

Problem 1 - Simple Application of variables, methods, selection and repetition (4p +4 p +4 p +4 p +4 p)

The documentation for the methods you will use in the task is at the bottom of the page.

a) the sum of $1 + 2 + 3 + 4 + \dots + N$ can be calculated by the formula $n(n + 1) / 2$. Write a program in which the user enters an integer value. Thereafter, the program calculate and print the sum of all numbers up to the entered value.

b) Write a program that reads a year from the user. The program will examine whether the entered year is a leap year, and then print an appropriate message.

Lead! It is a leap year if it is evenly divideable by 4 but not by 100, except the years that are divisible by 400, they are also a leap year.

c) Write a program that provides the following output. Use two nested for-loops.

```
java
java java
java java java
java java java java
java java java java java
```

d) Write a program that acts as a "one-number-lotto. Users enter a number in the range 1-100. Thereafter, the program random integer in the range 1-100 until the user integer found. The program should print how many rounds have been required randomly to receive the required match.

e) Write a program that reads a full name the user (first and last name). The program is based on the scanned name to produce and print 2 different proposals on the e-mail addresses. The first address must contain the full first name and last name separated by `_`. The other address takes the first 3 letters of first name and the first 3 of the last name and add the two figures, the first number will be length of the first name and the second number of occurrences of the letter "s" in the name (both capital and lower case s to be counted).

Use

"@hh.se" as host name.

Example! When I run the program and enter
Stina Karlsson do I print:

```
Stina_Karlsson@hh.se
StiKar53@hh.se
```

Use one / some of the following methods from class String

`int length ()`

Returns the length of this string.

`int indexOf (String str)`

Returns the index within this string of the first occurrence of the specified substring.

`String substring (int begin index, int endIndex)`

Returns a new string that is a substring of this string.

Random numbers using a random object. Constructed from the class and method nextInt Random () to use for that the random number is defined as below:

Random ()

Create a new random number generator.

Int nextInt (int n)

Returns a pseudorandom, uniformly distributed int value between 0 (inclusive) and the specified value (exclusive), drawn from this random number generator's sequence.

Task 2 - Using the classes, Array (4p +4 p +2 p +2 p)

a) Class Point describes a point in a two-dimensional coordinate system. Consider the class.

```
public class Point
```

```
{  
    private int x; // instance variables  
    private int y;
```

```
public Point (int ix, int iy) // constructors
```

```
{  
    x = ix;  
    y = iy;  
}
```

```
public int getX ()
```

```
{  
    return x;  
}
```

```
public int getY ()
```

```
{  
    return y;  
}
```

```
}
```

a) Implement a class named the Mathematics with the method

```
public static double distance (Point p1, Point p2) {.... }.
```

As you can see the method takes as arguments two objects of class Point, and should return the distance between these two points.

The distance between two points on a coordinate calculated by the formula:

$$d = \sqrt{(x_1-x_2)^2 + (y_1-y_2)^2}.$$

Use the pow () and sqrt () of class Math, see the documentation below.

static double pow (double a, double b)

Returns of value of the first argument raised to the power of the second argument.

static double sqrt (double a)

Returns the correctly rounded positive square root of a double value.

b) Use the class Point and method distance () in a program that does the following:

- Create two points ie. Point objects, values of x and y of the Point objects are randomly generated.
- The program should then print out the distance between the two points.

c) What values will the array a contain after the following code fragment has executed?

```
int n = 10;
int [] a = new int [n];
a [0] = 1;
a [1] = 1;
for (int i = 2; i <n; i++)
    a [i] = a [i-1] + a [i-2];
```

d) The following programs had the purpose to create a copy of an array, then modify all elements in the copy to the corresponding negative value (by multiplying the elements by -1). Something was not correct; explain what I have done wrong (Note: no syntax errors) and how I must modify the code to eliminate the problem.

```
class Uppgift3a {
public static void main (String [] arg)
{
    int [] numbers = {3,4,6,8,5,2,9};
    int [] copy;
    copy = numbers;
    for (int i = 0; i <copy.length; i++)
        copy [i] = (-1) * copy [i];
    }
}
```

Task 3 - Classes and Arrays (3p +8 p)

a) The following class describes a EXAMINEE ie, a person to write a exams.

```
class EXAMINEE
{
    private String name;
    private int time; // how much time students studying for
                    // exams (h)
```

```
Public EXAMINEE (String inamn, int time)
{
    name = inamn;
    this.time = time;
}
```

```
public String getNamn ()
{
    return name;
}
```

/** Method to return true if nedlagdtid (the time the student has studied) is more than 40 hours, otherwise the method return false */

```
public boolean ambitious ()
{
    // Your code here
}

}
```

b) Class Exam below describes an exam and consists of an array of EXAMINEE objects. The class is not fully implemented, it is your task to implement the methods listStudents() and numberOfSleepers()

```
class Exam
{
    private EXAMINEE [] students;
    private int pos = 0;

    public Exam () {
        students = new EXAMINEE [50];
    }
```

```
public void addTentand (String name, int time)
{
    students [pos] = new EXAMINEE (name, time);
    pos ++;
}
```

/** Method to print the names of students who have studied more than 40 hours */

```
public void listStudents()
{
    // Your code here
}
```

/** method to calculate and return the number of students who have studied less than 40 hours */

```
public int numberOfSleepers()
{
    // Your code here
}

}
```