iu
INTERNATIONAL
UNIVERSITY OF
APPLIED SCIENCES

Part 1

Units 1,2,3

2/8/2023

Suhyl Mekkawy

Main structure

1- Object orientation
2- The object as a basic concept of oop
3-Phases in object oriented development process
4- Basic principles of oo system development
5-Structuring Problems With Classes
6-Identifying classes
7-Attributes as Properties of Classes
8- Methods as functions of classes
9-Associations between classes
10- Unified modeling language (UML)
11-Introduction to the java programming language
12-Basic elements of a class in Java
13-Attributes on Java*
14- Methods in Java*

- More practical knowledge of class,attribute,methods are needed as the course book doesn't cover it well

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1- Object orientation

2- OPQs (One point questions)

1- What is object orientation ?

- It is the approach of creating and maintaining a complex IT system

2- What is an IT system?

- It is the interaction between complex objects

3- Object oriented programming is not a programming language but **it is a way of looking at complex objects in an IT system but there are programming languages that supports oop in a particular way**

4- Machine code programming concept is not in use nowadays

3- MPQs(Multiple points questions)

5- Mention the programming concepts that are historically used

1- Machine code
2- Assembly code
3- Model driven
4- Imperative programming
5- Structured programming
6- Component based development
7- Object oriented programming

6- Mention the applications of assembly code

1- Controllers
2- Fan , AC
3- electronic devices
4- Sensor systems
5- Imbedded programming

7- Mention the application of model driven programming concept

1- Reuse of customizability of cross cutting function (login mechanism)
2- generate program code reflects oop concepts

8- Mention the applications of imperative programming

1- Small programs that solve simple tasks
2- In special programming languages

9- Mention the applications of Structured programming

1- Simple web applications
2- Technical components

10- Mention the applications of component based development

1- Reuse of previous programmed functions
(Usually programmed by oop)

2- The object as a basic concept of oop

1- Idea :

Object name —> digital clock
Object Attribute —> Current time / Current time zone
Object method —> Set current time / Set time zone / Output time

2-OPQs

11- What is an object as a concept of oop ?

- It is a part of object oriented programming that takes part in the execution of IT system and stored in the memory

12- What is an attribute(property) ?

- It is a part of the object that stores information and values in an object

13- What is a method?

- It is the part of the object that creates, reads , perform calculations and change data of the attribute values and determine object behavior and function related to other objects

3- Phases in object oriented development process

2-OPOs

14- What is the software development process ?

- A process consists of many phases concerned with developing and maintaining the IT system

15- What does oo analysis phase do?

- Determines what the program should do by gaining a comprehensive understanding of program functionality by communicating between client and developers

16- what does oo design do ?

- Design the program depending on previous analysis and controls the quality of the programmed system for future customizations

17- What does oo programming do?

- Translate the designated program into functional code

18- What will happen if we skipped the ooa or ood

- System will be unusable because the requirements and analysis won't match what the client really needs as well as the future maintenance and customizations for the program won't be performed correctly

3- MPQs

19- Mention the phases of software development process

1- Object oriented analysis
2- Object oriented design
3- Object oriented programming

4- Basic principles of oo system development

2-OPQs

20-What is encapsulation in OOP ?

- It is the process of separation of every object in the system from other objects so any change in any object alone won't affect the whole system

3-MPQs

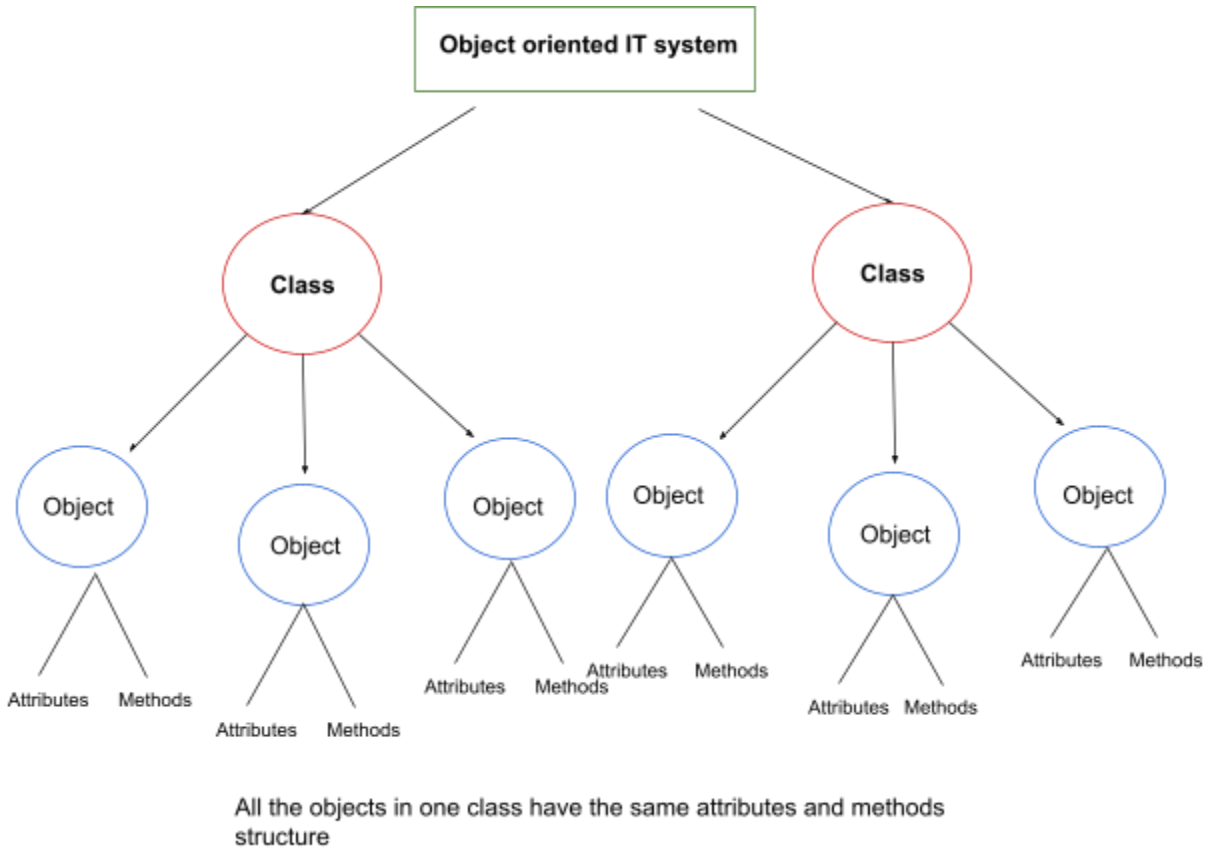
21- Systems that are generated using oop should be:

1- Testable
2- Stable
3- Extensible
4- Maintainable
5- Scalable

5-Structuring Problems With Classes

1- Idea

1-



All the objects in one class have the same attributes and methods structure

2- OPQs

22- What is a class in OOP?

