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JOBSHEET III
ARRAY OF OBJE CTS

3.1 Objectives of the Practicum

After completing this practical material, students are able to:

1. Understand and explain the function of arrays containing object variables.
2. Students are able to implement instantiation of arrays of objects in Java.
3. Students are able to perform operations on elements in an array of objects.

3.2 Creating an Array from Objects, Filling and Displaying

In this practical, we will practice how to create an array of objects, then fill and display the array.

3.2.1 Experimental Steps

1. Create a new folder with the name Praktikum03 .
2. Create a class **Student< Presence No >** :

```
public class Mahasiswa {
    public String nim;
    public String nama;
    public String kelas;
    public float ipk;
}
```

3. Create a class **MahasiswaDemo<NoPresensi>** then add the main function as follows ;

```
public class MahasiswaDemo {
    public static void main(String[] args) {
        Mahasiswa[] arrayOfMahasiswa = new Mahasiswa[3];
    }
}
```

4. Then fill in each attribute:

```
public class MahasiswaDemo {
    public static void main(String[] args) {
        Mahasiswa[] arrayOfMahasiswa = new Mahasiswa[3];
        arrayOfMahasiswa[0] = new Mahasiswa();
        arrayOfMahasiswa[0].nim = "244107060033";
        arrayOfMahasiswa[0].nama = "AGNES TITANIA KINANTI";
        arrayOfMahasiswa[0].kelas = "SIB-1E";
        arrayOfMahasiswa[0].ipk = (float) 3.75;

        arrayOfMahasiswa[1] = new Mahasiswa();
        arrayOfMahasiswa[1].nim = "2341720172";
        arrayOfMahasiswa[1].nama = "ACHMAD MAULANA HAMZAH";
        arrayOfMahasiswa[1].kelas = "TI-2A";
        arrayOfMahasiswa[1].ipk = (float) 3.36;

        arrayOfMahasiswa[2] = new Mahasiswa();
        arrayOfMahasiswa[2].nim = "244107023006";
        arrayOfMahasiswa[2].nama = "DIRHAMAWAN PUTRANTO";
        arrayOfMahasiswa[2].kelas = "TI-2E";
        arrayOfMahasiswa[2].ipk = (float) 3.80;
    }
}
```

5. Print to the screen all attributes of the **`arrayOfStudents object`** :

```
        System.out.println("NIM     : "+ arrayOfMahasiswa[0].nim);
        System.out.println("Nama    : "+ arrayOfMahasiswa[0].nama);
        System.out.println("Kelas   : "+ arrayOfMahasiswa[0].kelas);
        System.out.println("IPK     : "+ arrayOfMahasiswa[0].ipk);
        System.out.println("-------------------------------------");
        System.out.println("NIM     : "+ arrayOfMahasiswa[1].nim);
        System.out.println("Nama    : "+ arrayOfMahasiswa[1].nama);
        System.out.println("Kelas   : "+ arrayOfMahasiswa[1].kelas);
        System.out.println("IPK     : "+ arrayOfMahasiswa[1].ipk);
        System.out.println("-------------------------------------");
        System.out.println("NIM     : "+ arrayOfMahasiswa[2].nim);
        System.out.println("Nama    : "+ arrayOfMahasiswa[2].nama);
        System.out.println("Kelas   : "+ arrayOfMahasiswa[2].kelas);
        System.out.println("IPK     : "+ arrayOfMahasiswa[2].ipk);
        System.out.println("-------------------------------------");
```

6. Run the program and observe the results.

```java
package com.jobsheet3;

public class Student8
{
    public String nim;
    public String name;
    public String student_class;
    public float ipk;
}
```

```java
package com.jobsheet3;

public class StudentDemo8
{
    Run | Debug | Run main | Debug main
    public static void main(String[] args)
    {
        Student8[] arrayOfStudents = new Student8[3];
        arrayOfStudents[0] = new Student8();
        arrayOfStudents[0].nim = "244107060033";
        arrayOfStudents[0].name = "AGNES TITANIA KINANTI";
        arrayOfStudents[0].student_class = "SIB-1E";
        arrayOfStudents[0].ipk = 3.75f;

        arrayOfStudents[1] = new Student8();
        arrayOfStudents[1].nim = "2341720172";
        arrayOfStudents[1].name = "ACHMAD MAULANA HAMZAH";
        arrayOfStudents[1].student_class = "TI-2A";
        arrayOfStudents[1].ipk = 3.36f;

        arrayOfStudents[2] = new Student8();
        arrayOfStudents[2].nim = "244107023006";
        arrayOfStudents[2].name = "DIRHAMAWAN PUTRANTO";
        arrayOfStudents[2].student_class = "TI-1E";
        arrayOfStudents[2].ipk = 3.80f;

        System.out.println("NIM\t: " + arrayOfStudents[0].nim);
        System.out.println("Name\t: " + arrayOfStudents[0].name);
        System.out.println("Class\t: " + arrayOfStudents[0].student_class);
        System.out.println("IPK\t: " + arrayOfStudents[0].ipk);
        System.out.println(x: "------------------------------");
        System.out.println("NIM\t: " + arrayOfStudents[1].nim);
        System.out.println("Name\t: " + arrayOfStudents[1].name);
        System.out.println("Class\t: " + arrayOfStudents[1].student_class);
        System.out.println("IPK\t: " + arrayOfStudents[1].ipk);
        System.out.println(x: "------------------------------");
        System.out.println("NIM\t: " + arrayOfStudents[2].nim);
        System.out.println("Name\t: " + arrayOfStudents[2].name);
        System.out.println("Class\t: " + arrayOfStudents[2].student_class);
        System.out.println("IPK\t: " + arrayOfStudents[2].ipk);
        System.out.println(x: "------------------------------");
    }
}
```

```
NIM     : 244107060033
Name    : AGNES TITANIA KINANTI
Class   : SIB-1E
IPK     : 3.75
-----------------------------
NIM     : 2341720172
Name    : ACHMAD MAULANA HAMZAH
Class   : TI-2A
IPK     : 3.36
-----------------------------
NIM     : 244107023006
Name    : DIRHAMAWAN PUTRANTO
Class   : TI-1E
IPK     : 3.8
-----------------------------
```

