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CLASS : 1I - IT
TOPIC : JOBSHEET 3 ARRAY OF OBJECT

3.1 Purpose

After doing this lab exercise, students are able to:

1. Understand and explain array functions that contain object variables.
2. Students are able to capture logic about the problem of array of objects in Java
3. Students are able to apply array of objects in Java

3.2 Creating Arrays of Objects, Assign and Displaying

In this practicum, we will practice how to create an array of objects, then assign value and display the array

3.2.1 Lab Unit – 1

1. Create new Project, with the name "ArrayObjects". Create a package with the name week3.
2. Create a new class with the name RectangleAbsentNumber:

```
public class Rectangle00 {
    public int length;
    public int width;

}
```

3. Create a new class with the name ArrayObjectAbsentNumber: which contains the main method, create an array of object from Rectangle class that can store 3 elements:

```
public class ArrayofObject00 {

    public static void main(String[] args) {
        Rectangle00 rtgArray[] = new Rectangle00[3];
    }
}
```

4. Assign values to each attribute:

```
rtgArray[0]=new Rectangle00();
rtgArray[0].length=110;
rtgArray[0].width=30;

rtgArray[1]=new Rectangle00();
rtgArray[1].length=80;
rtgArray[1].width=40;

rtgArray[2]=new Rectangle00();
rtgArray[2].length=100;
rtgArray[2].width=20;
```

5. Print to the screen all the attributes of the rtgArray object:

```
System.out.println("0th Rectangle, length : "+rtgArray[0].length+ "width : "+rtgArray[0].width);
System.out.println("1th Rectangle, length : "+rtgArray[1].length+ "width : "+rtgArray[1].width);
System.out.println("2th Rectangle, length : "+rtgArray[2].length+ "width : "+rtgArray[2].width);
```

NAME : FARICHA AULIA
NIM : 2141720155
ABSENT : 08
CLASS : 1I - IT
TOPIC : JOBSHEET 3 ARRAY OF OBJECT

6. Run ArrayObjectAbsentNumber class and observe the results!

Answer Lab Unit 1 :

```
src > week3 > ArrayObjects08.java > ...
1   package week3;
2
3   public class ArrayObjects08 {
        Run | Debug
4       public static void main(String[] args) {
5           Rectangle08 rtgArray[] = new Rectangle08[3];
6
7           rtgArray[0] = new Rectangle08();
8           rtgArray[0].length = 110;
9           rtgArray[0].width = 30;
10
11          rtgArray[1] = new Rectangle08();
12          rtgArray[1].length = 80;
13          rtgArray[1].width = 40;
14
15          rtgArray[2] = new Rectangle08();
16          rtgArray[2].length = 100;
17          rtgArray[2].width = 20;
18
19          System.out.println("0th rectangle, length : " + rtgArray[0].length + " and width : " + rtgArray[0].width);
20          System.out.println("1st rectangle, length : " + rtgArray[1].length + " and width : " + rtgArray[1].width);
21          System.out.println("2nd rectangle, length : " + rtgArray[2].length + " and width : " + rtgArray[2].width);
22      }
23  }
```

The results:

```
0th rectangle, length : 110 and width : 30
1st rectangle, length : 80 and width : 40
2nd rectangle, length : 100 and width : 20
```

3.2.2 Questions

1. Based on lab-unit 1 - 3.2.1 section, does the class that will be created an array of objects always have attributes and methods at the same time? Explain!
   Answer: yes, because to run the method requires an attribute
2. Does the Rectangle class have a constructor? If not, why do we call the constructor in the following line of program:

   ```
   rtgArray[0]=new Rectangle00();
   ```

   Answer: If class doesn't have a constructor, mk can't create objects (automatically)
3. What does the following code mean:

   ```
   Rectangle00 rtgArray[] = new Rectangle00[3];
   ```

   Answer: Create an array of objects, declarations and instances
4. What does the following code mean:

   ```
   rtgArray[0]=new Rectangle00();
   rtgArray[0].length=110;
   rtgArray[0].width=30;
   ```

   Answer: Create a value for the attribute

NAME : FARICHA AULIA
NIM : 2141720155
ABSENT : 08
CLASS : 1I - IT
TOPIC : JOBSHEET 3 ARRAY OF OBJECT

5. Why ArrayObject class and class Rectangle class written separately in the lab unit -1?
   Answer: Cannot create classes at the same time

3.3 Receiving Array Input Using Looping

In this practicum we will change the results of the program from practicum 3.2 so that the program can accept input from the keyboard and use looping to assign values to the attributes of all rectangles in the rtgArray.

