Name: KEY Section: ________ CM: ___________

CSSE 220---Object-Oriented Software Development

Exam 2 -- Part 1, October 23, 2019

This exam consists of two parts. Part 1 is to be solved on these pages. If you need more space, please ask your instructor for blank paper.

Allowed Resources on Part 1: You may use a single sheet of 8.5" x 11" inch paper with notes on both sides. You can also use your "UML Cheatsheet" and your "Design Principles" handouts if you brought them. Your computer must be closed the entire time you are completing Part 1.

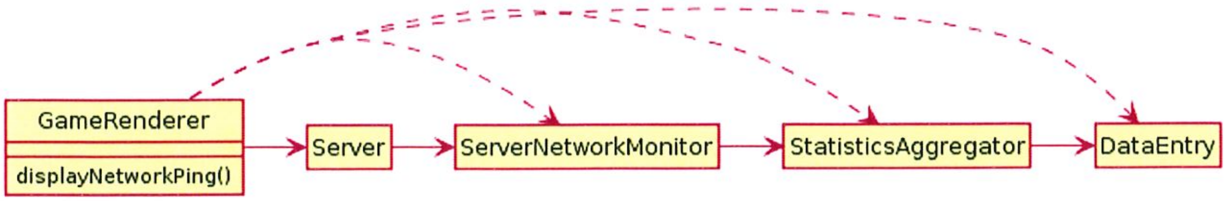
You will have two back-to-back class periods to complete Part 1.
Part 2 will be completed in the next class.

Please, begin by writing your name on every page of the exam. We encourage you to skim the entire exam before answering any questions.

Problem	Points Possible	Earned
1	6	______
2	8	______
3	10	______
4	5	______
5	15	______
Paper Part Subtotal	44	______
Computer Part Subtotal	56	______
Total	100	______

Initials: __________

1. (6 points)



Consider the following method chain in GameRenderer's displayNetworkPing method:

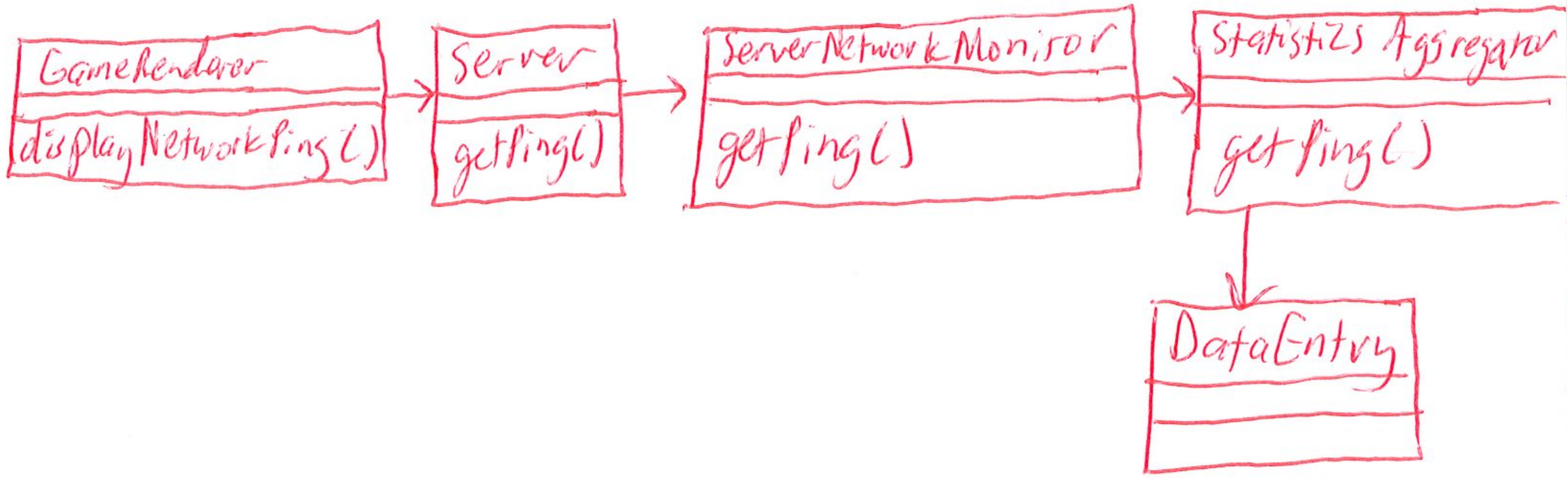
```
double ping = server.getNetworkMonitor().getStatistics().getEntry("ping").asDouble()
```

The UML above shows the classes involved.

a. (2 points) Given what you know about method chains and the diagram above, would you call this primarily an issue with coupling or cohesion? Explain why in a sentence or two.