- This is a structure that is used to create digital objects in software development

23- Any desired number of objects can be created with a class as a basis.

24- All objects created from one class will have the same structure,same attributes and methods

25- Which classes an object-oriented system consists of and what the structure of the required classes looks like will be determined
In the object oriented design phase

26- The starting point for the object oriented design design are the identified and specified requirements

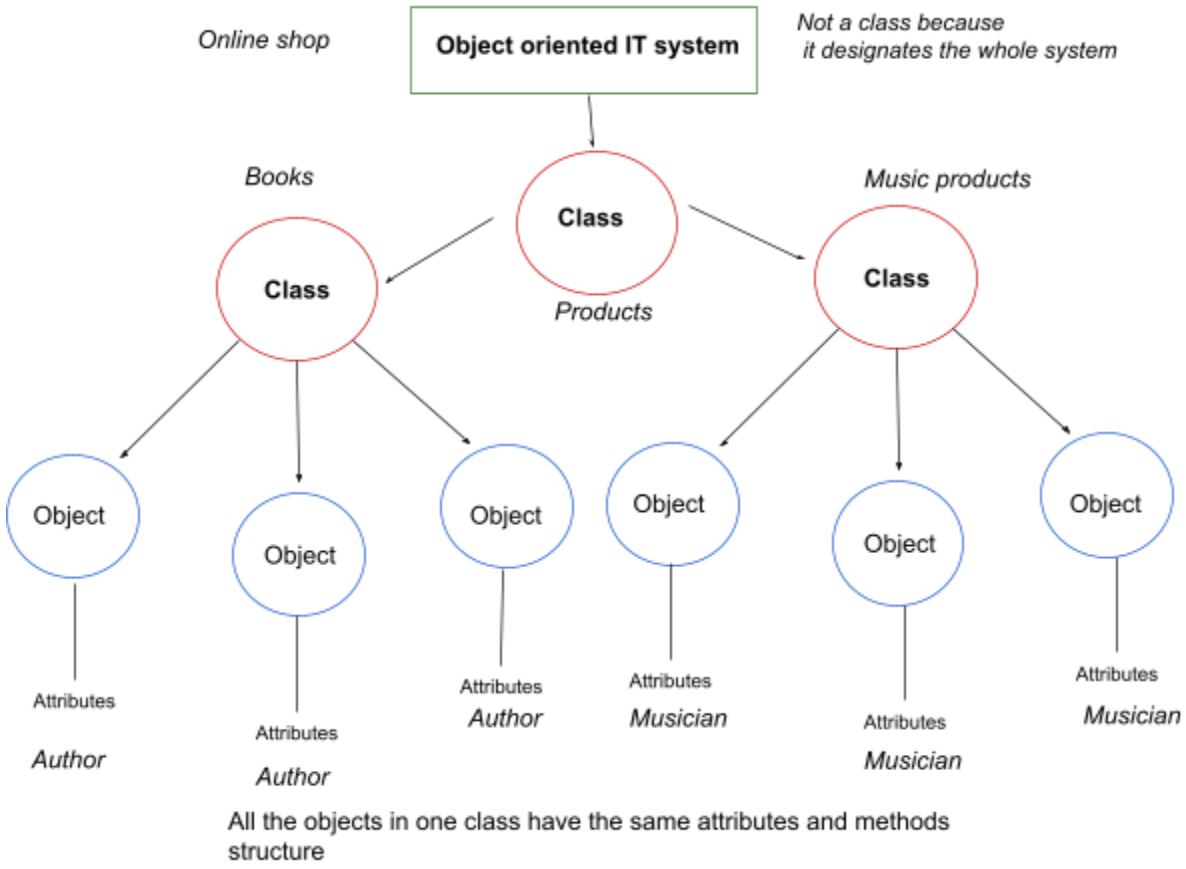
27- Object oriented programming for IT systems consists of the implementation of the classes then implementing the objects needed inside the classes

28- The description of the classes guarantees that all objects
that are created based on these classes behave identically.

29- All objects created from the same class can thus be processed by the functions of the system in the same way.

6- Identifying classes

1-Idea



2- a class in a candidate list is everything that contains objects or other classes inside of it

3-an attribute in a candidate list is a property or a value of an object

EX: *The products that Mr. Lange sells in the online shop will be media of all types, in particular books, music products, films, and games. Each product has a manufacturer, a title, and a product number. Books and games have an author, films have a director, and music products have a performer.*

Step 1: After listing all of the nouns, the list will consist of the following entries (the nouns are listed in singular form only):

- online shop
- product
- media
- type

• book
• music product
• film
• game
• manufacturer
• title
• product number
• author
• director
• performer

Steps 2—4: Check candidate for class, attribute, and relevance in general.

• Online shop: not relevant because it designates the system as a whole
• Product: relevant as class
• Media: not relevant because it only describes a product
• Type: not relevant because it only describes a product
• Book: relevant as class because it is refined by attributes
• Music product: relevant as class because it is refined by attributes
• Film: relevant as class because it is refined by attributes
• Game: relevant as class because it is refined by attributes
• Manufacturer: relevant as attribute because it fits description of classes
• Title: relevant as attribute because it fits description of classes
• Product number: relevant as attribute it fits because description of classes
• Author: relevant as attribute because it fits description of classes
• Director: relevant as attribute because it fits description of classes
• Performer: relevant as attribute because it fits description of classes

2- OPQs

30- What is the analysis model?

- This is the result of the object oriented analysis which is used to define what a system should do and in communication between the developers and the client of the system

31- Possible candidates for classes must be identified and listed based on the defined problem statement and the requirements.