3.3.2 Lab Unit - 2

1. Import scanner on ArrayObjects class

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

2. On lab unit- 1 step number 4, replace the code with the following code, which creates a Scanner object to accept input, then loops to receive input:

```
Scanner sc00 = new Scanner(System.in);

for (int i=0; i<3;i++)
{
    rtgArray[i]=new Rectangle00();
    System.out.println(i+"th Rectangle:");
    System.out.print("input length: ");
    rtgArray[i].length=sc00.nextInt();
    System.out.print("input width: ");
    rtgArray[i].width=sc00.nextInt();
}
```

3. In the lab-unit 1 (3.2.1 section) step number 5, replace the code with the following code, which uses a loop to access the value of the rtgArray and print it to the screen:

```
for (int i=0; i<3;i++)
{
    System.out.println("====output======");
    System.out.println(i+"th Rectangle:");
    System.out.println("length: "+rtgArray[i].length+ " width : "+rtgArray[i].width);
}
```

4. Run and observe the results!

3.3.3 Verifikasi Hasil Percobaan

Match the results of your compiled program code with the following image

NAME : FARICHA AULIA
NIM : 2141720155
ABSENT : 08
CLASS : 1I - IT
TOPIC : JOBSHEET 3 ARRAY OF OBJECT

```
0th Rectangle:
input length: 100
input width: 80
1th Rectangle:
input length: 75
input width: 25
2th Rectangle:
input length: 120
input width: 60
====output======
0th Rectangle:
length: 100 width : 80
====output======
1th Rectangle:
length: 75 width : 25
====output======
2th Rectangle:
length: 120 width : 60
```

Answer Lab Unit 2 :

src > week3 > ArrayObjects08.java > ArrayObjects08 > main(String[])

```java
package week3;
import java.util.Scanner;

public class ArrayObjects08 {
    Run | Debug
    public static void main(String[] args) {
        Rectangle08 rtgArray[] = new Rectangle08[3];

        Scanner sc08 = new Scanner(System.in);

        for (int i = 0; i <3; i++){
            rtgArray[i] = new Rectangle08();
            System.out.println(i + "th Rectangle");
            System.out.print("Input length : ");
            rtgArray[i].length = sc08.nextInt();
            System.out.print("Input width : ");
            rtgArray[i].width = sc08.nextInt();
            System.out.println("=======================");
        }

        for ( int i = 0; i<3; i++){
            System.out.println("=========output=========");
            System.out.println(i + "th Rectangle : ");
            System.out.println("length : " + rtgArray[i].length + " || width : " + rtgArray[i].width);
        }
    }
}
```

NAME : FARICHA AULIA
NIM : 2141720155
ABSENT : 08
CLASS : 1I - IT
TOPIC : JOBSHEET 3 ARRAY OF OBJECT

```
0th Rectangle
Input length : 60
Input width : 40
=======================
1th Rectangle
Input length : 50
Input width : 45
=======================
2th Rectangle
Input length : 80
Input width : 50
=======================
========output=========
0th Rectangle :
length : 60 || width : 40
========output=========
1th Rectangle :
length : 50 || width : 45
========output=========
2th Rectangle :
length : 80 || width : 50
```

3.4.1 Lab unit - 3

1. Create new package “Week3Cube”.
2. Create CubeAbsenNumber Class:

```java
public class cube00 {
    int length;
    int width;
    int height;

    public cube00(int l, int w, int h){
        length=l;
        width=w;
        height=h;
    }

    public int CalculateVolume(){
        int volume;
        volume = length*width*height;
        return volume;
    }

}
```

3. Create class ArrayCubeAbsenNumber, add main method inside ArrayCube class, create array of object CubeArr that can store 3 element:

```java
public static void main(String[] args) {
    cube00[] cubeArr = new cube00[3];
}
```

4. Then add the following code to value the CubeArr array using the constructor of the Cube class:

NAME : FARICHA AULIA
NIM : 2141720155
ABSENT : 08
CLASS : 1I - IT
TOPIC : JOBSHEET 3 ARRAY OF OBJECT

```
cubeArr[0]=new cube00(100, 30, 12);
cubeArr[1]=new cube00(50, 40, 22);
cubeArr[2]=new cube00(80, 500, 25);
```