3.2.2 Verification of Experimental Results

Match the results of compiling your program code with the following image.

```
run:
NIM     : 244107060033
Nama    : AGNES TITANIA KINANTI
Kelas   : SIB-1E
IPK     : 3.75
-------------------------------------
NIM     : 2341720172
Nama    : ACHMAD MAULANA HAMZAH
Kelas   : TI-2A
IPK     : 3.36
-------------------------------------
NIM     : 244107023006
Nama    : DIRHAMAWAN PUTRANTO
Kelas   : TI-2E
IPK     : 3.8
-------------------------------------
BUILD SUCCESSFUL (total time: 0 seconds)
```

3.2.3 Question

1. Based on test 3.2, does **a class** that will create **an array of objects** always have to have both **attributes** and **methods** ? Explain!

   No, a class does not always have to have attributes and methods just because it will be used to create an array of objects.

2. What does the following program code do?

```
Mahasiswa[] arrayOfMahasiswa = new Mahasiswa[3];
```

Student declare an object array type where new Student[3] will create an array with a length of 3 elements with arrayOfStudents as the variable name.

3. Does the **`Student class`** have a constructor? If not, why is the constructor called in the following line of the program?

```
arrayOfMahasiswa[0] = new Mahasiswa();
```

No, because that line of code will automatically call the constructor to create a new object.

4. What does the following program code do?

```
arrayOfMahasiswa[0] = new Mahasiswa();
arrayOfMahasiswa[0].nim = "244107060033";
arrayOfMahasiswa[0].nama = "AGNES TITANIA KINANTI";
arrayOfMahasiswa[0].kelas = "SIB-1E";
arrayOfMahasiswa[0].ipk = (float) 3.75;
```

The first line will create a new object and store it in the first element of the array, then the following lines will fill in the values for each attribute.

5. **`the Student`** and **`StudentDemo`** classes separated in test 3.2?

   Yes, the two classes are in separate files.

3.3 Receiving Array Input Using Looping

In this practical we will change the program results from practical 3.2 so that the program can accept input and use looping to fill in the attributes of all Student objects.

3.3.1 Experimental Steps

1. Import scanner in the **`MahasiswaDemo class`** .

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

Note: Place the import code below the package code (if any).

2. In practical 3.2, point 4, modify the program code as follows. Create a **`Scanner object`** to receive input, then loop to retrieve the length and width information:

```
Scanner sc = new Scanner(System.in);
Mahasiswa[] arrayOfMahasiswa = new Mahasiswa[3];
String dummy;

for(int i=0; i < 3; i++) {
    arrayOfMahasiswa[i] = new Mahasiswa();

    System.out.println("Masukkan Data Mahasiswa ke-" + (i + 1));
    System.out.print("NIM    : ");
    arrayOfMahasiswa[i].nim = sc.nextLine();
    System.out.print("Nama   : ");
    arrayOfMahasiswa[i].nama = sc.nextLine();
    System.out.print("Kelas  : ");
    arrayOfMahasiswa[i].kelas = sc.nextLine();
    System.out.print("IPK    : ");
    dummy = sc.nextLine();
    arrayOfMahasiswa[i].ipk = Float.parseFloat(dummy);
    System.out.println("--------------------------------");
}
```

3. In practical 3.2, point 5, modify the program code as follows. Loop through the array elements of **`the student objects`** and display their information on the screen:

```
for(int i=0; i < 3; i++) {
    System.out.println("Data Mahasiswa ke-" + (i + 1));
    System.out.println("NIM      : "+ arrayOfMahasiswa[i].nim);
    System.out.println("Nama     : "+ arrayOfMahasiswa[i].nama);
    System.out.println("Kelas    : "+ arrayOfMahasiswa[i].kelas);
    System.out.println("IPK      : "+ arrayOfMahasiswa[i].ipk);
    System.out.println("--------------------------------");
}
```

