CS569 - Special Topics in Computer Science

Assignment 1

Group members :

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I. Printing strings
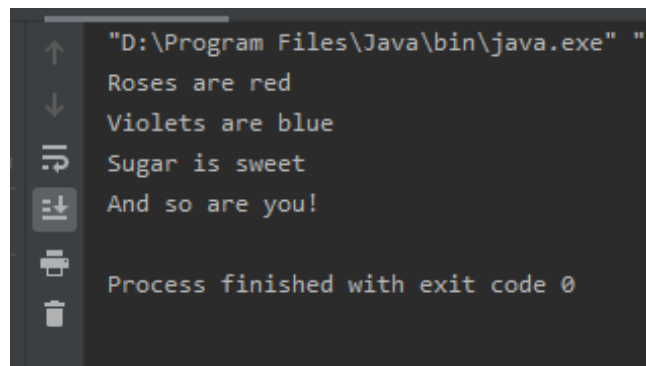
1. Prelab exercises

```java
// ***************************************************************
// File Name: CSYes
//
// Purpose: Print some message about computer science
// ***************************************************************
public class CSYes {
    public static void main(String[] args){
        System.out.println("Computer Science, Yes!!!! \n=========================");
    }
}
```

```
"D:\Program Files\Java\bin\java.exe" "-
Computer Science, Yes!!!!
=========================

Process finished with exit code 0
```

2. Poem

```java
// ***************************************************************
// File Name: Poem
//
// Purpose: Print some message about poem
// ***************************************************************

public class Poem {
    public static void main(String[] args){
        System.out.println("Roses are red\n" +
                "Violets are blue\n" +
                "Sugar is sweet\n" +
                "And so are you!");
    }
}
```
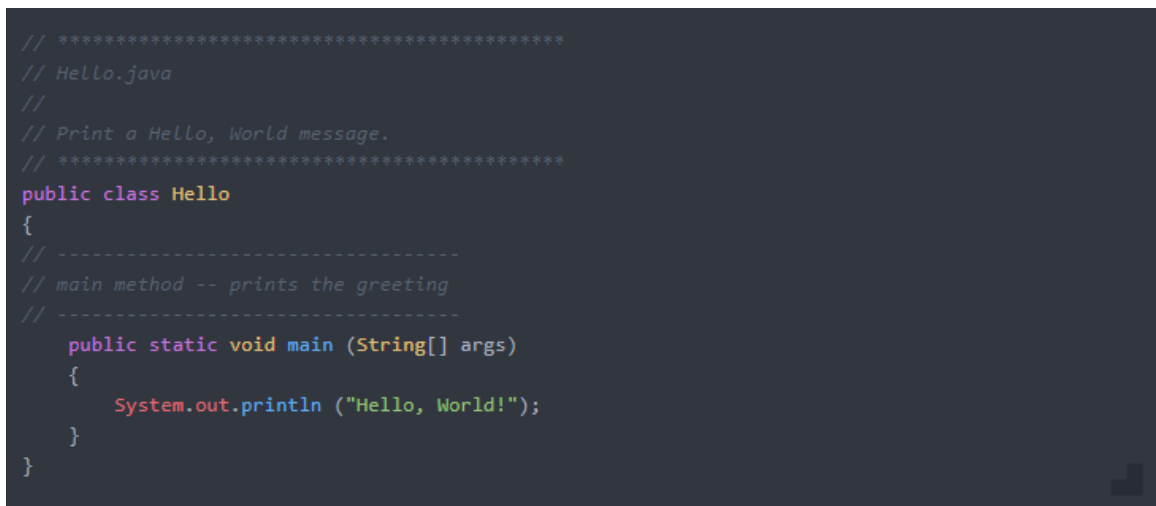
```
"D:\Program Files\Java\bin\java.exe" "
Roses are red
Violets are blue
Sugar is sweet
And so are you!

Process finished with exit code 0
```
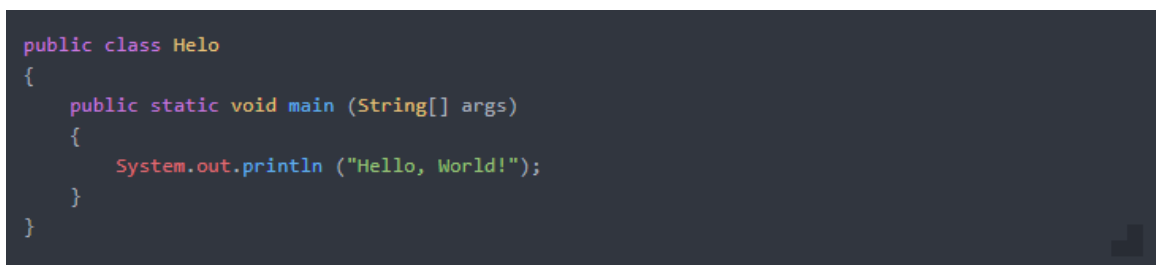
II. Syntax errors

