

UNIVERSITY OF WISCONSIN-LA CROSSE  
Department of Computer Science

CS 120  
Practice Midterm Exam 02

Software Design I

Spring 2018  
Monday, 09 April 2018

- Do not turn the page until instructed to do so.
- This booklet contains 7 pages including the cover page.
- This is a closed-book exam. All you need is the exam and a writing utensil.  
(A calculator is permitted.)
- You have exactly 55 minutes.
- The maximum possible is 55.

PROBLEM	SCORE
1	10
2	10
3	10
4	10
5	15
TOTAL	55

*ANSWER KEY*

1. (10 pts.) TRUE/FALSE.

For each of the following, indicate whether the statement is true or false.

(**Note:** I am including some explanations for a few of these; this is just for the purpose of the answer key, and you **will not** be expected to do the same on the actual exam.)

- a. A **public** instance variable *can be* accessed and altered by any class, including the class in which it is declared.

**True:** this is just the definition of **public** access.

- b. A **private** instance variable *can not be* accessed and altered by any class, including the class in which it is declared.

**False:** while the variable can not be accessed by any *other* class, it can still be accessed and altered by its own (declaring) class.

- c. We can make local method variables either **public** or **private**, as we choose.

**False:** global instance variables are **public** or **private**; local method variables do not use these access modifiers at all.

- d. If we create a **new** instance of an object in our code, then we can call any method from that class that we like.

**False:** we can only call the **public** methods.

- e. You can create a global variable and a local method variable in the same class, with the same name, and with the same type.

**True:** if we do so, the method will use the local version instead of the global.

- f. If the boolean condition for a **while** loop is **false**, then the loop will never run.

**True:** the condition is always evaluated before the loop can run, even once.

- g. If a loop does not make progress, then it will run infinitely.

**False:** for example, the loop may *never run at all*.

- h. An integer counter variable used in a **for** loop is *always* local to the loop.

**False:** we can, if we like, declare the variable *before* the loop header, so it will be accessible in a higher scope.

- i. Within a class, methods can use input variables with the same names as input variables in other methods.

**True:** input variables are local to their methods.

- j. A non-void method must *always* have a **return** statement.

**True:** while the **return** is optional for **void** methods, it is mandatory in this case.

2. (10 pts.) **SHORT ANSWER.**

- a. (3 pts.) How many times will the following loops run (assuming they are in a correct program)?

```
(1)      int num = 0;
         while ( num < 11 ) {
             System.out.println( num );
             num = num + 1;
         }
```

**Answer:** 11 times (for num == 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10).

```
(2) for ( int i = 0; i <= 10; i += 2 ) {
        System.out.println( i );
    }
```

**Answer:** 6 times (for i == 0, 2, 4, 6, 8, 10).

```
(3) for ( int j = 0; j < 10; j = j + 3 ) {
        System.out.println( j );
    }
```

**Answer:** 4 times (for j == 0, 3, 6, 9).

- b. (3 pts.) List **three things** that make up a method signature (i.e., the top line of the method, when you are creating it yourself), *not including the name of the method*.

- (1) Access control (**public** or **private**).
- (2) Return type (**void** or some other non-void type).
- (3) Input parameters (or at least empty parentheses to indicate no inputs used).

- c. (4 pts.) Suppose we have a class, **Driver**, and in that class we call a method on a **Gadget** object:

```
Gadget g = new Gadget();
String s = g.make( 10.5, "Test" );
```

Without knowing what the **make()** method does, we do know what its method declaration (i.e., its first line) will look like. What will it be?

