

Question 1 A:

```
import java.util.ArrayList;

public class Student extends Person {

    public Student(String name) {

        super(name);

        // TODO Auto-generated constructor stub

    }

    // Attributes for name and id of student

    private int id;

    private String name;

    // Atrophies named as courses that the student is taking

    private String science = "Science";

    private String math = "Math";

    // arraylist of courses

    ArrayList<String> listOfcourses = new ArrayList<>();

    // get and set methods for id

    public int getterId()

    { return id; }

    public void setterId(int id)

    { this.id = id; }

    // get and set methods for name

    public String getName()

    { return name; }

    public void setName(String name)

    {this.name = name;}

    // get and set methods for the attribute science
```

```
public String getScience()

{ return science;}

public void setScience(String science)

{ this.science = science;}

//get and set methods for math

public String getMath()

{ return math; }

public void setMath(String math)

{this.math = math; }

// Operation to add a course to the arraylist

public void addCourse() {

    // adding the courses to the arraylist

listOfcourses.add(math);

listOfcourses.add(science);

}

// Operation to delete a course to the arraylist

public void removeCourse(String math) {

    // course deleted

math = "Course has been deleted";

}

// Operation to print the arraylist

public void printCourses() {

for (int i = 0; i < listOfcourses.size(); i++) {

System.out.println(listOfcourses);

}

}

// Overridden toString method that returns the attributes

@Override
```

```
public String toString() {  
  
return name + id + math + science;  
  
}  
  
}
```

```
public class UndergraduateStudent extends Student {  
  
    public UndergraduateStudent(String name) {  
        super(name);  
        // TODO Auto-generated constructor stub  
    }  
  
    //Implements Research interface for Undergrad honours student  
    public interface Research {  
        public abstract String research();  
        public String research = "does research";  
    }  
  
    // attributes for name, honours student and research  
    private String name;  
    private String honoursStudent = "True";  
    private String research = "Research Area: Computer science";  
  
    // get and set methods for name  
    public String getName()  
    {return name; }  
    public void setName(String name)  
    { this.name = name; }
```

```

        // get and set methods for research

        public String getResearch()

        { return research; }

        public void setResearch(String research) {

            this.research = research;

        }


        // get and set method for honours student

        public String getHonoursStudent()

        { return honoursStudent; }

        public void setHonoursStudent(String honoursStudent)

        { this.honoursStudent = honoursStudent; }


        //Overridden toString method that returns the attributes

        @Override

        public String toString() {

            return name + research + honoursStudent;

        }

    }
}

```

```

public class Department {

    // attribute location

    private String location;

    //department offers courses math and science

    public String math;

    public String science;
}

```

```
// Constructor that defines location math and science

public Department(String location, String math, String science) {

    this.location = "Computer Science Department: Room #112";

    this.math = "Math";

    this.science = "Science";

}

// get and set methods for the attribute science

public String getScience()

{ return science;}

public void setScience(String science)

{ this.science = science;}

//get and set methods for math

public String getMath()

{ return math; }

public void setMath(String math)

{this.math = math; }

// get and set methods for location

public String getLocation()

{ return location; }

public void setLocation(String location)

{ this.location = location; }

// prof teaching courses method

public void teaching (String professor) {

    professor = "Teaching math and science courses";

}

//Overridden toString method returns attribute location

@Override

public String toString() {
```

```
return location + math + science;
}
}
```

```
public class Course {

    // attributes id and name

    private int id;

    private String name;

    // Constructor that defines id and name
    public Course(int id, String name) {

        this.id = 2240;

        this.name = "COIS";

    }

    // get and set methods for id
    public int getId()

    { return id; }

    public void setId(int id)

    { this.id = id; }

    // get and set method for name
    public String getName()

    { return name; }

    public void setName(String name)

    { this.name = name; }

    //overriden toString method that returns the attributes
    @Override

    public String toString() {

        return name + id;

    }

}
```

```

}

}

public abstract class Professor extends Person {

public Professor(String name) {

    super(name);

    // TODO Auto-generated constructor stub

}

// Implements Research interface for professor

public interface Research {

    public abstract String research();

    public String research = "does research";

}

// attributes name and research

    private String name;

    private String research = "Research Area: Environmental Studies";

    //get and set methods for name

    public String getName()

    { return name; }

public void setName(String name)

{ this.name = name; }

// get and set methods for research

public String getResearch()

{ return research; }

public void setResearch(String research)

{ this.research = research; }

//Overridden toString method returns attributes

@Override

public String toString() {