1. Recognizing Syntax Errors

a. Type the following program into a file called Hello.java. (This is the traditional first program a computer scientist writes in a new language.)

```java
// ************************************************
// Hello.java
//
// Print a Hello, World message.
// ************************************************
public class Hello
{
// ----------------------------------
// main method -- prints the greeting
// ----------------------------------
    public static void main (String[] args)
    {
        System.out.println ("Hello, World!");
    }
}
```

b. Class name different from file name. Delete one l (el) from the name of the class (so the first non-comment lineis public class Helo), save the program, and recompile it. What was the error message?
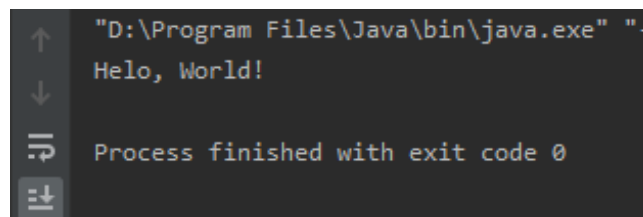
```java
public class Helo
{
    public static void main (String[] args)
    {
        System.out.println ("Hello, World!");
    }
}
```

Error:(6, 8) java: class Helo is public, should be declared in a file named Helo.java

c. Misspelling inside string. Correct the mistake above, then delete one l from the Hello in the message to be printed (inside the quotation marks). Save the program and recompile it. There is no error message—why not? Now run the program. What
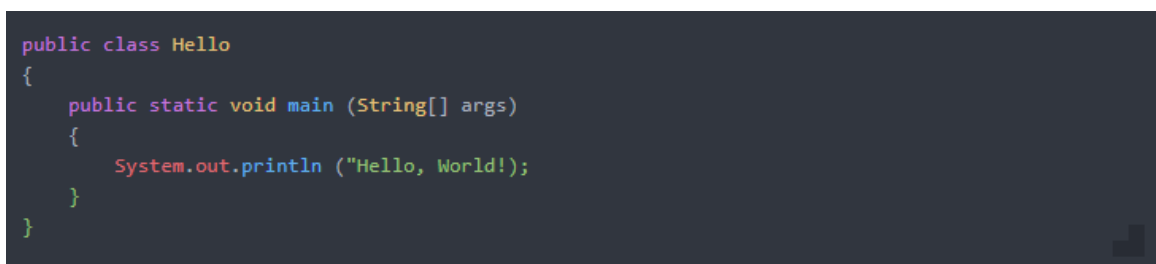
has changed?

