CSE 002: Fundamentals of Programming

Lab 9 and Sample Questions For exam 2

Instructions:
Attached are several pages of sample questions that are similar to some of those that will appear on the second exam. Do not assume that they represent the full coverage of the exam, but they are representative of the difficulty of the exam.

Answers are not provided for some questions due to length constraints. You should be able to get all of the answers yourself. However, we are also assigning these questions as Lab 9. The lab on Friday 11/2 will be a hands-on review session where you may work on these questions and receive any help that you may need, including answers. Lab completion will be based on attendance rather than the completion of all these problems.

Given the extreme weather constraints relating to Hurricane Sandy, there will be no class at Lehigh University on Monday 10/19 or Tuesday 10/30. Under these constraints we are not yet planning on moving the exam date (currently scheduled for 11/5), but we will move it if additional teaching days are lost. Please continue to check your email for updates. The current makeup day for the exam is 11/9 in Packard lab 324, during class (for both sections). If you have an officially acceptable reason for taking the makeup exam, please contact your professor.

Note that the exam for CSE002 section 10 will be held in the normal class room, but for CSE section 11, it will be held in Packard lab 101.

Question 1: LOOPS----------

Write the STDOUT from the following code. If there is no output, write "NONE". If it is an infinite loop, write "∞".

```
//////////////////////////////////// easy
//5, 3, 1,
int i = 0;
for(i = 5; i > 0; i=i-2){
     System.out.println("i: " + i);
}

//////////////////////////////////////// tricky
// NONE
int i = 0;
while( i > 0){
     System.out.println("i: " + i);
     i++;
}

//////////////////////////////////////// tricky
//2, 2, 2, 2,
int i = 0;
int j = 0;
for(i = 2; i<7; j++){
     if( j > 3){
          break;
     }
     System.out.println("i: " + i);
}

//////////////////////////////////////// easy,
// infinite loop
int i = 0;
do{
     System.out.println("i: " + i);
     i++;
} while( i > 0);
```

```
//////////////////////////////////// easy
```

```
/// 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0
int i = 10;
while( true ){
     System.out.println("i: " + i--);
     if( i < 0 ){ break; }
}

////////////////////////////////////// hard
// 0, 1, 2, 3, 0,
int i = 0;
for( ; i < 25; i+=5){
     System.out.println("Value: " + (i%4));
}


////////////////////////////////////// tricky
//infinite loop
int i = 4;
while( i>0 ){
     if( i % 2 == 0 ){ continue; }
     System.out.println("(" + i + ")");
     i--;
}

////////////////////////////////////// slightly tricky
//0, 2, 4
int i = 0;
do{
     System.out.println("i:" + 2*i);
     i++;
}while(i<3);

////////////////////////////////////// easy
//3, 2, 1
for( int i = 0; i<3; i++){
     System.out.println("i:" + 3-i);
}

////////////////////////////////////// easy, time consuming.
// 1 1
int i = 2, j = 3;
while( i * j > 0 ){
     System.out.println("product: " + (j-i) );
     i--;
     j--;
```

```
}
```

Question 2: Nested Loops----------

Write the STDOUT from the following code. If there is no output, write "NONE". If it is an infinite loop, write "∞".

```
//////////////////////////////////// tricky
//infinite loop
int i = 0;
int j = 0;
for(i = 0; i<5; i++){
     System.out.println("This List: " + i);
     for(j = 0; j<3; j++){
          System.out.print(" " + j);
     }
     i--;
}

//////////////////////////////////// tricky
//(0,0) (0,2) (2,0) (2,2)
int i = 1;
int j = 1;
for(i = 0; i<3; i++){
     for(j = 0; j<3; j++){
          System.out.println("(" + i + "," + j + ")");
          j++;
     }
     i++;
}

//////////////////////////////////// very hard
//probably better for sample questions, not the exam.
//0, 25, 50, 75, 100, 125
int i = 0;
int j = 0;
int k = 0;
int counter = 0;
for(i = 0; i<5; i++){
     for(j = 0; j<5; j++){
          for(k = 0; k<5; k++){
```

```
                counter++;
                if( counter % 25 == 0 ){
                     printf(“counter:” + counter);
                }
           }
     }
}
////////////////////////////////////too hard?
//infinite loop
int counter = 1;
while( counter % 2 == 1 ){
     counter++;
     while( counter % 2 == 0 ){
          if (counter > 0){
               counter -=3;
               break;
          }
          counter += 2;
     }
     counter += 2;
}

////////////////////////////////////hard
//9, 6, 3, 0
int counter = 12;
while( counter > 0 ){
     int i = 0;
     while(i < 5){
          counter--;
          i++;
     }
     while(i < 7){
          counter++;
          i++;
     }
     System.out.print(counter + “ “);
}
```