**Answer:** Here is what the method will look like (note that the input variable names can be different, but everything else about the method is as shown here):

```
public String make( double num, String s )
```

3. (10 pts.) **CODE EVALUATION.**

- a. Suppose we run the following method, with input "Hello". Write out what will be printed.

```
private void method1( String sin ) {  
    String sout = new String();  
    for ( int i = 0; i < sin.length(); i++ ) {  
        sout = sin.charAt( i ) + sout;  
        System.out.println( sout );  
    }  
}
```

---

**Answer:** the code outputs the following:

H  
eH  
leH  
lleH  
olleH

---

- b. Write out what will be printed by the following method on inputs 5 and 10, in that order.

```
private void method2( int num1, int num2 ) {  
    for ( int i = 0; i < num1; i++ ) {  
        System.out.print( i + ": " );  
        int j = i;  
        while ( j < num2 ) {  
            System.out.print( j + " " );  
            j = j + 2;  
        }  
        System.out.println( "END" );  
    }  
}
```

---

**Answer:** the code outputs the following:

0: 0 2 4 6 8 END  
1: 1 3 5 7 9 END  
2: 2 4 6 8 END  
3: 3 5 7 9 END  
4: 4 6 8 END

---

#### 4. (10 pts.) CODING NESTED LOOPS

Fill in the `main()` method in the class below so that when it runs it prints output (using `System.out`) that looks like this:

```
1 2 4 8
2 4 8 16
3 6 12 24
4 8 16 32
5 10 20 40
```

For full points, your code must use a pair of **nested loops**, each of which is actually used to generate the output. (You may use whatever types of loops you choose.)

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**Answer:** Here are two solutions. One uses `for` loops, the other uses `while` loops.

```
public class Main
{
    public static void main( String[] args ) {
        for ( int i = 1; i <= 5; i++ ) {
            int num = i;
            for ( int j = 0; j < 4; j++ ) {
                System.out.print( num + " " );
                num = num * 2;
            }
            System.out.println();
        }
    }
}
```

```
public class Main
{
    public static void main( String[] args ) {
        int x = 1;
        while ( x <= 5 ) {
            int num = x;
            int y = 0;
            while( y < 4 ) {
                System.out.print( num + " " );
                num = num * 2;
                y++;
            }
            System.out.println();
            x++;
        }
    }
}
```

5. (15 pts.) **CODE COMPLETION.**

On the next page, complete the given **Driver** class as follows:

- a. Write the method **removeVowels()** so that it works with the code as given:
  - i. It will take a **String** as input.
  - ii. It will return a **String** as output. The output will be identical to the input, but with any lower-case vowels (**a, e, i, o, u**) removed.
- b. Write the method **longest()** so that it works with the code as given:
  - i. This method will take two **String** inputs.
  - ii. It will return as output the **String** that is the longest of the two inputs. (If they are of the **same length**, then it should return the **first one** input.)
- c. Write the method **swapChars()** so that it works with the code as given:
  - i. This method should take in two **char** inputs and a single **String** input.
  - ii. It should return a **String**. The output should be identical to the input **String**, but with every occurrence of the first **char** replaced with the second **char**.

When complete, the code should produce the following output when run.

```
Starting string = Pork tacos
String without vowels = Prk tcs
Longest string = Pork tacos
Swapped string = Perk taces
```

```

public class Driver
{
    public static void main( String[] args ) {
        Driver d = new Driver();
        String s = "Pork tacos";
        String noVowels = d.removeVowels( s );
        String longest = d.getLongest( s, noVowels );
        String swap = d.swapChars( 'o', 'e', s );
        System.out.println( "Starting string = " + s );
        System.out.println( "String without vowels = " + noVowels );
        System.out.println( "Longest string = " + longest );
        System.out.println( "Swapped string = " + swap );
    }

    private String removeVowels( String s ) {
        String out = "";
        for ( int i = 0; i < s.length(); i++ ) {
            char c = s.charAt( i );
            if ( c != 'a' && c != 'e' && c != 'i' && c != 'o' && c != 'u' ) {
                out = out + c;
            }
        }
        return out;
    }

    private String getLongest( String s1, String s2 ) {
        if ( s1.length() >= s2.length() ) {
            return s1;
        }
        else {
            return s2;
        }
    }

    private String swapChars( char c1, char c2, String s ) {
        String out = new String();
        for ( int i = 0; i < s.length(); i++ ) {
            char c = s.charAt( i );
            if ( c == c1 ) {
                out = out + c2;
            }
            else {
                out = out + c;
            }
        }
        return out;
    }
}

```