32- Nouns are listed in singular form only while listing the candidates nouns for classes

3-MPQs

33- An established procedure for the identification of classes can be described as follows:

1- Mark all nouns in a problem statement as candidates for classes

2- Check whether the nouns that have been identified can be described using other nouns or if they have associations with other nouns, If one of the statements is true the noun is modeled as a class

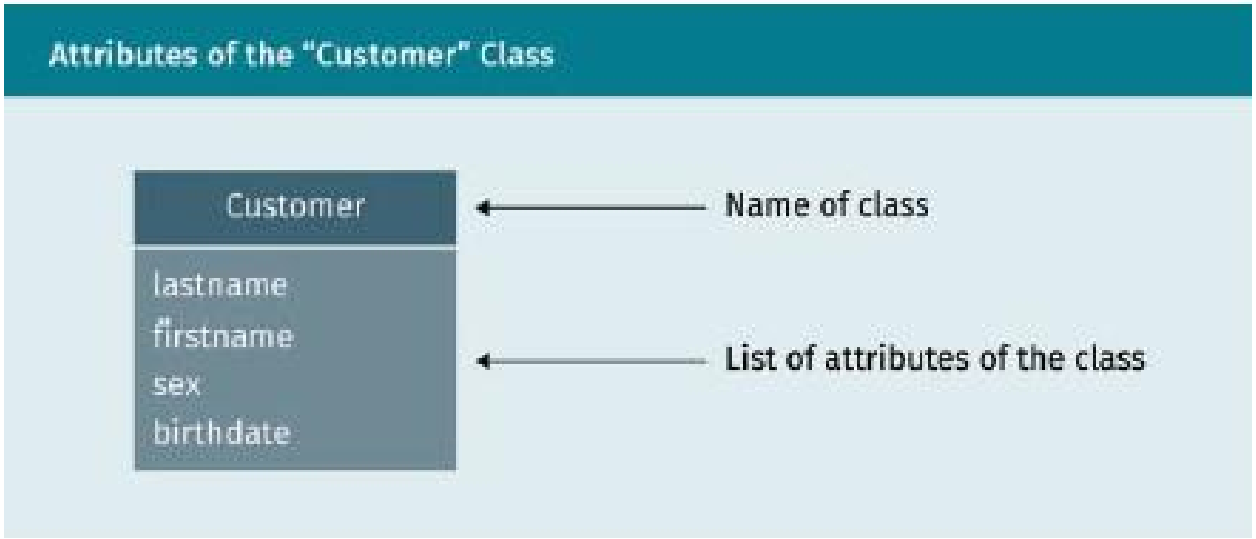
3- If the nouns is used to add details to other noun then it is an attribute of a class

4- Check the rest of the nouns that are neither classes or attributes then remove them from the candidates list

7- Attributes as Properties of Classes

1- Idea

1-



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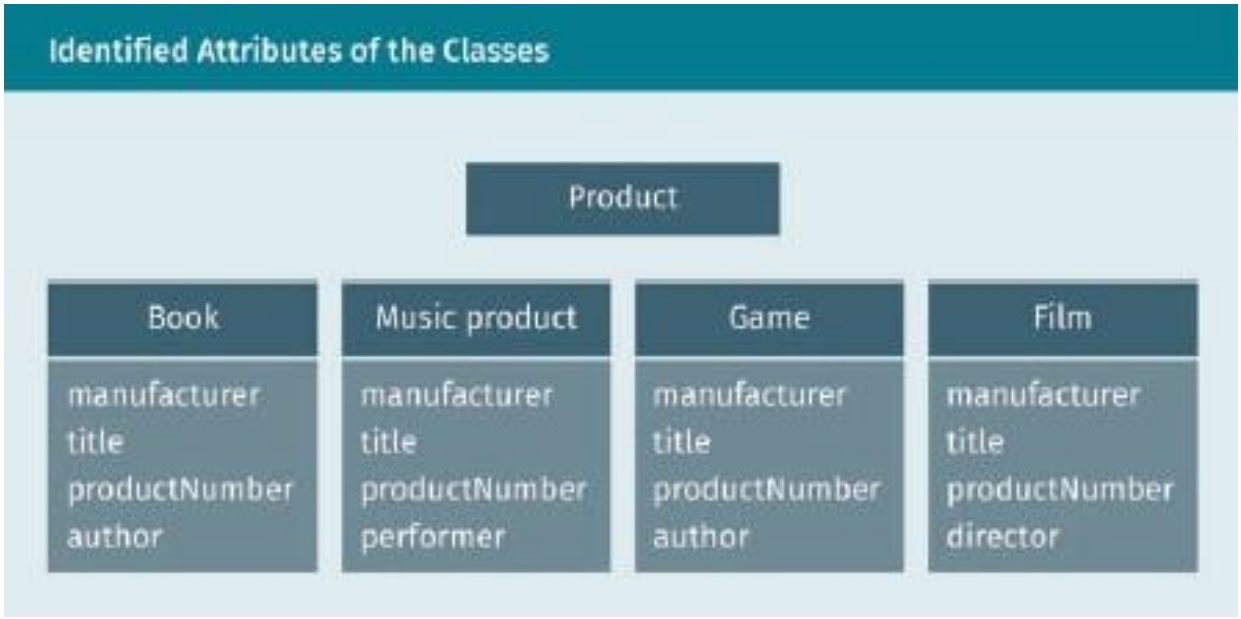


2- OPQs

34- What are attributes of a class?

- They are static elements of a class that save concrete values of an object and can be understood as a free memory inside an object

35-the values of all attributes of an object describe its state

36- Objects that have been created from the same class and whose attributes have the exact same values, are identical.