5. Print all the volume cubes by calling the calculateVolume() method in the loop as follows:

```
for(int i =0; i<3; i++)
{
    System.out.println("Volume of "+i+"th Cube is : "+cubeArr[i].CalculateVolume());
}
```

6. Run and observe the results!

3.4.2 Verification

Match the results of your compiled program code with the following image

```
Volume of 0th Cube is : 36000
Volume of 1th Cube is : 44000
Volume of 2th Cube is : 1000000
Mamluatuls-MacBook-Air:datastructure
```

Answer Lab Unit 3:

src > week3cube > ArrayCube08.java > ...

```
1  package week3cube;
2
3  public class ArrayCube08 {
       Run | Debug
4      public static void main(String[] args) {
5          Cube08[] cubeArr = new Cube08[3];
6
7          cubeArr[0] = new Cube08(100,30,12);
8          cubeArr[1] = new Cube08(50,40,22);
9          cubeArr[2] = new Cube08(80,500,25);
10
11         for (int i=0; i<3; i++){
12             System.out.println("Volume of " +i+ "th cube is : " +cubeArr[i].CalculateVolume());
13         }
14     }
15 }
```

NAME : FARICHA AULIA
NIM : 2141720155
ABSENT : 08
CLASS : 1I - IT
TOPIC : JOBSHEET 3 ARRAY OF OBJECT

```java
package week3cube;

public class Cube08 {
    int length;
    int width;
    int height;

    public Cube08(int l, int w, int h){
        length = l;
        width = w;
        height = h;
    }

    public int CalculateVolume(){
        int volume;
        volume = length*width*height;
        return volume;
    }
}
```

```
Volume of 0th cube is : 36000
Volume of 1th cube is : 44000
Volume of 2th cube is : 1000000
PS C:\Users\ASUS\Dasar Pemrograman\ARRAYOFOBJECT>
```

3.4.3 Questions

1. Can there be more than one constructor in a class? Explain with examples!
   Yes can, Example :
   public class Car{
   public Car(){
   }
   }
2. If it is known that there is a Triangle class as follows:
   Add a constructor to the Triangle class which contains parameters int b, int h, which are used to assign values to the base and height attributes.
3. Add the calculateArea() and calculatePerimeter() methods to the Triangle class.
4. In the main Method, Create array of object with the name trgArray that can store 4 element, assign the value of each attribute as follows:
   0th trgArray base: 10, height: 4
   1st trgArray base: 20, height: 10
   2nd trgArray base: 15, height: 6
   3rd trgArray base: 25, height: 10
5. Use looping to display the area and perimeter of rectangle by calling calculateArea() and calculatePerimeter() methods.

NAME	:	FARICHA AULIA
NIM	:	2141720155
ABSENT	:	08
CLASS	:	1I - IT
TOPIC	:	JOBSHEET 3 ARRAY OF OBJECT

Answer:

src > week3exercise > quesLab3.java > quesLab3

```java
package week3exercise;

public class quesLab3 {
    int base;
    int height;

    public double calcArea(){
        int area;
        area = (base*height)/2;
        return surface;
    }

    public double calcPerimeter(){
        int perimeter, hypotenuse;
        hypotenuse = (int) Math.pow(Math.pow(base, 2) + Math.pow(height,2),0.5);
        perimeter = base + height + hypotenuse;
        return perimeter;
    }
}
```

3.5 Exercise

1. Make a program that can calculate the surface area and volume of several shapes (at least 3, you can choose the type of shape you want). Make 3 (three) classes according to the number of types of shapes. And create a main class to create an array of objects that input existing attributes using the constructor of all the shapes. Description: Create a loop to input each attribute, then display the surface area and volume of each type of shape.

Answer:

src > week3exercise > arrayEx1.java > arrayEx1 > main(String[])

```java
package week3exercise;
import java.util.Scanner;

public class arrayEx1 {
    Run | Debug
    public static void main(String[] args) {

        Scanner sc = new Scanner(System.in);
        System.out.println("How Many beam : ");
        int a = sc.nextInt();
        beamEx1[] beam=new beamEx1[a];
        System.out.println("How Many pyramid :" );
        int b = sc.nextInt();
        pyramidEx1[] pyramid= new pyramidEx1[b];
        System.out.println("How Many cone :" );
        int c = sc.nextInt();
        coneEx1[] cone= new coneEx1[c];
        System.out.println("======================");

        for(int i=0; i<beam.length; i++){
            beam[i]= new beamEx1();

            System.out.println(i+"th beam:");
            System.out.println("sc length : ");
            beam[i].length = sc.nextInt();
            System.out.println("sc width : ");
            beam[i].width = sc.nextInt();
            System.out.println("sc heigth : ");
            beam[i].height = sc.nextInt();
            System.out.println("==========result==========");
            System.out.println("volume of "+i+"th beam: "+ beam[i].calcVolume());
            System.out.println("surface of "+i+"th beam: "+ beam[i].calcSurface());
            System.out.println("==========================");

        }

        for(int i=0; i<pyramid.length; i++){
            pyramid[i]= new pyramidEx1();

            System.out.println(i+"th pyramid : ");
            System.out.println("sc base length : ");
            pyramid[i].bsLength = sc.nextInt();
            System.out.println("sc heigth : ");
            pyramid[i].height = sc.nextInt();
            System.out.println("sc triangle base : ");
            pyramid[i].trglBase = sc.nextInt();
            System.out.println("sc triangle height : ");
            pyramid[i].trglHeight = sc.nextInt();
            System.out.println("==========result==========");
```

NAME	:	FARICHA AULIA
NIM	:	2141720155
ABSENT	:	08
CLASS	:	1I - IT
TOPIC	:	JOBSHEET 3 ARRAY OF OBJECT

2. A land buying and selling company needs a program that can tell the land area. The program can receive input via the keyboard how many lands to calculate and input the length and width attributes of each land. The program can display the land area of each inputted land and the largest land area of the existing land.

Answer:

src > week3exercise > ex2.java > ex2 > main(String[])

```java
package week3exercise;
import java.util.Scanner;

public class ex2 {
    Run | Debug
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] area = new int[50];
        int total,i,j;
        int wide,length;
        int max = area[0];
        System.out.print("How Many Land: ");
        total =sc.nextInt();
        System.out.println("================");
        for(i=0;i<total;i++) {
            System.out.println(i+"th land:");
            System.out.print("Input Length : ");
            wide = sc.nextInt();
            System.out.print("Input Width  : ");
            length = sc.nextInt();
            area[i]=wide*length;
            System.out.println();
        }
        System.out.println("================");
        for(j=0;j<total;j++) {
            System.out.println("area of "+j+"th land: "+area[j]);
        }
        System.out.println("================");
        for (i = 0; i < total; i++) {
            if (area[i] > max) {
                max = area[i];
            }
        }
        System.out.println("Maximal Area: "+max);
    }

}
```

NAME	:	FARICHA AULIA
NIM	:	2141720155
ABSENT	:	08
CLASS	:	1I - IT
TOPIC	:	JOBSHEET 3 ARRAY OF OBJECT

3. A campus needs a program to display student information: name, id, gender and also the student's GPA (GPA). The program can receive input from the keyboard all the information (name, id, gender, GPA) and then display the information back to the user. Implement the program, for example, there are 3 student data available.

Answer:

c > week3exercise > ex3.java > ex3 > main(String[])

```java
package week3exercise;
import java.util.Scanner;

public class ex3 {
    Run | Debug
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        String[] name = new String[50];
        String[] gender = new String[50];
        int[] nim = new int[50];
        double[] value = new double[50];
        int i,j;
        int totStud,nim2;
        double gpa;
        String nameInput="",genderInput="";
        System.out.print("How Many Students: ");
        totStud = sc.nextInt();
        sc.nextLine();
        System.out.println("==================");
        for(i=0;i<totStud;i++) {
            System.out.println((i+1)+"th Student:");
            System.out.print("Input Name   : ");nameInput=sc.nextLine();
            System.out.print("Input NIM    : ");nim2=sc.nextInt();
            System.out.print("Input Gender: ");genderInput=sc.next();
            System.out.print("Input GPA    : ");gpa=sc.nextDouble();
            name[i] = nameInput;
            nim[i] = nim2;
            gender[i] = genderInput;
            value[i] = gpa;
            sc.nextLine();
            System.out.println();
        }
        System.out.println("=============OUTPUT=============");
        for(j=0;j<totStud;j++) {
            System.out.println("Name      : "+name[j]);
            System.out.println("NIM       : "+nim[j]);
            System.out.println("Gender    : "+gender[j]);
            System.out.println("GPA Score : "+value[j]);
        }
    }
    }
}
```