UNIVERSITY OF WISCONSIN-LA CROSSE
Department of Computer Science

CS 120	Software Design I	Spring 2018
Midterm Exam 01		26 February 2018

- **Do not turn the page until instructed to do so.**
- **This booklet contains 10 pages including the cover page.**
- **This is a closed-book exam. All you need is the exam and a writing utensil. (You may use a calculator if you wish.)**
- **You have exactly 55 minutes.**
- **The maximum possible score is 50.**

PROBLEM	SCORE
1	
2	
3	
4	
5	
6	
TOTAL	

NAME: ____

1. **(8 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. If the left-hand target of an assignment statement is a variable of `double` type, then the expression on the right-hand side will always be evaluated using `double` arithmetic.

b. The following two lines of code produce the same result:

```
String str = 1 + 2 + "3";
String str = (1 + 2) + "3";
```

c. The following two lines of code produce the same result:

```
String str = 1 + 2 + "3";
String str = "1" + 2 + 3;
```

d. When doing arithmetic in Java, cast operations have ***higher*** precedence than the additive operators (`+`, `-`), but ***lower*** precedence than the multiplicative ones (`*`, `/`).

e. The following line of code will not compile, due to an error:

```
int x = 3 / 4;
```

f. The following line of code will not compile, due to an error:

```
double x = 3 / 4;
```

g. The following line of code will not compile, due to an error:

```
String x = 3 / 4;
```

h. The following will always print some result, ***no matter what*** value integer `x` has, assuming that it has some non-negative value (`x >= 0`):

```
if( x % 2 == 0 ) {
    System.out.println( "First" );
}
else if ( x % 2 == 1 ) {
    System.out.println( "Second" );
}
```

2. **(8 pts.)** **SHORT ANSWER.**

Circle the appropriate answer and fill in the blanks where required.

a. (*4 pts.*) An assignment like the following:

```
int x = (int) 7 / 2.0;
```

(WILL / WON'T) compile properly, because ______________________________

____.

____.

An assignment like the following:

```
int x = (int)( 7 / 2.0 );
```

(WILL / WON'T) compile properly, because ______________________________

____.

____.

b. (*4 pts.*) Consider the following method description, from the `String` class:

```
public char charAt( int i )
```

This is a **(VOID / NON-VOID)** method, and returns a ______________________.

To avoid runtime exceptions, input `i` must be a numerical value between ____________

and ____, inclusive.

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

For each of the following, give the value of the variable `x` after each line executes. If the line produces an error, then write `ERROR`. If the variable can have different values (as when using a random number generator), then indicate those values by writing, e.g., `1 <= x <= 5`.

a. `int x = 20 - 3 * 3 / 2;`

b. `int x = (int)( 20 - 3 * 3 / 2.0  );`

c. `int x = 20 - 3 * (int)( 3 / 2.0 );`

d. `int x = 20 - 3 * 3 / (int) 2.0;`

e. `double x = 10 + 5 / 2;`

f. `double x = 10 + 5 / 2.0;`

g.
```
String s = "Pancakes!";
String x = s.substring( 2, 5 );
```

h. `int x = (int)( Math.random() * 20 + 1 );`

i. `int x = (int) Math.random() * 5 + 10;`

j. `boolean x = ( 9 / 2 ) == ( 8 / 2 );`

4. **(4 pts.) CODE EVALUATION (II).**

Consider the following code:

```
String s1 = "This";
String s2 = "Is";
String s3 = "A";
String s4 = "Test";

s4 = s3;
s3 = s2;
s2 = s1;
s1 = s4;
```

a. The first four lines of code above create 4 distinct `String` objects in memory. When the code is complete, one of those objects have been orphaned. Write down the line of code that causes this to happen, and write down the `String` literal that is orphaned by it.

b. Circle any method call below that would produce the result `true`, if executed ***after all*** of the code given in the question is complete. Remember that the `equals()` method returns `true` if and only if both the `String` that is calling the method and the input `String` are the same, character for character:

(i) `s4.equals( s3 )`

(ii) `s3.equals( s2 )`

(iii) `s2.equals( s1 )`

(iv) `s1.equals( s4 )`

5. **(10 pts.)** **CODE COMPLETION (I).**

On the next page, fill in the class given so that it contains a `main()` method that:

a. Generates two random integer values between `1` and `5`, inclusive.

b. Uses `System.out` to ask the user for the product of those two numbers, and reads in their answer from `System.in`, using a `Scanner`.

c. Tells the user if their answer was correct, too high, or too low, while also showing the correct result whenever the answer given was incorrect. (See below for expected format.)

d. Tells the user that they have given an improper response if they enter something that is not in proper integer format, like a floating-point number or text string.

Thus, five different runs of the program—the first three with integer input, and the others with non-integer input—could be as follows:

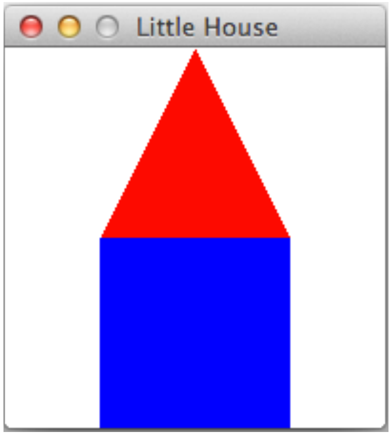
```
What is (1 * 1) ?
Answer: 1
That is correct!

What is (2 * 2) ?
Answer: 2
That is too low (correct answer: 4).

What is (1 * 2) ?
Answer: 4
That is too high (correct answer: 2).

What is (5 * 5) ?
Answer: 25.0
Sorry, that is an improper response.

What is (1 * 2) ?
Answer: I like turtles!
Sorry, that is an improper response.
```

Note: in the above sample runs, all the user is entering is the number or text following the colon (`:`), not the colon, nor the word "`Answer`" itself.

```
// write the code for Question 5 here
import java.util.Scanner;

public class Q5
{
















}
```

6. **(10 pts.)** **CODE COMPLETION (II).**

On the next page, complete the class given so that it creates something like the following image when run (although this is printed in black and white, here we are seeing a red triangle on top of a blue square).



a. Set the size of the window at random, so it is a square of side-length L, with $200 \leq L \leq 500$.