Question 3: Loop Design----------

Given the StdOut provided below, construct a loop or nested loop that could have generated that output. Note that "…", sometimes found at the end of the StdOut indicates an infinite loop that repeats the entire output again.

```
//////////////////////////////////  easy
i: 0
i: 1
i: 2
i: 3

//////////////////////////////////// easy
(0,0)
(0,1)
(0,2)
(1,0)
(1,1)
(1,2)
...

//////////////////////////////////// easy
i: 1
test
i: 3
test
i: 5
test
i: 7
test

//////////////////////////////////  medium
i: 1
i: 2
i: 4
i: 7
i: 11
```

```
i: 16

////////////////////////////////  medium
i: 0
i: 7
i: 1
i: 6
i: 2
i: 5
i: 3
i: 4

////////////////////////////////  medium
0 5 1 6 2 7 3 8 4 9
...

////////////////////////////////  medium
a: 0
b: 1
a: 1
b: 2
a: 3
b: 5
a: 8
b: 13
...(this sequence simply continues upwards)

//////////////////////////////// medium
// note: I would call this hard if instead of "a:" and "b:"
// it was all "a:" or simply nothing. implementation hint.
a: 0
b: 0
c: 1
a: 1
b: 2
c: 4
a: 7
b: 13
c: 24
...(this sequence simply continues upwards)

//////////////////////////////// hard
i: 4
i: 6
i: 3
```

```
i: 7
i: 2
i: 8
i: 1
i: 9

//////////////////////////////// hard
i: 2
i:  4
i:   6
i:    8
```

Question 4: Methods----------

Write the STDOUT generated by the methods/main method written below.

```
////////////////////////////////  easy
public static int A(int a){
     return a+2;
}

public static int B(int b){
     return b-1;
}

public static void main( String args[] ){
     int i = 0;
     counter = 0;
     for( i = 0; i < 3; i++){
          counter += A( B( i ) );
          System.out.println( "counter: " + counter );
     }
}

////////////////////////////////  tricky
//trick based on call by value.
//
public static void A(int a){
     a = a+2;
}

public static void B(int b){
     b = b-1;
}
```

```
public static void main( String args[] ){
     int input = 1;
     for( i = 0; i < 3; i++){
          B( input );
          A( input );
          System.out.println( "input: " + input );
     }
}
```

```
////////////////////////////////  tricky
//output: .25
public static double A(double a){
     return a*a;
}

public static double B(double b){
     return b/2;
}

public static void main( String args[] ){
     double val = 2.0;
     System.out.println("val: " + A( B( B(val) ) ) );
}
```

```
////////////////////////////////  easy
public static int A(int a){
     return a % 4;
}

Public static int B(int b){
     return b % 7;
}

public static void main( String args[] ){
     double val = 27;
     System.out.println("val: " + A( B(val) ) );
}
```

```
////////////////////////////////  easy
```

```
// 1
public static int A(int a, int b, int c){
     int z = b;
     if( a<z ){
          z = a;
     }
     if( c<z ){
          z = c;
     }
     return z;
}

public static void main( String args[] ){
     int a = 5, b = 2, c = 4, d = 1, e = 3;
     int x = A(a, b, c), y = A(c, d, e);
     System.out.println("i: " +  A(x, y, a) );
}
```

Question 5: Compilation Problems (methods)----------

Indicate what the output type of the methods called "A()" in the following code. If the compiler would generate an error, say "Compiler Error"

```
////////////////////////////////  easy
// int
public static int A(int a, int b){
     return a + b;
}

////////////////////////////////  easy
// void
public static void A(int a){
     return;
}

////////////////////////////////  weird
// compiler error
public static int A(int a){
     public static int B(int b){
          return b;
     }
     return a;
}

////////////////////////////////  casting
// double
public static double A(int a){ return a; }
```

```
////////////////////////////////  overloading
// int
public static double B( double b ){
     return b+3.5;
}

public static int B( int b ){
     return b+3;
}

public static int A( int a ){
     return B(a);
}
```

```
//////////////////////////////// variable scope
// compiler error
public static double B(){
     double c = 25;
     return c;
}

public static double A( double a ){
     return B()+c;
}
```

```
//////////////////////////////// variable scope
// compiler error
public static double B(double b){
     int c = 2*b
     return c;
}

public static double A( double a ){
     double b = B(a);
     return b + c;
}
```

Question 6: Compilation Problems (loops)----------

Indicate the output type of the loops in the following code. If the compiler would generate an error, write “Compiler Error” (or CE), or write “Runtime Error” (RE)

```
////////////////////////////////  easy
// compiler Error
int i = 0;
for(i<5; i=0; i++){
     System.out.println(“count:” + i);
}

////////////////////////////////
//
int i = 0;
do{
     System.out.println(“info: ” + i);
     i--;
}while( i>=5 )
////////////////////////////////
//
int i = 0;
do{
     System.out.println(“info: ” + i);
     i--;
}while( i>=5 );
////////////////////////////////
//Runtime Error
int i = 0;
int j = 0;
for( i=5; i<10; i++){
     for( j = 0; j<5; j++){
          if( i/j > 1 ){
               System.out.println(“i/j: ” + i/j);
          }
     }
}
//////////////////////////////// variable scope
//Runtime Error
int i = 0;
for( i=5; i<10; i++){
     int counter = 0;
     counter ++;
}
System.out.println(“Counter: ” + counter);
```

3) Write a void method called metaBox() that accepts integers from 0 to 9 and generates boxes of “#” within boxes of “O” (capital “o”). See examples below. The 0 case should print nothing. Assume the input is always an integer from 0 to 9. 10 distinct case statements are not acceptable.

input = 7

```
#######
#OOOOO#
#O###O#
#O#O#O#
#O###O#
#OOOOO#
#######
```

input = 2

```
OO
OO
```

input = 1

```
#
```

input = 4

```
OOOO
O##O
O##O
OOOO
```

input = 5

```
#####
#OOO#
#O#O#
#OOO#
#####
```