Coupling - GameRenderer depends too much on all the other classes. It should just be asking Server to do the work

a. (4 points) Now, use a UML to propose a change that fixes the problem you identified in the previous part.



Initials: __________

an

2. (8 points)
At investment company bank there are 2 kinds of accounts, regular accounts and VIP accounts. Both accounts allow deposits and withdrawals but each does something different monthly.

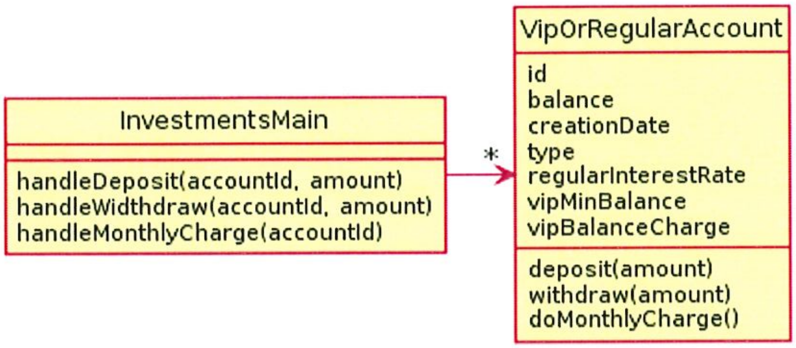
is

Every month, the regular account balance is decreased by a small percentage, stored as a negative interest rate which is set when the account is created. Every month, the VIP account is checked to see it above the minimum balance - if the balance is above minimum there is no fee, but if the account balance is below minimum a fixed balance fee is subtracted from the account. Both the minimum balance and the balance fee are set when the VIP account is created.

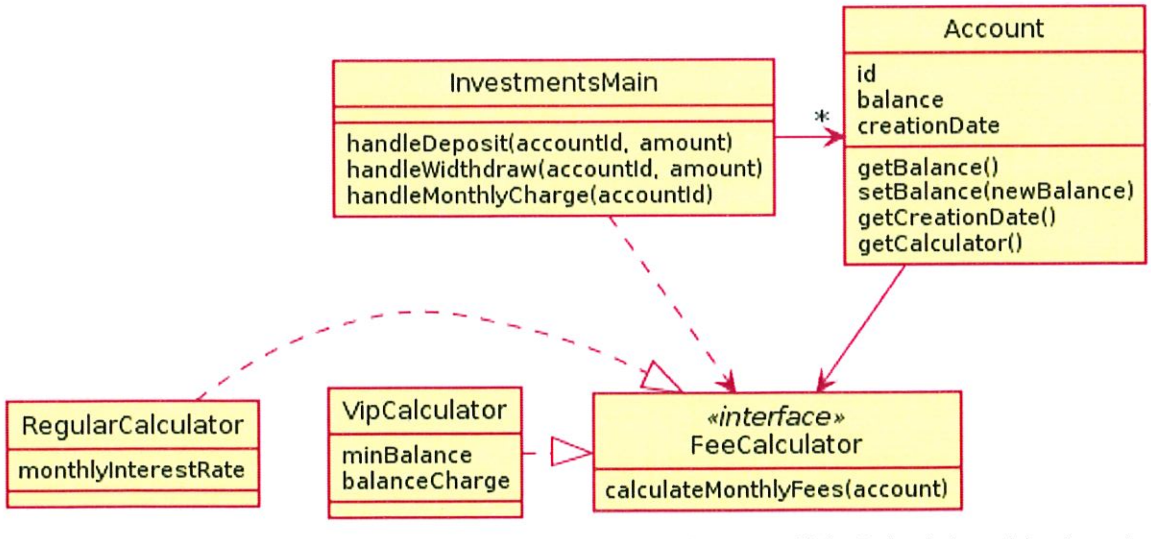
Both accounts also charge an annual fee, which is assessed as part of the fees during the month that the account was created. For that reason, the system must store the creation date for each account. Regular accounts charge $10 per year, VIP accounts charge $100/year.

Here are 2 possible solutions. You can assume both of these designs function correctly (that is, exclude principle 1 from your consideration).

Solution A



Solution B



* Note this diagram does not show how RegularCalculator and VipCalculator objects get created. Don't worry about that issue.

Initials: __________

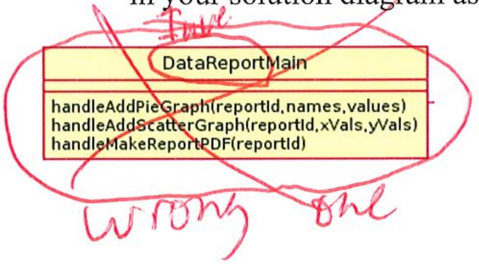
a. (2 points) Explain the problems with Solution A using your design principles.

VipOrRegularAccount does not represent one concept. It is doing too much.

b. (2 points) Explain the problem with Solution B using your design principles.

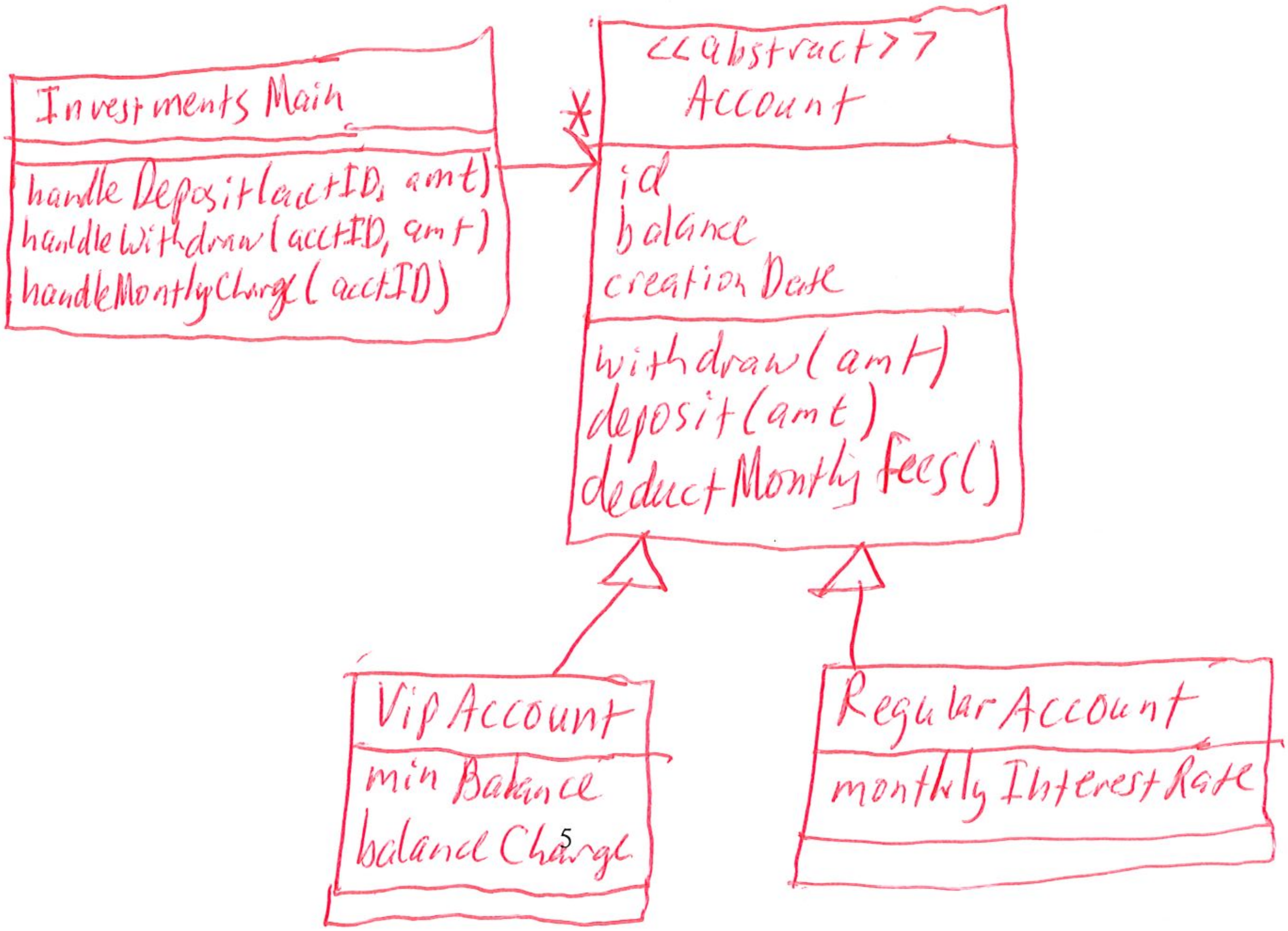
Account has too many ask methods. It is essentially a data class. Account could do more in terms of functionality.

c. (4 points) Make a UML diagram of your proposed solution to the problem. For your solution we have provided a DataReportMain to get you started. Feel free to omit any regular getter methods in your solution diagram as well.