4. Run the program and observe the results.

```java
package com.jobsheet3;

public class Student8
{
    public String nim;
    public String name;
    public String student_class;
    public float ipk;
}
```

```java
package com.jobsheet3;

import java.util.Scanner;

public class StudentDemo8
{
    Run | Debug | Run main | Debug main
    public static void main(String[] args)
    {
        Scanner sc = new Scanner(System.in);
        Student8[] arrayOfStudents = new Student8[3];
        String dummy;

        for (int i = 0; i < 3; i++)
        {
            arrayOfStudents[i] = new Student8();

            System.out.println("Enter data for student " + (i + 1) + ":");
            System.out.print(s: "NIM: ");
            arrayOfStudents[i].nim = sc.nextLine();
            System.out.print(s: "Name: ");
            arrayOfStudents[i].name = sc.nextLine();
            System.out.print(s: "Class: ");
            arrayOfStudents[i].student_class = sc.nextLine();
            System.out.print(s: "IPK: ");
            dummy = sc.nextLine();
            arrayOfStudents[i].ipk = Float.parseFloat(dummy);
            System.out.println(x: "------------------------------");
        }

        for (int i = 0; i < 3; i++)
        {
            System.out.println("Data for student " + (i + 1) + ":");
            System.out.println("NIM\t: " + arrayOfStudents[i].nim);
            System.out.println("Name\t: " + arrayOfStudents[i].name);
            System.out.println("Class\t: " + arrayOfStudents[i].student_class);
            System.out.println("IPK\t: " + arrayOfStudents[i].ipk);
            System.out.println(x: "------------------------------");
        }

        sc.close();
    }
}
```

```
Enter data for student 1:
NIM: 244107060033
Name: AGNES TITANIA KINANTI
Class: SIB-1E
IPK: 3.75
------------------------------
Enter data for student 2:
NIM: 2341720172
Name: ACHMAD MAULANA HAMZAH
Class: TI-2A
IPK: 3.36
------------------------------
Enter data for student 3:
NIM: 244107023006
Name: DIRHAMAWAN PUTRANTO
Class: TI-1E
IPK: 3.80
------------------------------
Data for student 1:
NIM     : 244107060033
Name    : AGNES TITANIA KINANTI
Class   : SIB-1E
IPK     : 3.75
------------------------------
Data for student 2:
NIM     : 2341720172
Name    : ACHMAD MAULANA HAMZAH
Class   : TI-2A
IPK     : 3.36
------------------------------
Data for student 3:
NIM     : 244107023006
Name    : DIRHAMAWAN PUTRANTO
Class   : TI-1E
IPK     : 3.8
------------------------------
```

3.3.2 Verification of Experimental Results

Example of verification of the results of this experiment.

```
run:
Masukkan Data Mahasiswa ke-1
NIM   : 244107060033
Nama  : AGNES TITANIA KINANTI
Kelas : SIB-1E
IPK   : 3.75
--------------------------------
Masukkan Data Mahasiswa ke-2
NIM   : 2341720172
Nama  : ACHMAD MAULANA HAMZAH
Kelas : TI-2A
IPK   : 3.36
--------------------------------
Masukkan Data Mahasiswa ke-3
NIM   : 244107023006
Nama  : DIRHAMAWAN PUTRANTO
Kelas : TI-2E
IPK   : 3.80
--------------------------------
Data Mahasiswa ke-1
NIM     : 244107060033
Nama    : AGNES TITANIA KINANTI
Kelas   : SIB-1E
IPK     : 3.75
--------------------------------

Data Mahasiswa ke-1
NIM     : 244107060033
Nama    : AGNES TITANIA KINANTI
Kelas   : SIB-1E
IPK     : 3.75
--------------------------------
Data Mahasiswa ke-2
NIM     : 2341720172
Nama    : ACHMAD MAULANA HAMZAH
Kelas   : TI-2A
IPK     : 3.36
--------------------------------
Data Mahasiswa ke-3
NIM     : 244107023006
Nama    : DIRHAMAWAN PUTRANTO
Kelas   : TI-2E
IPK     : 3.8
--------------------------------
BUILD SUCCESSFUL (total time: 1 minute 46 seconds)
```

