Tutorial For I/O and control statement1

> Based on the tutorial of "2020S-Java-A" designed by teaching group in SUSTech
>
> Modified (mainly change to markdown file) by ZHU Yueming in 2021. Jan. 11th
>
> Improved by ZHU Yueming in 2023 Sep. 11th: add OJ format exercise

Objectives

1. Practice using input and output statement through Scanner.
2. Practice I/O question by Online Judge format
3. Practice storing values with primitive types
4. Practice while loop

1 Input and Output

Example 1:

Write and test the following source code to see how Scanner class works:

```
import java.util.Scanner;

public class Sum {
    public static void main(String[] args) {
        System.out.println("Welcome to CS109!");

        Scanner input = new Scanner(System.in);

        int number1, number2, sum;

        System.out.print("Enter the first integer: ");
        number1 = input.nextInt();
        System.out.print("Enter the second integer: ");
        number2 = input.nextInt();

        sum = number1 + number2;
        System.out.printf("Sum is %d\n", sum);
    }
}
```

`Scanner input = new Scanner(System.in);` : Create a object named input, through which we can read data from command line and convert the type to int, double or others by the method `nextInt()` , `nextDouble()` etc.

`import java.util.Scanner;` : The class `Scanner` is not in the package `java.lang`, so that we cannot use it directly. If we want to use Scanner, we should import it from `java.util.Scanner;`

Example 2:

Write a program that prompts the user to enter his information, and exercise `printf` statement

`printf` statement contains two parts:

1. a format String that would be print. example: `"%d + %d = %d"`
2. a list of parameters: `1, 1, 2`

```
System.out.printf("%d + %d = %d", 1, 1, 2);
```

output:

```
1 + 1 = 2
```

The first part would contains `%d, %f, %c, %s`, which can be replaced by following parameters in the second part.

data type or class	simple
byte, short, int, long	%d
float, double	%f
char	%c
String	%s

```
import java.util.Scanner;

public class Information {
    public static void main(String[] args) {
        String name;
        int age;
        float weight;
        char grade;

        // Creating object of Scanner class
        Scanner input = new Scanner(System.in);

        System.out.print("Enter your name: ");
```

```
        name = input.next();
        System.out.print("Enter your age: ");

        age = input.nextInt();
        System.out.print("Enter your weight in KG: ");
        weight = input.nextFloat();
        System.out.print("Enter your highest grade in last semester: ");
        grade = input.next().charAt(0);

        System.out.printf("You are %s.\nYou are %d years old.\n", name, age);
        System.out.printf("You weigh %.1f KG.\nThe highest grade you got is
%c\n", weight, grade);
    }
}
```

The output looks like this:

```
Enter your name: Jack
Enter your age: 20
Enter your weight in KG: 60.5
Enter your highest grade in last semester: A
You are Jack.
You are 20 years old.
You weigh 60.5 KG.
The highest grade you got is A
```

What happens if you enter 21.5 to the age? Try it out. We will talk about exception handling later in this course.

Exercise 1:

Write a program that prompts the user to enter the height and width of a rectangle then prints the area and perimeter of the rectangle. The area and perimeter should be printed to the nearest two decimal place. The output looks like this:

```
Enter the width of a rectangle: 1.7
Enter the height of a rectangle: 2.4
The area is 4.08
The perimeter is 8.20
```

Exercise 2:

Write a time converter that prompts the user to enter the number of seconds then prints the equivalent time in hours, minutes and seconds. The output looks like this:

```
Enter the number of seconds: 7402
The equivalent time is 2 hours 3 minutes and 22 seconds.
```

2 Control Statement

Exercise 1: if else

Write an application which can convert the grades on 100-point scale into GPA according to the following table.