~~Ignore~~
DataReportMain
handleAddPieGraph(reportId,names,values)
handleAddScatterGraph(reportId,xVals,yVals)
handleMakeReportPDF(reportId)

Wrong one

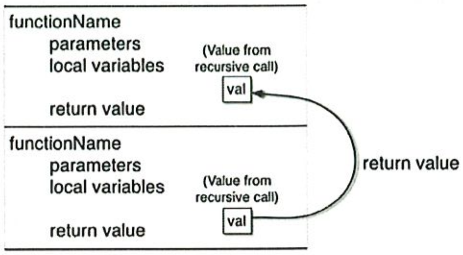


Initials: __________

3. (10 Points)

For this problem, determine the output from this program by tracing the call to operation *mystery*.

```
public static void main(String[] args) {
   int[] a = {1, 2, 9, 5};
   int[] b = {2, 2, 2, 2};
   int result = mystery(a, b, false, 0);
   System.out.println("Result is: " + result);
}
  public static int mystery(int[] a, int[] b, boolean afterNine, int curIndex) {
     if(curIndex == a.length-1)
          return a[curIndex];
      if(a[curIndex] == 9) {
          curIndex++;
          return mystery(a, b, true, curIndex);
     } else if(afterNine) {
          int current = a[curIndex] * b[curIndex];
          return current + mystery(a, b, afterNine, curIndex + 1);
      } else {
          int current = a[curIndex] + 1;
          return current + mystery(a, b, afterNine, curIndex + 1);
     }
  }
```



mystery([1,9,5],[2,2,2], false, 0)

a = [1, 9, 5]
b = [2, 2, 2]
afterNine = false
curIndex = 0
curIndex == a.length - 1 ? No
a[curIndex] == 9 ? No
current = 1 + 1 = 2
return 2 + 5 = 7

return to caller value 7

mystery([1,9,5],[2,2,2], false, 1)

a = [1, 9, 5]
b = [2, 2, 2]
afterNine = false
curIndex = 1
curIndex == a.length - 1 ? No
a[curIndex] == 9 ? Yes
return 5

mystery[1,9,5],[2,2,2], true, 2

a = [1, 9, 5]
b = [2, 2, 2]
afterNine = true
curIndex = 2
curIndex == a.length - 1 ?
Yes return 5

print "Result is: 7"

Initials: __________

4. (5 points)
Write what this code outputs.

```
public class Tester {
  public static void main(String[] args) {
    try {
      doSomething();
    } catch (ArithmeticException e) {
      System.out.println("No divide by 0!");
    }
  }
  public static int helper(int a, int b) {
    if(b == 0)
      throw new ArithmeticException();
    else if ((a%b) != 0)
      throw new IllegalArgumentException();
    else
      return a/b;
  }
  public static int worker(int a, int b) {
    int result = 0;
    try {
      result= helper(a, b);
      System.out.println("Result is " + result);
    } catch (IllegalArgumentException e) {
      System.out.println("Did not divide evenly");
    }
    System.out.println("Finished worker");
    return result;
  }
  public static void doSomething() {
    worker(1, 3);
    worker(9, 3);
    worker(2, 0);
  }
}
```

Write your answer here:

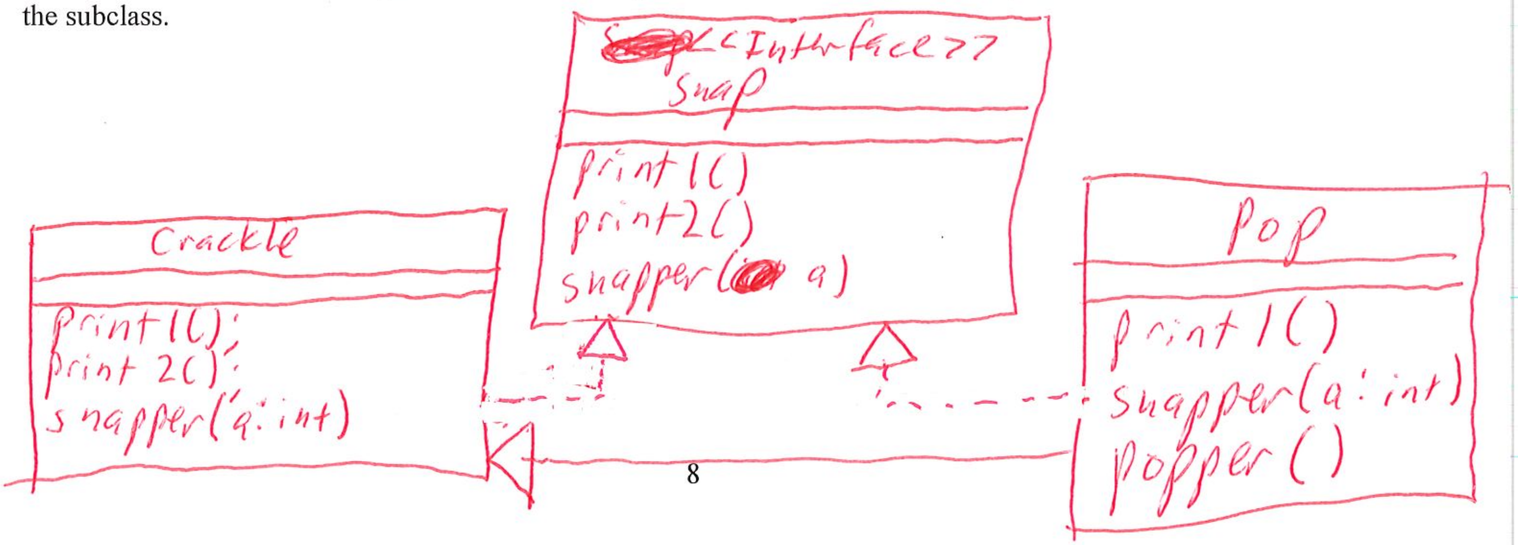
Did not divide evenly
Finished worker
Result is 3
Finished worker
No divide by 0!

Initials: __________

5. (15 Points)

```
public interface Snap {
   void print1();
   void print2();
   void snapper(int a);
}
public class Crackle implements Snap {
   @Override
   public void print1() {
      System.out.print("1");
   }
   @Override
   public void print2() {
      System.out.print("2");
      this.print1();
   }
   @Override
   public void snapper(int a) {
      System.out.print(a+1);
      this.print2();
   }
}
public class Pop extends Crackle implements Snap {
   @Override
   public void print1() {
      System.out.print("One");
   }
   @Override
   public void snapper(int a) {
      System.out.print(a);
      super.print1();
   }
   public void popper() {
      System.out.print("POP!");
      ~~this.print2();~~
   }
}
```

a. (4 points) Draw a UML diagram to represent the given interface and classes. Include all methods, but when writing subclass methods, only show a method on the subclass if the subclass method overrides the parent class's method, or if the method is specific only to the subclass.



Initials: __________

b. (11 points) For each line of code below, if the line results in an error, circle the appropriate error; otherwise, provide the output in the provided blank. If the code works but does not print anything, write "nothing". Consider each line of code separately. That is, if a line would give an error, then assume that line doesn't affect any others. If the result would print on multiple lines, remove the newline from your result and show it on a single line.

Code **Either circle the error or provide the output**

```
Snap a = new Crackle();
Snap b = new Pop();
Crackle c = new Pop();
Crackle d = new Crackle();
Pop p = new Pop();
```

Code			Output:
1. Snap s = new Snap();	runtime error	[✓ compiler error]	________
2. Snap s2 = new Pop();	runtime error	compiler error	nothing
3. a.print2();	runtime error	compiler error	21
4. ((Crackle) c).print1();	runtime error	compiler error	One
5. b.snapper(3);	runtime error	compiler error	31
6. b.print2();	runtime error	compiler error	2 One
7. b.popper();	runtime error	[✓ compiler error]	________
8. ((Pop) b).popper();	runtime error	compiler error	Pop!
9. c.print1();	runtime error	compiler error	One
10. ((Snap) p).popper()	runtime error	[✓ compiler error]	________
11. ((Pop) d).popper();	[✓ runtime error]	compiler error	________