37-Good candidates for attributes are nouns that can be used for describing or adding
details to other nouns

38- What is the description of data type of the attribute ? and give an example

- Defines how the values of the attribute will look like, (Date,String,Integer)

39- What is the description of constant of the attribute ? and give an example

- It specifies whether the value of the attribute can change or not , (Rounded Pi; 3.1415)

40- What is the description of the default value of the attribute ? and give an example

- It specifies the default value of the attribute, (2022-1-2)

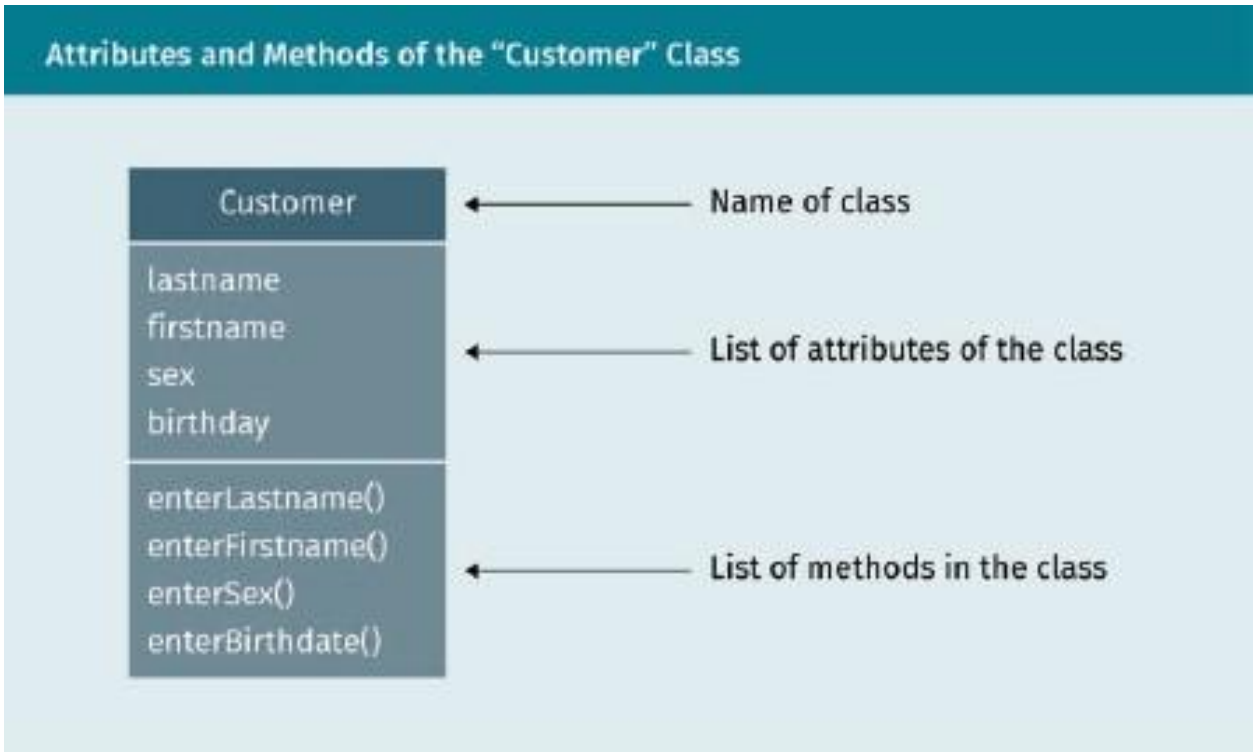
3-MPQs

41- Mentions properties / elements of an attribute inside of a class

1- Name of the attribute
2- Data type of the attribute
3- Constant
4- Default value

7- Methods as functions of classes

1- Idea



2- OPQs

42- What are methods?

- These are dynamic elements of classes and describe the behavior of classes
  Or
  are dynamic elements of classes. They contain
  algorithms, statements, and processing specifications that can be used to create, calculate, modify, and delete values.

43- The results of the methods can be saved in attributes
of the class or in newly created objects

44- What is the description of Parameter of the method? and give an example

- Defines the required objects and values that are needed for processing the method

(Date birthdate),
(String lastname,String firstname)
(Integer number1, Integer number2)

45- What is the description of the return value of the method? and give an example

- Defines the data type of the object in which the result of the method is stored

Date
String
Integer

46- it is only possible to access attributes from outside via methods, and never directly

3- MPQs

47- What is the use of a method?

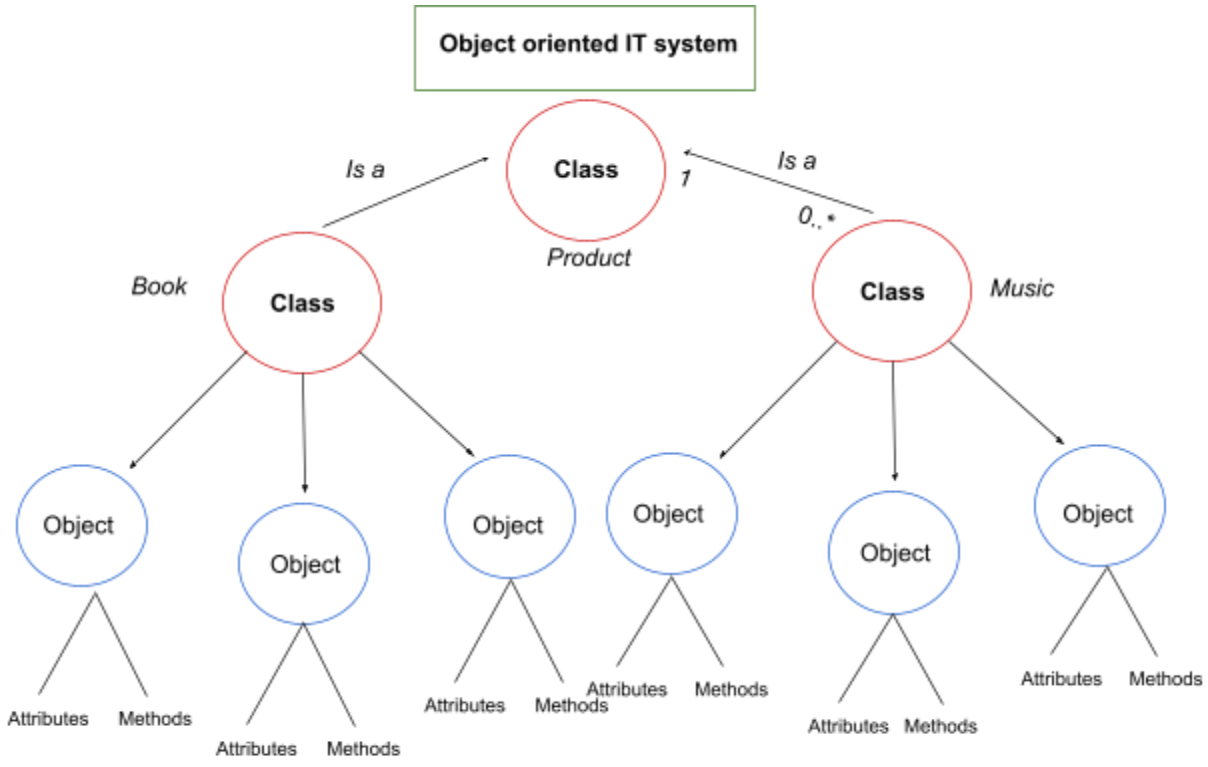
1- Describe the behavior of objects and classes
2- Used to program calculations of values
3- Application of business rules or specifications in the creation and deletion of objects

48- Mention properties on methods inside a class

1-Visibility modifier
2- Return data type
3- Name of the method
4- Parameter list
5-Method body
6- Return value

9- Associations between classes

1- Idea



All the objects in one class have the same attributes and methods structure

2- OPQs

49- What are associations between classes ?

