Name: _____

Term Test 1 A (15W)

Instructions (Read These):

- **Starting the test before permission has been given will result in an immediate zero. Everyone starts at the same time once everyone is seated.**
- **Turn mobile phones / mobile devices off**
- **Remove all papers, books, laptops etc. from the desks**
- **Using any electronic device – laptop, mobile phone, PDA, calculator during the test will result in immediate zero**
- **Strictly no talking for any reason during the test or you get zero, unless to ask the professor a question If you complete your test early, do not talk to friends who are still taking the test.**
- **Write your name at the top of the test document on page 1 and at the end for part 2, as well as on the Multiple Choice Answer Sheet.**
- **Assume code samples shown will run / compile as part of a larger code listing, unless there is an option provided "does not compile" or similar for a possible answer**
- **All questions are within the context of Java, and computer programming**
- **If you see what you think may be a mistake raise your hand and ask quietly when I reach you**
- **Please do not leave the room during the first 30 minutes of the test.**
- **All test materials must be returned at the end of the test**

Additional Notes:

(**No Calculators allowed)**

The test is in two parts, Part 1 is multiple-choice questions, and Part 2 is short answer.

Place your answers for Part 1 onto the provided answer sheet, only the answer sheet will be used for grading Part 1

Note: Make sure your handwriting is readable; I suggest using upper case letters ensuring that D looks different from B.

Place your answers for Part 2 into the spaces provided. If you need more room clearly note that your answer is continued on extra paper, and on the extra paper clearly indicate what question you are continuing.

There is an extra blank page at the end of the test you can detach to use as scrap paper, remember to return all sheets at the end of the test, including scrap paper.

Ensure that your name is on all parts of the test:

- Multiple Choice answer sheet
- The test (this document)
- Any extra sheets you detach

Total Test Time will be 1hour

Part 1 Multiple Choice: Each question is worth 3 points; there is only one correct answer per question.

1. Which programming language combines data and functions that operate on the data into a single unit?
   a) Object Oriented Programming
   b) Procedural Programming
   c) Functional Programming

2. The _____ states: Each component of a system should have sufficient rights and privileges to accomplish its designated task, but no additional rights or privileges.
   a) Principle of Least Privilege
   b) Open/Closed Principle
   c) Principle of Least Astonishment

3. Given the code sample below, what command line command will compile the class and create the needed folders on the hard drive as well?

```
package network;
public class ShannonsTheorem{ }
```

   a) javac ShannonsTheorem.java
   b) javac -package ShannonsTheorem.java
   c) javac -d . ShannonsTheorem.java

4. _____ are core solutions to common problems.
   a) Design patterns
   b) Inheritance
   c) Principles

5. Which of the following design patterns ensures that only one instance of a class is made?
   a) Builder Design Pattern
   b) Delegate Design Pattern
   c) Singleton Design Pattern

6. Which of the following is not one of the 3 steps used in implementing a Singleton Design Pattern?
   a) public static final field variable to refer to one instance of the object
   b) private constructor
   c) public static read-only property to grant access to the one instance of the object

7. You are designing a banking application and need different behaviours for the accounts, e.g. change from Savings to Chequing behaviour. One solution is to use the _____ design pattern to solve this problem.
   a) Composite (A)
   a) Delegate (B)
   b) Singleton (C)

8. Professional Java programmers follow _____ to help ensure their code is readable.
   a) Coding Conventions
   b) Compiler Requirements
   c) Proprietary Principle Practices (i.e. PPP)

9. A _____ method calls itself either directly or indirectly through another method. Termination of the method calls is controlled when a base case is reached.
   a) Overloaded
   b) Overridden
   c) Recursive

10. Given the code sample below, what is the program output?

```
public static int recurse(int n){
        if(n > 1){
                return n - recurse(n / 2);
        }
        else{
                return n;
        }
}
public static void main(String[] args){
        System.out.println(recurse(6));
}
```

   a) 3
   b) 4
   c) 5

11. Given the following code, what will be the output from the program from System.out.println(s1 == s2);

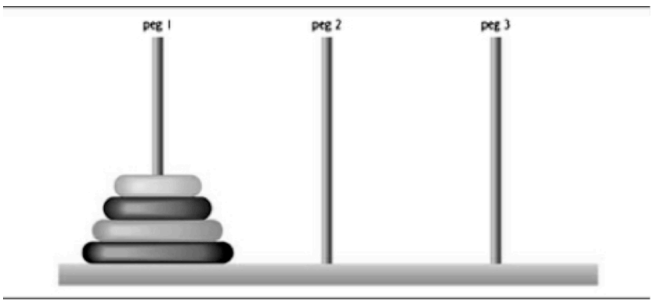
```
public static void main(String[] args){
        java.util.Scanner input = new java.util.Scanner(System.in);
        String s1 = "abc";
        System.out.print("Enter: abc");
        String s2 = input.nextLine(); // assume user will enter abc
        s2 = s2.intern();
        System.out.println(s1 == s2); // what is output from this line?
}
```

   a) false
   b) true
   c) "abc == abc"

