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JOBSHEET 7

OVERLOADING AND OVERRIDING

1. **Competence**

   After taking this subject, students are able to:

   a. Understand the concepts of overloading and overriding,

   b. Understand the difference between overloading and overriding,

   c. Accuracy in identifying overriding and overloading methods

   d. Accuracy in practicing instructions on the jobsheet

   e. Implement overloading and overriding methods.

2. **Introduction**

   2.1 Overloading

   is to rewrite a method with the same name on a class. The goal is to facilitate the use/invocation of methods with similar functionality. The Overloading method declaration rules are as follows:

   - The method name must be the same.
   - The list of parameters should be different.
   - The return type can be the same, or it can be different.

   There are several lists of parameters on overloading can be seen as follows:

   - The difference in the list of parameters does not only occur in the difference in the number of parameters, but also in the order of the parameters.
   - For example, the following two parameters:
     - Function_member (int x, string n)
     - Function_member (String n, int x)
   - The two parameters are also considered different in the list of parameters.
   - The parameter list is not related to the naming of the variables present in the parameter.
   - For example, the following 2 list of parameters:
     - function_member(int x)
     - function_member(int y)

- The two lists of parameters above are considered the same because the only difference is the naming of the variable parameters.

Overloading can also occur between the parent class and its subclass if it meets all three overload conditions. There are several overloading rules, namely:

- Primitive widening conversions take precedence over overloading over boxing and var args.
- We can't do the widening process from one wrapper type to another (changing the Integer to Long).
- We can't do the widening process followed by boxing (from int to Long)
- We can do boxing followed by widening (int can be an Object via an Integer)
- We can combine var args with either widening or boxing

2.2 Overriding

is a Subclass that seeks to modify behaviors inherited from super classes. The goal is that the subclass can have more specific behavior so that it can be done by redeclaring the parent class's method in the subclass.
The method declaration in the subclass must be the same as the one in the super class. Similarities on:

- Name
- Return type (for return type: class A or is a subclass of class A)
- List of parameters (number, type and order)

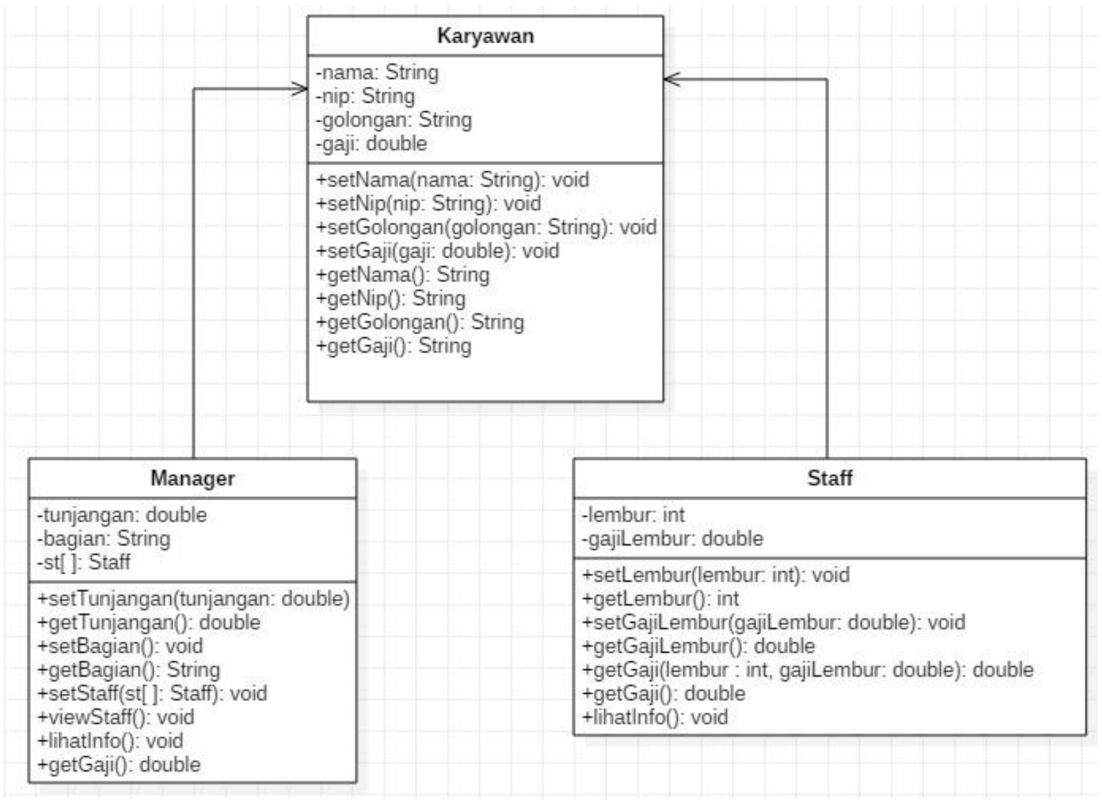
So that the method in the parent class is called the overridden method and the method in the subclass is called the overriding method. There are several method rules in overriding:

- The access mode of the overriding method must be the same or broader than the overridden method.
- A subclass can only override a superclass method once, there must not be more than one method in the exact same class.
- The overriding method must not throw checked exceptions that are not declared by the overridden method.

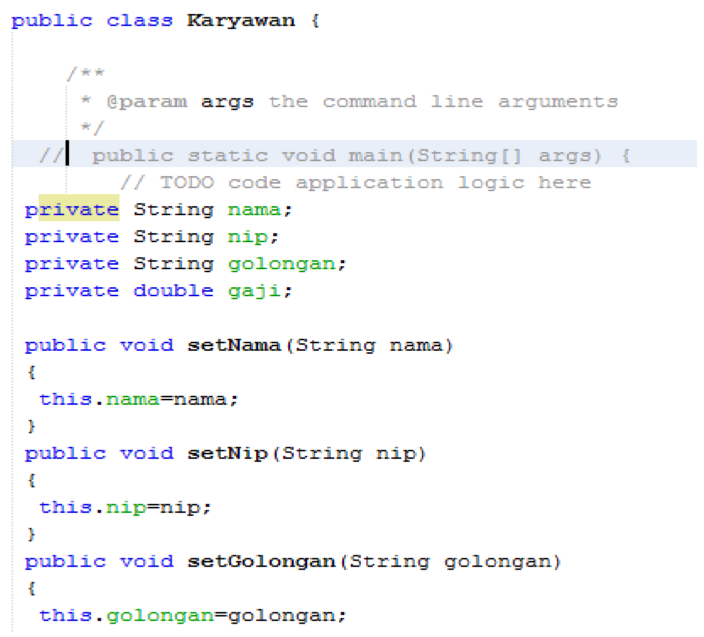
3. Practicum

3.1 Experiment 1

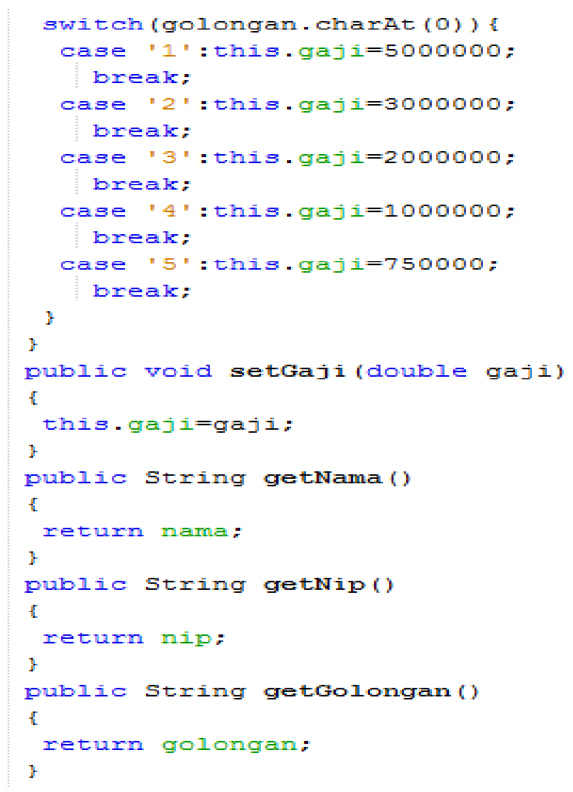
For the following example case, there are three classes, namely Karyawan, Manager, and Staff. Employee Class is a superclass of Manager and Staff where the Manager and Staff subclasses have different methods for calculating salaries.