- These are interactions between classes describe dependencies and relationships between classes,thereby enabling cooperation between objects.

50- Cooperation between objects is only possible when associations have been defined between classes

51- What is the description of (has / Knows) association

- It expresses the fact that one class has or knows another class

52- What is the description of (consists of) association

- It expresses the fact that a class is a part of another class that can't be described or refined by using simple attributes

53- What is the description of (is a) association

- It expresses the fact that a class A is a class B by type, But it has a more specific meaning and may have different attributes and methods than class B

54- Mention the type of the associations below

1- A policyholder has children.
2- A contract has insurance conditions.
3- A car consists of an engine, 4 wheels, 3 doors, 1 transmission, and 2 seats.
4- A truck is an automobile.

5- A customer is a person
6- A calendar has months.
7- A seller knows their customers.
8-A book is a product.
9- A hedgehog is a mammal

55-The simplest way to create relationships is with a continuous line connecting the two classes

56- What is the meaning of a relationship represented in a a continuous line without an arrowhead and without a label ?
(Contract —Address)

It represents a relationship between both classes the contract and the address with no additional information

57- What is the meaning of a relationship represented in a a continuous line without an arrowhead but with a label ?
(Contract — (billing address) — Address)

- It means that both classes are associated through the association/relationship called billing address

58- What is the meaning of a relationship represented in a a continuous line with an arrowhead with a label ?
(Contract — (billing address) —>Address)

It represents “has/knows” relationship, Which means that the contract knows the address but the address doesn’t know anything about the existence of the contract

59- What is the meaning of a relationship represented in a continuous line with an arrowhead with a label associated with multiplicities at the end of the relationship ?
(Contract 1..* — (billing address) —>1 Address)

- It means a contract has exactly 1 address but the address has at minimum of 1 contract without a maximum limit

60- What are multiplicities?

- They are specification for quantity of associations between different classes

61- What is the use of multiplicities ?

- They are used to specify how many objects of a class can be associated with how many objects of another class

62- In multiplicities the information to the left of “...” represents the lower bound of the quantity specifications and the information on the right of “...” is the upper bound

63- What does 0..1 multiplicity notation mean? Give an example

- It means optional association
  (0..1 car belongs to one car / 0..1 trailers belong to one car)

64 What does 1 multiplicity notation mean? Give an example

- It mean obligatory association

(A car has exactly one driver / A driver has exactly one car)

65- What does 0..* multiplicity notation mean? Give an example

- It means optionally any number,
  (A student can take minimum of 0 course)

66- What does 1..* multiplicity notation mean? Give an example

- It means any desired number but at least 1
  (A course can be taken by at least 1..* student)

67- What does n..m multiplicity notation mean? Give an example

- It means a minimum n and a maximum m
  (a car has a minimum of 3 and a maximum of 4 cars)

68- If no value is explicit then 1 (obligatory association) is assumed but it should be avoided to avoid misunderstanding

3- MPOs:

69- Mention the typical associations between classes

1- has / knows
2-Consists of
3- is a

70- Mention the notations of multiplicities in relationships

1- 0..1
2- 1
3- 0..*
4- 1..*
5- n..m

10- Unified modeling language (UML)

1- Idea

2- OPQs

71- What is a unified modeling language?

This is a universal modeling language that is a global standard for modeling in IT systems

72- A distinction is made between diagrams for modeling structure and modeling behavior when taking an overview on UML

73- What is a structure diagram used for ?

- It is used for modeling what a system consists of (structure, elements, compositions, interfaces)

74- What are Behavior modeling diagrams used for ?

- They are used to model what happens in a system

75- What is a class diagram?

- This is a UML structure diagram that is used to model classes and their attributes and methods as well as their associations

76- All other structure diagrams of the UML are based more or less on the modeling concepts of the class diagram.

77- What is object diagram ?

- Special form of class diagrams, they can be used to model specific instances of classes, like objects whose attributes contain values are modeled

3- MPQs

78 Mentions structural diagrams

1- Class diagram (cld)
2- Component diagram
3- Composite structure diagram
4- Object diagram
5- Deployment diagram
6- Package diagram

79- Mention behavioral diagrams

1- Activity diagram (acd)
2- Use case diagram
3- State machine diagram (smd)

