DISTRIBUTED APPLICATIONS SESSION 2

Eng. Mouhsen Ibrahim

CONTENTS

- Java Data types
- Java variables
- Operators
- Conditionals
- Loops
- Classes
- Methods and attributes
- Inheritance
- Exercise
- Homework

JAVA DATA TYPES

- There are two kinds of Java Data types these are:
- Primitive data types: Are predefined by language, they include: byte, short, int, long, float, double, boolean and char.
- Reference data types: These are defined using classes and constructors, they are actually pointers to data in memory and their default value is null.
- Java literals: these are values that can be assigned to primitive data types only, examples for them include:
- 12, 172L, ‘J’, 013, 0x7fa, 12.3f, 78.901d, 0.9e-12, …..

JAVA VARIABLES

- There are three kinds of variables in java
- Local variables: these are declared within methods, constructors and blocks, they do not have access modifiers and last until the method, constructor or block ends, the do NOT HAVE default values.
- Instance variables: declared within classes but outside methods, they have access modifiers and default values, they are created with the object and destroyed when the object is destroyed.
- Static variables: declared within classes and are shared among all class instances, created when the program starts and destroyed when it ends.

OPERATORS

- There are 6 types for java operators
- Arithmetic operators: +, -, *, /, %, ++, --.
- Relational operators: ==, !=, >, <, >=, <=.
- Bitwise operators: &, |, ^, ~, <<, >>, >>>.
- Logical operators: &&, ||, !.
- Assignment operators: =, +=, -=, *=, /=, %=, <<=, >>=, &=, |=, ^=.
- Misc operators: ?:, instanceof.

CONDITIONALS

- We can use the if statement to execute code only when a condition is true.
- The else statement can be used to execute code when the condition is false.
- We can use nested if statements to specify multiple conditions and execute code based on them.
- The switch statement is used to execute code when a variable evaluates to some value.
- ?: operator can be used instead of if/else statements.

LOOPS

- There are three kinds of loops in java
- While loop: execute some code as long as a condition is true.
- For loop: execute some code for a number of times.
- Do..while loop: like the while loop but the condition test happens at the end of the statement not at the beginning.
- Inside loops we can use break to finish the loop immediately or continue to go to the next iteration immediately.
- There is an enhanced version of for loop to iterate over the elements of an array: for (int x: arr){} where arr is an array of ints.

LOOPS - CONT

CLASSES

- Classes are a fundamental concept in OOP, they are used as templates or blueprints for objects.
- Each object has a state defined by its attributes and a behavior defined by its methods.
- Each class defines a constructor that is used to create an object from a class and give initial values to its attributes.
- The new keyword followed by the class constructor is used to create an object from a class.
- Attributes are usually declared as private and public methods are used to access them (encapsulation).

CLASSES - CONT

- There can be only one public class per source file, and many non-public classes, the name of the source file must match the name of the class after adding .java extension.
- If the class is in a package then the first statement must be package <package name>;
- Import statement exist between package declaration and class definition.
- Packages are used to organize code in big projects where similar classes and interfaces exist in the same package.

METHODS AND ATTRIBUTES

- An attribute is a variable defined inside a class.
- Attributes are usually private and methods are used to access them.
- Methods have return type and a list of input parameters.
- Methods have access to all attributes in the same class.
- Parameters passed to attributes by value if they are of primitive types and by reference if they are objects.
- If a method does not return a value its return type is void.

METHODS AND ATTRIBUTES - CONT

- If two methods have the same name and return type but with different parameters we say these methods overload each other.
- Method overriding happens when methods have the same name, type and parameters, this happens between child and parent classes.
- The this keyword is used to pint to the current object.
- We can define methods with variable number of arguments using typeName… variablename.
- The finalize method is called when an object is about to be destroyed.

INHERITANCE

- Inheritance is used when many classes share many similar attributes and methods so a new class is created with the shared methods and attributes and all classes extend it.
- Inside the child classes the super keyword is used to call the constructor of base class, access its attributes and methods.
- Inheritance can be defined using IS-A relationship.
- The HAS-A relationship is defined when a class has another object as part of its attributes.

EXERCISE

- Write java code to implement the shapes model as described bellow:
  - The Shape class is an abstract class and has the following methods and attributes: draw(), contour(), area(), sidesNum.
  - The Rectangle inherits from Shape and has sides = 4 always with two additional attributes: length, width.
  - The Square inherits from Rectangle and has length = width always.
  - Triangle inherits from Shape and has side = 3 with four additional attributes side1, side2, side3.
  - Circle inherits from Shape and has sides = 0 always with an additional attribute diameter
- The solution can be found here: https://github.com/mohsenSy/java-1

HOMEWORK

- Write java code to implement the model described bellow
  - An abstract Human class that has the following attributes and methods: age, gender, length, job, name, eat() and sleep().
  - A teacher class inherits Human and has job = “teacher”, degree, courses.
  - A student class inherits Human and has job = “student”, year and courses.
  - A Year class that represents an academic year and has courses attribute.
  - A Course class that represents an academic course and has these attributes: year, name, teacher and practicalMark.

THE END