The propram successed to compile because there's no syntax error. Only the string printed got changed.
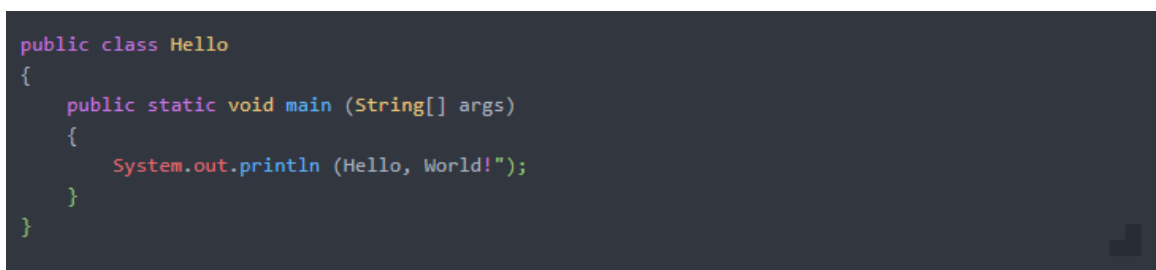

d. No ending quotation mark in a string literal. Correct the spelling in the string, then delete the ending quotation mark enclosing the string Hello, World!. Save the program and recompile it. What error message(s) do you get?

```java
public class Hello
{
    public static void main (String[] args)
    {
        System.out.println ("Hello, World!);
    }
}
```

Error:(13, 42) java: unclosed string literal

e. No beginning quotation mark in a string literal. Put the ending quotation mark back, then take out the beginning one. Save and recompile. How many errors this time? Lots, even though there is really only one error. When you get lots of errors always concentrate on finding the first one listed!! Often fixing that one will fix the rest. After we study variables the error messages that came up this time will make more sense.

```java
public class Hello
{
    public static void main (String[] args)
    {
        System.out.println (Hello, World!");
    }
}
```

Error:(13, 41) java: ')' expected
Error:(13, 42) java: unclosed string literal

f. No semicolon after a statement. Fix the last error (put the quotation mark back). Now remove the semicolon at the end of the line that prints the message. Save the program and recompile it. What error message(s) do you get?

```java
public class Hello
{
    public static void main (String[] args)
    {
        System.out.println ("Hello, World!")
    }
}
```

Error:(10, 45) java: ';' expected

2. Correcting Syntax Errors

```java
// *********************************************
// Problems.java
//
// Provide lots of syntax errors for the user to correct.
//
//**********************************************
public class Problems
{
    public static void main(String[] args)
    {
        System.out.println ("!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!");
        System.out.println ("This program used to have lots of problems,");
        System.out.println ("but if it prints this, you fixed them all.");
        System.out.println (" *** Hurray! ***"); System.out.println
            ("!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!");
    }
}
```

```
Problems ×
  "D:\Program Files\Java\bin\java.exe" "-javaagen
  !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
  This program used to have lots of problems,
  but if it prints this, you fixed them all.
   *** Hurray! ***
  !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

  Process finished with exit code 0
```

III. Names and Places

The goal in this exercise is to develop a program that will print out a list of student names together with other information for each. The tab character (an escape sequence) is helpful in getting the list to line up nicely. A 4 program with only two names is in the file Names.java.

1. Save Names.java to your directory. Compile and run it to see how it works.

```
// ****************************************************************
// Names.java
//
// Prints a list of student names with their hometowns
// and intended major
// ****************************************************************
public class Names
{
    // --------------------------
    // main prints the list
    // --------------------------
    public static void main (String[] args)
    {
        System.out.println ();
        System.out.println ("\tName\t\tHometown");
        System.out.println ("\t====\t\t========");
        System.out.println ("\tSally\t\tRoanoke");
        System.out.println("\tAlexander\tWashington");
        System.out.println ();
    }
}
```
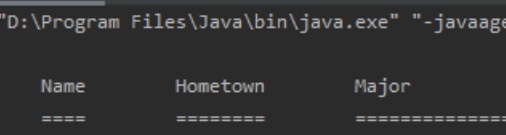
2. **Modify the program so that your name and hometown and the name and hometown of at least two classmates sitting near you in lab also are printed. Save, compile and run the program. Make sure the columns line up.**

```
public class Names
{
    public static void main (String[] args)
    {
        System.out.println ();
        System.out.println ("\tName\t\tHometown");
        System.out.println ("\t====\t\t========");
        System.out.println ("\tYi\t\tZhengzhou");
        System.out.println("\tWentao\t\tShanghai");
        System.out.println("\tAlex\t\tToronto");
        System.out.println ();
    }
}
```

```
Names ×

    "D:\Program Files\Java\bin\java.exe"

        Name            Hometown

        ====            ========
        Yi              Zhengzhou
        Wentao          Shanghai
        Alex            Toronto


Process finished with exit code 0
```