3.3.3 Question

1. Add **`the printInfo() method`** to the **`Student class`** then modify the program code in step no. 3.

```java
package com.jobsheet3;

public class Student8
{
    public String nim;
    public String name;
    public String student_class;
    public float ipk;

    void printInfo(int i)
    {
        System.out.println("Data for student " + (i + 1) + ":");
        System.out.println("NIM\t: " + nim);
        System.out.println("Name\t: " + name);
        System.out.println("Class\t: " + student_class);
        System.out.println("IPK\t: " + ipk);
        System.out.println(x: "------------------------------");
    }
}
```

```java
package com.jobsheet3;

import java.util.Scanner;

public class StudentDemo8
{
    Run | Debug | Run main | Debug main
    public static void main(String[] args)
    {
        Scanner sc = new Scanner(System.in);
        Student8[] arrayOfStudents = new Student8[3];
        String dummy;

        for (int i = 0; i < 3; i++)
        {
            arrayOfStudents[i] = new Student8();

            System.out.println("Enter data for student " + (i + 1) + ":");
            System.out.print(s: "NIM: ");
            arrayOfStudents[i].nim = sc.nextLine();
            System.out.print(s: "Name: ");
            arrayOfStudents[i].name = sc.nextLine();
            System.out.print(s: "Class: ");
            arrayOfStudents[i].student_class = sc.nextLine();
            System.out.print(s: "IPK: ");
            dummy = sc.nextLine();
            arrayOfStudents[i].ipk = Float.parseFloat(dummy);
            System.out.println(x: "------------------------------");
        }

        for (int i = 0; i < 3; i++)
        {
            arrayOfStudents[i].printInfo(i);
        }

        sc.close();
    }
}
```

2. Suppose you have a new array **`array of`** type **`Students`** named **`myArrayOfStudents`** . Why does the following code cause an error?

```
Mahasiswa[] myArrayOfMahasiswa = new Mahasiswa[3];
myArrayOfMahasiswa[0].nim = "244107060033";
myArrayOfMahasiswa[0].nama = "AGNES TITANIA KINANTI";
myArrayOfMahasiswa[0].kelas = "SIB-1E";
myArrayOfMahasiswa[0].ipk = (float) 3.75;
```

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Because the newly created array only contains empty slots (null) and not Student8 objects.

3.4 Parameterized Constructor

In this practical, we will instantiate an **array of objects** using a parameterized **constructor** .

3.4.1 Experimental Steps

1. **a** new class with the name **Matakuliah<NoPresensi>** **with** a **constructor** with the following parameters;

```
public class Matakuliah {
    public String kode;
    public String nama;
    public int sks;
    public int jumlahJam;

    public Matakuliah(String kode, String nama, int sks, int jumlahJam) {
        this.kode = kode;
        this.nama = nama;
        this.sks = sks;
        this.jumlahJam = jumlahJam;
    }
}
```

2. **a** new class **MatakuliahDemo<NoPresensi>** **and** add the main() function. Then, instantiate **the Matakuliah object array** using the following parameterized **constructor** ;

```
import java.util.Scanner;
public class MatakuliahDemo {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        Matakuliah[] arrayOfMatakuliah = new Matakuliah[3];
        String kode, nama, dummy;
        int sks, jumlahJam;

        for(int i=0; i < 3; i++) {
            System.out.println("Masukkan Data Matakuliah ke-" + (i + 1));
            System.out.print("Kode       : ");
            kode = sc.nextLine();
            System.out.print("Nama       : ");
            nama = sc.nextLine();
            System.out.print("Sks        : ");
            dummy = sc.nextLine();
            sks = Integer.parseInt(dummy);
            System.out.print("Jumlah Jam : ");
            dummy = sc.nextLine();
            jumlahJam = Integer.parseInt(dummy);
            System.out.println("--------------------------------");

            arrayOfMatakuliah[i] = new Matakuliah(kode, nama, sks, jumlahJam);
        }
    }
}
```

3. Run the program then observe the results.

4. Modify the **`MatakuliahDemo class`** so that it can display the input results of the variable **`array of Matakuliah objects`** in the layer;

```
for(int i=0; i < 3; i++) {
    System.out.println("Data Matakuliah ke-" + (i + 1));
    System.out.println("Kode        : "+ arrayOfMatakuliah[i].kode);
    System.out.println("Nama        : "+ arrayOfMatakuliah[i].nama);
    System.out.println("Sks         : "+ arrayOfMatakuliah[i].sks);
    System.out.println("Jumlah Jam : "+ arrayOfMatakuliah[i].jumlahJam);
    System.out.println("--------------------------------");
}
```

5. Run the program and observe the results.

```
1   package com.jobsheet3;
2
3   public class Course8
4   {
5       public String code;
6       public String name;
7       public int credits;
8       public int totalHours;
9
10      public Course8(String code, String name, int credits, int totalHours)
11      {
12          this.code = code;
13          this.name = name;
14          this.credits = credits;
15          this.totalHours = totalHours;
16      }
17  }
```

```java
package com.jobsheet3;

import java.util.Scanner;

public class CourseDemo8
{
    Run | Debug | Run main | Debug main
    public static void main(String[] args)
    {
        Scanner sc = new Scanner(System.in);
        Course8[] arrayOfCourses = new Course8[3];

        String code, name, dummy;
        int credits, totalHours;

        for (int i = 0; i < 3; i++)
        {
            System.out.println("Enter data for course " + (i + 1) + ":");
            System.out.print(s: "Code\t\t: ");
            code = sc.nextLine();
            System.out.print(s: "Name\t\t: ");
            name = sc.nextLine();
            System.out.print(s: "Credits\t\t: ");
            dummy = sc.nextLine();
            credits = Integer.parseInt(dummy);
            System.out.print(s: "Total Hours\t: ");
            dummy = sc.nextLine();
            totalHours = Integer.parseInt(dummy);

            System.out.println(x: "------------------------------");
            arrayOfCourses[i] = new Course8(code, name, credits, totalHours);
        }

        for (int i = 0; i < 3; i++)
        {
            System.out.println("Data for course " + (i + 1) + ":");
            System.out.println("Code\t\t: " + arrayOfCourses[i].code);
            System.out.println("Name\t\t: " + arrayOfCourses[i].name);
            System.out.println("Credits\t\t: " + arrayOfCourses[i].credits);
            System.out.println("Total Hours\t: " + arrayOfCourses[i].totalHours);
            System.out.println(x: "------------------------------");
        }

        sc.close();
    }
}
```

```
Enter data for course 1:
Code            : 1345
Name            : Algorithm & Data Structure
Credits         : 2
Total Hours     : 6
------------------------------
Enter data for course 2:
Code            : 54321
Name            : Database System
Credits         : 2
Total Hours     : 4
------------------------------
Enter data for course 3:
Code            : 83652
Name            : Programming Fundamentals
Credits         : 2
Total Hours     : 4
------------------------------
Data for course 1:
Code            : 1345
Name            : Algorithm & Data Structure
Credits         : 2
Total Hours     : 6
------------------------------
Data for course 2:
Code            : 54321
Name            : Database System
Credits         : 2
Total Hours     : 4
------------------------------
Data for course 3:
Code            : 83652
Name            : Programming Fundamentals
Credits         : 2
Total Hours     : 4
------------------------------
```

3.4.2 Verification of Experimental Results

Match the results of compiling your program code with the following image.

```
Masukkan Data Matakuliah ke-1
Kode        : 12345
Nama        : Algoritma & Struktur Data
Sks         : 2
Jumlah Jam : 6
--------------------------------
Masukkan Data Matakuliah ke-2
Kode        : 54321
Nama        : Sistem Basis Data
Sks         : 2
Jumlah Jam : 4
--------------------------------
Masukkan Data Matakuliah ke-3
Kode        : 83652
Nama        : Dasar Pemrograman
Sks         : 2
Jumlah Jam : 4
--------------------------------
Data Matakuliah ke-1
Kode        : 12345
Nama        : Algoritma & Struktur Data
Sks         : 2
Jumlah Jam : 6
--------------------------------
Data Matakuliah ke-2
Kode        : 54321
Nama        : Sistem Basis Data
Sks         : 2
Jumlah Jam : 4
--------------------------------
Data Matakuliah ke-3
Kode        : 83652
Nama        : Dasar Pemrograman
Sks         : 2
Jumlah Jam : 4
--------------------------------
BUILD SUCCESSFUL (total time: 3 minutes 23 seconds)
```

3.4.3 Question

1. Can a class have more than 1 constructor? If yes, give an example.

   Yes, a class can have more than one constructor.

```java
package com.jobsheet3;

public class Course8
{
    public String code;
    public String name;
    public int credits;
    public int totalHours;

    public Course8(String code, String name, int credits, int totalHours)
    {
        this.code = code;
        this.name = name;
        this.credits = credits;
        this.totalHours = totalHours;
    }

    public Course8()
    {
        this.code = "13579";
        this.name = "Operating System";
        this.credits = 3;
        this.totalHours = 4;
    }

    public Course8(String code, String name)
    {
        this.code = code;
        this.name = name;
        this.credits = 2;
        this.totalHours = 3;
    }
}
```

2. Add the **`addData() method`** to **`the Matakuliah class`** , then use this method in **`the MatakuliahDemo class`** to add Course data.

```java
package com.jobsheet3;

import java.util.Scanner;

public class Course8
{
    public String code;
    public String name;
    public int credits;
    public int totalHours;
    String dummy;

    void addData(Scanner sc, int i)
    {
        System.out.println("Enter data for course " + (i + 1) + ":");
        System.out.print(s: "Code\t\t: ");
        code = sc.nextLine();
        System.out.print(s: "Name\t\t: ");
        name = sc.nextLine();
        System.out.print(s: "Credits\t\t: ");
        dummy = sc.nextLine();
        credits = Integer.parseInt(dummy);
        System.out.print(s: "Total Hours\t: ");
        dummy = sc.nextLine();
        totalHours = Integer.parseInt(dummy);

        System.out.println(x: "-----------------------------");
    }
}
```

```java
package com.jobsheet3;

import java.util.Scanner;

public class CourseDemo8
{
    Run | Debug | Run main | Debug main
    public static void main(String[] args)
    {
        Scanner sc = new Scanner(System.in);
        Course8[] arrayOfCourses = new Course8[3];

        for (int i = 0; i < 3; i++)
        {
            arrayOfCourses[i] = new Course8();
            arrayOfCourses[i].addData(sc, i);
        }

        for (int i = 0; i < 3; i++)
        {
            System.out.println("Data for course " + (i + 1) + ":");
            System.out.println("Code\t\t: " + arrayOfCourses[i].code);
            System.out.println("Name\t\t: " + arrayOfCourses[i].name);
            System.out.println("Credits\t\t: " + arrayOfCourses[i].credits);
            System.out.println("Total Hours\t: " + arrayOfCourses[i].totalHours);
            System.out.println(x: "-----------------------------");
        }

        sc.close();
    }
}
```

3. Add **the `printInfo()` method** to **the `Matakuliah` class** , then use this method in **the `MatakuliahDemo` class** to display the input data on the screen.

```java
package com.jobsheet3;

import java.util.Scanner;

public class Course8
{
    public String code;
    public String name;
    public int credits;
    public int totalHours;
    String dummy;

    void addData(Scanner sc, int i)
    {
        System.out.println("Enter data for course " + (i + 1) + ":");
        System.out.print(s: "Code\t\t: ");
        code = sc.nextLine();
        System.out.print(s: "Name\t\t: ");
        name = sc.nextLine();
        System.out.print(s: "Credits\t\t: ");
        dummy = sc.nextLine();
        credits = Integer.parseInt(dummy);
        System.out.print(s: "Total Hours\t: ");
        dummy = sc.nextLine();
        totalHours = Integer.parseInt(dummy);

        System.out.println(x: "-----------------------------");
    }

    void printInfo()
    {
        System.out.println("Code\t\t: " + code);
        System.out.println("Name\t\t: " + name);
        System.out.println("Credits\t\t: " + credits);
        System.out.println("Total Hours\t: " + totalHours);
        System.out.println(x: "-----------------------------");
    }
}
```

```java
package com.jobsheet3;

import java.util.Scanner;

public class CourseDemo8
{
    Run | Debug | Run main | Debug main
    public static void main(String[] args)
    {
        Scanner sc = new Scanner(System.in);
        Course8[] arrayOfCourses = new Course8[3];

        for (int i = 0; i < 3; i++)
        {
            arrayOfCourses[i] = new Course8();
            arrayOfCourses[i].addData(sc, i);
        }

        for (int i = 0; i < 3; i++)
        {
            System.out.println("Course " + (i + 1) + ":");
            arrayOfCourses[i].printInfo();
        }

        sc.close();
    }
}
```

4. Modify the program code in the **`MatakuliahDemo class`** so that the length (number of elements) of **`the array of Matakuliah objects`** is determined by the user via input with Scanner

```java
package com.jobsheet3;

import java.util.Scanner;

public class CourseDemo8
{
    Run | Debug | Run main | Debug main
    public static void main(String[] args)
    {
        Scanner sc = new Scanner(System.in);

        System.out.print(s: "Course Data Input: ");
        int totalCourses = sc.nextInt();
        System.out.println(x: "-----------------------------");

        Course8[] arrayOfCourses = new Course8[totalCourses];

        for (int i = 0; i < arrayOfCourses.length; i++)
        {
            arrayOfCourses[i] = new Course8();
            arrayOfCourses[i].addData(sc, i);
        }

        for (int i = 0; i < arrayOfCourses.length; i++)
        {
            System.out.println("Course " + (i + 1) + ":");
            arrayOfCourses[i].printInfo();
        }

        sc.close();
    }
}
```

3.5 Task

1. Create a program to display information about lecturers. The program can accept input of all lecturer-related information and display it back on the screen. This program consists of the Dosen<NoPresensi> class **with the following** attributes/properties:

   Code string
   Name string
   Boolean **gender**
   int **age**

   with the constructor method as follows;

   public lecturer(String **code,** String **name,** Boolean **gender,** int **age**) {
   ……;
   ……;
   }