3.2 Karyawan



```
public class Karyawan {

    /**
     * @param args the command line arguments
     */
  //  public static void main(String[] args) {
        // TODO code application logic here
 private String nama;
 private String nip;
 private String golongan;
 private double gaji;

 public void setNama(String nama)
 {
  this.nama=nama;
 }
 public void setNip(String nip)
 {
  this.nip=nip;
 }
 public void setGolongan(String golongan)
 {
  this.golongan=golongan;
```



```
  switch(golongan.charAt(0)){
   case '1':this.gaji=5000000;
     break;
   case '2':this.gaji=3000000;
     break;
   case '3':this.gaji=2000000;
     break;
   case '4':this.gaji=1000000;
     break;
   case '5':this.gaji=750000;
     break;
  }
 }
 public void setGaji(double gaji)
 {
  this.gaji=gaji;
 }
 public String getNama()
 {
  return nama;
 }
 public String getNip()
 {
  return nip;
 }
 public String getGolongan()
 {
  return golongan;
 }
 public double getGaji()
 {
  return gaji;
 }
}
```

3.3 Staff

```
 public class Staff extends Karyawan {
private int lembur;
private double gajiLembur;

public void setLembur(int lembur)
{
 this.lembur=lembur;
}
public int getLembur()
{
 return lembur;
}
public void setGajiLembur(double gajiLembur)
{
 this.gajiLembur=gajiLembur;
}
public double getGajiLembur()
{
 return gajiLembur;
}
public double getGaji(int lembur,double gajiLembur)
{
 return super.getGaji()+lembur*gajiLembur;
}
```

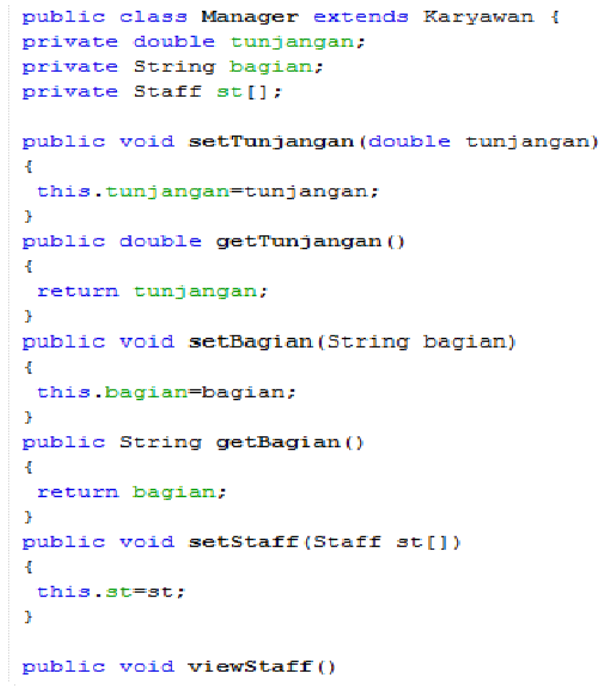
Overloading

```
 public double getGaji()
 {
  return super.getGaji()+lembur*gajiLembur;
 }
```

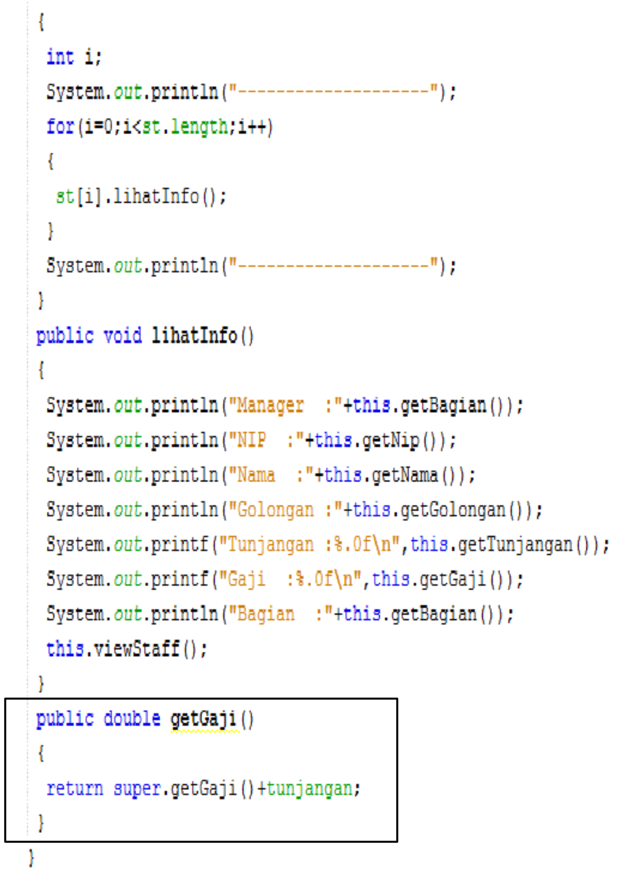
Overriding

```
 public void lihatInfo()
 {
  System.out.println("NIP  :"+this.getNip());
  System.out.println("Nama  :"+this.getNama());
  System.out.println("Golongan :"+this.getGolongan());
  System.out.println("Jml Lembur :"+this.getLembur());
  System.out.printf("Gaji Lembur :%.0f\n", this.getGajiLembur());
  System.out.printf("Gaji  :%.0f\n",this.getGaji());
 }
}
```

3.4 Manager

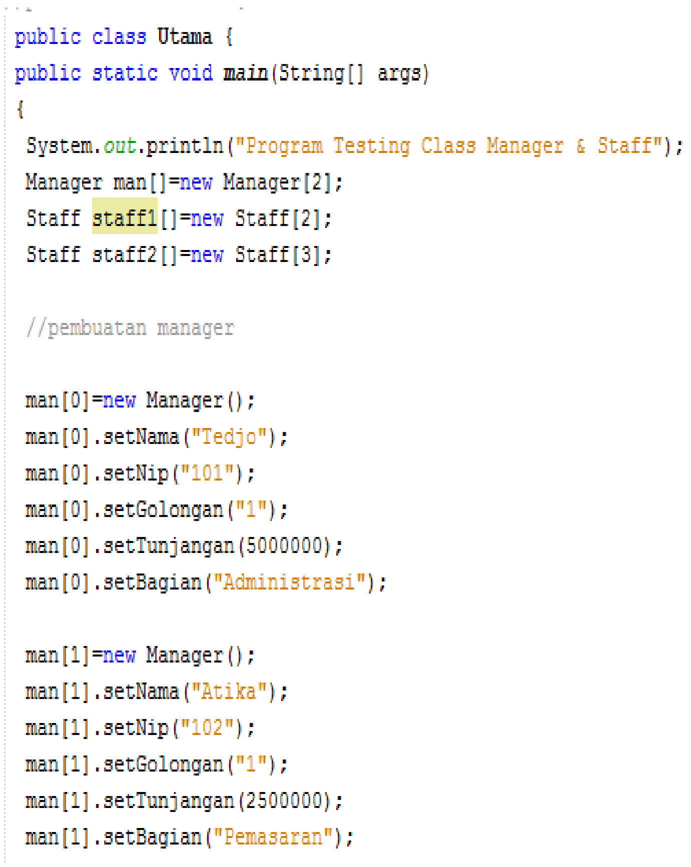


```
public class Manager extends Karyawan {
private double tunjangan;
private String bagian;
private Staff st[];

public void setTunjangan(double tunjangan)
{
 this.tunjangan=tunjangan;
}
public double getTunjangan()
{
 return tunjangan;
}
public void setBagian(String bagian)
{
 this.bagian=bagian;
}
public String getBagian()
{
 return bagian;
}
public void setStaff(Staff st[])
{
 this.st=st;
}

public void viewStaff()
```

