Object Oriented Programming
Inheritance

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1 Experiment 1

ClassA.java

```
package experiment1;

public class ClassA {
    public int x;
    public int y;

    public void getValue() {
        System.out.println(String.format("Value of x: %d", x));
        System.out.println(String.format("Value of y: %d", y));
    }
}
```

ClassB.java

```
package experiment1;

public class ClassB {
    public int z;

    public void getZValue() {
        System.out.println(String.format("Value of Z: %d", z));
    }

    public void getSum() {
        System.out.println(String.format("Sum: %d", (x+y+z)));
    }
}
```

Experiment1.java

```
package experiment1;

public class Experiment1 {
    public static void main(String[] args) {
        ClassB calculate = new ClassB();
        calculate.x = 20;
        calculate.y = 30;
        calculate.z = 5;
        calculate.getValue();
        calculate.getZValue();
```

```
        calculate.getSum();
    }
}
```

Terminal

```
PS D:\Kuliah>  & 'C:\Program Files\Java\jdk-18.0.2.1\bin\java.exe'
↪  '-XX:+ShowCodeDetailsInExceptionMessages' '-cp'
↪  'C:\Users\G4CE-PC\AppData\Roaming\Code\User\workspaceStorage\
↪  80d97a47d24665dc0bce7ab1e048ecbd\redhat.java\jdt_ws\
↪  Kuliah_28156aa7\bin' 'experiment1.Eperiment1'
Exception in thread "main" java.lang.Error: Unresolved compilation
↪  problems:
        x cannot be resolved or is not a field
        y cannot be resolved or is not a field
        The method getValue() is undefined for the type ClassB

        at experiment1.Eperiment1.main(Eperiment1.java:6)
```

1.1 Question

1. Pada percobaan 1 diatas program yang dijalankan terjadi error, kemudian perbaiki sehingga program tersebut bisa dijalankan dan tidak error!

2. Jelaskan apa penyebab program pada percobaan 1 ketika dijalankan terdapat error!

1.2 Answer

1. -

   ```
   package experiment1;

   public class ClassB extends ClassA {
       ...
   }
   ```

2. Because the ClassB haven't inherit ClassA yet. ClassB was missing the attributes and methods from ClassA and thus it can't use anything from ClassA.

2 Experiment 2

ClassA.java

```java
package experiment2;

public class ClassA {
    public int x;
    public int y;

    public void setX(int x) {
        this.x = x;
    }

    public void setY(int y) {
        this.y = y;
    }

    public void getValue() {
        System.out.println(String.format("Value of x: %d", x));
        System.out.println(String.format("Value of y: %d", y));
    }
}
```

ClassB.java

```java
package experiment2;

public class ClassB extends ClassA {
    public int z;

    public void setZ(int z) {
        this.z = z;
    }

    public void getZValue() {
        System.out.println(String.format("Value of Z: %d", z));
    }

    public void getSum() {
        System.out.println(String.format("Sum: %d", (x+y+z)));
    }
}
```

Experiment2.java

```java
package experiment2;

public class Experiment2 {
    public static void main(String[] args) {
        ClassB calculate = new ClassB();
        calculate.setX(20);
        calculate.setY(30);
        calculate.setZ(5);
        calculate.getValue();
        calculate.getZValue();
        calculate.getSum();
    }
}
```

Terminal

```
PS D:\Kuliah>  d:; cd 'd:\Kuliah'; & 'C:\Program Files\Java\jdk-18.0.2.1\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\G4CE-PC\AppData\Roaming\Code\User\workspaceStorage\80d97a47d24665dc0bce' 'experiment2.Eperiment2'
Exception in thread "main" java.lang.Error: Unresolved compilation problems:
        The method setX(int) is undefined for the type ClassB
        The method setY(int) is undefined for the type ClassB
        The method getValue() is undefined for the type ClassB

        at experiment2.Eperiment2.main(Eperiment2.java:6)
```

2.1 Question

1. Pada percobaan 2 diatas program yang dijalankan terjadi error, kemudian perbaiki sehingga program tersebut bisa dijalankan dan tidak error!

2. Jelaskan apa penyebab program pada percobaan 1 ketika dijalankan terdapat error!

2.2 Answer

1. -

   ```
   package experiment2;

   public class ClassB extends ClassA {
       ...
   }
   ```

2. Because the ClassB haven't inherit ClassA yet. ClassB was missing the attributes and methods from ClassA and thus it can't use anything from ClassA.

