Praktikum: Grundlagen der Programmierung

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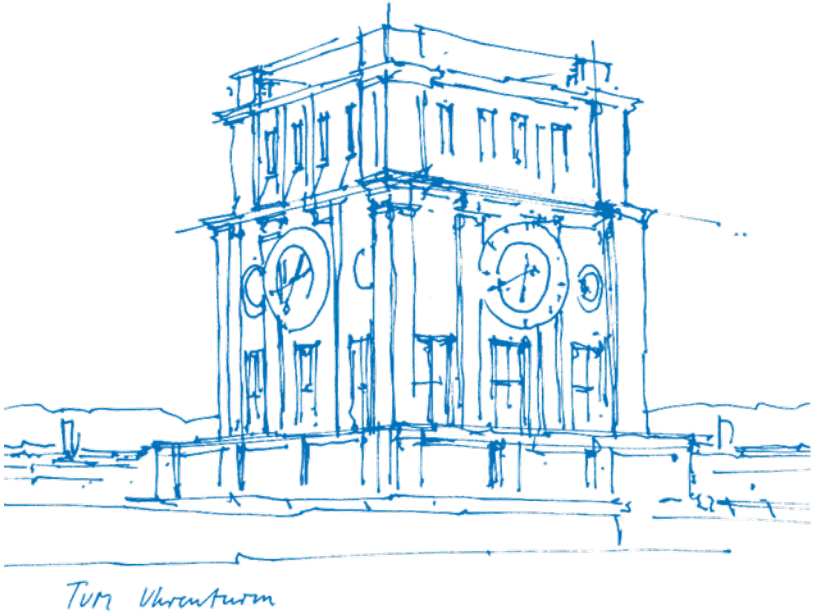
2. Tutorübung



Overview

Lecture Review

Control Statements in Java

1. Decision Making
   - if...then
   - if...then...else
   - if...then...else if...then...
   - Switch
   - Ternary operation A ? B : C
2. Looping Statements
   - While Loop
   - Do-While Loop
   - For Loop
   - Foreach Loop
3. Branching Statements
   - Break
   - Countinue
   - Return

P01: Summieren

In this task, a program is to be created which calculates the sum of several integers entered by the user. Ask the user to enter a number with "*Bitte Zahl eingeben :*" **until 0 is entered**.

As soon as the number 0 is entered, print "*Summe :*", print the sum of the numbers entered by the user in another line and **terminated** the program.

Example Output:

```
<Bitte Zahl eingeben:
>-3
<Bitte Zahl eingeben:
>31
<Bitte Zahl eingeben:
>0
<Summe:
<28
```

Flow Diagram

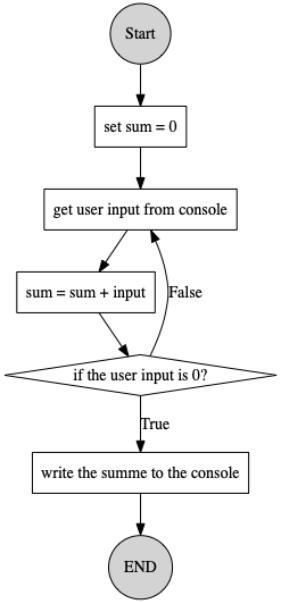


Figure: v1

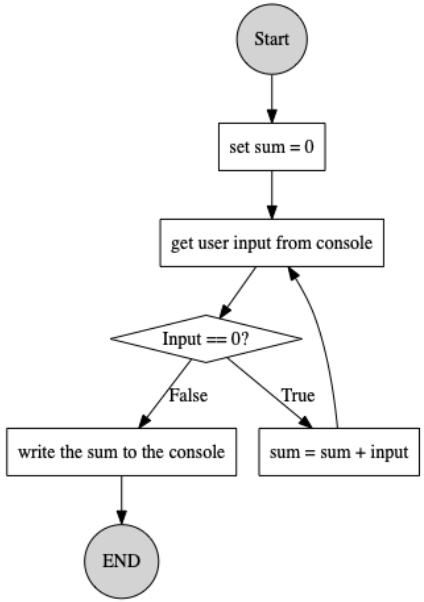


Figure: v2

Code -1

```
int sum = 0;

while (true){
  int input;
  input = MiniJava.readInt("Bitte Zahl eingeben:");
  sum += input;
  if (input == 0)
    break;
}
MiniJava.write("Summe:\n" + sum);
```

Code -2

```
int sum = 0;

    int input = 0;
    input = MiniJava.readInt("Bitte Zahl eingeben:");

    while (input != 0){
      sum += input;
      input = MiniJava.readInt("Bitte Zahl eingeben:");
    }

    MiniJava.write("Summe:\n" + sum);
```

P02: Integer factorization

Any natural number $n > 1$ is either a prime itself or can be represented as a product of prime numbers. To calculate the prime factorization of a number n, divide it by all natural numbers starting from 2. If a divisor t is found, then output t. If the quotient $\frac{n}{t} > 1$, then it is also decomposed into its prime factors.