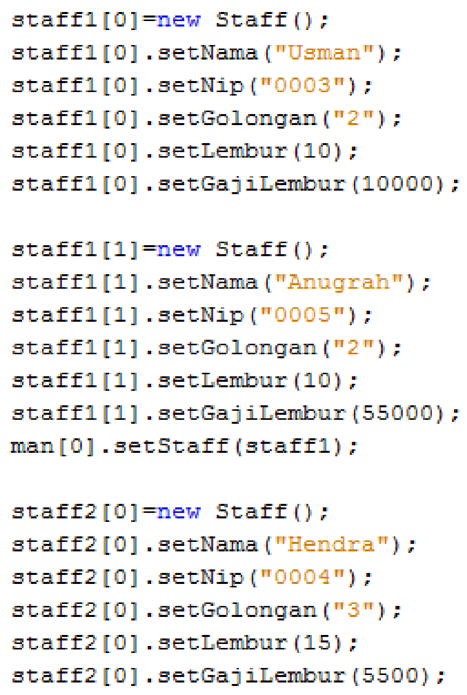


```
{
 int i;
 System.out.println("--------------------");
 for(i=0;i<st.length;i++)
 {
  st[i].lihatInfo();
 }
 System.out.println("--------------------");
}
public void lihatInfo()
{
 System.out.println("Manager  :"+this.getBagian());
 System.out.println("NIP  :"+this.getNip());
 System.out.println("Nama  :"+this.getNama());
 System.out.println("Golongan :"+this.getGolongan());
 System.out.printf("Tunjangan :%.0f\n",this.getTunjangan());
 System.out.printf("Gaji  :%.0f\n",this.getGaji());
 System.out.println("Bagian  :"+this.getBagian());
 this.viewStaff();
}
public double getGaji()
{
 return super.getGaji()+tunjangan;
}
}
```

3.5 Main



```
public class Utama {
public static void main(String[] args)
{
 System.out.println("Program Testing Class Manager & Staff");
 Manager man[]=new Manager[2];
 Staff staff1[]=new Staff[2];
 Staff staff2[]=new Staff[3];

 //pembuatan manager

 man[0]=new Manager();
 man[0].setNama("Tedjo");
 man[0].setNip("101");
 man[0].setGolongan("1");
 man[0].setTunjangan(5000000);
 man[0].setBagian("Administrasi");

 man[1]=new Manager();
 man[1].setNama("Atika");
 man[1].setNip("102");
 man[1].setGolongan("1");
 man[1].setTunjangan(2500000);
 man[1].setBagian("Pemasaran");
```

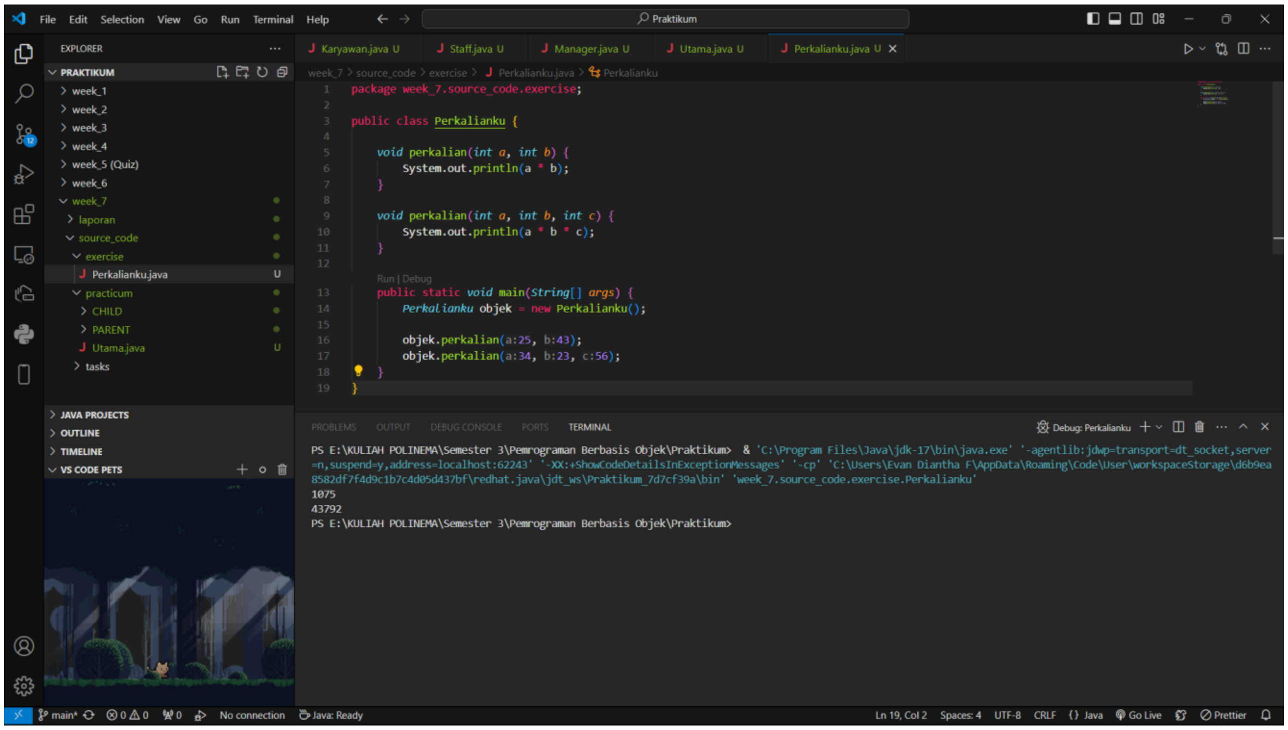


```
 staff1[0]=new Staff();
 staff1[0].setNama("Usman");
 staff1[0].setNip("0003");
 staff1[0].setGolongan("2");
 staff1[0].setLembur(10);
 staff1[0].setGajiLembur(10000);

 staff1[1]=new Staff();
 staff1[1].setNama("Anugrah");
 staff1[1].setNip("0005");
 staff1[1].setGolongan("2");
 staff1[1].setLembur(10);
 staff1[1].setGajiLembur(55000);
 man[0].setStaff(staff1);

 staff2[0]=new Staff();
 staff2[0].setNama("Hendra");
 staff2[0].setNip("0004");
 staff2[0].setGolongan("3");
 staff2[0].setLembur(15);
 staff2[0].setGajiLembur(5500);
```

```
staff2[1]=new Staff();
staff2[1].setNama("Arie");
staff2[1].setNip("0006");
staff2[1].setGolongan("4");
staff2[1].setLembur(5);
staff2[1].setGajiLembur(100000);

staff2[2]=new Staff();
staff2[2].setNama("Mentari");
staff2[2].setNip("0007");
staff2[2].setGolongan("3");
staff2[2].setLembur(6);
staff2[2].setGajiLembur(20000);
man[1].setStaff(staff2);

//cetak informasi dari manager + staffnya
man[0].lihatInfo();
man[1].lihatInfo();
}
```

4. Exercise

```
public class PerkalianKu {

 void perkalian(int a, int b){

  System.out.println(a * b);

 }

 void perkalian(int a, int b, int c){

  System.out.println(a * b * c);

 }

 public static void main(String args []){

  PerkalianKu objek = new PerkalianKu();

  objek.perkalian(25, 43);
  objek.perkalian(34, 23, 56);
 }
}
```

