Object-Oriented Programming
Lab Session #3

I. References
- Oracle Java Documentation: https://docs.oracle.com/javase/tutorial/java/IandI/index.html
- Inheritance in Java Tutorial: https://www.tutorialspoint.com/java/java_inheritance.htm

II. Exercises
You are required to implement the following design as well as a main() method in a another class to test your implementation:

1. Shapes (25 points)
   Implement the hierarchy below where
   - MyShape is an abstract class with an abstract Draw method,
   - MyBoundedShape is an abstract class with an abstract GetArea method,
   - MyLine, MyOval, MyRectangle are concrete classes

   In the main() method,
   - Ask user to select 5 shapes and input their dimension
   - Draw selected shapes
   - Compute and show area of selected shapes if they are a bounded shape
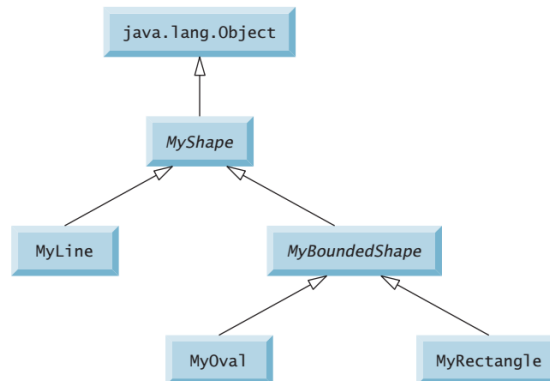
2. Triangle and Point (25 points)
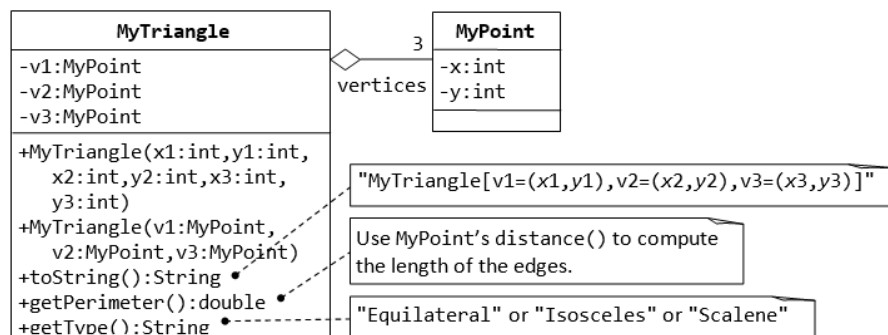
3. Person, Student & Staff (25 points)

```
                    ┌─────────────────────────────────────┐
                    │              Person                 │
                    ├─────────────────────────────────────┤
                    │ -name:String                        │
                    │ -address:String                     │
                    ├─────────────────────────────────────┤
                    │ +Person(name:String,address:String) │
                    │ +getName():String                   │
                    │ +getAddress():String                │
                    │ +setAddress(address:String):void    │
                    │ +toString():String ●----------------┼---- "Person[name=?,address=?]"
                    └─────────────────────────────────────┘
                              extends  △
                                       │
          ┌──────────────────┴──────────────────┐
```
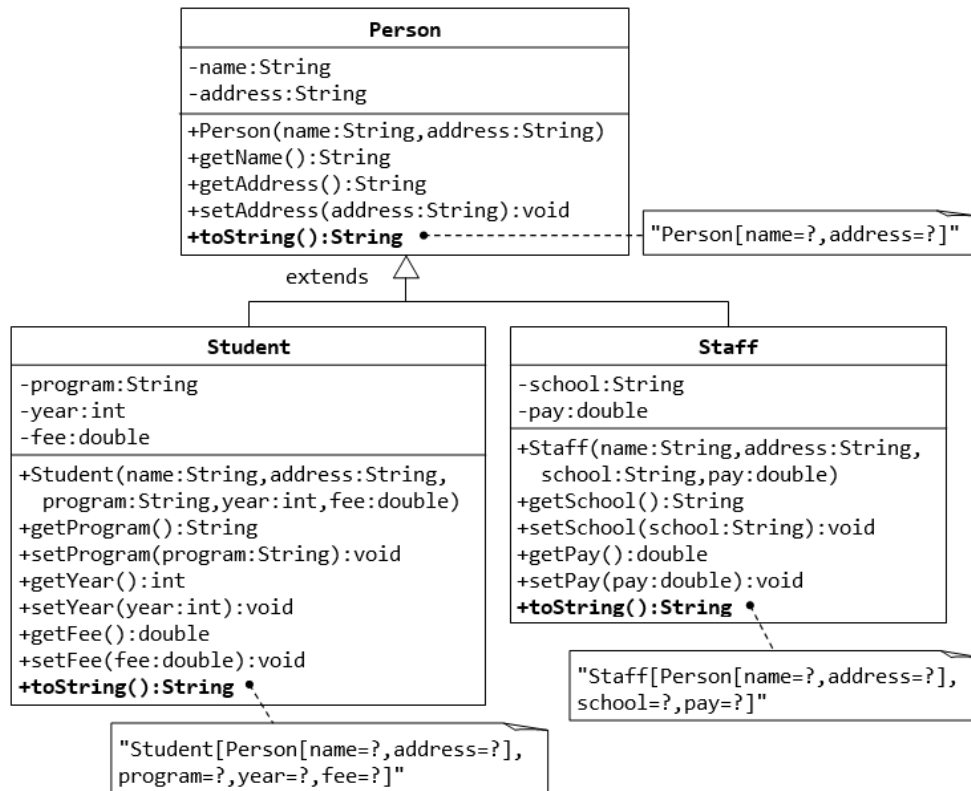
```
┌──────────────────────────────────────┐   ┌──────────────────────────────────────┐
│               Student                │   │                Staff                 │
├──────────────────────────────────────┤   ├──────────────────────────────────────┤
│ -program:String                      │   │ -school:String                       │
│ -year:int                            │   │ -pay:double                          │
│ -fee:double                          │   ├──────────────────────────────────────┤
├──────────────────────────────────────┤   │ +Staff(name:String,address:String,   │
│ +Student(name:String,address:String, │   │    school:String,pay:double)         │
│    program:String,year:int,fee:double)│  │ +getSchool():String                  │
│ +getProgram():String                 │   │ +setSchool(school:String):void       │
│ +setProgram(program:String):void     │   │ +getPay():double                     │
│ +getYear():int                       │   │ +setPay(pay:double):void             │
│ +setYear(year:int):void              │   │ +toString():String ●                 │
│ +getFee():double                     │   └──────────────────────────────────────┘
│ +setFee(fee:double):void             │              \
│ +toString():String ●                 │               "Staff[Person[name=?,address=?],
└──────────────────────────────────────┘                school=?,pay=?]"
          \
           "Student[Person[name=?,address=?],
            program=?,year=?,fee=?]"
```