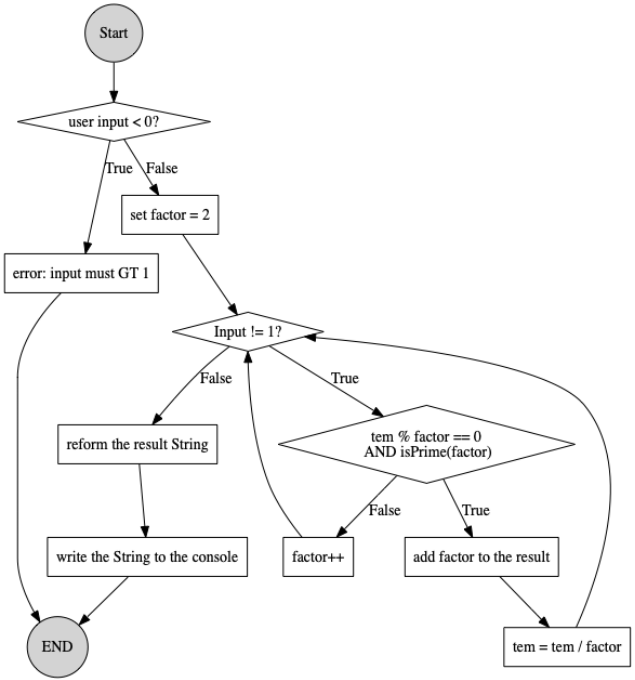
Write a MiniJava program that says *"Bitte Zahl eingeben:"* and reads a natural number $n > 1$ from the user and breaks it up into prime terms. Your program should output all prime factors of the number n separated by spaces on the screen. If the input number entered is $n \leq 1$, then print *"Fehler: $n > 1$ erwartet!"*.

Tip: You can use the *writeConsole*() method to print something on the console without extra line break. By using method *writeLineConsole*() you can print a line with the line feed.

Example Output:

```
1 Bitte Zahl eingeben:
2 >12321342
3 2 3 3 3 11 20743
```

Flow Diagram



Code

```java
public static boolean isPrime(int num){
    for (int i = 2; i < num; i++){
      if (num % i == 0)
        return false;
    }
    return true;
  }

  public static void factorisation(int num){
    if (num < 1)
      MiniJava.write("Fehler: n>1 erwartet!");
    int factor = 2;
    int tem = num;
    ArrayList<Integer> results = new ArrayList<>();
    while (tem != 1){
      if (tem % factor == 0 && isPrime(factor)){
        results.add(factor);
        tem = tem / factor;
      } else
        factor++;
    }
    String str = results.stream().map(Object::toString).collect(Collectors.joining(" "));
    MiniJava.write(str);
  }
```

P03: Population of Rabbit

We put a pair of mature rabbits on a desert island to find out how many rabbits will born within a year. It is assumed that every mature couple will give birth to a new pair of rabbits each month. Each rabbit pair is sexually mature for the first month of life and each rabbit has **a lifetime of** 3 **months**.

Write a MiniJava program that reads in the number n, which is the n^{th} month. Your program should print out the sum of the rabbit pairs, which are mature in the n^{th} month. You can assume that $n \geq 1$.

Example Output:

```
<Bitte Zahl eingeben:
>3
<4
```

Code

```
public static void main(String[] args){
        int n = readInt("Geben Sie n ein:");

        int[] rabbits = new int[3];
        rabbits[0] = 1;

        int month = 1;

        while(month < n){
            int sum = 0;
            int i=0;
            while(i<3){
                sum += rabbits[i];
                i++;
            }

            rabbits[2] = rabbits[1];
            rabbits[1] = rabbits[0];
            rabbits[0] = sum;
            month++;
        }
        write(rabbits[0]+rabbits[1]+rabbits[2]);
    }
```

P04: 3 and 7

Write a program that prints *"Bitte Zahl eingeben:"*" and then read in a number *n*. Then it calculate the sum of all positive numbers less than or equal to n, and are divisible by 3 or 7. Then print the result to console. If the user enters a negative number,*"Fehler: n > 1 erwartet!"* and exit the program.

If the user types e.g. If the number is 25, so we add 3, 6, 7, 9, 12, 14, 15, 18, 21, *and*24 and it gives us 129.

Example Output:

```
1 Bitte Zahl eingeben:
2 >91
3 1822
4
5 Bitte Zahl eingeben:
6 >16
7 1822
```

Code

```java
public static void main(String[] args) {
    int input = MiniJava.readInt();
    int sum = 0;

    for (int i = 0; i < input; i++) {
      if (i % 3 == 0 || i % 7 == 0)
        sum += i;
    }
    MiniJava.write(sum);
  }
```

Thank You!