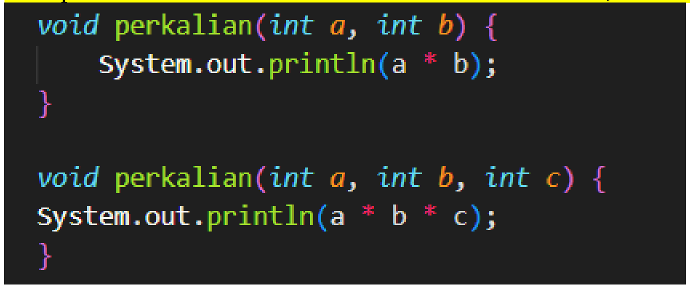


```java
package week_7.source_code.exercise;

public class Perkalianku {

    void perkalian(int a, int b) {
        System.out.println(a * b);
    }

    void perkalian(int a, int b, int c) {
        System.out.println(a * b * c);
    }

    public static void main(String[] args) {
        Perkalianku objek = new Perkalianku();

        objek.perkalian(a:25, b:43);
        objek.perkalian(a:34, b:23, c:56);
    }
}
```

```
PS E:\KULIAH POLINEMA\Semester 3\Pemrograman Berbasis Objek\Praktikum>  & 'C:\Program Files\Java\jdk-17\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server
=n,suspend=y,address=localhost:62243' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Evan Diantha F\AppData\Roaming\Code\User\workspaceStorage\d6b9ea
8582df7f4d9c1b7c4d05d437bf\redhat.java\jdt_ws\Praktikum_7d7cf39a\bin' 'week_7.source_code.exercise.Perkalianku'
1075
43792
PS E:\KULIAH POLINEMA\Semester 3\Pemrograman Berbasis Objek\Praktikum>
```

4.1 From the source coding above, where is the overloading?

The overloading in the source code above is located in the multiplication method. There are two multiplication methods that have the same method name, but have different number of parameters.

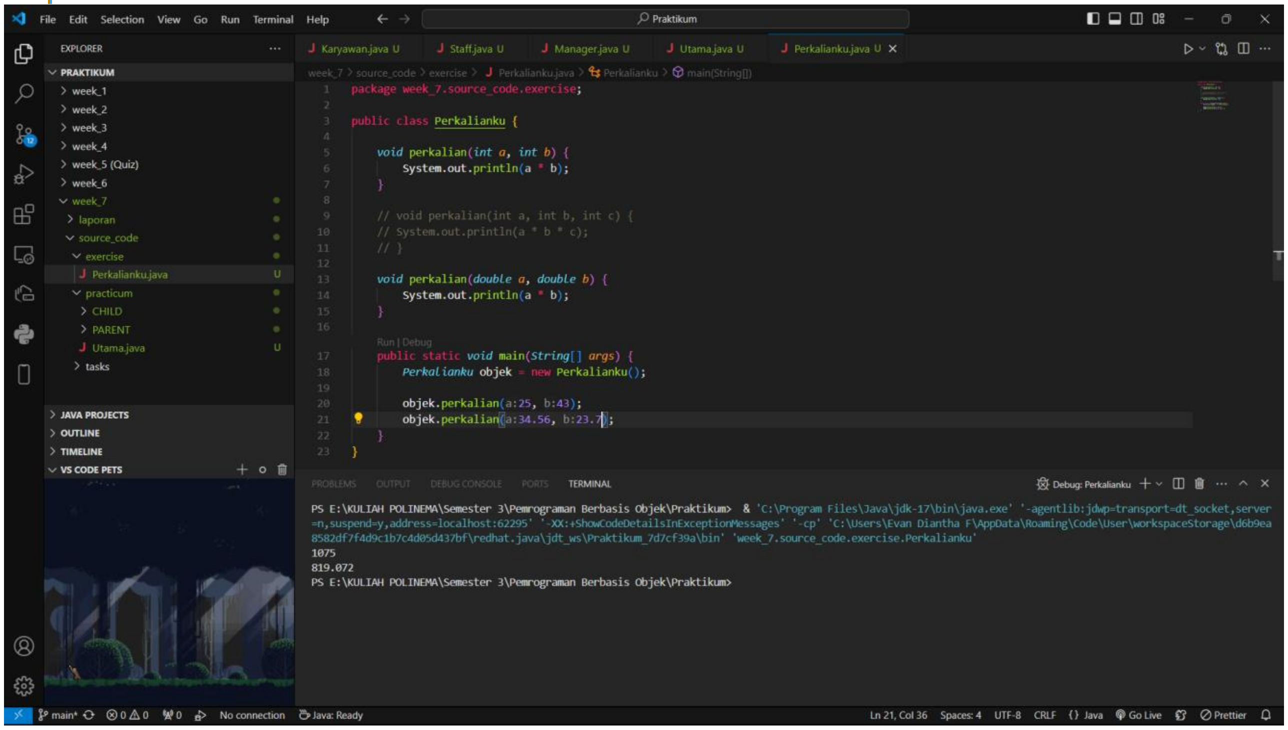


```java
void perkalian(int a, int b) {
    System.out.println(a * b);
}

void perkalian(int a, int b, int c) {
System.out.println(a * b * c);
}
```

4.2 If there is overloading, how many different parameters are there?

Two parameters: multiplication(int a, int b)
Three parameters: multiplication(int a, int b, int c)
Thus, the compiler can distinguish between the two methods based on the number of parameters used when calling the multiplication method.

```java
public class PerkalianKu {

 void perkalian(int a, int b){

  System.out.println(a * b);

 }

 void perkalian(double a, double b){

  System.out.println(a * b);

 }

 public static void main(String args []){

  PerkalianKu objek = new PerkalianKu();

  objek.perkalian(25, 43);
  objek.perkalian(34.56, 23.7);
 }
}
```

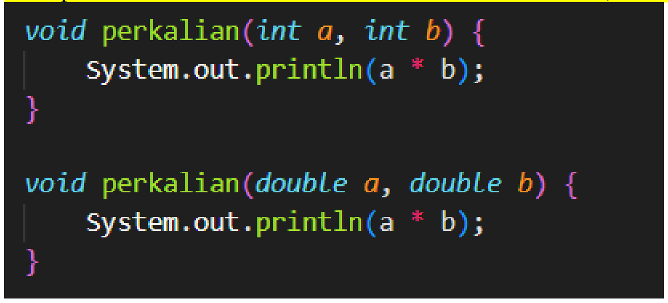


```java
package week_7.source_code.exercise;

public class Perkalianku {

    void perkalian(int a, int b) {
        System.out.println(a * b);
    }

    // void perkalian(int a, int b, int c) {
    // System.out.println(a * b * c);
    // }

    void perkalian(double a, double b) {
        System.out.println(a * b);
    }

    public static void main(String[] args) {
        Perkalianku objek = new Perkalianku();

        objek.perkalian(a:25, b:43);
        objek.perkalian(a:34.56, b:23.7);
    }
}
```

```
PS E:\KULIAH POLINEMA\Semester 3\Pemrograman Berbasis Objek\Praktikum>  & 'C:\Program Files\Java\jdk-17\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:62295' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Evan Diantha F\AppData\Roaming\Code\User\workspaceStorage\d6b9ea8582df7f4d9c1b7c4d05d437bf\redhat.java\jdt_ws\Praktikum_7d7cf39a\bin' 'week_7.source_code.exercise.Perkalianku'
1075
819.072
PS E:\KULIAH POLINEMA\Semester 3\Pemrograman Berbasis Objek\Praktikum>
```

4.3 From the source coding above, where is the overloading?

The overloading in the source code above is located in the multiplication method. There are two multiplication methods that have the same method name, but have different parameter types.

