

# Object Oriented Programming Inheritance



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# 1 Experiment 1

ClassA.java

```
1 package experiment1;
2
3 public class ClassA {
4     public int x;
5     public int y;
6
7     public void getValue() {
8         System.out.println(String.format("Value of x: %d", x));
9         System.out.println(String.format("Value of y: %d", y));
10    }
11 }
```

ClassB.java

```
1 package experiment1;
2
3 public class ClassB {
4     public int z;
5
6     public void getZValue() {
7         System.out.println(String.format("Value of Z: %d", z));
8     }
9
10    public void getSum() {
11        System.out.println(String.format("Sum: %d", (x+y+z)));
12    }
13 }
```

Experiment1.java

```
1 package experiment1;
2
3 public class Experiment1 {
4     public static void main(String[] args) {
5         ClassB calculate = new ClassB();
6         calculate.x = 20;
7         calculate.y = 30;
8         calculate.z = 5;
9         calculate.getValue();
10        calculate.getZValue();
11    }
12 }
```

---

```
11         calculate.getSum();
12     }
13 }
```

#### Terminal

```
1 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'
2 Exception in thread "main" java.lang.Error: Unresolved compilation
  ↳ problems:
3     x cannot be resolved or is not a field
4     y cannot be resolved or is not a field
5     The method getValue() is undefined for the type ClassB
6
7     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.

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## 2 Experiment 2

ClassA.java

```
1 package experiment2;
2
3 public class ClassA {
4     public int x;
5     public int y;
6
7     public void setX(int x) {
8         this.x = x;
9     }
10
11     public void setY(int y) {
12         this.y = y;
13     }
14
15     public void getValue() {
16         System.out.println(String.format("Value of x: %d", x));
17         System.out.println(String.format("Value of y: %d", y));
18     }
19 }
```

ClassB.java

```
1 package experiment2;
2
3 public class ClassB extends ClassA {
4     public int z;
5
6     public void setZ(int z) {
7         this.z = z;
8     }
9
10    public void getZValue() {
11        System.out.println(String.format("Value of Z: %d", z));
12    }
13
14    public void getSum() {
15        System.out.println(String.format("Sum: %d", (x+y+z)));
16    }
17 }
```

---

Experiment2.java

```
1 package experiment2;
2
3 public class Experiment2 {
4     public static void main(String[] args) {
5         ClassB calculate = new ClassB();
6         calculate.setX(20);
7         calculate.setY(30);
8         calculate.setZ(5);
9         calculate.getValue();
10        calculate.getZValue();
11        calculate.getSum();
12    }
13 }
```

Terminal

```
1 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'
2 Exception in thread "main" java.lang.Error: Unresolved compilation
  ↳ problems:
3     The method setX(int) is undefined for the type ClassB
4     The method setY(int) is undefined for the type ClassB
5     The method getValue() is undefined for the type ClassB
6
7     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) {
```

---

```

11         super.r = r;
12     }
13
14     public void setT(int t) {
15         this.t = t;
16     }
17
18     public void volume() {
19         double volume = super.phi * super.r * super.r * this.t;
20         String text = String.format("Volume Tabung adalah: %.1f",
21             ↪ volume);
22         System.out.println(text);
23     }

```

Experiment3.java

```

1 package experiment3;
2
3 public class Experiment3 {
4     public static void main(String[] args) {
5         Tube tube = new Tube();
6         tube.setSuperPhi(3.14);
7         tube.setSuperR(10);
8         tube.setT(3);
9         tube.volume();
10    }
11 }

```

Terminal

```

1 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'
2 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",  
4         ↪ volume);  
5     System.out.println(text);  
6 }
```

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 assign value to it.
2. It is used to distinguish the attributes of the parent class and the child class.
3. Because the attribute “phi” and “r” have protected modifier which makes it accessible in the subclass.



---

## 4 Experiment 4

.java

```
1 package experiment4;
2
3 public class ClassA {
4     ClassA() {
5         System.out.println("Constructor A runned");
6     }
7 }
```

.java