```

```
return name + research;
}
}
```

```
public class Person {

    // Attribute for name
    private String name;

    // Constructor for name
    public Person(String name)
    {
        name = this.name;
    }

    // get and set methods for name
    public String getName()
    { return name; }

    public void setName(String name)
    { this.name = name; }

    // overridden toString method that return the attribute
    @Override
    public String toString() {
        return name;
    }
}
```

```
public class PhDStudent extends GraduateStudent {

    //Implements Research interface for pHd Student
```



```
public interface Research {

    public abstract String research();

    public String research = "does research";

}

public PhDStudent(String name) {

    super(name);

    // TODO Auto-generated constructor stub

}

// attributes for name and research

private String name = "Joe Smith";

private String research = "does research";


// get and set methods for name

public String getName()

{return name; }

public void setName(String name)

{ this.name = name; }

// get and set methods for research

public String getResearch()

{ return research; }

public void setResearch(String research) {

this.research = research;

}


//Overridden toString method that returns the attributes

@Override

public String toString() {
```

```
        return name + research;

    }

}
```

```
public class Masters extends GraduateStudent {

public Masters(String name) {

    super(name);

    // TODO Auto-generated constructor stub

}

// Attributes for name and research

private String name = "Jay Brown";

private String research = "Research Area: Math";

//Implements Research interface for Masters Student

public interface Research {

    public abstract String research();

    public String research = "does research";

}

// get and set methods for name

public String getName()

{return name; }

public void setName(String name)

{ this.name = name; }

// get and set methods for research

public String getResearch()

{ return research; }

public void setResearch(String research) {

this.research = research;

}

}
```

```

        //Overridden toString method that returns the attributes

        @Override

        public String toString() {

return name + research;

        }

}

```

```

public class GraduateStudent extends Student {

    public GraduateStudent(String name) {

        super(name);

        // TODO Auto-generated constructor stub

    }

    // Attribute name

    private String name;

    // get and set methods for the attribute

    public String getName()

    { return name; }

public void setName(String name)

{ this.name = name; }

    // overridden toString method that retunrs the attribute

    @Override

    public String toString() {

        return name;

    }

}

```

```
}
```

Question 1 B:

```
import java.util.ArrayList;

public class Assignment2 {

    public static void main(String[] args) {

        // ArrayList that contains names of students
        ArrayList<String> students = new ArrayList<>();

        // PhD student object
        String p = new String("PhD Student: Joe Smith");

        // add the object (p) to the arraylist
        students.add(p);

        // masters student object
        String masters = new String("Masters Student: Jay Brown");

        students.add(masters);

        // undergraduate student object and course they are taking
        String name = new String("Undergraduate Student: Abdullah");

        String course1 = new String ( "Courses: COIS 2240");

        String course2 = new String ( "Courses: COIS 1020");

        // add the objects to the arraylist
        students.add(course1);

        students.add(course2);

        students.add(name);

        // iterate through the array list of students
        for (int i = 0; i < students.size(); i++) {

            //print arraylist of students

            System.out.println(students.get(i));
        }
    }
}
```

```
}

    // checks the array list at index 0 to see if it is an instance of the
string class

if (students.get(0) instanceof String) {

    // if it is (which it is) print the statement

System.out.println( name + " is enrolled in " + course1+ " and " + course2);

}

}

}
```

Output:

```
PhD Student: Joe Smith
Masters Student: Jay Brown
Courses: COIS 2240
Courses: COIS 1020
Undergraduate Student: Abdullah
Undergraduate Student: Abdullah is enrolled in Courses: COIS 2240 and Courses: COIS 1020
```

Question 2:

