CS 2334: Programming Structures and Abstractions
Exam 1
October 5, 2015

General instructions:

- Please wait to open this exam booklet until you are told to do so.
- This examination booklet has 14 pages. You also have been issued a bubble sheet.
- Write your name, university ID number and date, and sign your name below. Also, write your name and ID number on your bubble sheet, and fill in the bubbles for your ID.
- You may have up to five pages of your own notes. No electronic devices or books may be used.
- The exam is worth a total of 137 points. Your grade counts for 10% of your final grade.
- You have 1.25 hours to complete the exam. Be a smart test taker: if you get stuck on one problem go on to the next.
- Use your bubble sheet to answer all multiple-choice questions. Make sure that the question number and the bubble row number match when you are answering each question.

On my honor, I affirm that I have neither given nor received inappropriate aid in the completion of this exam.

Signature: _____

Name: _____

ID Number: _____

Date: _____

Question	Points	Score
Types and Objects	30	
Inheritance and Polymorphism	32	
UML and Object Oriented Design	21	
Abstract Classes and Interfaces	30	
Exceptions and Error Handling	24	
Total:	137	

C A A B CC B A

Part I. Types and Objects

1. (5 points) What is printed by this block of code?

```
1  String s1 = "THX";
2  String s2 = "=";
3  Integer i3 = 11;
4  Integer i4 = 38;
5  System.out.println(i3+i4+s1+s2);
```

A. 1138THX= B. 1138=THX **C. 49THX=** D. 39=THX
E. Compilation error or answer not shown

Solution: "+" is an addition operator for ints and Integers and an append operator for Strings

2. (5 points) What is printed by this block of code?

```
1  int a = 3;
2  double c = 9;
3  int b = c*3;
4  c += b;
5  System.out.println(c);
```

A. 12.0 B. 18.0 C. 27.0 D. 36.0
E. Compilation error or answer not shown

Solution: A double value cannot be assigned to an int without casting.

3. (5 points) What is printed by this block of code?

```
1  String s1 = "foo";
2  int i2 = 5;
3  System.out.println(s1+i2);
```

A. foo B. 5 C. 5foo **D. foo5** E. Compilation error or answer not shown

4. (5 points) What is printed by this block of code?

```
1  String s1 = "BAZ";
2  String s2 = "BA";
3  s2 += "Z";
4  if(s1 == s2) {
5    System.out.println("FOUND:" + s2);
6  }else{
7    System.out.println("NOT:"+ s2);
8  }
```

A. FOUND:BA B. FOUND:BAZ C. NOT:BA **D. NOT:BAZ**
E. Compilation error or answer not shown

Solution: The "==" operator will compare (for Strings and most other objects) the values of the references, not the content of the objects.

5. (5 points) What is printed by this block of code?

```
1    int a = 4;
2    double c = 11;
3    int b = a+7;
4    c += b;
5    System.out.println(c);
```

A. 11.0 B. 15.0 C. 18.0 **D. 22.0**
E. Compilation error or answer not shown

6. (5 points) What is printed by this block of code?

```
1    String s1 = "THX";
2    String s2 = "=";
3    Integer i3 = 11;
4    Integer i4 = 38;
5    System.out.println(s2+s1+i3+i4);
```

A. =THX1138 B. =THX49 C. THX=1138 D. THX=49
E. Compilation error or answer not shown

Part II. Inheritance and Polymorphism

Consider the following class definitions:

```
public class C1 {
  private String id;

  public C1(String id){
    this.id = id;
  }

  public String toString(){
    return id;
  }
}


public class C2 extends C1 {
  private int number;

  public C2(int number, String val){
    super(val);
    if(number > 1000) {
      this.number = number*2+1;
    }else{
      this.number = number*2;
    }
  }

  public String get(){
    return super.toString() + " " + number;
  }

  public String toString(){
    return "I" + super.toString();
  }
}


public class C3  extends C2{

  public C3(int number, String id){
    super(number, id);
  }

  public String toString(){
    return super.get();
  }

  public String get(){
    return super.toString();
  }
}
```

7. (8 points) What is printed by this block of code?

```
C1 c = new C3(569, "THX");
System.out.println(c);
```

A. THX 1138 B. ITHX C. I569 D. 569 THX E. Answer not shown

8. (8 points) What is printed by this block of code?

```
C3 c = new C3(1708, "LUH");
System.out.println(c);
```

A. LUH 3416 B. I3416 C. I1708 **D. LUH 3417** E. Answer not shown

9. (8 points) What is printed by this block of code?

```
C1 c = new C2(2620, "SEN");
System.out.println(c);
```

A. SEN 5241 **B. ISEN** C. I2620 D. 2620 SEN E. Answer not shown

10. (8 points) What is printed by this block of code?

```
C2 c = new C2(455, "OMM");
System.out.println(c.get());
```

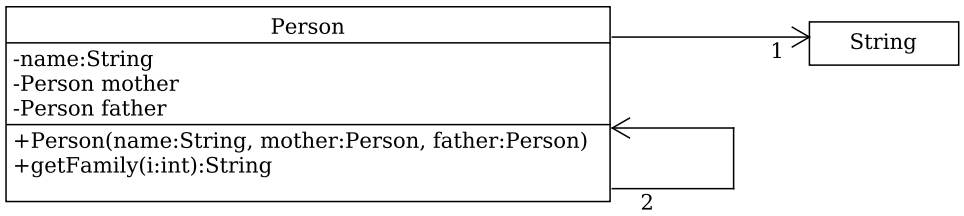
A. IOMM **B. OMM 910** C. 455 OMM D. OMM 911
E. Answer not shown

Part III. UML and Object Oriented Design

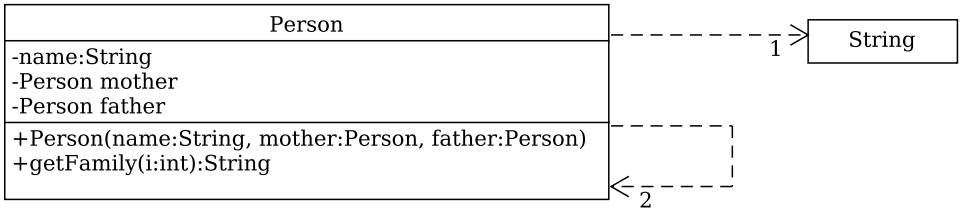
11. (7 points) Which UML diagram corresponds to the following code?

```
public class Person {
  private String name;
  private Person mother;
  private Person father;

  public Person(String name, Person mother, Person father){...};

  public String getFamily(int i){...};

}
```

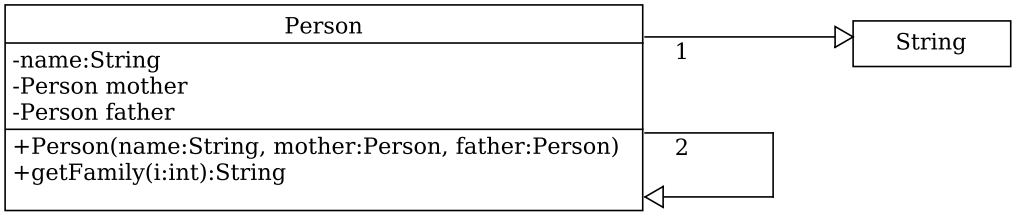
A.



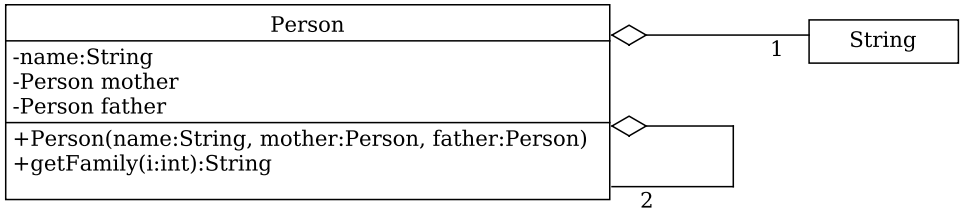
B.



C.



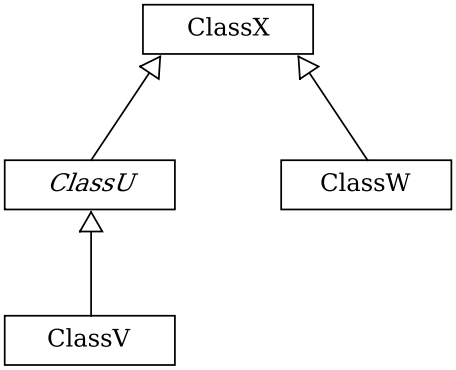
D.



E. Answer not shown

Solution: I will accept answer A, based on how we did things in class on one day. I will also accept E, because of the errors in the UML.

12. (7 points) Which set of class definitions corresponds to the following UML diagram?



A.
```
public ClassX {}
public ClassU extends ClassX{}
public ClassW extends ClassX{}
public ClassV extends ClassU{}
```

B.
```
public interface ClassX {}
public ClassU extends ClassX{}
public ClassW extends ClassX{}
public ClassV extends ClassU{}
```

C.
```
public abstract ClassX {}
public ClassU extends ClassX{}
public ClassW extends ClassX{}
public ClassV extends ClassU{}
```

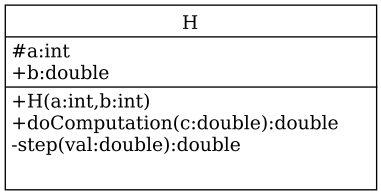
D.
```
public ClassX {}
public abstract ClassU extends ClassX{}
public ClassW extends ClassX{}
public ClassV extends ClassU{}
```

