
Object Oriented Programming

CS230

Assignment 1

Deadline: Day 3/3/2024 @ 23:59

[Total Mark for this Assignment is 8]

Student Details:

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Instructions:

- You must submit two separate copies (**one Word file and one PDF file**) using the Assignment Template on Blackboard via the allocated folder. These files **must not be in compressed format**.
- It is your responsibility to check and make sure that you have uploaded both the correct files.
- Zero mark will be given if you try to bypass the SafeAssign (e.g. misspell words, remove spaces between words, hide characters, use different character sets, **convert text into image** or languages other than English or any kind of manipulation).
- Email submission will not be accepted.
- You are advised to make your work clear and well-presented. This includes filling your information on the cover page.
- You must use this template, failing which will result in zero mark.
- You **MUST** show all your work, and text must not be converted into an image, unless specified otherwise by the question.
- Late submission will result in ZERO mark.
- The work should be your own, copying from students or other resources will result in ZERO mark.
- Use **Times New Roman** font for all your answers.

*Learning
Outcome(s):
CLO1*

*Explain the basic
principles of
programming,
concept of
language, and
universal
constructs of
programming
languages.*

Question One

(2 Marks)

Explain two roles of the java virtual machine as part of java runtime environment?

Answer: 1- JVM is responsible for executing bytecode 2- and loading and verification of said bytecode.

Describe the intermediate representation of a Java program that allows a JVM to translate a program into machine-level assembly instructions.

Answer: Java code gets compiled into bytecode which is platform independent and can be used anywhere where java runtime environment can be run. Bytecode then gets translated into assembly instructions by JRE.

*Learning
Outcome(s):
CLO4*

*Develop a
program based on
specification
using
programming
language
elements
including syntax,
data types,
conditional
statement, control
structures,
procedures,
arrays, objects
and classes.*

Question Two

(2 Marks)

Create a Java program that does the following:

1. Prompt the user for an input.
2. Enter your first and last names as the input.
3. Read the entered input into two variables (one variable stores the first name while the other stores the last name).
4. Using the *printf* function, print the variables in upper-case characters and each in a separate line.
(include screenshots of all program execution steps)

```
import java.util.Scanner;

public class Q2 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter your first name:");
        String firstName = scanner.nextLine();

        System.out.println("Enter your last name:");
        String lastName = scanner.nextLine();

        System.out.printf("First Name: %s\n", firstName.toUpperCase());
        System.out.printf("Last Name: %s\n", lastName.toUpperCase());
    }
}
```

```
}

CS230 src: main java Q2
Project
  CS230 build.gradle
  CS230 src
    main
      java
        Q2
      resources
    test
  build.gradle
  gradlew
  gradlew.bat
  settings.gradle
External Libraries
Scratches and Consoles

import java.util.Scanner;

public class Q2 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter your first name:");
        String firstName = scanner.nextLine();

        System.out.println("Enter your last name:");
        String lastName = scanner.nextLine();

        System.out.printf("First Name: %s\n", firstName.toUpperCase());
        System.out.printf("Last Name: %s\n", lastName.toUpperCase());
    }
}

Run CS230 [Q2.main()]
CS230 [Q2.main()] successful on 3/3/2024 7:09 PM 16 ms, 238 ms
7:09:25 PM: Executing 'Q2.main()'...

> Task :compileJava
> Task :processResources NO-SOURCE
> Task :classes

> Task :Q2.main()
Enter your first name:
WALEED
Enter your last name:
ALAEEL
First Name: WALEED
Last Name: ALAEEL

Deprecated Gradle features were used in this build, making it incompatible with Gradle 8.0.

Gradle sync finished in 32 s 650 ms (a minute ago)
```

*Learning**Outcome(s):**CLO4**Develop a**program based on**specification**using**programming**language**elements**including syntax,**data types,**conditional**statement, control**structures,**procedures,**arrays, objects**and classes.*

Question Three

(2 Marks)

The cubic polynomial function of the third degree can be represented as:

$$y = ax^3 + bx^2 + cx + d$$

- 1- Write the correct Java representation of the function without using parentheses using the Rules of Operator Precedence.

Answer: Considering the function as $y = ax^3 + bx^2 + cx + d$

```
double y = a * x * x * x + b * x * x + c * x + d;
```

- 2- Evaluate the java representation of the function and find the value of y when,

x=3, a=1, b=2, c=3, d=4

Make sure that you show all the steps in detail.