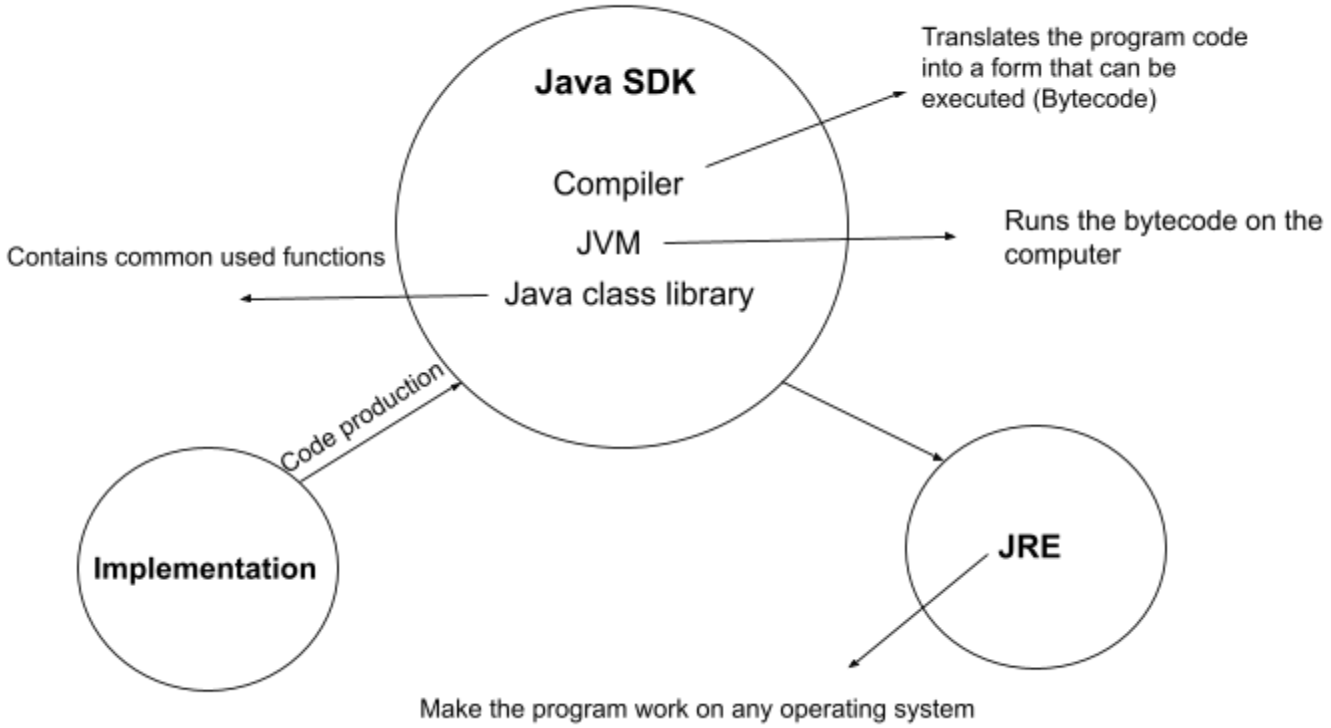
80- Mention interaction diagrams

1- Sequence diagram
2- Communication diagram
3- Timing diagram
4- Interaction overview diagram

11- Introduction to the java programming language

1- Idea

1- Production of the program code → Compiler (Translate the program code into bytecode) → JVM → Java class library → JRE→ Program running on the computer



2- OPQs

81- What is programming ?

- It is the activity of developing a program code that can be executed as a program or a program component after compilation on the computer.

82- What is a compiler?

- It is the software that translates the program code into a form that can be executed on the computer

83- What is the Bytecode ?

- This is the form that the java program takes after the program has been compiled which can be executed as a program by JRE

84- What is Java virtual machine (JVM) ?

- This is an operating system specific software that runs Java programmes in bytecode form on computer

85- What is Java software development kit (Java SDK)

- This is a basic tool for java development that includes the compiler for creating the bytecode , Java class library and JVM for running the java program and many other tools

86- What is the use of the Java class library?

- It is a part of Java SDK and it provides functions that are already part of the Java programming language, So that commonly used data structures (i.e lists and strings) can be reused without the need to reimplement them every time.

87-The java programming language is a platform independent programming language this means that its programmes can be operated on any of the operating systems such as Linux,Windows,Mac OS,..etc without the need to create/write a specific program for each operating system

88- JRE is installed on devices with any operating system in order to run java programme without the need to create/write the program for each operating system compared to other languages that requires runtime environment for each operating system

3-MPQs

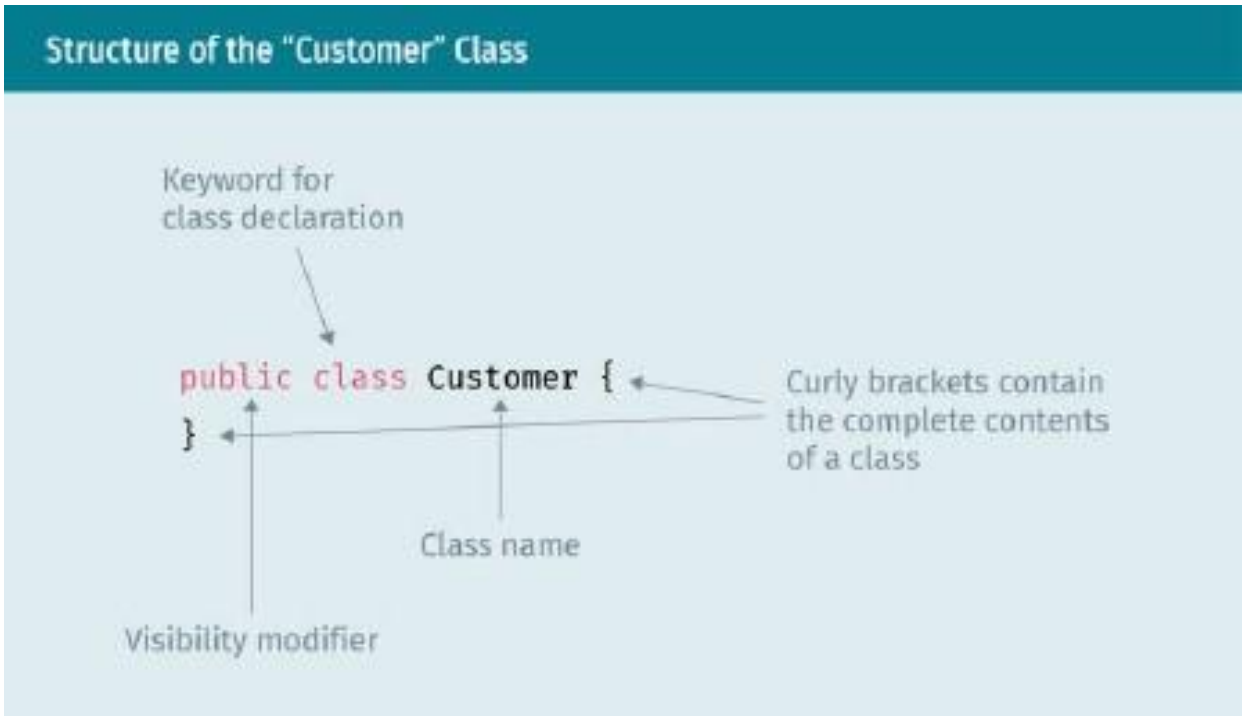
90- Programming (Implementation) consists of three different activities :

1- Production of program code (Programming)
2- Translation of program code into a form that can be executed (Compiling)
3- Running the compiled program on the computer (Executing)

