CS 2334: Programming Structures and Abstractions: Exam 1
October 3, 2016

General instructions:

- Please wait to open this exam booklet until you are told to do so.
- This examination booklet has 13 pages. You also have been issued a bubble sheet.
- Fill in the identifying information below (signature, name, ID and date) 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.
- Other than **this** page, you may tear any other page out of this booklet that does not contain numbered answers.
- If you cannot effectively erase erroneous answers from the bubble sheet, please clearly cross them out.

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:** _____

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Question	Points	Score
Types and Objects	32	
Inheritance and Polymorphism	35	
UML and Object Oriented Design	14	
Abstract Classes and Interfaces	24	
Exceptions and Error Handling	28	
Miscellaneous	4	
Total:	137	

Part I. Types and Objects

1. (4 points) What is printed by this block of code?

```
1  int i1 = 7;
2  int i2 = 5;
3  System.out.println(i1/i2);
```

A. 0 **B. 1** C. 1.4 D. 12 E. Compilation error or answer not shown

2. (4 points) What is printed by this block of code?

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

A. 15.0 B. 18.0 C. 22.0 D. 29.0
E. Compilation error or answer not shown

3. (4 points) What is printed by this block of code?

```
1  String a = "OOM";
2  Integer b = -5;
3  Integer c = new Integer(19);
4  System.out.println(c + b + a);
```

A. 14OOM B. 19-5M C. 19-5OOM D. -519OOM
E. Compilation error or answer not shown

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

```
1  int i1 = 42;
2  String s = "8";
3  System.out.println(i1 + s);
```

A. 6 B. 50 **C. 428** D. 842 E. Compilation error or answer not shown

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

```
String s1 = "XHT";
String s2 = "xHt";
s2.toUpperCase();
if(s1.equals(s2))
{
  System.out.println("Yes:" + s1);
}
else
{
  System.out.println("No:" + s2);
}
```

A. No:xHt B. No:XHT C. Yes:xHt D. Yes:XHT
E. Compilation error or answer not shown

6. (4 points) What is printed by this block of code?

```
int a = 17;
String b = "YYO";
int c = 22;
System.out.println(b + c + a);
```

A. YY39 B. YYO39 C. YYO1722 **D. YYO2217**
E. Compilation error or answer not shown

7. (4 points) What is printed by this block of code?

```
int a = 3;
int b = 7;
String c = "7117";
System.out.println(c + (a + b));
```

A. 7127 **B. 711710** C. 711737 D. 711773
E. Compilation error or answer not shown

8. (4 points) What is printed by this block of code?

```
int a = 32;
String b = "4EB";
int c = 8;
System.out.println(a + c + b);
```

A. 324EB8 B. 3284EB **C. 404EB** D. 84EB32
E. Compilation error or answer not shown

Part II. Inheritance and Polymorphism

Consider the following class definitions:

```
public class A
{
  private int val;

  public A(int val) {
    this.val = val;
  }

  public int getVal() {
    return val;
  }

  public String toString() {
    return "A:" + this.getVal();
  }
}

public class B extends A
{
  private String name;

  public B(int val, String name) {
    super(val);
    this.name = name;
  }

  public String getName() {
    return name;
  }
}

public class C extends B
{
  private int val;

  public C(int val, String name) {
    super(val*2, name);
    this.val = val;
  }

  public C(String name, int val) {
    super(val, name.toLowerCase());
    this.val = -1;
  }

  public int getVal() {
    return val;
  }

  public int getSuperVal() {
    return super.getVal();
  }

  public String toString() {
    return "C:" + this.getName() + ":" + super.toString();
  }
}
```

9. (7 points) What is printed by this block of code?

```
A a = new A(42);
System.out.println(a);
```

A. A: **B. A:42** C. A:84 D. A:A:42 E. Answer not shown

10. (7 points) What is printed by this block of code?

```
B b = new B(79, "Bob");
System.out.println(b);
```

A. A:79 B. B:79 C. Bob:79 D. B:Bob:79 E. Answer not shown

11. (7 points) What is printed by this block of code?

```
C c = new C(83, "Joe");
System.out.println(c);
```

A. C:Joe:A:-1 B. C:Joe:A:-2 **C. C:Joe:A:83** D. C:Joe:166
E. Answer not shown

12. (7 points) What is printed by this block of code?

```
C e = new C("Ann", 3);
System.out.println(e.getVal() + e.getSuperVal());
```

A. -1 B. 1 **C. 2** D. 3
E. Answer not shown

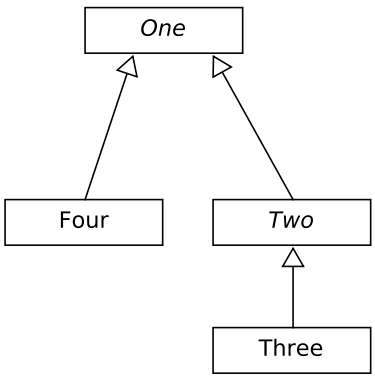
13. (7 points) What is printed by this block of code?

```
C d = new C("Henry", 19);
System.out.println(d);
```

A. C:henry:A:19 B. C:Henry:A:19 **C. C:henry:A:-1** D. C:Henry:A:-1
E. Answer not shown

Part III. UML and Object Oriented Design

14. (4 points) Which set of class definitions corresponds to the following UML diagram?



A.
```
public abstract class One {...}
public abstract class Two extends One {...}
public class Three extends Two {...}
public class Four extends Two {...}
```

B.
```
public interface One {...}
public interface Two implements One {...}
public class Three extends Two {...}
public class Four implements One {...}
```

C.
```
public class One {...}
public class Two extends One {...}
public class Three extends Two {...}
public class Four extends One {...}
```

D.
```
public abstract class One {...}
public abstract class Two extends One {...}
public class Three extends Two {...}
public class Four extends One {...}
```

E. Answer not shown

15. (4 points) **Carefully examine** the following UML models and select the one that corresponds to the following code.

```
public class MyClass
{
    private double val;
    protected char c;

    public MyClass(char c, double val) {
        this.val = val;
        this.c = c;
    }

    private void print() {
        System.out.println(c);
    }

    public double doubleValue() {
        return val * 2;
    }
}
```

A.

MyClass
-val: double #c: char
+MyClass(c:char, val:double) -print(): void +doubleValue(): double

B.

MyClass
-val: double -c: char
+MyClass(c:char, val:double) -print(): void +doubleValue(): double

C.

MyClass
-c: char #val: double
+MyClass(c:char, val:double) -print(): void +doubleValue(): double

D.

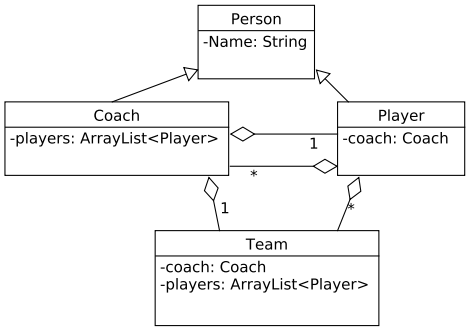
MyClass
-val: double #c: char
+MyClass(c:char, val:double) -print(): void +doubleValue(): double

E. Answer not shown

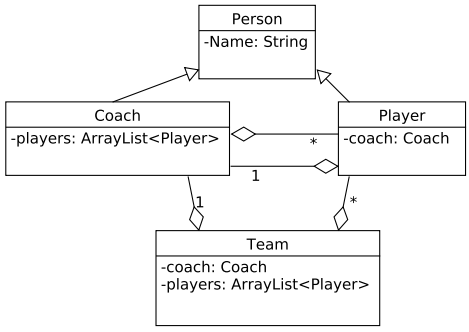
16. (6 points) Which UML diagram corresponds to the following code?

```
public class Person
{
  private String Name;
}

public class Coach extends Person
{
  private ArrayList<Player> players;
}

public class Player extends Person
{
  private Coach coach;
}

public class Team
{
  private Coach coach;
  private ArrayList<Player> players;
}
```

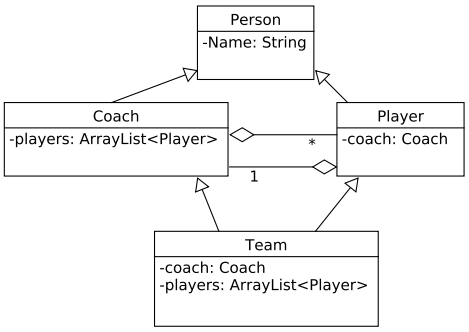
A.



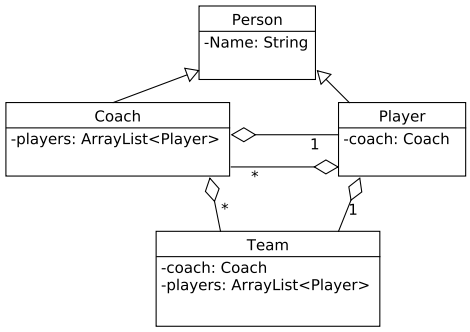
B.



C.



D.



E. Answer not shown

Part IV. Abstract Classes and Interfaces

17. (4 points) Which line (if any) will cause the program not to compile?

```
1  public interface MyList
2  {
3      public abstract void add(Integer i);
4      public abstract Integer get(int j);
5      public abstract void insert(Integer i, int j);
6  }
```

A. 1 B. 3 C. 4 D. 5 **E. Answer not shown**

18. (4 points) Which line (if any) will cause the program not to compile?

```
1    public interface MyInterface
2    {
3      public int value;
4
5      public abstract double setDouble(double v)
6      {
7        value = v;
8      }
9      public abstract String toString();
10   }
```

A. 3 B. 5 C. 7 **D. Multiple lines**
E. Answer not shown

19. (4 points) Which line (if any) will cause the program not to compile?

```
1    public abstract class Worker
2    {
3      private double workRate;
4
5      public Worker(double workRate)
6      {
7        this.workRate = workRate;
8      }
9
10     public abstract boolean canDoWork();
11
12     public double doWork()
13     {
14       if(this.canDoWork())
15       {
16         return this.workRate;
17       }
18       else
19       {
20         return 0;
21       }
22     }
23   }
```

A. 7 B. 10 C. 14 D. 16 **E. Answer not shown**

20. (4 points) Any class that extends an abstract class must provide implementations for all of the abstract methods.

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

> **Solution:** If the abstract class extends another abstract class, then it may leave some of the interface's methods unimplemented.

Consider the following class definition for the next two questions:

```
1   public class Course implements Comparator<Course>
2   {
3     private String name;
4     private int grade;
5
6     public Course(int name, String grade)
7     {
8       this.name = name;
9       this.grade = grade;
10    }
11
12   /**
13    * Sort first by grade and then by the
14    * natural order of the names.
15    * @return 1 if c1 comes after c2; -1 if c1 comes before c2;
16    *             and 0 if they are equal
17    */
18    public int compare(Course c1, Course c2)
19    {
20      if(c1.grade < c2.grade)
21      {
22        return -1;
23      }
24      else if(c1.grade > c2.grade)
25      {
26        return 1;
27      }
28      else
29      {
30        return c2.name.compareTo(c1.name);
31      }
32    }
33  }
```

21. (4 points) Which one line can be changed to fix a bug in the class definition or the Course constructor?

A. 1 **B. 6** C. 8 D. 9 E. Answer not shown

22. (4 points) Which one line can be changed to fix a bug in the compare() method?

A. 18 B. 20 C. 24 **D. 30** E. Answer not shown

Part V. Exceptions and Error Handling

Consider the following program:

```
public class ExceptionsOnExam
{
  public static int doSubJob(int value)
  {
    if(value <= 5)
    {
      throw new IllegalArgumentException("Error 1");
    }
    else if(value > 8)
    {
      throw new IllegalStateException("Error 2");
    }
    else
    {
      return 42;
    }
  }

  public static int doJob(int arg)
  {
    int value = -1;

    if (arg <= 10 && arg >= 2)
    {
      try
      {
        return doSubJob(arg + value);
      }
      catch(IllegalArgumentException e)
      {
        return value;
      }
    }
    else
    {
      return doSubJob(2 * value);
    }
  }

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

    try
    {
      int ret = doJob(value);
      System.out.println(ret);
    }
    catch (Exception e)
    {
      System.out.println(e.getMessage());
    }
  }
}
```

Note that both *IllegalArgumentException* and *IllegalStateException* are *RuntimeExceptions*.

23. (7 points) Assume that $value = 10$ in main(), what is printed by the program?
A. Error 1 **B. Error 2** C. -1 D. 42 E. Answer not shown

24. (7 points) Assume that $value = 1$ in main(), what is printed by the program?
A. Error 1 B. Error 2 C. -1 D. 42 E. Answer not shown

25. (7 points) Assume that $value = 6$ in main(), what is printed by the program?
A. Error 1 B. Error 2 **C. -1** D. 42 E. Answer not shown

26. (7 points) Assume that $value = 7$ in main(), what is printed by the program?
A. Error 1 B. Error 2 C. -1 **D. 42** E. Answer not shown

Part VI. Miscellaneous

Consider the following program:

```
1   public class MyClass
2   {
3     private double val;
4     protected char c;
5
6     public MyClass(char c, double val) {
7       this.val = val;
8       this.c = c;
9     }
10
11    private void print() {
12      System.out.println(c);
13    }
14
15    public double doubleValue() {
16      return val * 2;
17    }
18
19    public static void main(String[] args)
20    {
21      MyClass m = new MyClass('a', 7.2);
22      int a = 4;
23
24      System.out.println(m + a);
25    }
26  }
```

27. (2 points) In which part of memory is the variable declared on line 4 stored?
A. Heap B. Stack C. Answer not shown

28. (2 points) In which part of memory is the variable declared on line 22 stored?
A. Heap **B. Stack** C. Answer not shown