```
1 package experiment4;
2
3 public class ClassB extends ClassA {
4     ClassB() {
5         System.out.println("Constructor B runned");
6     }
7 }
```

.java

```
1 package experiment4;
2
3 public class ClassC extends ClassB {
4     ClassC() {
5         System.out.println("Constructor C runned");
6     }
7 }
```

.java

```
1 package experiment4;
2
3 public class ClassC extends ClassB {
4     ClassC() {
5         System.out.println("Constructor C runned");
6     }
7 }
```

---

## Terminal

```
1 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'
2 Constructor A runned
3 Constructor B runned
4 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 Pertama 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 konstruktor 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

```
1 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'
2 Constructor A runned
3 Constructor B runned
4 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. -

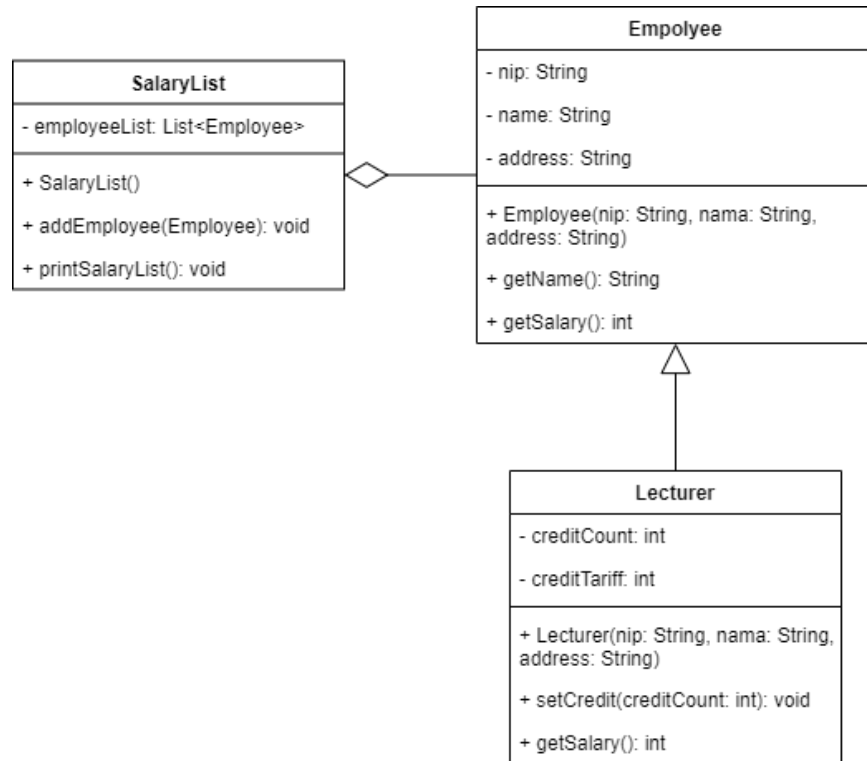
```
PS D:\Kuliah> d:; cd 'd:\Kuliah'; & 'C:\Program
↪ Files\Java\jdk-18.0.2.1\bin\java.exe'
↪ '-XX:+ShowCodeDetailsInExceptionMessages' '-cp'
↪ 'C:\Users\G4CE-PC\AppData\Roaming\Code\User\workspaceStorage\
↪ 80d97a47d24665dc0bce7able048ecbd\redhat.java\jdt_ws\
↪ Kuliah_28156aa7\bin' 'experiment4.Experiment4'
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
72                 ↵ %,d", employee.getName(), employee.getSalary()));
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);

```

---

```
99         lecturer3.setCreditTariff(47_500);
100        list.addEmployee(lecturer1);
101        list.addEmployee(lecturer2);
102        list.addEmployee(lecturer3);
103        list.printSalaryList();
104    }
105 }
```

#### Terminal

```
1 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'
2 Employee salary list:
3 Alpha: Rp 900.000
4 Beta: Rp 855.000
5 Charlie: Rp 1.045.000
```