   , create a class **DosenDemo<NoPresensi>** to process input and display data for several lecturers. Use a loop with **FOR** To create **an array of objects , use FOREACH** looping. to display data on the screen.

```java
package com.jobsheet3;

import java.util.Scanner;

public class Lecturer8
{
    String code;
    String name;
    boolean gender;
    int age;

    Lecturer8(String code, String name, boolean gender, int age)
    {
        this.code = code;
        this.name = name;
        this.gender = gender;
        this.age = age;
    }

    void inputData(Scanner sc)
    {
        System.out.print("Input Lecturer Code: ");
        this.code = sc.next();
        sc.nextLine();
        System.out.print("Input Lecturer Name: ");
        this.name = sc.nextLine();
        System.out.print("Input Lecturer Gender (true for male, false for female): ");
        this.gender = sc.nextBoolean();
        System.out.print("Input Lecturer Age: ");
        this.age = sc.nextInt();
        sc.nextLine();
    }

    void printInfo()
    {
        System.out.println("Lecturer Code\t: " + code);
        System.out.println("Lecturer Name\t: " + name);
        System.out.println("Lecturer Gender\t: " + (gender ? "Male" : "Female"));
        System.out.println("Lecturer Age\t: " + age);
        System.out.println("------------------------------");
    }
}
```

```java
package com.jobsheet3;

import java.util.Scanner;

public class LecturerDemo8
{
    Run main | Debug main | Run | Debug
    public static void main(String[] args)
    {
        Scanner sc = new Scanner(System.in);

        System.out.print(s: "Input the number of Lecturer: ");
        int n = sc.nextInt();
        System.out.println(x: "------------------------------");

        Lecturer8[] lecturer = new Lecturer8[n];

        for (int i = 0; i < n; i++)
        {
            System.out.println("Input data for Lecturer " + (i+1) + ":");
            lecturer[i] = new Lecturer8(code: "", name: "", gender: false, age: 0);
            lecturer[i].inputData(sc);
            System.out.println(x: "------------------------------");
        }

        for (int i = 0; i < n; i++)
        {
            System.out.println("Data for Lecturer " + (i+1) + ":");
            lecturer[i].printInfo();
        }

        sc.close();
    }
}
```

```
Input the number of Lecturer: 2
-----------------------------
Input data for Lecturer 1:
Input Lecturer Code: 123
Input Lecturer Name: Vivin Ayu Lestari, B.Ed., M.Comp.Sc
Input Lecturer Gender (true for male, false for female): false
Input Lecturer Age: 30
-----------------------------
Input data for Lecturer 2:
Input Lecturer Code: 234
Input Lecturer Name: Wilda Imama Sabilla, B.Comp.Sc., M.Comp.Sc
Input Lecturer Gender (true for male, false for female): false
Input Lecturer Age: 35
-----------------------------
Data for Lecturer 1:
Lecturer Code   : 123
Lecturer Name   : Vivin Ayu Lestari, B.Ed., M.Comp.Sc
Lecturer Gender : Female
Lecturer Age    : 30
-----------------------------
Data for Lecturer 2:
Lecturer Code   : 234
Lecturer Name   : Wilda Imama Sabilla, B.Comp.Sc., M.Comp.Sc.
Lecturer Gender : Female
Lecturer Age    : 35
-----------------------------
```

2. Add a new class **`DataDosen<NoPresensi>`** **`with`** the following methods ;
   a. **`dataAllDosen(Dosen[] arrayOfDosen)`** to display data for all lecturers
   b. **`numberOfLecturersPerGender(Lecturers[] arrayOfLecturers)`** to display data on the number of lecturers per gender (Male / Female)
   c. **`AverageAgeOfLecturersPerGender`** (**`Lecturers[] arrayOfLecturers`**) to display the average age of lecturers per gender (Male / Female)
   d. **`infoDosenPalingTua`** (**`Dosen[] arrayOfDosen`**) to display the oldest lecturer data
   e. **`infoDosenMostYoungest`** (**`Dosen[] arrayOfDosen`**) to display the youngest lecturer data

   All these methods must be able to be called/tested from the **`DosenDemo class`**.

```java
package com.jobsheet3;

import java.util.Scanner;

public class Lecturer8
{
    String code;
    String name;
    boolean gender;
    int age;

    Lecturer8(String code, String name, boolean gender, int age)
    {
        this.code = code;
        this.name = name;
        this.gender = gender;
        this.age = age;
    }

    void inputData(Scanner sc)
    {
        System.out.print(s: "Input Lecturer Code: ");
        this.code = sc.next();
        sc.nextLine();
        System.out.print(s: "Input Lecturer Name: ");
        this.name = sc.nextLine();
        System.out.print(s: "Input Lecturer Gender (true for male, false for female): ");
        this.gender = sc.nextBoolean();
        System.out.print(s: "Input Lecturer Age: ");
        this.age = sc.nextInt();
        sc.nextLine();
    }

    void printInfo()
    {
        System.out.println("Lecturer Code\t: " + code);
        System.out.println("Lecturer Name\t: " + name);
        System.out.println("Lecturer Gender\t: " + (gender ? "Male" : "Female"));
        System.out.println("Lecturer Age\t: " + age);
        System.out.println(x: "-----------------------------");
    }
}
```

```java
package com.jobsheet3;

public class LecturerData8
{
    void dataAllLecturer(Lecturer8[] arrayOfLecturer)
    {
        for (Lecturer8 lecturer : arrayOfLecturer)
        {
            lecturer.printInfo();
        }
    }

    void numberOfLecturersPerGender(Lecturer8[] arrayOfLecturer)
    {
        int male = 0,
            female = 0;

        for (Lecturer8 lecturer : arrayOfLecturer)
        {
            if (lecturer.gender)
            {
                male++;
            }
            else
            {
                female++;
            }
        }

        System.out.println("Number of Male Lecturer: " + male);
        System.out.println("Number of Female Lecturer: " + female);
    }

    void averageAgeOfLecturersPerGender(Lecturer8[] arrayOfLecturer)
    {
        int male = 0,
            female = 0;
        int maleSum = 0,
            femaleSum = 0;
        for (Lecturer8 lecturer : arrayOfLecturer) {
            if (lecturer.gender) {
                male++;
                maleSum += lecturer.age;
            } else {
                female++;
                femaleSum += lecturer.age;
            }
        }
        if (male > 0)
            System.out.println("Average Male Age: " + (maleSum / male));
        if (female > 0)
            System.out.println("Average Female Age: " + (femaleSum / female));
    }

