ITTalents Training Camp Season 5

Test 1

Introduction to programming

Name:_____

Points on theory: _____ of 100 %

Points on practice tasks: _____ of 100 %

Time available to complete the test: 3 hours.

Minimum passing score: 50% on theory and 50% on practice tasks.

Theory

1: (25%) What is the difference between primitive data types and reference data types in Java? Describe the main differences concerning memory storage and common operations with variables of both types. Describe all primitive data types you know.

2: (25%) What are methods in Java? What are they used for and how are they defined? Give examples. What is scope of variables? How are primitives and reference data types passed to a method as arguments?

3: (25%) What is Recursion? Describe it with examples. Describe the differences between an infinite loop and an infinite recursion.

4: (25%) What is the definition of an algorithm? Why do we use algorithms? What is algorithm complexity? Describe the most common complexities you know. Describe how Counting sort works. What is the complexity of Counting sort? When can we use Counting sort?

Practice tasks

1: (25%) Write a program that asks you to roll two dice and checks the sum of their values. The program asks you to throw the dice until you achieve seven consecutive sums of value '7'. After that the program must tell you how many total tries you have done to achieve this result.

2: (25%) Write a method that takes a String variable that holds some text. The method must return the ratio between all upper case letters and all lower case letters in the text. For example if there are 75 lower case letters and 25 upper case letters, the ratio is 3:1.

3: (25%) Write a method that takes a sorted array of numbers and retrieves the number of negative elements in the array. Try to achieve this with the lowest possible complexity.

4: (25%) Write a method that fills the matrix of the game “Minesweeper” with the proper values in each cell. The method takes a matrix of pixels N*N that is filled with character “*” on random coordinates. The method must fill all cells of the matrix with numbers corresponding to the number of mines that exist right next to each cell. Write a program that creates the array, prompts the user to input the coordinates of 10 different mines, inserts them in the array (put the symbol '*' in the cell that has a mine), then uses the method to fill the array with the proper numbers and then prints the array in the console in a readable and understandable way.

Example:

1	1	1				1	1	1	
1	*	1				2	*	2	
1	1	2	2	2	1	2	*	2	
		1	*	*	1	2	*	2	
		1	2	3	2	3	2	2	
			1	2	*	2	*	1	
			1	*	3	3	1	1	
			1	2	*	1			
				1	1	1			