# ECE 30862 Fall 2013 Second Exam Answer Sheet

All answers should be on this sheet. Both this sheet and your test must be signed and turned in. You may detach this sheet from the rest of the test to make it easier to write your answers on it. Each question is worth 4 points.

I promise that I have neither Given nor received disallowed aid on this test.

Name (Printed):                                   Name (Signed):

1.                                                 14.

2.                                                 15.

3.                                                 16.

4.                                                 17.

5.                                                 18.

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7.                                                 20.

8.                                                 21.

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11.                                                24.

12.                                                25.

13.                                                25.

**DO NOT START WORKING ON THIS UNTIL TOLD TO DO SO. LEAVE IT ON THE DESK.**

You have until 7:25 to take this exam.

Your exam should have 10 pages total (including this cover sheet but not counting the answer sheet). *Please let Prof. Midkiff know immediately if it does not.* **ALL ANSWERS SHOULD BE ON THE ANSWER SHEET THAT IS THE FIRST PAGE OF THIS TEST**

This exam is open book, open notes, but absolutely no electronics. If you have a question, please ask for clarification. If the question is not resolved, state on the test whatever assumptions you need to make to answer the question, and answer it under those assumptions. *Check the front board occasionally for corrections.*

I have neither given nor received help during this exam from any other person or electronic source, and I understand that if I have I will be guilty of cheating and will fail the exam and the course.

**Name (must be signed to be graded):**

**Name (printed, worth 1 pt):**

**Last four digits of your ID:**

```cpp
#include <iostream>
using namespace std;

class Double {
public:
   double num;
   Double(double d) : num(d) { }
   Double(const Double& orig) {
      num = orig.num;
   }
   Double  operator-( )  {
      return Double(-num);
   }
   Double  operator-(const Double d) {
      return Double(num-d.num);
   }
   friend ostream& operator<<
         (ostream& os, const Double & arg);
};
```

```cpp
Double operator/(const Double& d1,
                 const Double& d2) {
   return Double(d1.num/d2.num);
}

ostream& operator<< (ostream& os, const Double & arg) {
   os << arg.num;
   return os;
}

int main( ) {
   Double n1(6.0);
   Double n2(3.0);

   cout << n1 << endl; // A
   cout << n1/-n2 << endl; // B
   cout << n1-n1/n2 << endl; // C
   cout << n1-n2 << endl; // D
   cout << -n2 << endl; // E
   return 0;
}
```

**Question 1 (C++).** Pick the answer that best describes what would happen when line A executes or is compiled if function `ostream& operator<<(stream& os, const Double & arg)` was both not defined and not declared:

**a.** No compiler error and the address of `n1` would be printed.

**b.** There would be a compiler error because no "`<<`" operator would be defined on the `ostream`.

**c.** The default "`<<`" operator would be called and it would print each member of `n1` in the order they are declared in the class.

**d.** The behavior is undefined.

**Question 2 (C++).** What is printed when line B executes?

**a.** -0.5

**b.** 0.5

**c.** 2.0

**d.** -2.0

**e.** Error because you cannot take the negation of an object

**f.** A compile time error will result because we are trying to perform arithmetic on objects.

**Question 3 (C++).** What is printed when line C executes?

**a.** 0.0

**b.** 4.0

**c.** 5.5

**d.** -0.5

**e.** Zero divide

**f.** Error because `operator-` takes either zero or one arguments and the subtraction has two operands, `n1` and `n2`.

**g.** Error because you cannot take the negation of an object

**h.** A compile time error will result because we are trying to perform arithmetic on objects.

**This code is the same as the code used by Questions 1 − 3.**

```cpp
#include <iostream>
using namespace std;

class Double {
public:
   double num;
   Double(double d) : num(d) { }
   Double(const Double& orig) {
      num = orig.num;
   }
   Double  operator-( )  {
      return Double(-num);
   }
   Double  operator-(const Double d) {
      return Double(num-d.num);
   }
   friend ostream& operator<<
         (ostream& os, const Double & arg);
};

Double operator/(const Double& d1,
               const Double& d2) {
   return Double(d1.num/d2.num);
}
```

```cpp
ostream& operator<< (ostream& os, const Double & arg) {
   os << arg.num;
   return os;
}

int main( ) {
   Double n1(6.0);
   Double n2(3.0);

   cout << n1 << endl; // A
   cout << n1/-n2 << endl; // B
   cout << n1-n1/n2 << endl; // C
   cout << n1-n2 << endl; // D
   cout << -n2 << endl; // E
   return 0;
}
```

**Question 4 (C++).** What will be printed when line D executes?

**a.** Error because `operator-` takes either one or two arguments and the subtraction operation has two operands **n1** and **n2**.

**b.** Error because you cannot take the negation of an object

**c.** -3.0

**d.** 3.0

**Question 5 (C++).** What will be printed when statement E is executed?

**a.** -3.0

**b.** 6.0

**c.** A left shift of the bits of the two's complement of n2

**d.** A compile time error will result because we are trying to perform arithmetic on objects.

```
    public class Q6 extends Thread {

        public static int s1=0;
        public static int s2=0;
                                                    public static void main(String args[]) {
        public int f1;                                  Q6 t0 = new Q6(1,1);
        public int f2;                                  Q6 t1 = new Q6(2,2);

        Q6(int arg1, int arg2) {                        t0.run( );
           f1 = arg1;                                   t1.run( );
           f2 = arg2;
        }                                               System.out.println("s1: "+Q6.s1+", s2: "+Q6.s2);
                                                    }
        public void run() {
           s1 = f1;
           s2 = f2;
        }
    }
```

**Question 6 (Java** Put the letter of the most correct answer on the answer sheet?

**a.** Because there is no synchronization the program behavior is undefined.

**b.** t0.run( ) and t1.run( ) may execute at the same time.

**c.** t0.run( ) will finish executing before t1.run( ) begins executing

**Question 7 (Java**

The main function in the program above is changed
to:

```
public static void main(String args[]) {
   Q6 t0 = new Q6(1,1); // CHANGED Q7 to Q6.
   Q6 t1 = new Q6(2,2); // CHANGED Q7 to Q6.
    t0.start( ); // CHANGED from run to start
    t1.start( ); // CHANGED from run to start
    System.out.println("s1: "+Q7.s1+", s2: "+Q7.s2);
}
```

Put the letter of the most correct answer on
the answer sheet?

**a.** t0.start( ) and t1.start( ) may run
at the same time.

**b.** t0.start( ) will completely run before
t1.start( ) starts

**c.** Because there is no synchronization the
program behavior is undefined.

**d.** Because no start( ) method is defined in
the program there is an error.

**Question 8 (Java).** If the main function is as in in Question 7, i.e. with calls to start instead of run, select the
answer that is most true about the program execution

**a.** No synchronization is needed because the two threads t0 and t1 do not run at the same time.

**b.** No synchronization is needed because the two threads do not share any data.

**c.** Synchronization is needed and using a synchronized run method is sufficient.

**d.** Synchronization is needed and using a synchronized run is NOT sufficient.

```
#include <iostream>
using namespace std;

class Copied {
public:
   int* num;
   int len;

   Copied(int l) {
      num = new int[100];
      for (int i = 0; i < 100; i++)
         num[i] = i;
      len = 100;
   }

   Copied (const Copied& c) : // A
      num(c.num), len(c.len) { }

   virtual Copied operator=(const Copied& c) {
      return Copied(c);
   }
};
```

```
int main( ) {
   Copied n1(5);
   Copied n2(n1);
   n2.num[0] = 50;
   cout << "n2.num[0] = " << n2.num[0];
   cout  << ", n1.num[0] = " << n1.num[0];
   cout << endl;
   return 0;
}
```

**Question 9 (C++).** What is printed by the `cout` statements in `main`?

**a.** `n2.num[0] == 50, n1.num[0] == 50`

**b.** `n2.num[0] = 50, n1.num[0] = 0`

**c.** `n2.num[0] = 0, n1.num[0] = 50`

**d.** `n2.num[0] = 0, n1.num[0] = 0`

**e.** There is an error because $<<$ is not overloaded by the copied class.

**Question 10 (C++).** Replace the constructor `Copied (const Copied& c)` at (A) above with the code below. With this new constructor, what is printed by the `cout` statement?

```
Copied (const Copied& c) : len(c.len) {
   num = new int[len];
   for (int i = 0; i < len; i++) {
      num[i] = c.num[i];
   }
}
```

**a.** `n2.num[0] == 50, n1.num[0] == 50`

**b.** `n2.num[0] = 50, n1.num[0] = 0`

**c.** `n2.num[0] = 0, n1.num[0] = 50`

**d.** `n2.num[0] = 0, n1.num[0] = 0`

**e.** `n2.num[0] = 50, n1.num[0] = 50`

**f.** There is an error because $<<$ is not overloaded
   by the copied class.

```
public class L implements Cloneable {

    public int[ ] iArray = null;
    public int len = 0;

    public L(int len) {
        iArray = new int[len];
        for (int i = 0; i < len; i++) {
            iArray[i] = i;
        }
    }

    public Object clone( ) {
        L lClone = null;
        try {
            lClone = (L) super.clone( );
        } catch (java.lang.CloneNotSupportedException e) {
            System.out.println("Cloning problem: "+e);
        };
        int cloneArray[ ] = new int[iArray.length];
        for (int i = 0; i < iArray.length; i++) {
            cloneArray[i] = iArray[i];
        }
        lClone.iArray = cloneArray;
        return lClone;
    }
}

public class Test {

    public static void main(String[] args) throws Exception {
        L obj1 = new L(5);
        L obj2 = (L) obj1.clone( );
        L obj3 = obj1;
        obj1.iArray[0] = 6;
        System.out.println("obj1 = "+obj1.iArray[0]+", obj2 = "+obj2.iArray[0]+ ", obj3 = "+obj3.iArray[0]);
    }
}
```

**Question 11 (Java).** Pick the answer that best describes the output of the program and put it on the answer sheet.

**a.** obj1 = 6, obj2 = 0, obj3 = 0

**b.** obj1 = 6, obj2 = 6, obj3 = 0

**c.** obj1 = 6, obj2 = 0, obj3 = 6

**d.** obj1 = 6, obj2 = 6, obj3 = 6

**e.** None of the above.

```
public class EB extends Exception {
    public String msg;
    public EB(String s) {msg=s;}
    public String toString( ) {return msg;}
}
public class ED extends EB {
    public String toString( ) {return "from ED"+msg;}
    public ED(String s) {super(s);}
}
public class Test {
    static int count = 0;

    public static void heave(int i) throws ED, EB {
        if (i == 0) {throw new EB("i=0");}
        if (i == 1) {throw new ED("i=1");}
        if (i == 2) {throw new ED("i=2");}
    }

    public static void main(String[] args) throws Exception {
        try {
            heave(2);
            heave(1);
            heave(0);
        } catch (EB e) {System.out.print("EB: "+e); count++;
        } catch (ED e) {System.out.print("EB: "+e); count++;
        } finally {System.out.println("count: "+count);
        }
    }
}
```

**Question 12 (Java).** Pick the answer that shows the output from running the program.

a.    EB: from ED, i=2, count: 1

b.    EB: from ED, i=2, count: 1
      EB: from ED, i=2, count: 2
      EB: from ED, i=2, count: 3

c.    EB: from ED, i=2

d.    EB: from ED, i=2
      EB: from ED, i=2
      EB: from ED, i=2

e.    EB: from ED, i=2
      EB: from ED, i=2
      EB: from ED, i=2, count: 3

```
#include <iostream>
using namespace std;

void timesTwo(int i) {
   throw 2*i;
}

int main( ) {
   for (int i=0; i<2; i++) {
      try {
         timesTwo(i);
      } catch (int j) {cout << i << " times 2 = " << j << endl;}
   }
   return 0;
}
```

**Question 13 (C++).** Pick the answer that describes the output of the program.

**a.** `0 times 2 = 0`
    `1 times 2 = 2`

**b.** `0 times 2 = 0`

**c.** `A runtime error because you cannot throw an integer variable as an exception.`

**Question 14 (C++).** Write the letter of the most correct statement about the above program on the answer sheet.

**a.** This is a good use of exceptions because it saves having to return a value from the function using the runtime stack.

**b.** This is acceptable C++ programming because if it wasn't the compiler would give an error or warning.

**c.** Exceptions should be used to handle unusual conditions that result from program input and not to return values during ordinary executions..

**d.** Exceptions should be used to handle programmer errors that cannot be fixed before shipping the code and not to return values under ordinary executions.

```cpp
#include <iostream>
#include <string>
using namespace std;

class B {

public:
   B( ) { }
   ~B( ) { }

   virtual void m1(double ff) {
      cout << "B's" << endl;
   }

   virtual void m1(int i ) {
      cout << "B's" << endl;
   }
};

class D : public B {
public:
   D( ) { }

   ~D( ) { }

   virtual void m1(int i) {
      cout << "D's" << endl;
   }
};
```

```cpp
int main(int argc, char * argv[ ]) {

   D* dP = new D( );
   B* bP = dP;
   B bo = *dP;;
   B& br = *dP;

   dP->m1(1);    // A
   dP->m1(1.0);  // B
   bP->m1(1);    // C
   bP->m1(1.0);  // D
   br.m1(1);     // E
   br.m1(1.0);   // F
   bo.m1(1);     // G
   bo.m1(1.0);   // H
}
```

**Question 15 (C++).** What is printed by line A?
**Question 16 (C++).** What is printed by line B?
**Question 17 (C++).** What is printed by line C?
**Question 18 (C++).** What is printed by line D?
**Question 19 (C++).** What is printed by line E?
**Question 20 (C++).** What is printed by line F?
**Question 21 (C++).** What is printed by line G?
**Question 22 (C++).** What is printed by line H?

```java
class B {
   public double f;
   public B( ) { }

   public void m1(double ff) {
      System.out.println("B's");
   }

   public void m1(int i ) {
      System.out.println("B's");
   }
}
class D extends B {
   public D( ) { }

   public void m1(int i) {
      System.out.println("D's");
   }
}
class Poly {
   public static void main(String[] args) throws Exception {
      D d = new D( );
      B b = d;

      d.m1(1);    // A
      d.m1(1.0); // B
      b.m1(1);    // C
      b.m1(1.0); // D
   }
}
```

**Question 23 (Java).** What is printed by line A?
**Question 24 (Java).** What is printed by line B?
**Question 25 (Java).** What is printed by line C?
**Question 26 (Java).** What is printed by line D?