Rochester Institute of Technology

Department of Computer Science

CSCI-605, Spring '23

Midterm Exam 1

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Please make sure you have 7 pages in your exam including this cover page, printed 2-sided. The last page is blank.

Provide complete and concise answers. Try to limit yourself to the space below the question. If you need more space, use the last page.

This exam has 5 questions, each worth 8 points, totalling 40 points.

Student Full Name: _____

Question 1

```
public class Args {
    static void poke( String[] arg ) { arg[1] += "go"; }  // MARKED

    public static void main(String args[] ) {
        String[] array = {"dont","go"};
        System.out.println(array[1]);
        poke(array);
        System.out.println(array[1]);
    }
}
```

Answer the following.

1. Explain in detail what is happening in line //MARKED.

2. Still about the same line, is it syntactically valid?

3. What is the output of this program?

4. Draw a memory model diagram showing all object instances created and variables of this program

Question 2

```
interface Required {
    default String sayHey() { return ""; };
}

abstract class Parent {
    public String scream() { return "hey\n"; }
}

public final class Child extends Parent implements Required {
    private final String info = "";
    public String sayHey() { super.scream(); return "ho\n"; }
    public String sayHo() { return this.scream(); }
    public static void main(String[] args) {
        Child a = new Child();
        System.out.println(a.sayHey() + a.sayHo());
    }
}
```

Answer the following.

1. What is the output of the program run?

2. If the type of the local variable 'a' is changed from Child to Parent, what happens?

3. What advantage would there be to declare an immutable type class as final?

4. What happens if you replace the provided Required interface with the following one?

```
interface Required {
    String sayHey();
}
```

Question 3

```
public class MemoryModel {

    int i = 1;
    static int o = 0;
    MemoryModel m;
    MemoryModel(int o) {}

    static private MemoryModel inc(MemoryModel o) {
        o.o += 1;
        return o;
    }

    private MemoryModel inc() {
        i++;
        return this;
    }

    public String toString() { return String.valueOf(i); }

    public static void main(String[] args) {
        MemoryModel a = new MemoryModel(1);
        System.out.println(a.m);
        a.m = a;
        a.m.inc(a);
        System.out.println(a.m);
        a.m.inc().inc(a);
        System.out.println(a);
    }
}
```

Answer the following questions.

1. What is the output of this program?

2. Will private method inc() be callable from the main method? Explain.

Question 4

```
public class Super extends SuperParent {
    private int counter = 1;

    public Super inc(Super o) {
        super.counter -= 1;
        return o;
    }

    public SuperParent inc() {
        counter++;
        return this; // MARKED1
    }

    public String toString() { return String.valueOf(counter); }

    public static void main(String[] args) {
        Super child = new Super();
        SuperParent parent = child;
        System.out.println("" + parent.counter + " " + child.counter);
        parent.inc();
        child.inc((Super)parent);
        System.out.println("" + parent.counter + " " + child.counter);
    }
}

class SuperParent {
    protected int counter = -1;

    protected SuperParent inc() {
        counter--;
        return this;
    }
}
```

Answer the following questions.

1. What is the output of this code?

2. Is there a problem in line marked with //MARKED1? Explain.

Question 5

```
class SubClass extends SuperClass {
    private int value = 0;
    private SubClass() { super.value = value; }
    private void increment() { value++; }
    public String toString() { return String.valueOf(value); }
}

public class SuperClass {
    protected int value = 10;
//    SuperClass(int value) { this.value = value; } // MARKED
    public static void main(String[] args) {
        System.out.println(new SubClass());
    }
}
```

Answer the following.

1. This program has 2 problems. Identify and explain how to fix them.

2. Can the line with the comment "MARKED" be fully removed with no harm to the execution of this code? Why?

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