3 Experiment 3

Circle.java

```
1  package experiment3;
2
3  public class Circle {
4      protected double phi;
5      protected int r;
6  }
```

Tube.java

```
1  package experiment3;
2
3  public class Tube extends Circle {
4      protected int t;
5
6      public void setSuperPhi(double phi) {
7          super.phi = phi;
8      }
9
10     public void setSuperR(int r) {
```

```
        super.r = r;
    }

    public void setT(int t) {
        this.t = t;
    }

    public void volume() {
        double volume = super.phi * super.r * super.r * this.t;
        String text = String.format("Volume Tabung adalah: %.1f",
        ↪  volume);
        System.out.println(text);
    }
}
```

Experiment3.java

```
package experiment3;

public class Experiment3 {
    public static void main(String[] args) {
        Tube tube = new Tube();
        tube.setSuperPhi(3.14);
        tube.setSuperR(10);
        tube.setT(3);
        tube.volume();
    }
}
```

Terminal

```
PS D:\Kuliah>  d:; cd 'd:\Kuliah'; & 'C:\Program
↪  Files\Java\jdk-18.0.2.1\bin\java.exe'
↪  '-XX:+ShowCodeDetailsInExceptionMessages' '-cp'
↪  'C:\Users\G4CE-PC\AppData\Roaming\Code\User\workspaceStorage\
↪  80d97a47d47d24665dc0bce7ab1e048ecbd\redhat.java\jdt_ws\
↪  Kuliah_28156aa7\bin' 'experiment3.Experiment3'
Volume Tabung adalah: 942.0
```

3.1 Question

1. Jelaskan fungsi “super” pada potongan program berikut di class Tabung!

```
public void setSuperPhi(double phi) {
    super.phi = phi;
}

public void setSuperR(int r) {
    super.r = r;
}
```

2. Jelaskan fungsi “super” dan “this” pada potongan program berikut di class Tabung!

```
1 public void volume() {
2     double volume = super.phi * super.r * super.r * this.t;
3     String text = String.format("Volume Tabung adalah: %.1f",
      ↪  volume);
4     System.out.println(text);
5 }
```

3. Jelaskan mengapa pada class Tabung tidak dideklarasikan atribut “phi” dan “r” tetapi class tersebut dapat mengakses atribut tersebut!

3.2 Answer

1. It is used to access the parent class attributes and ansign value to it.
2. It is used to distinguished the attributes of the parent class and the child class.
3. Because the attribute ”phi” and ”r” have protected modifier which makes it accessable in the subclass.

4 Experiment 4

.java

```java
package experiment4;

public class ClassA {
    ClassA() {
        System.out.println("Constructor A runned");
    }
}
```

.java

```java
package experiment4;

public class ClassB extends ClassA {
    ClassB() {
        System.out.println("Constructor B runned");
    }
}
```

.java

```java
package experiment4;

public class ClassC extends ClassB {
    ClassC() {
        System.out.println("Constructor C runned");
    }
}
```

.java

```java
package experiment4;

public class ClassC extends ClassB {
    ClassC() {
        System.out.println("Constructor C runned");
    }
}
```

Terminal

```
PS D:\Kuliah>  d:; cd 'd:\Kuliah'; & 'C:\Program
↪  Files\Java\jdk-18.0.2.1\bin\java.exe'
↪  '-XX:+ShowCodeDetailsInExceptionMessages' '-cp'
↪  'C:\Users\G4CE-PC\AppData\Roaming\Code\User\workspaceStorage\
↪  80d97a47d24665dc0bce7ab1e048ecbd\redhat.java\jdt_ws\
↪  Kuliah_28156aa7\bin' 'experiment4.Experiment4'
Constructor A runned
Constructor B runned
Constructor C runned
```

4.1 Question

1. Pada percobaan 4 sebutkan mana class yang termasuk superclass dan subclass, kemudian jelaskan alasannya!

2. Ubahlah isi konstruktor default ClassC seperti berikut:

   ```
   package experiment4;

   public class ClassC extends ClassB {
       ClassC() {
           super();
           System.out.println("Constructor C runned");
       }
   }
   ```

   Tambahkan kata super() di baris Pertaman dalam konstruktor defaultnya. Coba jalankan kembali class Percobaan4 dan terlihat tidak ada perbedaan dari hasil outputnya!