```

```
55      void infoTheOldestLecturers(Lecturer8[] arrayOfLecturer)
56      {
57          Lecturer8 oldest = arrayOfLecturer[0];
58          for (Lecturer8 lecturer : arrayOfLecturer)
59          {
60              if (lecturer.age > oldest.age) oldest = lecturer;
61          }
62          System.out.println(x: "Oldest Lecturer: ");
63          oldest.printInfo();
64      }
65
66      public void infoTheYoungestLecturer(Lecturer8[] arrayOfLecturer)
67      {
68          Lecturer8 youngest = arrayOfLecturer[0];
69          for (Lecturer8 lecturer : arrayOfLecturer) {
70              if (lecturer.age < youngest.age) youngest = lecturer;
71          }
72          System.out.println(x: "Youngest Lecturer:");
73          youngest.printInfo();
74      }
75
76  }
```

```java
package com.jobsheet3;

import java.util.Scanner;

public class LecturerDemo8
{
    Run main | Debug main | Run | Debug
    public static void main(String[] args)
    {
        Scanner sc = new Scanner(System.in);

        System.out.print(s: "Input the number of Lecturer: ");
        int n = sc.nextInt();
        System.out.println(x: "------------------------------");

        Lecturer8[] lecturer1 = new Lecturer8[n];

        for (int i = 0; i < n; i++)
        {
            System.out.println("Input data for Lecturer " + (i+1) + ":");
            lecturer1[i] = new Lecturer8(code: "", name: "", gender: false, age: 0);
            lecturer1[i].inputData(sc);
            System.out.println(x: "------------------------------");
        }

        LecturerData8 lecturer2 = new LecturerData8();

        System.out.println(x: "\n=== All Lecturers ===");
        lecturer2.dataAllLecturer(lecturer1);

        System.out.println(x: "\n=== Number per Gender ===");
        lecturer2.numberOfLecturersPerGender(lecturer1);

        System.out.println(x: "\n=== Average Age per Gender ===");
        lecturer2.averageAgeOfLecturersPerGender(lecturer1);

        System.out.println(x: "\n=== Oldest Lecturer ===");
        lecturer2.infoTheOldestLecturers(lecturer1);

        System.out.println(x: "\n=== Youngest Lecturer ===");
        lecturer2.infoTheYoungestLecturer(lecturer1);

        sc.close();
    }
}
```

```
Input the number of Lecturer: 2
------------------------------
Input data for Lecturer 1:
Input Lecturer Code: 123
Input Lecturer Name: Vivin Ayu Lestari, B.Ed., M.Comp.Sc
Input Lecturer Gender (true for male, false for female): false
Input Lecturer Age: 32
------------------------------
Input data for Lecturer 2:
Input Lecturer Code: 234
Input Lecturer Name: Wilda Imama Sabilla, B.Comp.Sc., M.Comp.Sc.
Input Lecturer Gender (true for male, false for female): false
Input Lecturer Age: 30
------------------------------

=== All Lecturers ===
Lecturer Code   : 123
Lecturer Name   : Vivin Ayu Lestari, B.Ed., M.Comp.Sc
Lecturer Gender : Female
Lecturer Age    : 32
------------------------------
Lecturer Code   : 234
Lecturer Name   : Wilda Imama Sabilla, B.Comp.Sc., M.Comp.Sc.
Lecturer Gender : Female
Lecturer Age    : 30
------------------------------

=== Number per Gender ===
Number of Male Lecturer: 0
Number of Female Lecturer: 2

=== Average Age per Gender ===
Average Female Age: 31

=== Oldest Lecturer ===
Oldest Lecturer:
Lecturer Code   : 123
Lecturer Name   : Vivin Ayu Lestari, B.Ed., M.Comp.Sc
Lecturer Gender : Female
Lecturer Age    : 32
------------------------------

=== Youngest Lecturer ===
Youngest Lecturer:
Lecturer Code   : 234
Lecturer Name   : Wilda Imama Sabilla, B.Comp.Sc., M.Comp.Sc.
Lecturer Gender : Female
Lecturer Age    : 30
------------------------------
```

https://github.com/guramedadar/Praktikum-Algoritma-Struktur-Data/tree/main/src/com/jobsheet3