Answer: Considering the function as $y = ax^3 + bx^2 + cx + d$

```
int x = 3;
```

```
int a = 1;
```

```
int b = 2;
```

```
int c = 3;
```

```
int d = 4;
```

```
double y = a * x * x * x + b * x * x + c * x + d; // 1 * 3 * 3 * 3 + 2 * 3 * 3 + 3 * 3 + 4
```

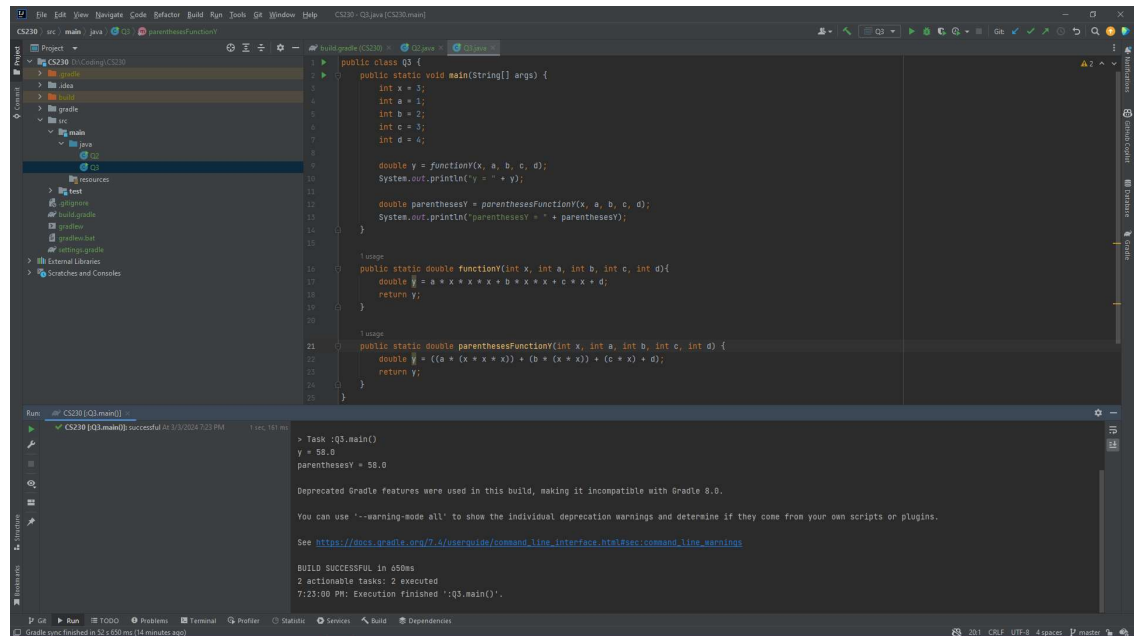
```
// y = 1 * 3 * 3 * 3 + 2 * 3 * 3 + 3 * 3 + 4;
```

```
System.out.println("y = " + y); // y = 58
```

5. Use parentheses to rewrite the java representation.

Answer: Considering the function as $y = ax^3 + bx^2 + cx + d$

`double y = ((a * (x * x * x)) + (b * (x * x)) + (c * x) + d);`



```
1 public class Q3 {
2     public static void main(String[] args) {
3         int x = 3;
4         int a = 1;
5         int b = 2;
6         int c = 3;
7         int d = 4;
8
9         double y = function(x, a, b, c, d);
10        System.out.println("y = " + y);
11
12        double parenthesesY = parenthesesFunction(x, a, b, c, d);
13        System.out.println("parenthesesY = " + parenthesesY);
14    }
15
16    // usage
17    public static double function(int x, int a, int b, int c, int d) {
18        double y = a * x * x * x + b * x * x + c * x + d;
19        return y;
20    }
21
22    // usage
23    public static double parenthesesFunction(int x, int a, int b, int c, int d) {
24        double y = ((a * (x * x * x)) + (b * (x * x)) + (c * x) + d);
25        return y;
26    }
27 }
```

Run: CS230 [Q3.main()]

```
> Task :Q3.main()
y = 58.0
parenthesesY = 58.0

Deprecated Gradle features were used in this build, making it incompatible with Gradle 8.0.
You can use '--warning-mode all' to show the individual deprecation warnings and determine if they come from your own scripts or plugins.
See https://docs.gradle.org/7.4/userguide/command_line_interface.html#sec:command_line_warnings

BUILD SUCCESSFUL in 10ms
2 actionable tasks: 2 executed
7:23:00 PM: Execution finished "Q3.main()".
```

*Learning**Outcome(s):**CLO4**Develop a**program based on
specification**using**programming**language**elements**including syntax,**data types,**conditional**statement, control**structures,**procedures,**arrays, objects**and classes.***Question Four****(2 Marks)**

Write a java program that asks the user to enter his/her name. Print a welcome message and ask the user to enter a number. Then, tell the user the type of the number (positive, negative, or zero).

