

# Exercise 10

## Objectives

The aim of this exercise is to learn how to bundle classes and interfaces into packages, and how to use classes that are in packages.

### A: Creating a Package [2 pt]

Consider the following two classes:

```
public class A{
    public void print(){
        System.out.println("This is A.");
    }
}
```

```
public class B{
    public B(){
        A a = new A();
        a.print();
    }
    public static void main(String[] args){
        new B();
    }
}
```

Place these classes in the package according to the following table.

Package Name	Class Name
package_a	A
package_b	B

Compile the program and check the execution results. Note that you must add the appropriate "statement" to the above source codes in order to compile and execute it correctly.

Submission Files	Types
package_a/A.java	Java Class
package_b/B.java	Java Class

## B: Access Control [3 pt]

Your task is to complete four classes, Alpha, Beta, Gamma, and Delta below, that satisfy the following conditions.

- Alpha has a field x that can be directly accessed only by Alpha.
- Alpha has a field z that can be accessed directly only by Alpha and Gamma.
- Gamma has a field w that can be accessed directly only by Alpha and Gamma.
- Alpha has a field u that can be accessed directly only by Alpha, Gamma and Beta.
- Beta has a field y that can be directly accessed only by Beta.
- Beta is the sub-class of Alpha
- Gamma has a field v that can be directly accessed by all classes.

Here, "directly accessible" means that it can be accessed directly by dot operations (e.g. a.x) or simple names (e.g. x) of object references, not through methods.

To compile and run the program and check its correctness, complete the following program by filling statements indicated by "\_\_\_\_\_" **according to the above-mentioned conditions.** Note that \_\_\_\_ can be empty.

```
package _____;

public class Alpha{
    _____ int u = 30;
    _____ int x = 120;
    _____ int z = 86;

    public void show(Gamma g){
        System.out.println("Alpha");
        System.out.println("u: " + u);
        System.out.println("v: " + g.v);
        System.out.println("w: " + g.w);
        System.out.println("x: " + x);
        System.out.println("z: " + z);
        System.out.println();
    }
}
```

```

package _____;
import _____;
import _____;

public class Beta extends Alpha{
    _____ int y = 30;

    public void show(Gamma g){
        System.out.println("Beta");
        System.out.println("u: " + u);
        System.out.println("v: " + g.v);
        System.out.println("y: " + y);
        System.out.println();
    }
}

```

```

package _____;

public class Gamma {
    _____ int v = 1000;
    _____ int w = 777;

    public void show(Alpha a){
        System.out.println("Gamma");
        System.out.println("u: " + a.u);
        System.out.println("v: " + v);
        System.out.println("w: " + w);
        System.out.println("z: " + a.z);
        System.out.println();
    }
}

```

```

package _____;

import _____;
import _____;
import _____;

public class Delta{
    Alpha alpha = new Alpha();
    Beta beta = new Beta();
    Gamma gamma = new Gamma();

    public Delta(){
        alpha.show(gamma);
        beta.show(gamma);
        gamma.show(alpha);
    }

    public static void main(String[] args){
        new Delta();
    }
}

```

The class Delta is the application which holds an instance of the above class and executes the methods.

The output of the program will be like this:

```
Alpha
u: 30
v: 1000
w: 777
x: 120
z: 86

Beta
u: 30
v: 1000
y: 30

Gamma
u: 30
v: 1000
w: 777
z: 86
```

Submission Files	Types
????/Alpha.java	Java Class
????/Beta.java	Java Class
????/Gamma.java	Java Class
????/Delta.java	Java Class

## Summary

Through this exercise, you have learned that package is not just an important concept that organizes class files and makes them easier to find, but also controls access to class members.