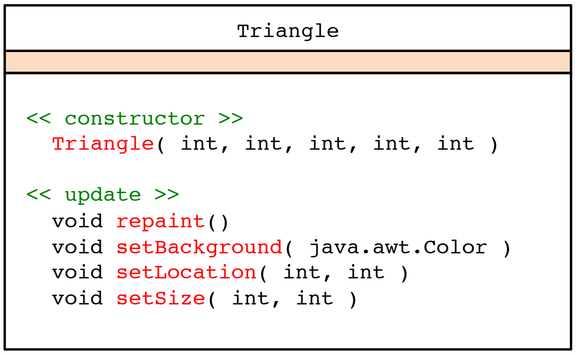
b. Create two objects, a `Rectangle` and a `Triangle`; each should have a side-length that is ***one half*** that of the size of the window; i.e., if the window itself is of size (300×300), then each of the two shapes should be of size (150×150). They should be arranged so that they are centered horizontally in the window; in addition, the square should be placed at the bottom of the window, with the triangle directly on top of the square.

c. Choose a random color combination for the two objects. Each should be either blue or red, and each of the four possible combinations (both blue, both red, or one of each color) should occur with equal probability on any given run of the program.

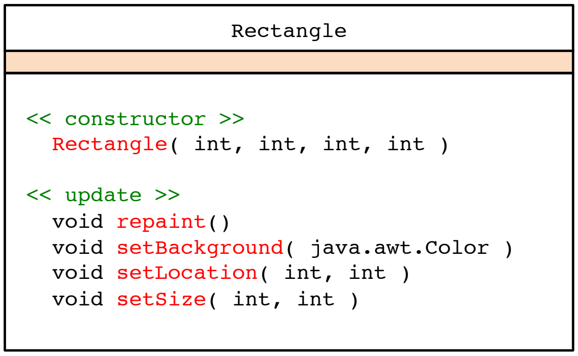
Note 1: Class diagrams for required graphical classes appear on the last page of the exam.

Note 2: The last input to the `Triangle()` constructor gives its orientation: if this number is `1`, then it will point upwards, and for any other value it will point downwards.

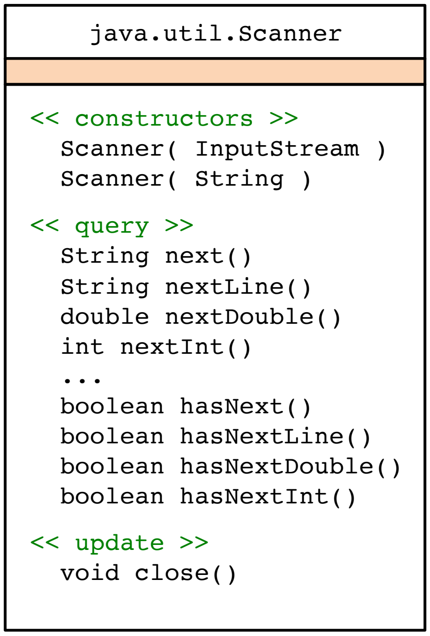
```
// Write the code for Question 6 here.
import java.awt.Color;

public class Q6
{
    public static void main( String[] args )
    {
        Window win = new Window();
        win.setTitle( "Little House" );
        win.setBackground( Color.white );





    }
}
```



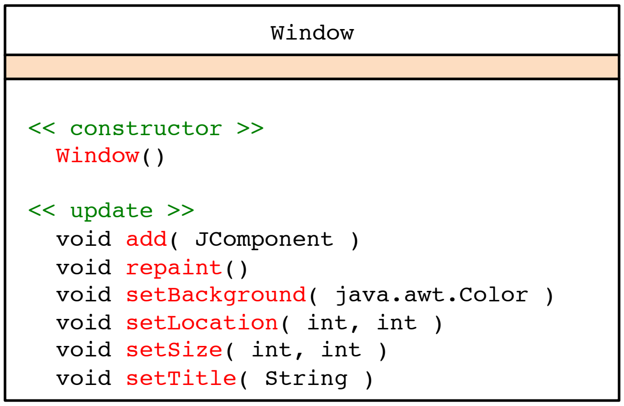
```
Triangle

<< constructor >>
  Triangle( int, int, int, int, int )

<< update >>
  void repaint()
  void setBackground( java.awt.Color )
  void setLocation( int, int )
  void setSize( int, int )
```



```
Rectangle

<< constructor >>
  Rectangle( int, int, int, int )

<< update >>
  void repaint()
  void setBackground( java.awt.Color )
  void setLocation( int, int )
  void setSize( int, int )
```



```
java.util.Scanner

<< constructors >>
  Scanner( InputStream )
  Scanner( String )

<< query >>
  String next()
  String nextLine()
  double nextDouble()
  int nextInt()
  ...
  boolean hasNext()
  boolean hasNextLine()
  boolean hasNextDouble()
  boolean hasNextInt()

<< update >>
  void close()
```



```
Window

<< constructor >>
  Window()

<< update >>
  void add( JComponent )
  void repaint()
  void setBackground( java.awt.Color )
  void setLocation( int, int )
  void setSize( int, int )
  void setTitle( String )
```