Note: you must take a screenshot of the output that shows your name in the run.

Sample of the run:

```
Enter your name:
Sara Ahmad
Welcome Sara Ahmad
Please, enter a number:
4
Positive number.
```

Answer:

```
import java.util.Scanner;
```

```
public class Q4 {
```

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

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

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

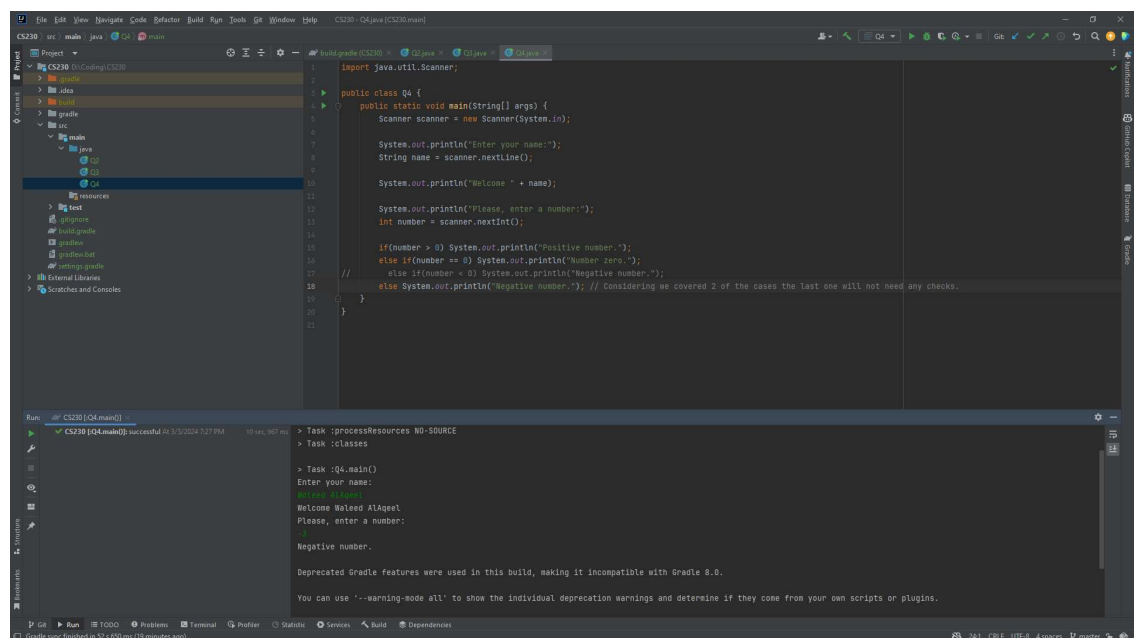
```
        String name = scanner.nextLine();
```

```
        System.out.println("Welcome " + name);
```

```
        System.out.println("Please, enter a number:");
```

```
        int number = scanner.nextInt();
```

```
        if(number > 0) System.out.println("Positive
number.");
        else if(number == 0) System.out.println("Number
zero.");
//        else if(number < 0) System.out.println("Negative
number.");
        else System.out.println("Negative number."); //
Considering we covered 2 of the cases the last one will
not need any checks.
    }
}
```



The screenshot shows an IDE with a Java project named 'CS230'. The main editor displays a Java class 'Q4' with the following code:

```
import java.util.Scanner;

public class Q4 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter your name:");
        String name = scanner.nextLine();

        System.out.println("Welcome " + name);

        System.out.println("Please, enter a number:");
        int number = scanner.nextInt();

        if(number > 0) System.out.println("Positive number.");
        else if(number == 0) System.out.println("Number zero.");
        // else if(number < 0) System.out.println("Negative number.");
        else System.out.println("Negative number."); // Considering we covered 2 of the cases the last one will not need any checks.
    }
}
```

The Run window shows the execution of the program:

```
> Task :processResources NO-SOURCE
> Task :classes
> Task :Q4.main()
Enter your name:
Welcome Halaed Alaqet
Please, enter a number:
Negative number.

Deprecated Gradle features were used in this build, making it incompatible with Gradle 8.0.
You can use '--warning-mode all' to show the individual deprecation warnings and determine if they come from your own scripts or plugins.
```