3. Modify the program to add a third column with the intended major of each person (assume Sally's major is Computer Science and Alexander's major is Math). Be sure to add a label at the top of the third column and be sure everything is lined up (use tab characters!)

```java
public class Names
{
    public static void main (String[] args)
    {
        System.out.println ();
        System.out.println ("\tName\t\tHometown\t\tMajor");
        System.out.println ("\t====\t\t========\t\t==============");
        System.out.println ("\tSally\t\tRoanoke\t\t\tComputer Science");
        System.out.println("\tAlexander\tWashington\t\tMath");
        System.out.println ();
    }
}
```

```
Names ×
"D:\Program Files\Java\bin\java.exe" "-javaagent:D:\

    Name        Hometown        Major

    ====        ========        ==============
    Sally       Roanoke         Computer Science
    Alexander   Washington      Math


Process finished with exit code 0
```

IV. A Table of Student Grades

```java
// ****************************************************************
// Grades.java
//
// Prints a list about students' grades
//
// ****************************************************************

public class Grades {
    /*** main prints the list***/
    public static void main(String[] args){
        String[] name = new String[]{"Amazon","Square","Arista","NewEgg","Google"};
        int[] lab = new int[]{51,54,52,50,55};
        int[] bonus = new int[]{2,5,3,2,6};
        System.out.println("//////////////////////\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\n" +
                "==          Student Points        ==\n" +
                "\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\//////////////////////"+"\n");
        System.out.println("Name" + "\t\t" + "Lab" + "\t\t" + "Bonus" + "\t" + "Total");
        System.out.println("----" + "\t\t" + "---" + "\t\t" + "-----" + "\t" + "-----");

        for(int i=0; i<5; i++){
            System.out.println(name[i] + "\t\t" + lab[i] + "\t\t" + bonus[i] + "\t\t" + (lab[i] +
        }

    }
}
```

Grades ×

```
//////////////////////\\\\\\\\\\\\\\\\\\\\\\
==          Student Points        ==
\\\\\\\\\\\\\\\\\\\\\\//////////////////////

Name        Lab       Bonus    Total
----        ---       -----    -----
Amazon      51        2        53
Square      54        5        59
Arista      52        3        55
NewEgg      50        2        52
Google      55        6        61

Process finished with exit code 0
```

V. Two Meanings of Plus

1. Observing the Behavior of +
c. Compile and run the program. For each of the last three output statements (the ones dealing with 8 6 plus 5) write down what was printed. Now for each explain why the computer printed what it did given that the following rules are used for +. Write out complete explanations.
The last three statements:
8 plus 5 is 85

8 plus 5 is 13

13 equals 8 plus 5.

Explanations:

1.There's no parentheses so the expression is evaluated left to right. For the first operator, one operand is a string, the other is an integer. So the '+' is the concatenation operator. For the second operator, the operand before has been converted to a string, in this way, the second '+' should also be the concatenation operator.

2.With parentheses inside, the second '+' should be evaluated preferentially. So the second '+' is an ordinary addition, while the first '+' should be the concatenation operator.

3.There's no parentheses so the expression is evaluated left to right. For the first '+', both operands are integers, and it should be an ordinary addition operator. For the Second '+', one of the operands is a string, so it is a concatenation operator.

d. The statement about when the computer was invented is too scrunched up. How should that be fixed?

