

Show all of your work clearly in the space provided or on the additional page at the end of the exam. If the additional page is used, clearly identify to which exam question it is related. Be sure to **read each problem carefully**. Note that the exam is double sided.

1. (15 points) True/False (**T** or **F**)

- _____ A `private` attribute is accessible to all methods defined within the class.
- _____ A `static` attribute can only be assigned a value once.
- _____ The Java Virtual Machine has a garbage collector that looks for incorrect values in the program that is running.
- _____ A variable that is declared within a method declaration is a *local variable*.
- _____ Local variables declared in a constructor are accessible from all other methods in the class.
- _____ Local variables declared in a constructor only are accessible from other constructors in the class.
- _____ A constructor may call another constructor.
- _____ A local variable with the same name as a class attribute will hide the attribute within the scope of the local variable.
- _____ Declaring an attribute as a `singleton` indicates that only a single instance exists for all objects from the class.

2. (10 points) Assign the format string an appropriate value so that the code below produces the following result:

```
12345678901234
 003.1416      1
 700.6411     301
```

```
String format = -----
System.out.println("12345678901234");
System.out.printf(format, Math.PI, 1);
System.out.printf(format, 700.641111, 301);
```

3. (20 points) Complete the program below so that the following is true:

- If the user selects cancel (then `null` is returned from the call to `showInputDialog()`), then the program terminates immediately.
- If the user does not enter anything or enters a negative integer, the program displays an error message and repeats the input prompt.
- If the user enters a non-negative integer, the program must display “Your age is: ” followed by the age entered by the user. E.g., “Your age is: 18”.
- Your program is allowed to crash if the user enters a non-integer value.

```
public static void main(String [] args) {  
    int age = -1;  
    String input = null;
```

```
    input = JOptionPane.showInputDialog("Enter your age");
```

4. A handout contains documentation for a class. Carefully study the documentation and answer the following questions:

(a) (15 points) Draw the complete UML class diagram for the class described in the appendix.

(b) (10 points) Implement the zoom method.



(c) (10 points) Implement the `getPerimeter` method.

(d) (20 points) Implement the `swap` method.