12- Basic elements of a class in Java

1- Idea

1-



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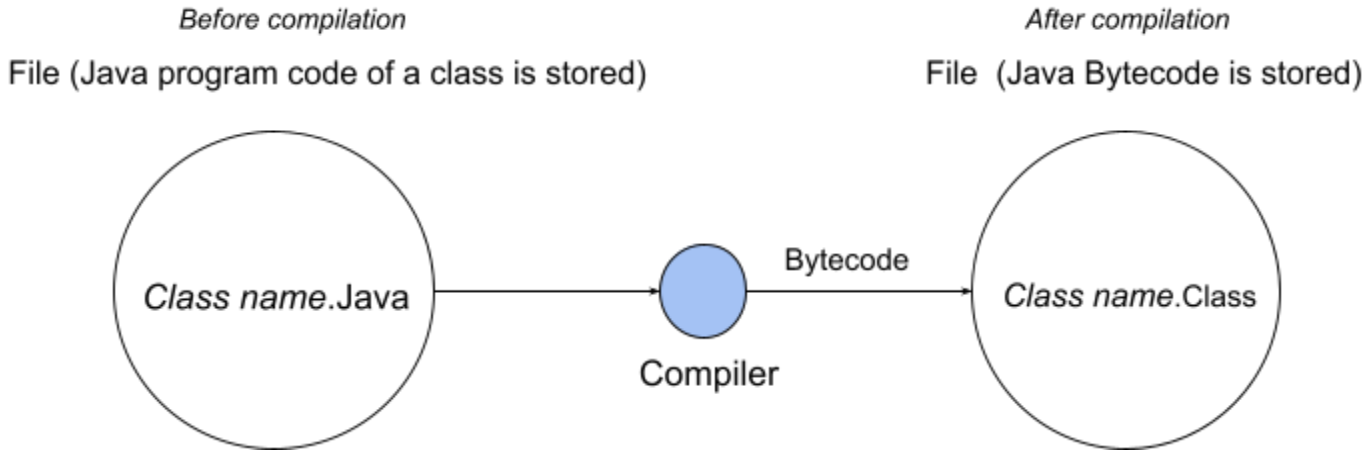


2- OPQs

91- What is the description of the visibility modifier of a class? and give an example on it.

- Defines the visibility of the class for other classes, (Public)

92- What is the description of the keyword for class declaration? and give an example on it.

- Indicates to the java compiler that a java class is programmed in the following, (Class)

93- What is the description of the class name? and give an example on it.

- Defines the name for the class and is used as a file name.(The class “Customer” is programmed in a text file “Customer.java”)

94- What is the description of the curly brackets of a class? and give an example on it.

- Marks the contents of a class (attributes and methods); everything inside the braces belongs to a class, { … }

95-The program code of a class is saved in Java in a text file with the file ending (.java) with a separate file is created for each class

96- the Java compiler creates a class with the ending (.class) in which the compiled bytecode of a class is saved.

3- MPQs

97- The following rules apply for the class name;

1- Begins with an uppercase letter
Consists of Unicode characters (with restrictions, e.g., no empty characters, no umlauts)

2- Can theoretically be of any length
(only limited by the maximum length of a file name)

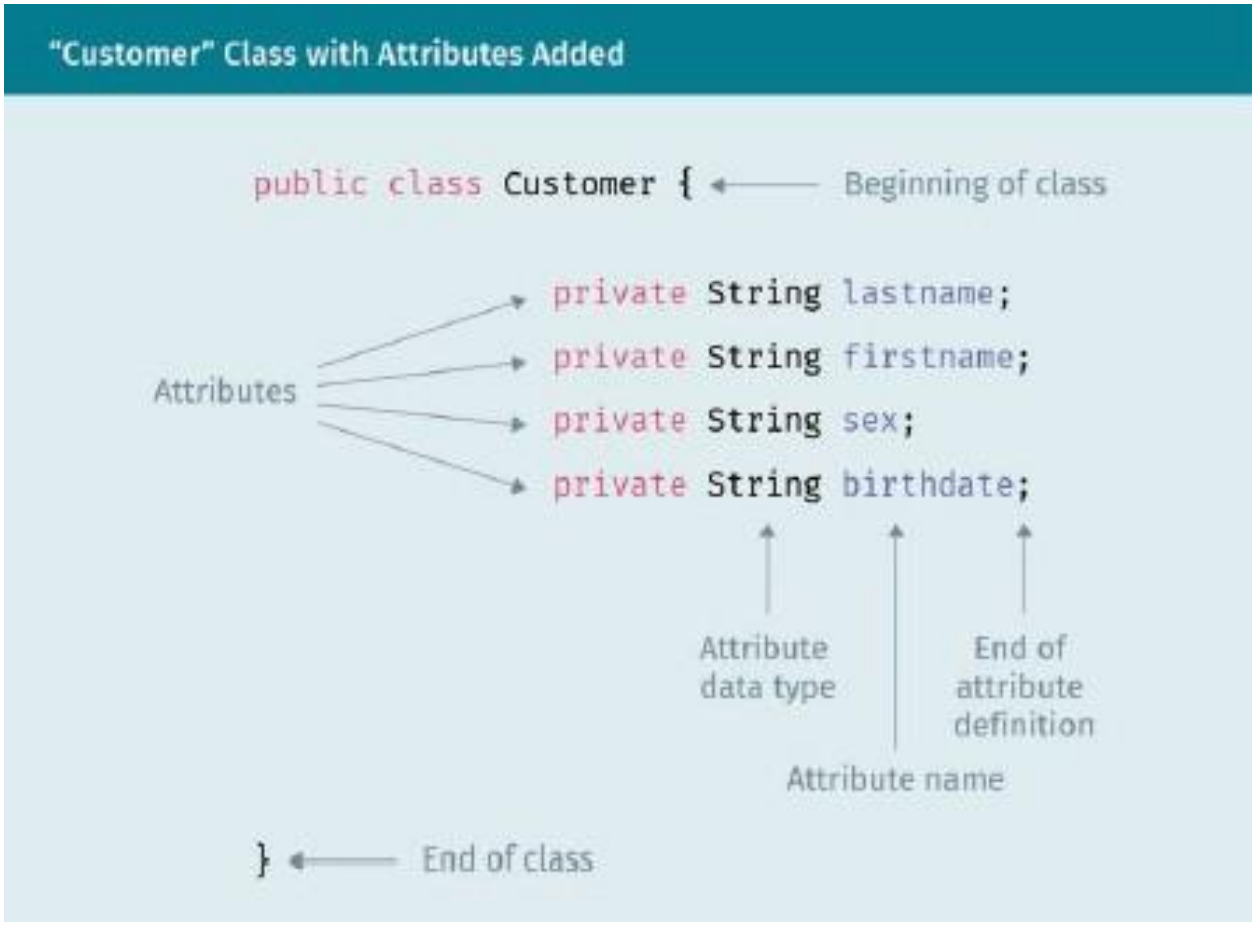
3-Cannot be a keyword of class declaration (e.g., class or public)

