UNIVERSITY OF WISCONSIN-LA CROSSE
Department of Computer Science

CS 120 | **Software Design I** | **Spring 2018**
Midterm Exam 02 | **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	
2	
3	
4	
5	
TOTAL	

NAME: ______________________________

1. **(10 pts.)** **TRUE/FALSE.**

   For each of the following, indicate whether the statement is true or false.
   You do not need to explain your answers.

   a. The following code contains a compile-time error (i.e., will not compile properly):

   ```
   for ( int i = 0; i < 10; i++ ) {
       int num = (int)( Math.random() * 10 );
       System.out.println( num );
   }
   System.out.println( "Final value of num = " + num );
   ```

   b. The following code contains a compile-time error (i.e., will not compile properly):

   ```
   for ( int i = 0; i < 10; i++ ) {
       int num = (int)( Math.random() * 10 );
       System.out.println( num );
   }
   System.out.println( "Final value of i = " + i );
   ```

   c. A `public` class method can ***only*** be called by other `public` methods in that class.

   d. A `private` class method can be called by public methods in that class.

   e. A non-`void` method must always have a `return` statement.

   f. Suppose that `methodA()` returns an `int`. Then the following is a legal line of code:

   ```
   int num = (int) methodA() / 2.0;
   ```

   g. Suppose that `methodB()` returns an `int`. Then the following is a legal line of code:

   ```
   double num2 = methodB();
   ```

   h. Any instance variable accessed by a `static` method like `main()` must itself be `static`.

   i. If we nest one loop inside of another, then both loops must be of the same type (i.e. both are `for` loops, or both are `while` loops).

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

a. (2 pts.) How many times will these loops run (i.e., how many lines will they print)?

(1)

```
int num = 10;
while ( num > 0 ) {
    System.out.println( num );
    num = num - 2;
}
```

Answer: ____________________

(2)

```
for ( int i = 1; i <= 32; i = i * 2 ) {
    System.out.println( i );
}
```

Answer: ____________________

b. (4 pts.) Consider the following method, with ***one of*** the two different versions of code inside it:

```
private boolean checkNum( int i )
{
    if ( i < 5 )                    |    if ( i < 5 )
        return true;                |        return true;
    else                            |    else if ( i > 5 )
        return false;               |        return false;
}
```

Answer True or False:

(i) The first (left-hand) version of the code will compile: ____________

(ii) The second (right-hand) version of the code will compile: ____________

If you answered **True** to **both** questions (so both versions compile), then explain what each version of the method will do. If you answered **False** for either version, then explain why the code will fail to compile:

____

____

c. (4 pts.) Suppose a class, `Driver`, contains the following method call on a `Helper` object:

```
Helper help = new Helper();
String str = "Banana";
double ratio = help.getRatio( str, 'a' );
```

What will the method declaration (i.e., first line) of method `getRatio()` be?

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

a. (5 pts.) Write out what will be **returned** by the following method, for each call given:

```
private String process( String s1, String s2 )
{
    int len = s1.length();
    if ( s2.length() < len ) {
        len = s2.length();
    }

    String out = new String();
    for ( int i = 0; i < len; i++ ) {
        if ( s1.charAt( i ) != s2.charAt( i ) ) {
            out = out + s2.charAt( i );
        }
    }
    return out;
}
```

i. `process( "Dogs", "Doges" )` ______________________________

ii. `process( "Doges", "Dogs" )` ______________________________

iii. `process( "Dogs", "Dogs" )` ______________________________

iv. `process( "Apple", "APPLE" )` ______________________________

v. `process( "", "Hello" )` ______________________________

b. (5 pts.) Write out what is printed by the following, given inputs `3` and `2.0`, in that order:

```
private void printNums( int num1, double num2 )
{
    for ( int i = 1; i <= num1; i++ ) {
        System.out.print( i + ": " );
        for ( int j = 0; j <= i; j++ ) {
            double val = j * num2;
            System.out.print( val + ", " );
        }
        System.out.println( ( i + 1 ) * num2 );
    }
}
```

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

Fill in the `main()` method below to print output (using `System.out.println()` or `print()`):

```
1 + 2 + 3 + 4 + 5 = 15
2 + 3 + 4 + 5 + 6 = 20
3 + 4 + 5 + 6 + 7 = 25
4 + 5 + 6 + 7 + 8 = 30
5 + 6 + 7 + 8 + 9 = 35
```

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.)

Hint: use the loops to actually calculate the sums that are displayed, as well as using them to produce the printed output.

```
public static void main( String[] args )
{











}
```

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

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

a. Write the method `countVowels()` so that it works with the code as given:
   i. This method will take a `String` as input.
   ii. It will `return` an integer, equal to the number of vowels (`a`, `e`, `i`, `o`, or `u`, in ***lower or upper* case**) in the input.

b. Write the method `reverse()` so that it works with the code as given:
   i. This method will take a `String` as input.
   ii. It will `return` a new `String` that is the reverse of the input.

c. Write the method `shuffle()` so that it works with the code as given:
   i. This method will take in two `String` inputs.
   ii. It will `return` a new `String`.
   iii. If the two inputs are the same length, the output is the result of shuffling the characters of the two inputs together, one at a time, starting with the first character of the first input, then the first character of the second input, followed by the second character of the first input, then the second character of the second input, and so on.
   iv. If the two inputs are different lengths, then it will return `"NO SHUFFLE POSSIBLE"`.

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

```
Everyone 4
enoyrevE 4
wWoOrRdD
EevneoryyroenveE
NO SHUFFLE POSSIBLE
NO SHUFFLE POSSIBLE
```

```
public class Q5
{
    public static void main( String[] args )
    {
        Q5 q5 = new Q5();
        String str1 = "Everyone";
        System.out.println( str1 + " " + q5.countVowels( str1 ) );
        String str2 = q5.reverse( str1 );
        System.out.println( str2 + " " + q5.countVowels( str2 ) );
        System.out.println( q5.shuffle( "word", "WORD" ) );
        System.out.println( q5.shuffle( str1, str2 ) );
        System.out.println( q5.shuffle( "start", "END" ) );
        System.out.println( q5.shuffle( "END", "start" ) );
    }
```

```
\\ complete code for methods here
```

```
}
```