E. Answer not shown

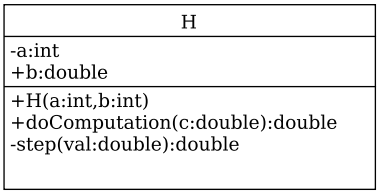
13. (7 points) Select the UML model that corresponds to the following code.

```
public class H {
  private int a;
  public double b;

  public H(int a, int b){
    this.a = a;
    this.b = b;
  }

  public double doComputation(double c){
    return step(c)/step(b);
  }

  private double step(double val){
    return Math.sqrt(Math.abs(val) * Math.sin(val));
  }
}
```

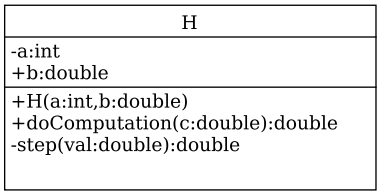
A.



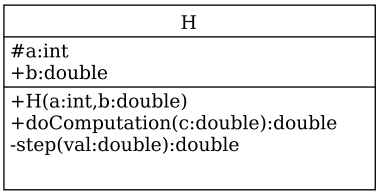
B.



C.



D.



E. Answer not shown

Part IV. Abstract Classes and Interfaces

14. (5 points) Which line (if any) will cause the program not to compile?

```
1  public interface MyList {
2    ArrayList<String> list;
3    int found;
4
5    public String findValue() {
6      return list.get(found);
7    }
8
9    public abstract boolean isFound();
10 }
```

A. 2 B. 3 C. 6 **D. Multiple lines** E. Answer not shown

Solution: In an interface, we cannot define instance variables and we cannot define methods with implementations.

Solution: I will accept choice D as well, because you could have had in mind lines 1 and 4.

15. (5 points) Which line (if any) will cause the program not to compile?

```
1    public class MyInterface {
2      String s;
3
4      public abstract double computeSum();
5
6      public String toString() {
7        return s;
8      }
9    }
```

A. 2 **B. 4** C. 7 D. Multiple lines
E. Answer not shown

Solution: I will accept answer D, as well.

16. (5 points) Which line (if any) will cause the program not to compile?

```
1    public abstract class MyFirstClass {
2      double price;
3
4      public abstract String getQualifiedName();
5
6      public double computeValue() {
7        return price * 4.0;
```

```
8         }
9     }
```

A. 2 B. 4 C. 6 D. Multiple lines **E. Answer not shown**

17. (5 points) Any class that implements an interface must provide implementations for all of the interface's abstract methods.

A. True **B. False** C. Answer not shown

Solution: If the abstract class implements an interface, then it may leave some of the interface's methods unimplemented.

Consider the following class definition for the next two questions:

```
1   public class MyInteger implements Comparable<MyInteger>{
2     private int i;
3
4     public MyInteger(int i){
5       i = this.i;
6     }
7
8     public String toString(){
9       return "Value: " + i;
10    }
11
12    /**
13    * Defines the natural ordering of our MyIntegers
14    */
15    public int compareTo(MyInteger o) {
16      if(o.i == i)
17         return 0;
18      if(o.i < i)
19         return -1;
20      return 1;
21    }
22  }
```

18. (5 points) Which one line can be changed to fix the bug?

A. 4 **B. 5** C. 8 D. 9 E. Answer not shown

Solution: I will accept E, as well.

19. (5 points) Which one line can be changed to fix the bug?

A. 16 B. 17 **C. 18** D. 19 E. 20

Part V. Exceptions and Error Handling

Consider the following program:

```
import java.io.IOException;

public class Compute {
  public static int compB(int k) throws IOException{
    if(k > 30)
      throw new NumberFormatException("Error B");
    if(k > 20)
      throw new IOException("Error C");
    return k-15;
  }

  public static int compA(int j){
    int ret = -1;
    try{
      if(compB(j) > 2){
        throw new NumberFormatException("Error A");
      }
      ret = 200;
    }catch(IOException e){
      ret =  5;
    }
    return ret;
  }

  public static void main(String[] args){
    int i = ?????;

    try{
      System.out.println(compA(i));
    }catch(Exception e){
      // This catch statement catches all exceptions that reach this point
      System.out.println(e.getMessage());
    }
  }
}
```

20. (8 points) Assume that $i = 18$ in main(), what is printed by the program?
    A. Error A B. Error B C. 5 D. 200 E. Answer not shown

21. (8 points) Assume that $i = 27$ in main(), what is printed by the program?
    A. Error A B. Error B **C. 5** D. 200 E. Answer not shown

22. (8 points) Assume that $i = 45$ in main(), what is printed by the program?
    A. Error A **B. Error B** C. 5 D. 200 E. Answer not shown