Instituto Superior de Engenharia de Coimbra

Advanced Programming (2019/20)

Exercises

Writing on the screen

Examples:

```
System.out.println ( "= x" + x);
System.err.println ( "Index" + i + "out of bounds");
```

Reading from the keyboard

Create an object of the Scanner class as follows:

```
Sc = new Scanner Scanner (System.in);
```

A scanner allows you to read sequences of characters separated by delimiters.

```
int n = sc.nextInt (); // Read an int
sc.nextDouble double x = (); // Read a double
```

By default, the delimiters are blank spaces, tabs and newlines.

You can set up other delimiter:

```
sc.useDelimiter ( "-");
```

You can test the type of the next value to read:

```
if (sc.hasNextDouble()) // Check if the next value is a double
 x = sc.nextDouble();
```

arrays of primitive types

Unidimensional:

```
int [] a = new int [10];
```

accessing the elements of the array (a.length - number of array elements):

```
for (int i = 0; i < a.length; i++) {
      // a[i] ...
}
```

Bidimensional

All lines have the same number of elements:

```
double [] [] b = new double [3] [4];
```

Lines with different number of elements:

```
int [] [] b = new int [3] [];
b [0] = new int [3];
b [1] = new int [4];
b [2] = new int [2];
```

```
b.length - number of rows of the array b
b [i] .length - number of elements in row i
```

Accessing the elements of a two-dimensional array:

```
for (int i = 0; i <b.length; i ++)
      for (int j = 0; j <b [i] .length; j ++) {
                  // b [i] [j] ...
      }
```

Random numbers

The class `Math` (package `java.lang`) has static mathematical functions.

`Math.random()` returns a `double` random value, greater than or equal to 0.0 and less than 1.0.

The expression

```
(int) (Math.random() * 49) + 1
```

generates a random integer number between 1 and 49.

Exercises

1. Write an application that generates a random integer between 0 and 100 and that leads the user to guess the number generated.

2. Write an application that asks the user to think of a number between 1 and 100. Through various questions to the user, the application must guess the number.

3. Write a console application that creates an array of integers (asking the user the size of the array and the values of its elements), print the array elements, calculate and print the largest element of that array.

4. Define a class that contains, as a member of an array of 20 int values. These values are random integers between 0 and 100. The array must not contain duplicate values. Use a boolean function to check whether a value exists in the array.

The class must have functions to list:

20 array values

the number of values that were generated in duplicate.

5. Define a class that represents a bet on the lottery. A bet is defined by six integers between 1 and 49, all different. The class should offer the following functionality:

- Fill in one bet number at a time for the construction of the bet.
- Check if the bet is completed.
- Automatically fill a full bet.
- Compare the current bet with a winning bet.

6. Write an application to add rectangular arrays.

7. Define a class that contains, as a member of an array of mxn elements. This class must have functions to change the array elements, calculate the sum of each row and the sum of all its elements and print all the information.

Example:

Matrix:

					Sum:
1	0	2	-1	3	5
4	3	2	1	0	10
1	-2	3	4	5	11
8	5	1	3	2	19

Total: 45

8. Write an application that calculate and print Pascal's triangle.