Classes And Objects

# Before Class

1. Watch the video Programming paradigms:

<https://youtu.be/Wt4FPjkCNaU>

Then list the main features of the following programming paradigms (you can search the Internet for some details):

* 1. Imperative programming
     + - 1. Sequence of Statements.
         2. Order of execution of Statements is very important.
         3. They contain state.
         4. They use both Immutable and Mutable Data.
         5. They can change state.
         6. They may have Side-effects.
         7. Stateful Programming Model.
         8. They directly change the state of Program.
  2. Procedural programming
     + - 1. Predefined functions. A predefined function is a function available in a procedural programming language from a library of available functions. ...
         2. Local variables. ...
         3. Global variables. ...
         4. Parameter passing. ...
         5. Modularity. ...
         6. Top-down approach.
  3. Structured programming

A structured program is characterized by **having each instance of each specific pattern specify a function**. A function is what the correspondence is between input data as sets of independent variables of some specified domains and output data as sets of dependent variables of some specified ranges.

1. Watch the video ‘Fundamental Concepts of Object Oriented Programming’

<https://youtu.be/m_MQYyJpIjg?feature=shared>

1. From the Java tutorial:

<https://www.w3schools.com/java/default.asp>

familiarize yourself with all topics, from the first one until the Java Booleans.

1. Check what data types and operators are available in Java.
2. From the course textbook, available in your local repository, read Chapter 1 (Computer Programming) and Chapter 2 (Variables and Operators).
3. Every Java program starts with the main() method. Look in your course textbook for the syntax of the main() method.
4. Familiarise yourself with the CamelCase – a naming convention for variables, constants, methods and classes in Java. Search the Internet for some details.
5. From the Chapter 1, complete all exercises in the Exercises section.
6. Write a program that contains variables with your data: name, surname, age, student id, whether you are a first-year student or not, field of study and the name of the university where you study. The program displays your data. Then, compile and run the program:
   1. In a terminal window (use javac and java commands)
   2. In the VSCode

# During Class

1. Watch the film:
   1. What is object-oriented language

<https://youtu.be/SS-9y0H3Si8>

* 1. Object Oriented Programming

[~~https://youtu.be/0yEBBCfaIZk~~](https://youtu.be/0yEBBCfaIZk)

Then answer the questions:

* 1. What is a class?

blueprint

* 1. What is an object?

The thing created from blueprint

* 1. What are object components?

Properties and methods

1. Specify at least five attributes and three behaviors for objects that represent students.
2. In the Java programming language, define an empty Student class. Pay attention to the class name and the file name in which the class is defined.

public class Student {  
  
}

1. In the Student class, add name and age fields to represent the object's attributes. Pay attention to attribute types.

public class Student {  
 String name;  
 int age;  
}

1. In the VSCode, display the list of object attributes, defined in the Student class (OUTLINE panel).
2. Create a Student class object. To do this, create a separate StudentTest class, in a separate file, with the main() method. Assign values to object attributes.

**Student.java**  
public class Student {  
 String name;  
 int age;  
}

**StudentTest.java**  
public class StudentTest {   
 public static void main(String[] args) {  
   
 // object creation  
 Student s = new Student();  
   
 // object manipulation  
 s.name = "Peter";  
 s.age = 21;  
 System.out.println(s.name + " " + s.age);  
 }  
}

1. In the Student class, add the following methods that represent object behaviors:
   1. sayHello()
   2. displayName()
   3. displayAge()

Then, add a statement in each of the methods to display the appropriate information.

void sayHello(){  
        System.out.println("Hello from "+name);  
}

1. In the VSCode, display the list of object attributes and methods, defined in the Student class (OUTLINE panel).
2. Create two Student class objects. Assign values to the object fields. Then, call the methods.
3. Add the following fields and methods to the Student class to represent object attributes and behaviors:
   1. Object attributes: (1) student ID card, (2) whether the student ID card is valid or not, (3) semester number, (4) average grade
   2. Object behaviors: (1) display the student’s name, semester number and average grade, (2) change the status of student ID card (valid/invalid), (3) display the student’s name, ID card number and whether the ID card is valid (you can use ?: operator)

Then create two Student class objects, assign them some values and call methods.

1. In the VSCode, display the list of object attributes and methods, defined in the Student class (OUTLINE panel).
2. Compile and run the StudentTest program in a terminal window. Use the commands:

javac StudentTest.java  
java StudentTest

# After Class

1. A variable contains your height in cm. Write a program that calculates and displays your height both in cm and in feet and inches. Sample result:

I am 170cm tall, i.e. 5 feet and 7 inches

1. The speed of vehicles on a highway in Poland must be between 40 and 140 km/h. Write a program that checks whether the vehicle speed saved in a variable is correct. Sample result:

Vehicle speed: 158  
Speed is valid: False

1. A bank buys and sells Euro. Write a program that, based on the Euro buying and selling rates saved in variables, calculates the difference between the buying and selling rates (spread). Display result with 4 decimal places (you can use printf() method). Sample result:

Bank buys EUR: 4.5940  
Bank sells EUR: 4.6250  
Spread: 0.0310

1. Variables ‘hours’ and ‘minutes’ contain the number of hours and minutes that have passed since midnight. Write a program that displays the given time (in the format hh:mm – you can use printf() method) and calculates and displays the number of minutes and the number of seconds that have passed since midnight. Sample result:

hours = 14  
minutes = 27  
time: 14:27  
minutes from midnight: …  
seconds from midnight: …

1. Specify at least five attributes and three behaviors for the objects:
   1. Smartphone
      * + 1. Properties

Model

Processor

Speed

Screen

Memory

* + - * 1. Methods

Work

Restart

Shutdown

* 1. Bank account
     + - 1. Properties

Money

ID

Owner

Creation\_date

Level

* + - * 1. Methods

CheckBalance

Withdraw

Deposit

Then, in separate files, create classes representing above objects. Define attributes and methods. Do not create a main method, just classes with their attributes and empty methods. After that, compile both classes to check whether their syntax is correct. Finally, display list of class attributes and methods in the VSCode (OUTLINE panel).

1. Define a class for describing books. Then, in the class, define fields and methods that represent the attributes and behaviors of book objects. Finally, create two books, assign them attribute values, and call defined methods.
2. Define a class for describing lamps. Then, define the following object attributes and behaviors:
   1. attributes: whether a lamp is on
   2. behaviors: (1) switch on the lamp, (2) switch off the lamp, (3) display information whether the lamp is on or off (use ?: operator)

After that, create two lamps, switch on the first one and switch off the second one. Display information whether the lamps are on or off.

1. Define a class for describing rectangles. Then create two objects that represents rectangles with dimensions of 3x4 and 2x7 respectively. Display their dimensions, perimeters and surface areas.
2. Design a simple counter. The initial value of the counter is 0. The counter can be increased or decreased by one, and increased and decreased by 10. It is possible to reset the counter to its initial value. Then, define a class for counters with five methods. Based on the class definition, create two counters. Finally, using the defined methods, set the value for the first counter to 23 and for the second one to -47. Display results.