4- If the class name contains multiple words, these are combined without separator (e.g., WordWord, NameOfClass)

3- Attributes in Java

Idea :

1-



2-

2- OPQs

99- What is the Default value of an attribute inside of a class ?

- It is the initial value of the attribute that is automatically assigned to an attribute when the object is created (i.e = 0 , = 1 , = false)

(private boolean isPremiumCustomer = false;)
(private int quantityOfPurchases= 0;)

100- What is the description of the visibility modifier of an attribute ? and give an example on it

- It defines the visibility of an attribute for other classes (Private)

101- What is the description of the Data type of the attribute ? and give an example on it

- It defines the type of the data of the attribute thereby determines the number and type of values that can be stored in the attribute (String,date..etc)

102- What is the description of the attribute name? and give an example on it

- Defines the name for the attribute of the class, Each name can only assigned once inside a class

103- What is the description of the Semicolon of an attribute? and give an example on it

- It marks the end of the attribute declaration, (;)

104- A data type of an attribute is either a primitive data type or a class, which is called a reference data type (e.g.,String or Customer).

3- MPQs

105- The following rules apply for the name of an attribute of a class

1- Begins with a lowercase letter

2- Consists of Unicode characters (with restrictions, e.g., no empty characters, no umlauts)

3- Can theoretically be of any length

4-Cannot be a keyword (e.g., public or class)

5-Is case sensitive (i.e., name is a different attribute than nAme)

6-If the attribute name contains multiple words, these are combined without separator
(e.g., attributeAttribute, nameOfCustomer)

13- Methods in Java

1- Idea: separated

2- OPQs

106- What is the principle of data encapsulation?

- It is the principle that prevents direct access of any object by another object but can be only accessed using methods

107- What is the description of the visibility modifier of a method? and give an example on it

- It defines the visibility of a method to other classes (Private)

108- What is the description of the return data type of the method? and give an example on it

- Defines the data type of the object in which the result of the method is output after processing the method body , (String,void..etc)

109- What is the description of the method name? and give an example on it

- Defines the name for the method, GetLastname()

110- What is the description of the parameter list of a method? and give an example on it

- Defines List of required objects and their data types which are needed for processing the method;if no parameters are defined, the list remains empty, , GetLastname(lastName) , ()

111- What is the description of the method body? and give an example on it

- Contains the specific statements for what is
  done when the method is invoked and in what order.

112-What is the signature for the method ?

- A signature uniquely identifies a method and consists of the name of the method and the parameter list.

113-What does getter and setter methods do?

- Getter is used to access the attribute values and the setter is used to change these attributes values

114- What is method overloading ?

- This is the process of implementing multiple methods with the same names but different parameter lists inside a class

115- What is the definition of the main method?

- It is the method that all the generation of the objects required by the program starts from

116- access to the attributes of an object by other objects is only possible through methods, but never through a direct access to the attributes of another class (encapsulation principle).

117-When the method does not output a result, the return data type is set to void

118- a method name can only be used more than once in a class if the number or data type of the parameters are different

119-The statements in a method body
are processed in sequence from the top down.

120- If a return data type is defined for the method, the last statement of the method body begins with the keyword return.

121- The return data type is not a part of the signature.

122-Each signature can only occur once in a class

123- The name of a method can be assigned more than once in a class as long as the parameter list is different.

124- Each statement ends with a semicolon in the method body ";"

125-To access the attributes of a class, any number of method names can be assigned.However, in general, names should be chosen so that it is easy to recognize what the method actually does.

126- the implementation of the getter and setter methods
is similar; only the names of the methods and parameters are different. The basic structure, however, remains the same
127-Methods can be invoked from within other method bodies of the same class or from method bodies of another class

128- A method is invoked using the name

129-Java program like wise consists of a combination of different classes that cooperate together through the invocation of methods.

131- To prevent confusion, however,there should only be one class with a main method.

132- Only the main method body is modified as necessary nothing else need to be modified in the main method

3- MPQs

133- The following rules apply for the name of the method:

1- Begins with a lowercase letter
2-Consists of Unicode characters (with restrictions, e.g., no empty characters, no umlauts)
3-Can theoretically be of any length
4-Cannot be a keyword (e.g., public or class)
5- Is case sensitive (i.e., method() is a different method than mEthod)

134- The following elements of the main method should be used without changes:

1- visibility modifier (public),

2- declaration of the main method as static method (static),
3- specification that there is no return type (void),
4- name of method (main), and
5- parameter list (String args[]).

Elements of :

Class	Attribute	Method	Main method
1- Visibility modifier **2-** Keyword for class declaration **3-** Class name **4-** {} curly brackets	**1-** Visibility modifier **2-** attribute data type **3-** Attribute name **4-** Semicolon ; **5-** constant **6-** Default value	**1-** Visibility modifier **2-** Return data type **3-** method name **4-** parameter list **5-** beginning of method body { **6-** statements in method body ends with semicolon ; **7-** return(output value) ; **8-** End of the method body }	**1-** V.M = Public **2-** keyword for static method = Static **3-** Return data type = void **4-** method name = name **5-** parameter list = string args [] **6-** method body {}

- **Example** *(Numercation in the example refers to its keyword on the table above)* , *The example is joining a class with its attribute and method except a main method* :

- Class ⇒ (1)public (2)class (3)Customer (**4**){
- Attributes ⇒ (1)private (2)string (3)lastname (4);
- Method ⇒ (1)public (2)string (3)getlastname(4)() (5){
  (6)return lastname; (7)}
  (**4**)}

- Main method:

- public static void main(string args[]) {....}