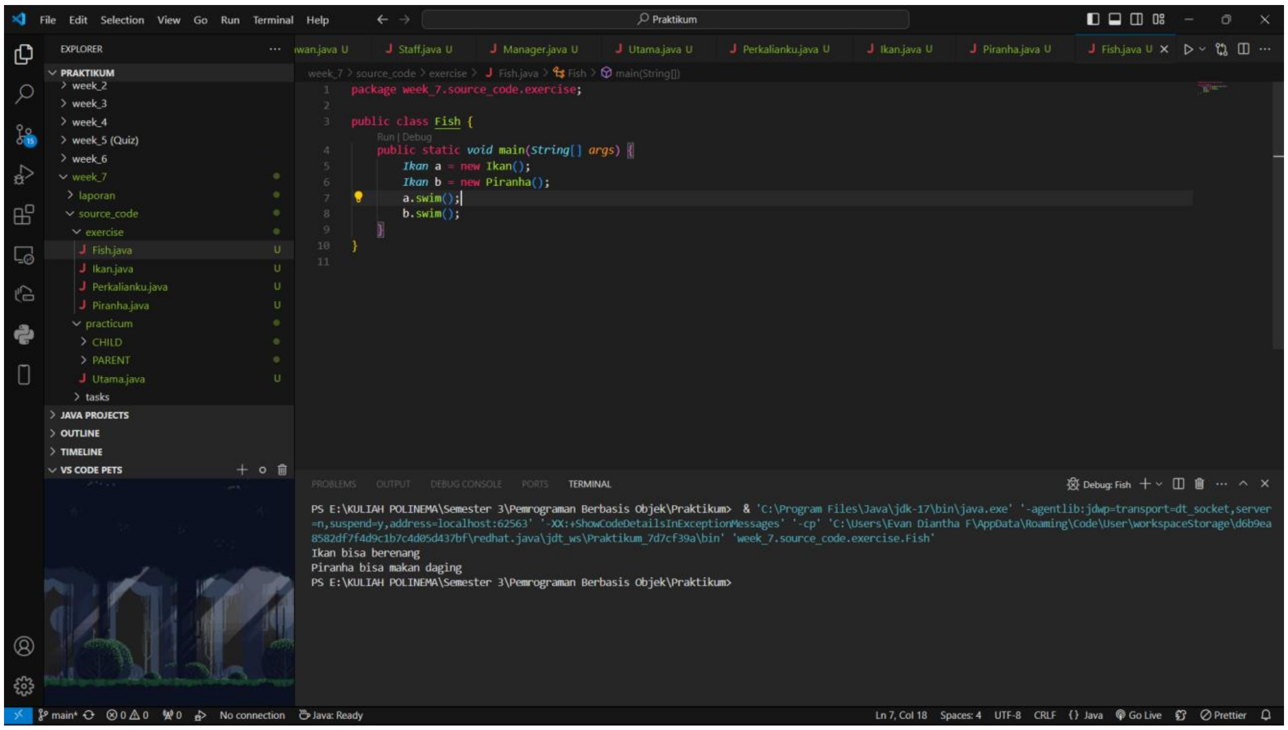


```java
void perkalian(int a, int b) {
    System.out.println(a * b);
}

void perkalian(double a, double b) {
    System.out.println(a * b);
}
```

4.4 If there is overloading, how many different types of parameters are there?

Two parameters of type int: multiplication(int a, int b)
Two parameters of type double: multiplication(double a, double b)
then, the compiler can distinguish between the two methods based on the parameter types used when calling the multiplication method.

```java
  class Ikan{
   public void swim(){
      System.out.println("Ikan bisa berenang");
   }
}
class Piranha extends Ikan{
   public void swim(){
      System.out.println("Piranha bisa makan daging");
   }
}
public class Fish {
    public static void main(String[] args) {
        Ikan a = new Ikan();
      Ikan b = new Piranha();
      a.swim();
      b.swim();
    }
   }
```



```java
package week_7.source_code.exercise;

public class Fish {
    public static void main(String[] args) {
        Ikan a = new Ikan();
        Ikan b = new Piranha();
        a.swim();
        b.swim();
    }
}
```

```
PS E:\KULIAH POLINEMA\Semester 3\Pemrograman Berbasis Objek\Praktikum>  & 'C:\Program Files\Java\jdk-17\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:62563' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Evan Diantha F\AppData\Roaming\Code\User\workspaceStorage\d6b9ea8582df7f4d9c1b7c4d05d437bf\redhat.java\jdt_ws\Praktikum_7d7cf39a\bin' 'week_7.source_code.exercise.Fish'
Ikan bisa berenang
Piranha bisa makan daging
PS E:\KULIAH POLINEMA\Semester 3\Pemrograman Berbasis Objek\Praktikum>
```

4.5 From the source coding above, where is the overriding?

The overriding in the source code above is located in the swim() method inside the Piranha class. The swim() method in the Piranha class overrides the swim() method in the Fish class.

4.6 Describe when sourcoding above if there is overriding?

If there is overriding, then the swim() method in class Piranha will override the swim() method in class Fish. That is, when we create object b from class Piranha and call the swim() method on object b, it will execute the swim() method in class Piranha, not the swim() method in class Fish.

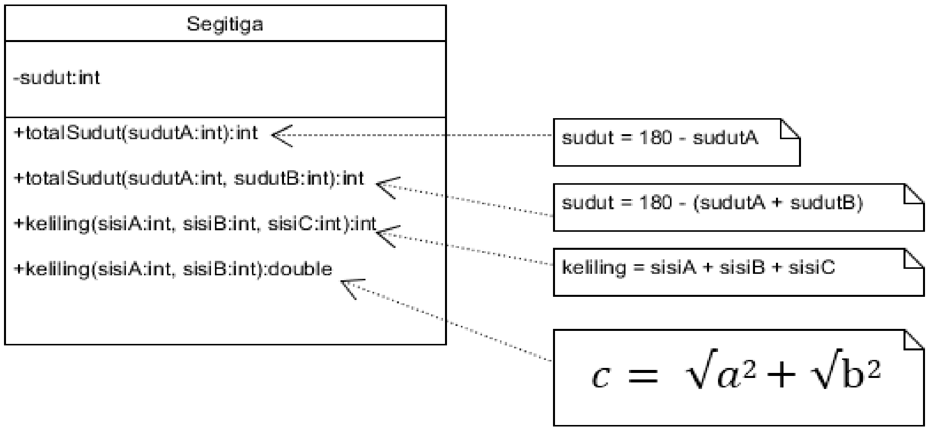
- a.swim() will print “Ikan bisa berenang”
- b.swim() will print “Piranha bisa makan daging”

