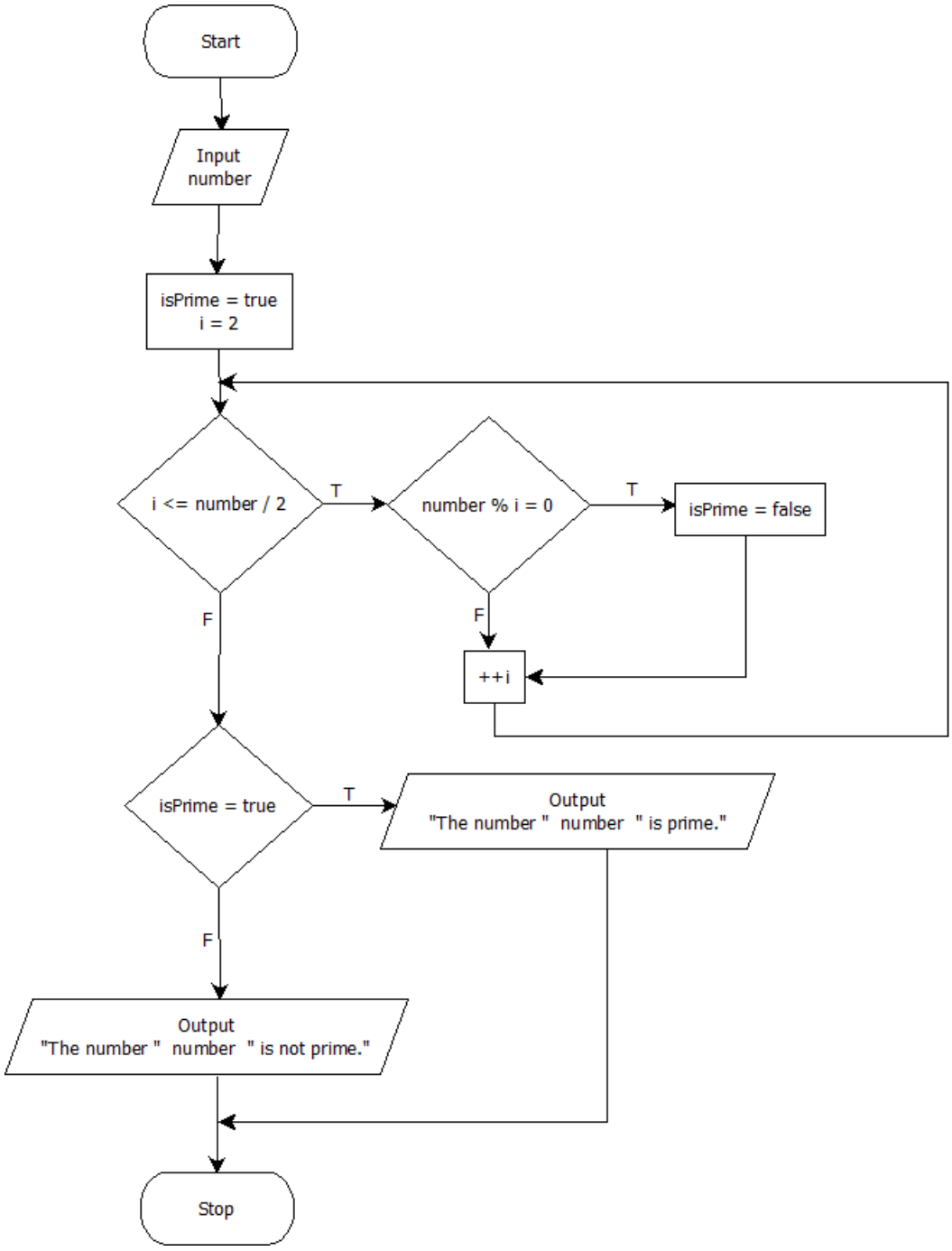
In this task, you are being asked to draw a flowchart and then write a loop in Java.

Draw a flowchart and write a program that prompts the user to input a positive integer. It should then output a message indicating whether the number is a prime number.

Note: Any integer is prime if it is not divisible by any other number, starting from **2,** and less than or equal to half of that number.

HINTS: The minimum divisor (factor) you should consider is **2.** The largest factor of any number would be half of that number.

1. Create a program called **PrimeNumber2Lab9.java**
2. Create appropriate variables and assign values using a **Scanner** object.
3. Correctly display appropriate messages.


Start
Input number
isPrime = true
i = 2
i <= number / 2
T
number % i = 0
T
isPrime = false
F
F
++i
isPrime = true
T
Output "The number " number " is prime."
F
Output "The number " number " is not prime."
Stop

```
import java.util.Scanner;

public class PrimeNumber2Lab9
{
   public static void main (String[] args)
   {
        Scanner input = new Scanner(System.in);

        System.out.print("Enter a number: ");
        int number = input.nextInt();
        boolean isPrime = true;

        int i = 2;
        while (i <= number / 2){
             if (number % i == 0){
                  isPrime = false;
             }//if
             ++i;
        }//while

        if (isPrime){
             System.out.println("The number " + number + " is
prime.");
        }
        else{
             System.out.println("The number " + number + " is
not prime.");
        }//if

   }//main
}//class
```

Task #5: Writing a while loop

In this task, you are being asked to write a loop in Java.

Write a program that uses while loops to perform the following steps:

a) Prompt the user to input two integers: firstNum and secondNum (firstNum must be less than secondNum).

b) Output all odd numbers between firstNum and secondNum.

c) Output the sum of all even numbers between firstNum and secondNum.

d) Output the numbers and their squares between firstNum and secondNum.

e) Output the sum of the square of the odd numbers between firstNum and secondNum.