3. Ublah isi konstruktor default ClassC seperti berikut:

```
package experiment4;

public class ClassC extends ClassB {
    ClassC() {
        System.out.println("Constructor C runned");
        super();
    }
}
```

Ketika mengubah posisi super() dibaris kedua dalam kontruktor defaultnya dan terlihat ada error. Kemudian kembalikan super() kebaris pertama seperti sebelumnya, maka errornya akan hilang. Perhatikan hasil keluaran ketika class Percobaan4 dijalankan. Kenapa bisa tampil output seperti berikut pada saat instansiasi objek test dari class ClassC

```
PS D:\Kuliah>  d:; cd 'd:\Kuliah'; & 'C:\Program
↪  Files\Java\jdk-18.0.2.1\bin\java.exe'
↪  '-XX:+ShowCodeDetailsInExceptionMessages' '-cp'
↪  'C:\Users\G4CE-PC\AppData\Roaming\Code\User\workspaceStorage\
↪  80d97a47d24665dc0bce7ab1e048ecbd\redhat.java\jdt_ws\
↪  Kuliah_28156aa7\bin' 'experiment4.Experiment4'
Constructor A runned
Constructor B runned
Constructor C runned
```

Jelaskan bagaimana urutan proses jalannya konstruktor saat objek test dibuat!

4. Apakah fungsi super() pada potongan program dibawah ini di ClassC!

```
package experiment4;

public class ClassC extends ClassB {
    ClassC() {
        super();
        System.out.println("Constructor C runned");
    }
}
```

4.2 Answer

1. Class A is a superclass of ClassB. ClassB is a subclass of ClassA and a superclass of ClassC. ClassC is a subclass of ClassB.

2. -

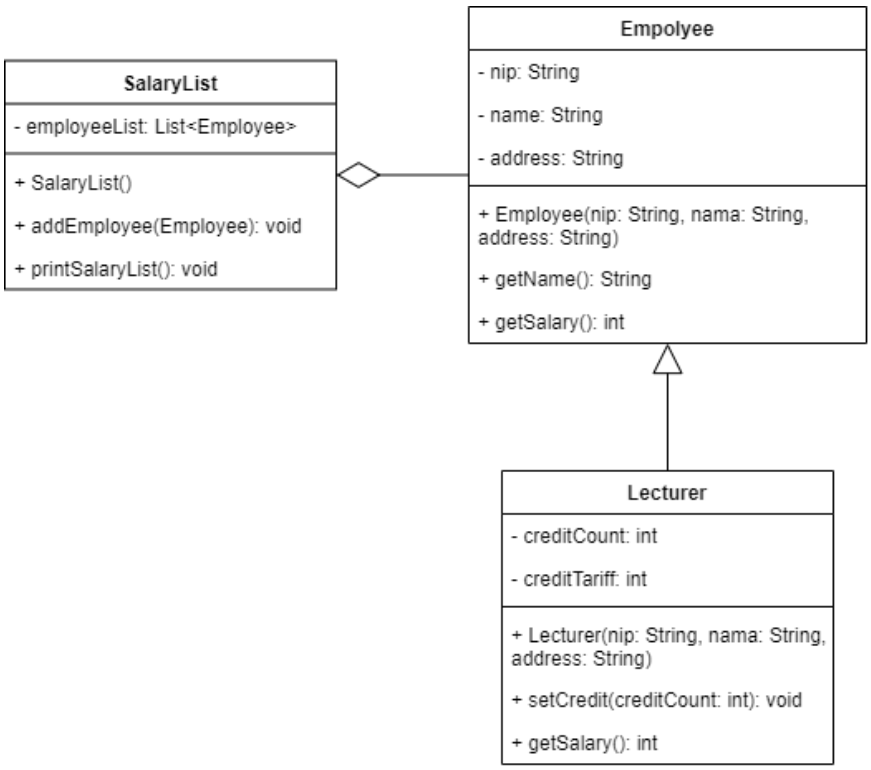
```
PS D:\Kuliah>  d:; cd 'd:\Kuliah'; & 'C:\Program
↪  Files\Java\jdk-18.0.2.1\bin\java.exe'
↪  '-XX:+ShowCodeDetailsInExceptionMessages' '-cp'
↪  'C:\Users\G4CE-PC\AppData\Roaming\Code\User\workspaceStorage\
↪  80d97a47d24665dc0bce7ab1e048ecbd\redhat.java\jdt_ws\
↪  Kuliah_28156aa7\bin' 'experiment4.Experiment4'
Constructor A runned
Constructor B runned
Constructor C runned
```

3. Normally when ClassC is instantiated, because it is a subclass of ClassB, the Constructor for ClassB is runned. But because the ClassC constructor run SysOut first and then the super constructor after that, it return an error. Normally super constructor need to be run first before anything could happend since it would need the superclass to be ready first.

4. It instantiate the superclass of the class. In this case it instantiate the ClassB to inherit its property.

5 Assignment

Buatlah sebuah program dengan konsep pewarisan seperti pada class diagram berikut ini. Kemudian buatlah instansiasi objek untuk menampilkan data nama pegawai dan gaji yang didapatkannya.