---

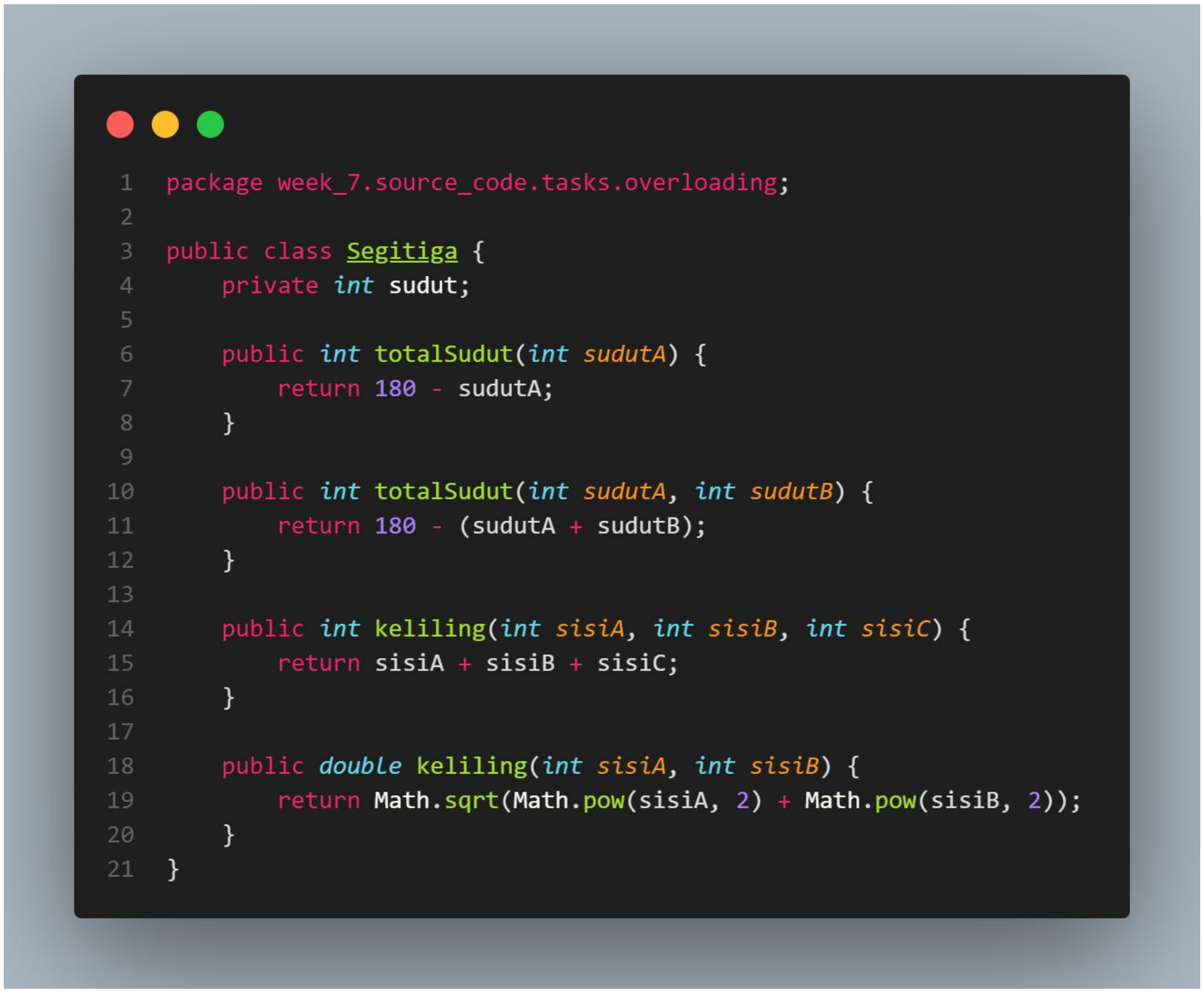
5. Tasks

5.1 Overloading

Implement the overloading concept in the diagram class below:

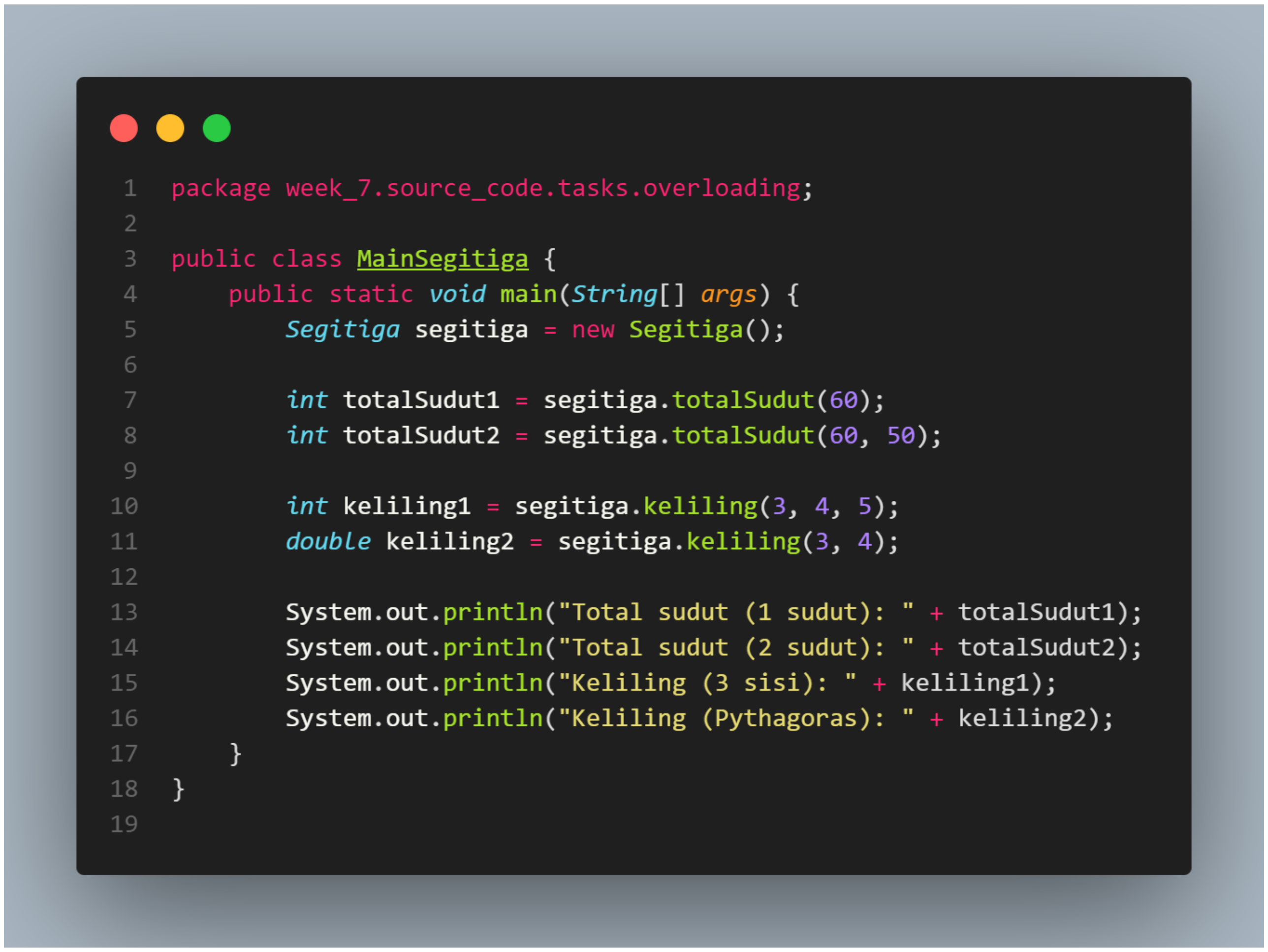

Segitiga
-sudut:int
+totalSudut(sudutA:int):int
+totalSudut(sudutA:int, sudutB:int):int
+keliling(sisiA:int, sisiB:int, sisiC:int):int
+keliling(sisiA:int, sisiB:int):double
sudut = 180 - sudutA
sudut = 180 - (sudutA + sudutB)
keliling = sisiA + sisiB + sisiC
c = √a² + √b²

- Segitiga



```java
package week_7.source_code.tasks.overloading;

public class Segitiga {
    private int sudut;

    public int totalSudut(int sudutA) {
        return 180 - sudutA;
    }

    public int totalSudut(int sudutA, int sudutB) {
        return 180 - (sudutA + sudutB);
    }

    public int keliling(int sisiA, int sisiB, int sisiC) {
        return sisiA + sisiB + sisiC;
    }

    public double keliling(int sisiA, int sisiB) {
        return Math.sqrt(Math.pow(sisiA, 2) + Math.pow(sisiB, 2));
    }
}
```

