

OBJECT-ORIENTED PROGRAMMING LAB 2: JAVA, HOW TO PROGRAM (CONT.)

I. Objective

In this second tutorial, you will:

- Practice with array in Java.
- Have basic knowledge about object, how to create object in Java and practice it with the sample class which defined by Java.

II. Array

Java provides a data structure, the array, which stores a fixed-size sequential collection of elements of the same type. To declare an array, we have 4 possible ways:

```
dataType[] arrayName;  
dataType arrayName[];  
dataType[] arrayName = new dataType[arraySize];  
dataType[] arrayName = {value0, value1, ..., valueK};
```

Example:

```
public class MyFirstProgram {  
    public static void main(String[] args) {  
        int[] a = {1, 2, 3, 4, 5};  
        int sum1 = 0, sum2 = 0;  
        for (int i = 0; i < a.length; i++) {  
            sum1 = sum1 + a[i];  
        }  
        System.out.println("sum1 = " + sum1);  
        for (int x : a) {  
            sum2 = sum2 + x;  
        }  
        System.out.println("sum2 = " + sum2);  
    }  
}
```

We have a special for loop in the above sample called *enhanced for* loop. The *enhanced for* loop is mainly used to traverse a collection of elements including arrays. The syntax is as follows.

Example:

```
public class MyFirstProgram {  
    public static void main(String[] args) {  
        int[] a = {1, 3, 5, 7, 9};  
        for (int x : a) {  
            System.out.println(x);  
        }  
    }  
}
```

III. Classes and objects in Java

Java is an Object-Oriented Programming (OOP) language. Everything you work in Java is through classes and objects. In this lab, we just learn how to create an object from the available class in Java, we will learn about this topic more carefully in Lab 4.

BigDecimal is a class, which is defined in the **java.math** package. This class provides operations for arithmetic, scale manipulation, rounding, comparison, hashing, and format conversion. Besides that, the BigDecimal class gives its user complete control over rounding behavior. You can read more about this class [here](#).

Object is an instance of a Class.

Example:

```
import java.math.BigDecimal;  
  
class Test {  
    public static void main(String[] args) {  
        BigDecimal num = new BigDecimal(1);  
        BigDecimal num1 = new BigDecimal(4);  
        BigDecimal x = num;  
  
        // BigDecimal y;  
  
        System.out.println(num);  
        System.out.println(num1);  
        System.out.println(x);  
  
        // System.out.println(y);  
    }  
}
```

Output:

```
1  
4  
1
```

With the above example, the variables: *num*, *num1*, *x*, *y* were created from the BigDecimal class. In other words, the variables: *num*, *num1*, *x*, *y* are the pointers to the objects. However, variable *y* hasn't

been initialized. Therefore, the value of that variable will be undermined until an object is actually created and assigned to it. If you try using an uninitialized variable, you will get a compiler error.

The format of code when you want to create an object from the class is:

```
ClassName instanceName = new ClassConstructor([paramater1, parameter2, ...])
```

Let observe another example:

```
import java.math.BigDecimal;

class Test1 {
    public static void main(String[] args) {
        BigDecimal x = new BigDecimal(4);
        BigDecimal y = new BigDecimal(4);

        System.out.println(x == y);
        System.out.println(x.equals(y));
    }
}
```

Output:

```
false
true
```

With objects, we don't use operator "==" to compare values, because this operator will compare the addresses and there are the pointers so they have different address. BigDecimal supports the method called **equals** to compare the value of two BigDecimal objects.

Next, we will learn how to invoke the **non-static method** and **static method** from a class. To invoke a static method, you do not need to create an object, instead you can invoke directly from class name. Contrarily, with non-static method, you need to create an object to invoke it.

Example:

```
import java.math.BigDecimal;

class Test2 {
    public static void main(String[] args) {
        BigDecimal x = new BigDecimal(-4);

        //abs() is non-static method of BigDecimal class
        BigDecimal y = x.abs();

        //valueOf() is static method of BigDecimal class
        BigDecimal z = BigDecimal.valueOf(20.22);

        System.out.println(y);
        System.out.println(z);
    }
}
```

Output:

```
4
20.22
```

IV. Exercises

1. Write a function *public static int findMax(int arr[])* to find the maximum value of an array.
2. Write a function to find the minimum value of an array.
3. Write a function to sum all even numbers of an array.
4. Write a function to count how many specific element in an array.
5. Write a function to count how many prime number in an array.
6. Write a function *public static int find(int arr[], int k)* to find the index of an element *k* in an array, if the element doesn't exist in an array return -1. (the first element index is 0)
7. Write a function *public static void square(int arr[])* to square all elements of an array.
8. Write a function *public static BigDecimal findMax(BigDecimal []arr)* to find the maximum value of an BigDecimal object array.
9. *Write a function *public static int[] divisibleNumbers(int arr[], int k)* to find the elements which divisible by *k* in an array. (Hint: You can use the loop twice times to solve this problem. The first loop will count how many elements meet the condition to define the size. Create a new array with this size to contain the result. The second loop will copy elements that meet the condition into the result array. Ex: a = [1,2,3,4,5,6,7] with *k* = 2 → [2,4,6]).
10. *Write a function to find the third largest element in an array.