Add spaces to strings which are adjacent to the integer, like this:

```
System.out.println ("The first computer was invented about " + 55 +
              " years ago.");
```

```
"D:\Program Files\Java\bin\java.exe" "-javaagent:D:\Windows
This is a long string that is the concatenation of two shor
The first computer was invented about 55 years ago.
8 plus 5 is 85
```

2. Writing Your Own Program With + Now write a complete Java program that prints out the following sentence: Ten robins plus 13 canaries is 23 birds.

```java
// ****************************************************************
// PlusTest2.java
//
// Demonstrate the different behaviors of the + operator
// ****************************************************************
public class PlusTest2
{
    public static void main (String[] args)
    {
        System.out.println("Ten robins plus " + 13 + " canaries is " + 23 + " birds.");

    }
}
```
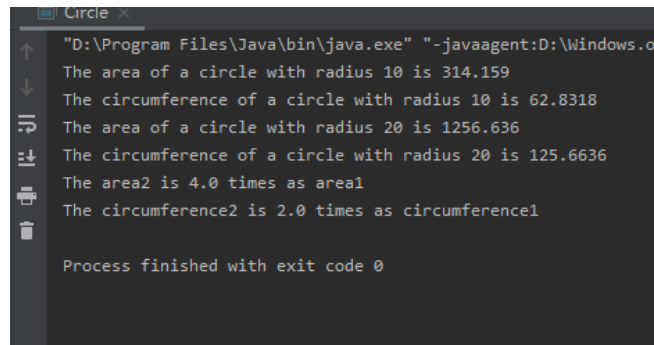
VI. Area and Circumference of a Circle

1. The circumference of a circle is two times the product of Pi and the radius.

```java
// ***********************************************************
// Circle.java
//
// Print the area of a circle with two different radii
// ***********************************************************
public class Circle
{
    public static void main(String[] args)
    {
        final double PI = 3.14159;
        int radius = 10;
        double area = PI * radius * radius;
        double circum = 2 * PI * radius;
        System.out.println("The area of a circle with radius " + radius + " is " + area);
        System.out.println("The circumference of a circle with radius " + radius + " is " + circu

        radius = 20;
        area = PI * radius * radius;
        circum = 2 * PI * radius;
        System.out.println("The area of a circle with radius " + radius + " is " + area);
        System.out.println("The circumference of a circle with radius " + radius + " is " + circu
    }
}
```

```
"D:\Program Files\Java\bin\java.exe" "-javaagent:D:\Windows.o
The area of a circle with radius 10 is 314.159
The circumference of a circle with radius 10 is 62.8318
The area of a circle with radius 20 is 1256.636
The circumference of a circle with radius 20 is 125.6636

Process finished with exit code 0
```

2. When the radius of a circle doubles, what happens to its circumference and area?

```java
public class Circle
{
    public static void main(String[] args)
    {
        final double PI = 3.14159;
        int radius = 10;
        double area1 = PI * radius * radius;
        double circum1 = 2 * PI * radius;
        System.out.println("The area of a circle with radius " + radius + " is " + area1);
        System.out.println("The circumference of a circle with radius " + radius + " is " + circu

        radius = 20;
        double area2 = PI * radius * radius;
        double circum2 = 2 * PI * radius;
        System.out.println("The area of a circle with radius " + radius + " is " + area2);
        System.out.println("The circumference of a circle with radius " + radius + " is " + circu

        double factor1 = area2/area1;
        double factor2 = circum2/circum1;
        System.out.println("The area2 is " + factor1 + " times as area1");
        System.out.println("The circumference2 is " + factor2 + " times as circumference1");
    }
}
```

```
Circle ×
    "D:\Program Files\Java\bin\java.exe" "-javaagent:D:\Windows.c
    The area of a circle with radius 10 is 314.159
    The circumference of a circle with radius 10 is 62.8318
    The area of a circle with radius 20 is 1256.636
    The circumference of a circle with radius 20 is 125.6636
    The area2 is 4.0 times as area1
    The circumference2 is 2.0 times as circumference1

    Process finished with exit code 0
```

When the radius of a circle doubles, the circumference also doubles, while the area is 4 times as the original area, which is exactly what I expected.