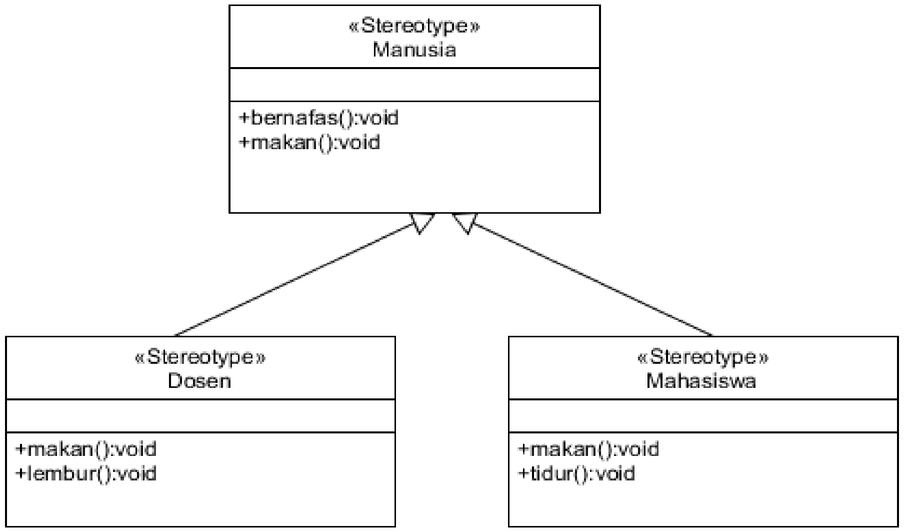
- MainSegitiga



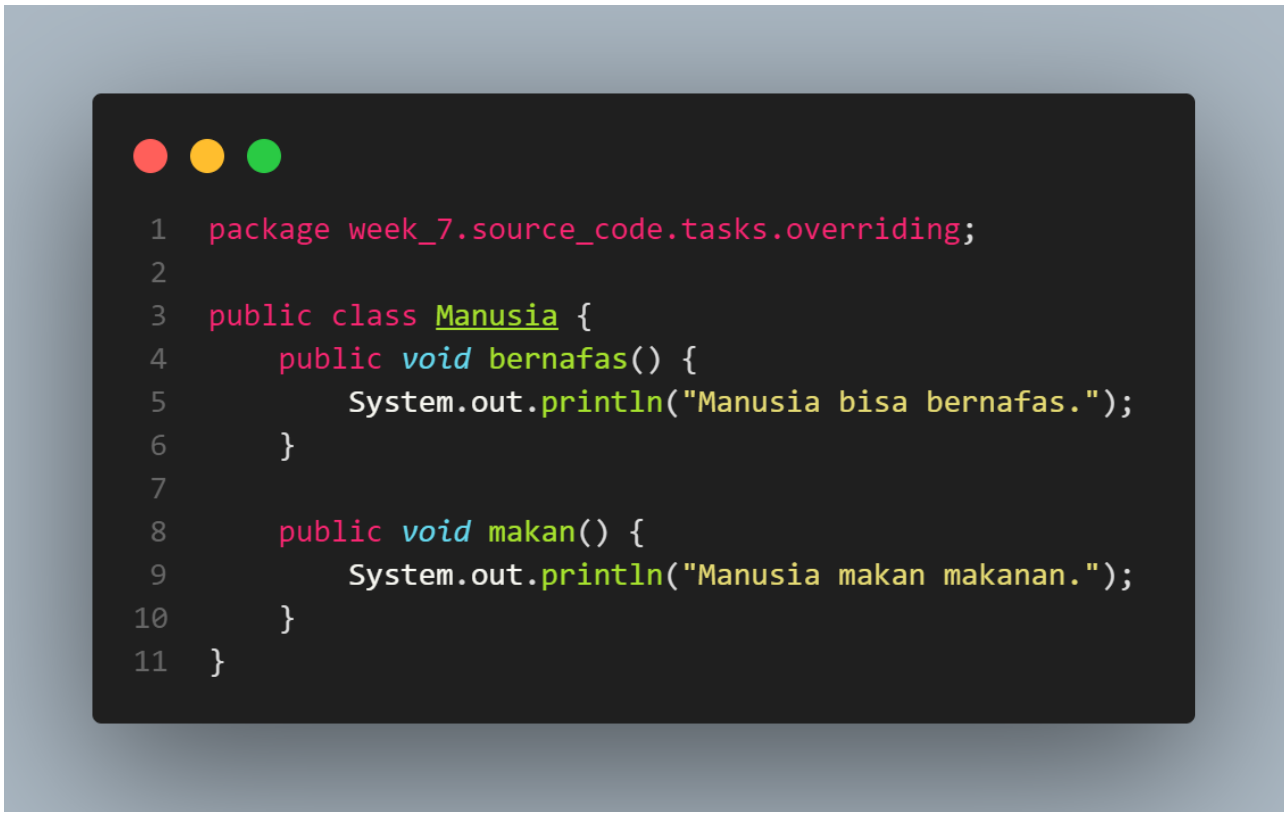
```java
package week_7.source_code.tasks.overloading;

public class MainSegitiga {
    public static void main(String[] args) {
        Segitiga segitiga = new Segitiga();

        int totalSudut1 = segitiga.totalSudut(60);
        int totalSudut2 = segitiga.totalSudut(60, 50);

        int keliling1 = segitiga.keliling(3, 4, 5);
        double keliling2 = segitiga.keliling(3, 4);

        System.out.println("Total sudut (1 sudut): " + totalSudut1);
        System.out.println("Total sudut (2 sudut): " + totalSudut2);
        System.out.println("Keliling (3 sisi): " + keliling1);
        System.out.println("Keliling (Pythagoras): " + keliling2);
    }
}

```

5.2 Overriding

Implement the diagram class below using the dynamic method dispatch technique:

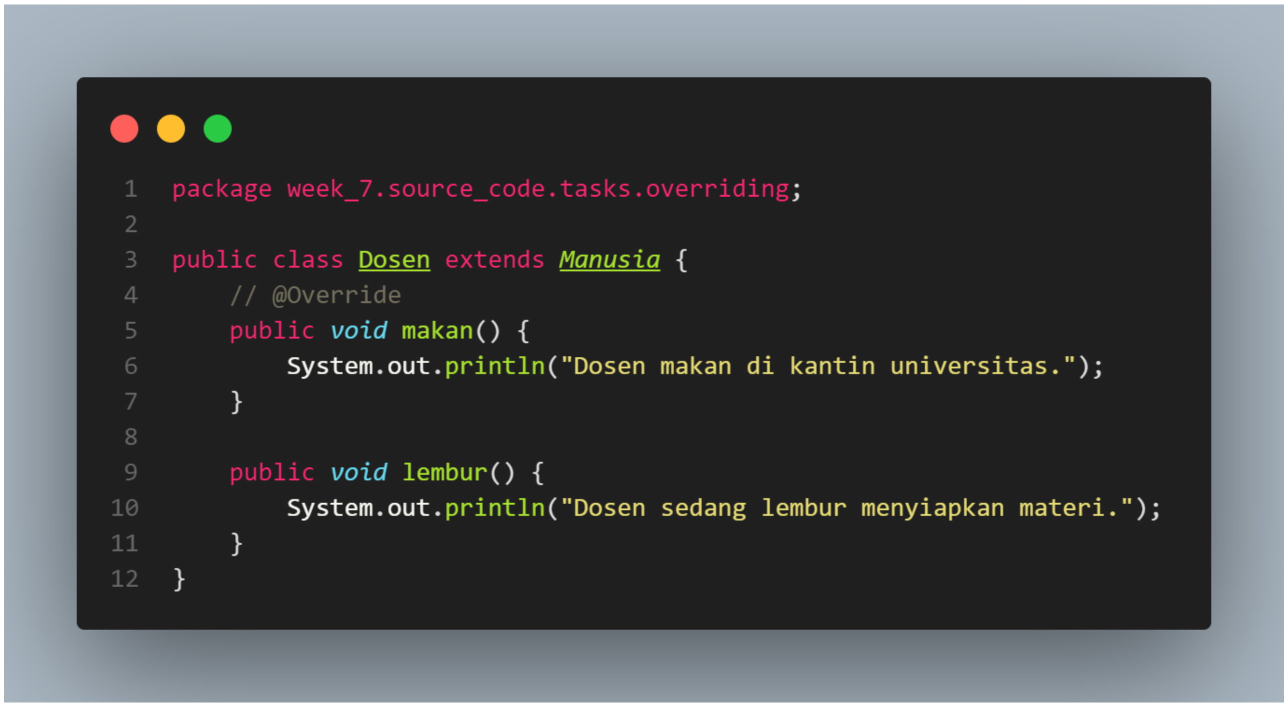


- Manusia



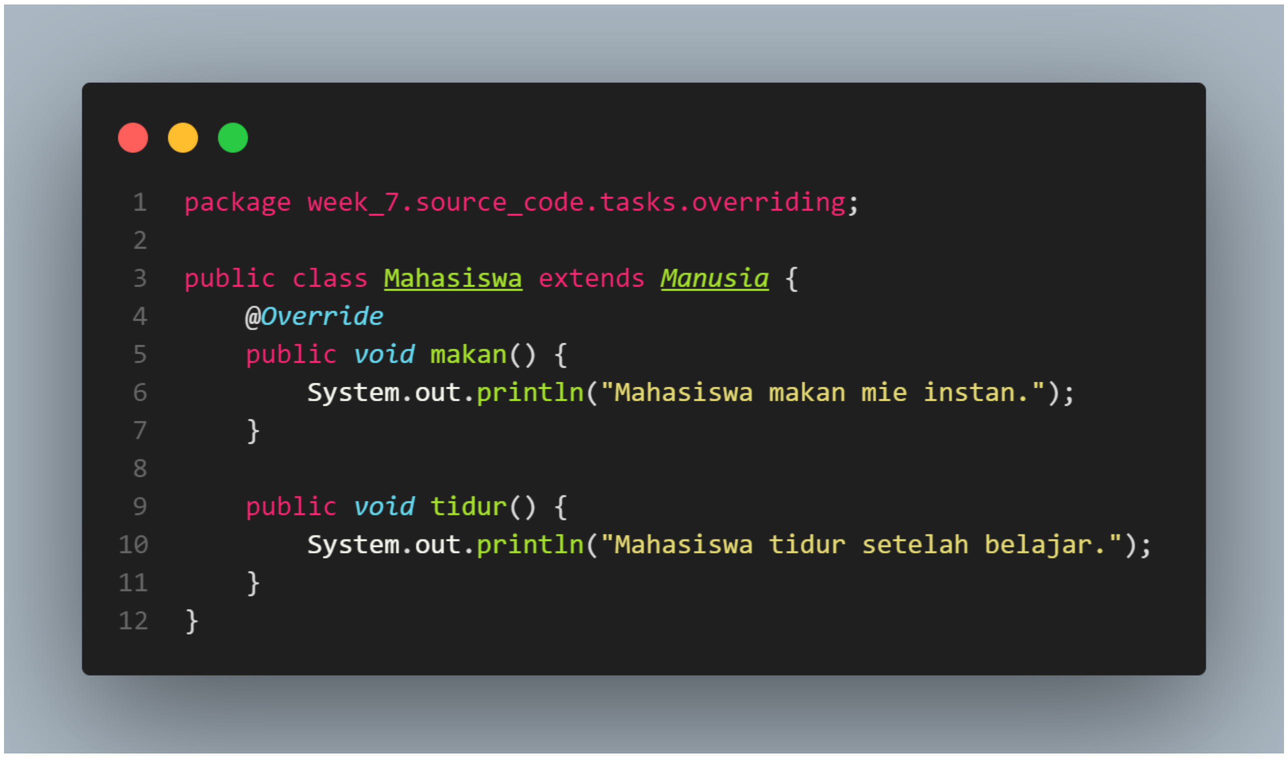
```java
package week_7.source_code.tasks.overriding;

public class Manusia {
    public void bernafas() {
        System.out.println("Manusia bisa bernafas.");
    }

    public void makan() {
        System.out.println("Manusia makan makanan.");
    }
}
```

- Dosen



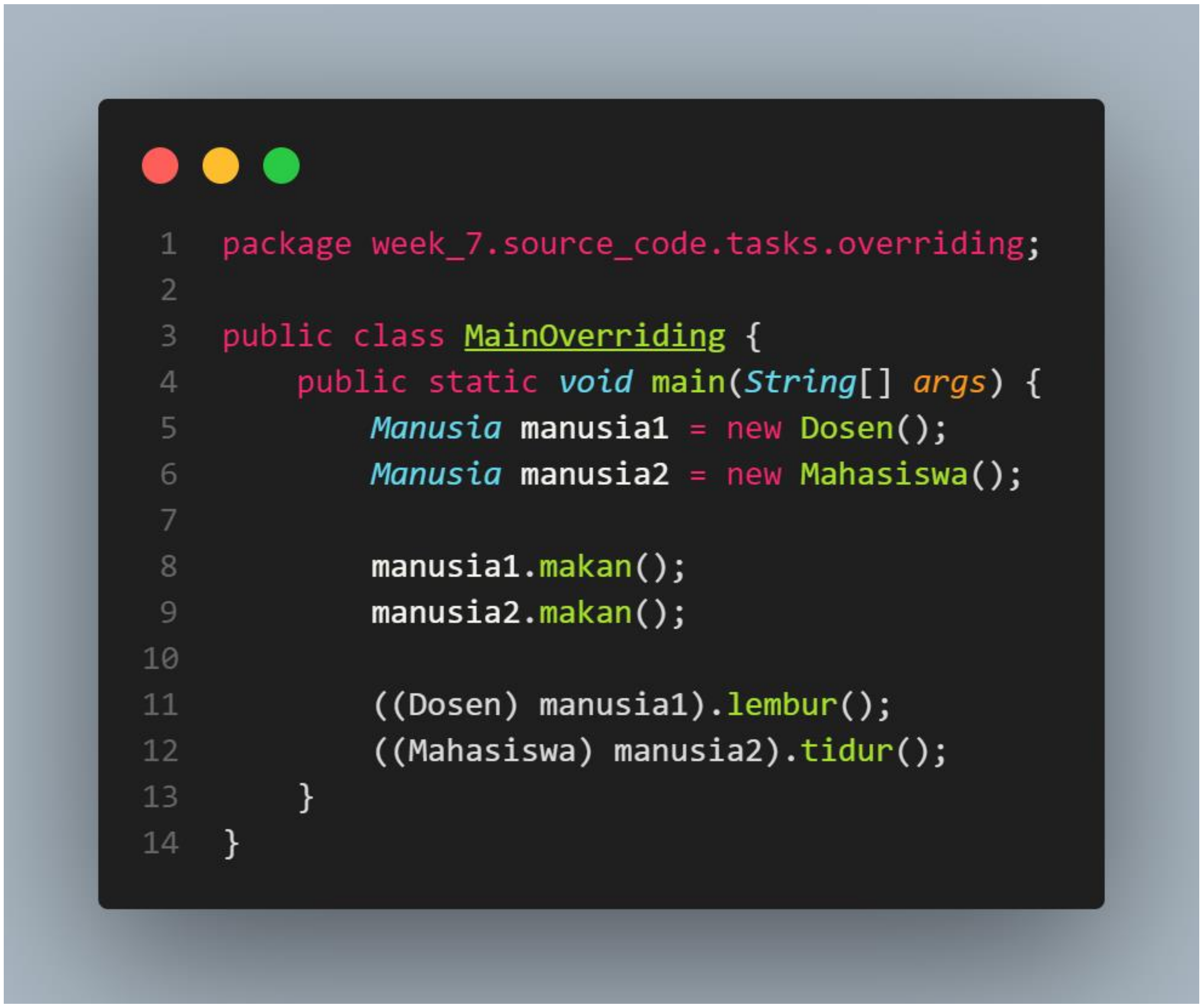
```java
package week_7.source_code.tasks.overriding;

public class Dosen extends Manusia {
    // @Override
    public void makan() {
        System.out.println("Dosen makan di kantin universitas.");
    }

    public void lembur() {
        System.out.println("Dosen sedang lembur menyiapkan materi.");
    }
}
```

- Mahasiswa



```java
package week_7.source_code.tasks.overriding;

public class Mahasiswa extends Manusia {
    @Override
    public void makan() {
        System.out.println("Mahasiswa makan mie instan.");
    }

    public void tidur() {
        System.out.println("Mahasiswa tidur setelah belajar.");
    }
}
```

- MainOverriding



```java
package week_7.source_code.tasks.overriding;

public class MainOverriding {
    public static void main(String[] args) {
        Manusia manusia1 = new Dosen();
        Manusia manusia2 = new Mahasiswa();

        manusia1.makan();
        manusia2.makan();

        ((Dosen) manusia1).lembur();
        ((Mahasiswa) manusia2).tidur();
    }
}
```