1. Create a program called **WhileLoops3Lab9.java.** All loops will be written in this file.
2. Create appropriate variables and assign values using a **Scanner** object.
3. Correctly display appropriate messages.

```
import java.util.Scanner;

public class WhileLoops3Lab9
{
   public static void main (String[] args)
   {
        Scanner input = new Scanner(System.in);

        System.out.print("Enter first number: ");
        int firstNum = input.nextInt();
        System.out.print("Enter second number: ");
        int secondNum = input.nextInt();

        if (firstNum < secondNum){
             System.out.println("\nAll odd numbers between " +
firstNum + " and " + secondNum);

             //We will copy the value of firstNum to i,
because we need it for second while loop
             int i = firstNum;

             /*
```

```
            As we have to count only odd numbers between
firstNum and secondNum
            So we will jump by 2 in every iteration instead
of 1
            This will eliminate the need of if condition in
every iteration
            But, first we have to make sure that the firstNum
is odd, if it is not
            We will increment it by one to make it odd.
            */
            if (i % 2 == 0){
                  ++i;
               }//if
            while (i <= secondNum){
               System.out.println(i);
               i += 2;
            }//while

            int sumEven = 0;
            int sumOddSquare = 0;
            i = firstNum;
            System.out.println("\nAll numbers and their
squares between " + firstNum + " and " + secondNum);
            System.out.println("Number\t\tSquare");
            while (i <= secondNum){
               int square = (int)Math.pow(i,2);
               System.out.println(i + "\t\t" + square);
               if (i % 2 == 0){
                  sumEven += i;
               }
               else{
                  sumOddSquare += square;
               }//if
               ++i;
            }//while

            System.out.println("\nSum of all even numbers
between " + firstNum + " and " + secondNum + ": " + sumEven);
            System.out.println("Sum of the square of all odd
numbers between " + firstNum + " and " + secondNum + ": " +
sumOddSquare);
```

```
            }
            else{
                System.out.println("The first number should be
   less than second number.");
            }//if

      }//main
}//class
```

Task #6: Writing a while loop

In this task, you are being asked to write a loop in Java.

Write a program that uses **while** loops to perform the following steps:

a) Output all uppercase letters.
b) Output all lowercase letters.
c) Output all uppercase letters between **J** and **S**
d) Output all lowercase letters starting from **a** and skipping two letters
   For example, **a, d, g, …**
e) All uppercase letters from **Z** to **K**, by decrementing loop

HINTS: To print characters, see the below code:

```
char c = 'A';
System.out.println(c);          //prints A

++c;
System.out.println(c);          //prints B
```

1. Create a program called **CharactersLab9.java.** All loops will be written in this file.
2. Correctly display appropriate messages.

```
public class CharactersLab9
{
   public static void main (String[] args)
   {

        System.out.println("All uppercase letters.");
        char c = 'A';
        while (c <= 'Z'){
             System.out.print(c + " ");
             ++c;
        }//while

        System.out.println("\n\nAll lowercase letters.");
        c = 'a';
        while (c <= 'z'){
             System.out.print(c + " ");
```

```
            ++c;
        }//while

        System.out.println("\n\nAll uppercase letters between
J and S.");
        c = 'J';
        while (c <= 'S'){
            System.out.print(c + " ");
            ++c;
        }//while

        System.out.println("\n\nAll lowercase letters starting
from a and skipping two letters.");
        c = 'a';
        while (c <= 'z'){
            System.out.print(c + " ");
            c += 3;
        }//while

        System.out.println("\n\nAll uppercase letters from Z
to K.");
        c = 'Z';
        while (c >= 'K'){
            System.out.print(c + " ");
            --c;
        }//while

   }//main

   }//class
```

Task #7: Writing a while loop

In this task, you are being asked to write a loop in Java.

Write a program that prints a Celsius/Fahrenheit conversion table, starting from **0** to **100,** such as the following.

```
Celsius | Fahrenheit
--------+-----------
      0 | 32
     10 | 50
     20 | 68
     . . . . . .
    100 | 212
```

HINTS: Use the following formula to convert the Celsius to Fahrenheit:

$$T_{(°F)} = T_{(°C)} \times 9/5 + 32$$

1. Create a program called **CelsiusToFahrenheirLab9.java.**
2. Correctly display appropriate messages.

```
public class CelsiusToFahrenheirLab9
{
   public static void main (String[] args)
   {

        System.out.println("Celsius | Fahrenheit\n--------+---
--------");
        int tc  = 0;
        while (tc <= 100){
             System.out.println(tc + "\t\t" + (tc * 9 / 5 +
32));
             tc += 10;
        }//while

   }//main
}//class
```

Task #8: Writing a while loop

In this task, you are being asked to write a loop in Java.

Write a program that takes inputs a **base** and an **exponent** from the user and prints the power for that number. Both base and exponent must be greater than or equal to zero. You must also handle the case when the exponent is zero (see sample below).

Note: You cannot use any built-in library function from **Math** class.

Sample Output:

```
Enter Base: 2
Enter Exponent: 5
2 ^ 5 = 32

Enter Base: 3
Enter Exponent: 0
3 ^ 0 = 1
```

1. Create a program called **ExponentLab9.java.**
2. Correctly display appropriate messages.

```
import java.util.Scanner;

public class Exponents

{

     public static void main(String[] args)

     {

          Scanner input = new Scanner(System.in);

          System.out.print("Enter Base: ");

          int base = input.nextInt();

          System.out.print("Enter Power: ");

          int exponent = input.nextInt();
```

```
            if(base >= 0 && exponent >= 0)
            {
                  int power = 1, i = exponent;
                  while(i > 0)
                  {
                        power *= base;
                        --i;
                  }//while
                  System.out.println(base + " ^ " + exponent + " =
" + power);
            }//if


      }//main
}//class
```