3. In the program above, you showed what happened to the circumference and area

```java
// ***************************************************************
// Circle.java
//
// Print the area of a circle with two different radii
// ***************************************************************
import java.util.Scanner;

public class Circle
{
    public static void main(String[] args)
    {
        final double PI = 3.14159;
        int radius;
        Scanner scanner = new Scanner(System.in);
        System.out.println("Please enter a value for the radius:");
        radius = scanner.nextInt();

        double area1 = PI * radius * radius;
        double circum1 = 2 * PI * radius;
        System.out.println("The area of a circle with radius " + radius + " is " + area1);
        System.out.println("The circumference of a circle with radius " + radius + " is " + circu

        radius = radius * 2;
        double area2 = PI * radius * radius;
        double circum2 = 2 * PI * radius;
        System.out.println("The area of a circle with radius " + radius + " is " + area2);
        System.out.println("The circumference of a circle with radius " + radius + " is " + circu

        double factor1 = area2/area1;
        double factor2 = circum2/circum1;
        System.out.println("The area2 is " + factor1 + " times as area1");
        System.out.println("The circumference2 is " + factor2 + " times as circumference1");
    }
}
```

```
"D:\Program Files\Java\bin\java.exe" "-javaagent:D:\Windows.o:
Please enter a value for the radius:
2

The area of a circle with radius 2 is 12.56636
The circumference of a circle with radius 2 is 12.56636
The area of a circle with radius 4 is 50.26544
The circumference of a circle with radius 4 is 25.13272
The area2 is 4.0 times as area1
The circumference2 is 2.0 times as circumference1


Process finished with exit code 0
```

No matter what value input, the result doesn't change: the circumference doubles and the area become 4 times as the original area.

VII. Painting a Room

1. Fill in the missing statements


```java
//****************************************************************
//File: Paint.java
//
//Purpose: Determine how much paint is needed to paint the walls
//of a room given its length, width, and height
//****************************************************************
import java.util.Scanner;
public class Paint
{
    public static void main(String[] args)
    {
        final int COVERAGE = 350; //paint covers 350 sq ft/gal
        int length, width, height;
        double totalSqFt;
        double paintNeeded;
        Scanner scanner = new Scanner(System.in);
        System.out.println("Please input the length of the room:");
        length = scanner.nextInt();
        System.out.println("Please input the width of the room:");
        width = scanner.nextInt();
        System.out.println("Please input the height of the room:");
        height = scanner.nextInt();
        totalSqFt = 2 * (length * width + length * height + width * height);
        paintNeeded = totalSqFt/COVERAGE;
        System.out.println("The size of the room:\n" + "length = " + length + "\nwidth = " + widt
        System.out.println("Total gallons needed: " + paintNeeded);
    }
}
```

```
Please input the length of the room:
50
Please input the width of the room:
60
Please input the height of the room:
12
The size of the room:
length = 50
width = 60
height = 12
Total gallons needed: 24.685714285714287

Process finished with exit code 0
```

2. Suppose the room has doors and windows that don't need painting.

```java
import java.util.Scanner;
public class Paint
{
    public static void main(String[] args)
    {
        final int COVERAGE = 350; //paint covers 350 sq ft/gal
        int length, width, height;
        int numWindows = 0, numDoors = 0;
        double totalSqFt;
        double paintNeeded;
        Scanner scanner = new Scanner(System.in);
        System.out.println("Please input the length of the room:");
        length = scanner.nextInt();
        System.out.println("Please input the width of the room:");
        width = scanner.nextInt();
        System.out.println("Please input the height of the room:");
        height = scanner.nextInt();
        System.out.println("Please input the number of doors:");
        numDoors = scanner.nextInt();
        System.out.println("Please input the number of windows:");
        numWindows = scanner.nextInt();

        totalSqFt = 2 * (length * width + length * height + width * height) - 20 * numDoors - 15
        paintNeeded = totalSqFt/COVERAGE;
        System.out.println("The size of the room:\n" + "length = " + length + "\nwidth = " + widt
        System.out.println("Total gallons needed: " + paintNeeded);
    }
}
```

```
Please input the length of the room:
50
Please input the width of the room:
60
Please input the height of the room:
12
Please input the number of doors:
10
Please input the number of windows:
10
The size of the room:
length = 50
width = 60
height = 12
Total gallons needed: 23.685714285714287

Process finished with exit code 0
```