4. Point2D and Point3D (25 points)

```
            ┌──────────────────────────────────┐
            │             Point2D              │
            ├──────────────────────────────────┤
            │ -x:float = 0.0f                  │
            │ -y:float = 0.0f                  │
            ├──────────────────────────────────┤
            │ +Point2D(x:float,y:float)        │
            │ +Point2D()                       │
            │ +getX():float                    │
            │ +setX(x:float):void              │
            │ +getY():float                    │
            │ +setY(y:float):void              │
            │ +setXY(x:float,y:float):void ----┼--- Array of {x,y}
            │ +getXY():float[2] ●--------------┼---
            │ +toString():String ●-------------┼--- "(x,y)"
            └──────────────────────────────────┘
                        extends  △
                                 │
            ┌──────────────────────────────────┐
            │             Point3D              │
            ├──────────────────────────────────┤
            │ -z:float = 0.0f                  │
            ├──────────────────────────────────┤
            │ +Point3D(x:float,y:float,z:float)│
            │ +Point3D()                       │
            │ +getZ():float                    │
            │ +setZ(z:flaot):void              │
            │ +setXYZ(x:float,y:flaot,z:float):void --- Array of {x,y,z}
            │ +getXYZ():float[3] ●-------------┼---
            │ +toString():String ●------------─┼--- "(x,y,z)"
            └──────────────────────────────────┘
```