Grade	gpa
100~90	4.0
89~80	3.0
79~70	2.0
69~60	1.0
59~0	0

Sample output:

```
Please input your grade:
91
Your gpa is 4.0
```

Exercise 2: while loop

Create a class called `GuessingNumber`. In the main method, you should generate a random integer `magicNum` between 0 and 9, then keep asking the user to input an integer between 0 and 9 until the input number is equal to the attribute `magicNum`. When the input number is greater than the attribute `magicNum`, the method should output “Too big!Please try again:”.When the input number is less than the attribute `magicNum`, the method should output “Too small!Please try again:”. Then the method waits for the user to input a new integer. When the input number is equal to the attribute `magicNum`, the method should output “Congratulations!” and terminate.

Sample output 1:

```
Please input an Integer in {0,1,2,...,9}:
8
Too big!Please try again:
2
Too small!Please try again:
5
Congratulations!
```

Sample output 2:

```
Please input an Integer in {0,1,2,...,9}:
5
Too big!Please try again:
2
Too big!Please try again:
1
Congratulations!
```

Sample code:

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

   Random random = new Random();
   int magicNum = random.nextInt(10);
   int inputNum;
   Scanner sc = new Scanner(System.in);

   System.out.println("Please input an Integer in {0,1,2,...,9}:");
   inputNum = sc.nextInt();

   while(_____________){// to finish it
      if (_____________)// to finish it
        System.out.println("Too big!Please try again:");
      else
        System.out.println("Too small!Please try again:");
      _____________ //to finish it
   }

   System.out.println("Congratulations!");
   sc.close();
}
```

Example 1: OJ format question

> Question 1 from assignment 1 in 2022 Fall

The following question is the format of the OJ question. Read the question and sample code carefully to understand that input and output are two separate and different streams.

Input

The first line of input contains a single integer **T** ($0 < \mathbf{T} < 100$) as the number of **test cases (测试样例)**.

Then **T** lines follows. Each line contains a single integer $\mathbf{M_i}$, represents a month. You are required to print "yes" (without quote) if this month contains 31 days, otherwise print "no" (without quote).

Input sample

```
6
5
1
1
2
3
12
```

Output

Print one line for each test case, "yes" if the corresponding month has 31 days and "no" otherwise.

Output Sample

```
yes
yes
yes
no
yes
yes
```

Hint

The **6** in the first line indicates that there are 6 test cases in the input. Then follows 6 lines represents 6 months. The first month is May represented by 5. Since May has 31 days, you should print "yes".

Sample code

```
import java.util.Scanner;

public class Main {

    public static void main( String[] args ) {
        Scanner input = new Scanner(System.in)
            int T = input.nextInt();
            while( T-- > 0 ) {
                int month = input.nextInt();
                if( ( month<8 && month%2==1) || (month>7 && month%2==0) )
                    System.out.println("yes");
                else
                    System.out.println("no");
            }
    }
}
```

Exercise 3: OJ format Question

> Modified from assignment 1 in 2021 Fall

You are given N integers. The ith integer is denoted as c_i.

The problem is whether the sum of the all N integers is greater than or equal to M. If that's true, you should print the amount that the sum exceeds M (the sum minus M). Otherwise, you should print a minus sign, followed by the amount that the sum is less than M (M minus the sum).

The process above would do T times.

Input: The first line contains three integers N, T, M, where N is the number of integers, T is the times of process, and M is just a integer. The second line contains N integers. The i_{th} integer is c_i.

Output: Has T rows, each row only contains one integer, which means the difference between the sum of c_i and M. If the sum of ci is less than M , then add a minus sign in the front.

Sample Input 1:

```
5 2 10
5 4 3 2 1
2 2 2 2 2
```

Sample Output 1:

```
5
0
```

Sample Input 2:

```
10 3 30
2 2 2 2 2 2 2 2 2 2
1 2 3 4 5 0 0 0 0 0
3 3 3 3 3 4 4 4 4 4
```

Sample Output 2:

```
-10
-15
5
```

hints: In the first sample, (5+4+3+2+1) is 15, 15 is great than 10, so print 15-10=5. In the second line of the first sample, (2+2+2+2+2) is 10, 10 = 10, so print 0

In the first line of the second example 2+2+2+2+2+2+2+2+2+2=20, since 20 is less than 30, we shoulbe print a minus sign, followed by 30-20=10.