UNIVERSITY OF WISCONSIN-LA CROSSE
Department of Computer Science

CS 120 Software Design I Spring 2017
Midterm Exam 02 11 April 2017

- **Do not turn the page until instructed to do so.**
- **This booklet contains 8 pages including the cover page.**
- **This is a closed-book exam. All you need is the exam and a writing utensil.**
- **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. A `for` loop must always increase or decrease an integer counter variable by 1 each time.

   b. If a conditional features properly written `if` and `else` blocks, in that order, then it is guaranteed that the code in ***exactly one*** of those blocks will execute.

   c. If a conditional features properly written `if` and `else if` blocks, in that order, then it is guaranteed that the code in ***exactly one*** of those blocks will execute.

   d. A `public` instance variable can only be referenced in `public` methods in that same class.

   e. A `private` method in a class can be called by `public` methods in that same class.

   f. The following contains no compile-time errors (i.e., it will compile properly):

```
int i = (int)(Math.random() * 10);
if ( i % 2 == 0 )
{
    String s = "Hello";
}
else
{
    String s = "Goodbye";
}
System.out.println( s );
```

   g. Any instance variable that is accessed directly by a `static` method like `main()` must itself be `static`.

   h. A `void` method ***must not*** have a `return` statement.

   i. Suppose `methodA()` returns an `int` value. The following is then legal code:

```
double num = methodA() * 2;
```

   j. Suppose `methodB()` returns a `double` value. The following is then legal code:

```
double num2 = (int)(methodB() * 2);
```

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

a. (2 pts.) How many times will these loops run (assuming they are in a correct program)?

(1)
```
int num = 5;
while ( num >= 0 )
{
    System.out.println( num );
    num--;
}
```

Answer: _____

(2)
```
for ( int i = 1; i <= 20; i = i * 2 )
    System.out.println( i );
```

Answer: _____

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

```
private int checkNums( int i, int j )
{
    if ( i < j )                    |    if ( j > i )
        return i;                   |        return i;
    else if ( i > j )               |    else
        return j;                   |        return j;
}
```

One version ***will not compile***; is it the one on the left, or right? _____
Explain why the version that does not compile fails; in addition, explain what the version that does compile actually computes:

_____

_____

_____

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

```
Helper help = new Helper();
String s = "Test";
int num = help.calculate( s, s.length() );
```

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

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

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

```
private char process( String str, int i  )
{
    if ( str.length() == 0 )
    {
        return '0';
    }
    else if ( str.length() <= i )
    {
        return str.charAt( str.length() - 1 );
    }
    else
    {
        return str.charAt( i );
    }
}
```

i. `process( "Dogs", 0 );` _____

ii. `process( "Dogs", 3 );` _____

iii. `process( "Dogs", 4 );` _____

iv. `process( "Dogs", 5 );` _____

v. `process( "", 1 );` _____

b. (5 pts.) Write out what is printed by the following method when ***both*** inputs are `4`.

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

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.println()` or `print()`) that looks like this:

```
1 * 2 * 3 * 4 * 5 = 120
2 * 3 * 4 * 5 * 6 = 720
3 * 4 * 5 * 6 * 7 = 2520
4 * 5 * 6 * 7 * 8 = 6720
5 * 6 * 7 * 8 * 9 = 15120
```

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 products that are displayed, as well as using them to produce the printed output.

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









    }
}
```

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

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

a. Write the method `countVowels()` so that it works with the `main()` code as given:
   i. This method will take a `String` as input.
   ii. It will return the number of vowels (a, e, i, o, u) in the input.

b. Write the method `countChar()` so that it works with the `main()` code as given:
   i. This method will take a `String` and a single character as input.
   ii. It will return a count of the number of times the character occurs in the `String`.

c. Write the method `removeChar()` so that it works with the `main()` code as given:
   i. This method will take in a `String` and a single character as input.
   ii. It will return a new `String` as output, which will be the result of removing every occurrence of the character from the original `String`.

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

```
Vowels in Everyone: 4
Vowels in Fzplxzyz: 0
#a in Dark Aardvarks: 3
#q in Banana Hammers: 0
Banana Hammers - a: Bnn Hmmers
hamhamhamhamham - m: hahahahaha
```

```
public class Main
{
   public static void main( String[] args )
   {
      Main m = new Main();
      System.out.println("Vowels in Everyone: " + m.countVowels("Everyone"));
      System.out.println("Vowels in Fzplxzyz: " + m.countVowels("Fzplxzyz"));
      System.out.println("#a in Dark Aardvarks: " + m.countChar("Dark Aardvarks", 'a'));
      System.out.println("#q in Banana Hammers: " + m.countChar("Banana Hammers", 'q'));
      System.out.println("Banana Hammers - a: " + m.removeChar("Banana Hammers", 'a'));
      System.out.println("hamhamhamhamham - m: " + m.removeChar("hamhamhamhamham", 'm'));
   }
}
```

```
\\ Complete code for methods here (Question 5)

}
```