MainJoin.java

```
1  package assignment;
2
3  import java.util.ArrayList;
4  import java.util.List;
5  import java.util.Locale;
6
7  class EmployeeMain {
8      private String nip;
9      private String name;
10     private String address;
11
12     public EmployeeMain(String nip, String name, String address) {
13         this.nip = nip;
14         this.name = name;
15         this.address = address;
```

```
16      }
17
18      public String getNip() {
19          return nip;
20      }
21
22      public String getName() {
23          return name;
24      }
25
26      public String getAddress() {
27          return address;
28      }
29
30      public int getSalary() {
31          return 0;
32      }
33  }
34
35  class LecturerMain extends EmployeeMain {
36      private int creditCount;
37      private int creditTariff;
38
39      public LecturerMain(String nip, String name, String address) {
40          super(nip, name, address);
41      }
42
43      public void setCreditCount(int creditCount) {
44          this.creditCount = creditCount;
45      }
46
47      public void setCreditTariff(int creditTariff) {
48          this.creditTariff = creditTariff;
49      }
50
51      @Override
52      public int getSalary() {
53          return creditCount * creditTariff;
54      }
55  }
56
57  class SalaryListMain {
```

```
58      public List<EmployeeMain> employeeList;
59
60      public SalaryListMain() {
61          this.employeeList = new ArrayList<EmployeeMain>();
62      }
63
64      public void addEmployee(EmployeeMain employee) {
65          this.employeeList.add(employee);
66      }
67
68      public void printSalaryList() {
69          System.out.println("Employee salary list:");
70          for (EmployeeMain employee : this.employeeList) {
71              System.out.println(String.format(Locale.ITALY,"%s: Rp
                ↪  %,d", employee.getName(), employee.getSalary()));
72          }
73      }
74  }
75
76  public class MainJoin {
77      public static void main(String[] args) {
78          SalaryListMain list = new SalaryListMain();
79          LecturerMain lecturer1 = new LecturerMain(
80              "230001",
81              "Alpha",
82              "Home"
83          );
84          lecturer1.setCreditCount(18);
85          lecturer1.setCreditTariff(50_000);
86          LecturerMain lecturer2 = new LecturerMain(
87              "230002",
88              "Beta",
89              "Home"
90          );
91          lecturer2.setCreditCount(19);
92          lecturer2.setCreditTariff(45_000);
93          LecturerMain lecturer3 = new LecturerMain(
94              "230003",
95              "Charlie",
96              "Home"
97          );
98          lecturer3.setCreditCount(22);
```

```
        lecturer3.setCreditTariff(47_500);
        list.addEmployee(lecturer1);
        list.addEmployee(lecturer2);
        list.addEmployee(lecturer3);
        list.printSalaryList();
    }
}
```

Terminal

```
PS D:\Kuliah>  & 'C:\Program Files\Java\jdk-18.0.2.1\bin\java.exe'
↪  '-XX:+ShowCodeDetailsInExceptionMessages' '-cp'
↪  'C:\Users\G4CE-PC\AppData\Roaming\Code\User\workspaceStorage\
↪  80d97a47d24665dc0bce7ab1e048ecbd\redhat.java\jdt_ws\
↪  Kuliah_28156aa7\bin' 'assignment.MainJoin'
Employee salary list:
Alpha: Rp 900.000
Beta: Rp 855.000
Charlie: Rp 1.045.000
```

6 PPT Task

Main.java

```
package ppt_task;

public class Main {
    public static void main(String[] args) {

    }
}

class TwoDimensionalGeometry {
    public float calculateArea() {
        return 0;
    }

    public float calculateCircumference() {
        return 0;
    }
}

class Rectangle extends TwoDimensionalGeometry {
```

```
20      public float length;
21      public float width;
22
23      @Override
24      public float calculateArea() {
25          return length * width;
26      }
27
28      @Override
29      public float calculateCircumference() {
30          return 2 * (length + width);
31      }
32  }
33
34  class Circle extends TwoDimensionalGeometry {
35      public float r;
36
37      @Override
38      public float calculateArea() {
39          return 3.14f * r * r;
40      }
41
42      @Override
43      public float calculateCircumference() {
44          return 2 * 3.14f * r;
45      }
46  }
47
48  class Triangle extends TwoDimensionalGeometry {
49      public float base;
50      public float heigth;
51
52      @Override
53      public float calculateArea() {
54          return 0.5f * base * heigth;
55      }
56
57      @Override
58      public float calculateCircumference() {
59          return 3 * base;
60      }
61  }
```