12. The following figure came from your textbook; it depicts a classic recursion problem computer scientists struggle with to understand. What is the name of this classic puzzle?

   a) Disks and Sticks
   b) Towers of Hanoi
   c) Slides and Ladders

Reference: Deitel, Paul, Harvey Deitel. *CST8110 Java How to Program (early objects) 9e, 9th Edition*. Pearson Learning Solutions, 02/2011. VitalBook file.



13. Select the sequence of Big-O's from best case to worse case moving from left (best) to worse (right).
   a) O(1), O(log n), O(n), O(n log n), O(n^2)
   b) O(log n), O(1), O(n log n), O(n), O(n^2)
   c) O(n^2), O(n log n), O(n), O(log n), O(1)

14. What is the Big-O for a typical merge sort algorithm?
    a) O(1)
    b) $O(n^2)$
    c) O(n log n)

15. Which Java Collections API class, from the three below, has a lookup Big-O of O(1)?
    a) ArrayList
    b) TreeSet
    c) HashSet

16. Which of the following is not a Container class in Java Swing?
    a) JFrame
    b) JPanel
    c) JLabel

17. What is the default layout manager of a JFrame?
    a) BorderLayout
    b) GridLayout
    c) FlowLayout

18. When a Java class implements the interface java.util.Observer what is the one method that needs to be overridden?
    a) acceptNotification(Observable o, Object args)
    b) update(Observable o, Object args)
    c) actionUpdateListener(Observable wasUpdated)

19. When inheriting code from java.lang.Observable before calling method notifyObservers() it is important to call method _____ first.
    a) hasChanged()
    b) setChanged()
    c) clearChanged()

20. In the MVC design pattern what part stores and manipulates the data?
    a) View
    b) Controller
    c) Model

21. Part 2 Short Answer Questions (40%): Complete all questions. Each question is 8 points.

Question 1: [8 Points]

- Given the starter code below, refactor it so the class implements a Singleton Design Pattern. (i.e. add two things and make something private)

```
import javax.swing.*;
import java.awt.*;
public class PersonDetails extends JFrame{
	private JLabel personJLabel = new JLabel();

	private static final PersonDetails instance = new PersonDetails();


	private
	~~public~~ PersonDetails(){
		this.setDefaultCloseOperation(JFrame.HIDE_ON_CLOSE);
		this.add(personJLabel, BorderLayout.CENTER);
		this.setSize(300, 200);
		this.setVisible(true);
	}

	public static PersonDetails getInstance(){ return instance; }



}
```

Question 2: [8 Points]

- You are working on a class Person that has three fields: firstName, lastName, and age. (String, String, int)
- Write an overridden toString() method that uses a StringBuilder to generate and return a String similar to: [firstTest, lastTest, 39] where "firstTest", "lastTest", and 39 were values contained in the respective fields.

```
public class Person {
	private String firstName;
	private String lastName;
	private int age;
	public Person(){
		firstName = "firstTest";
		lastName = "lastTest";
		age = 39;
	}
	public String getFirstName(){ return firstName; }
	public void setFirstName(String firstName){
		this.firstName = firstName;
	}
	public String getLastName(){ return lastName; }
	public void setLastName(String lastName){
		this.lastName = lastName;
	}
	public int getAge(){ return age; }
	public void setAge(int age){
		this.age = age;
	}
	/* Your toString() goes here: */

	@Override
	public String toString(){
		StringBuilder builder = new StringBuilder();
		builder.append("[").append(firstName).append(", ")
			.append(lastName).append(", ")
			.append(age).append("]");
		return builder.toString();
	}
```

}

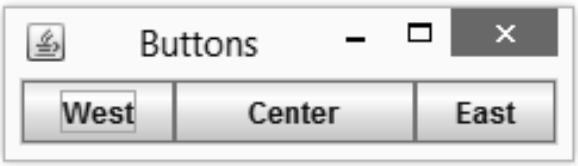
Question 3: [8 Points]

- Given the JUnit4 starter code below complete the code needed to test the Accessor and Mutator for Bandwidth in class ShannonsModel (both in the same test method).
- Use a Phone line bandwidth of 3000.0D hertz as well as a Delta of 0.01 for the test.

```
package networktest;
import network.ShannonsModel;
import static org.junit.Assert.*;
import org.junit.After;
import org.junit.AfterClass;
import org.junit.Before;
import org.junit.BeforeClass;
import org.junit.Test;
public class ShannonsModelTest {
	private ShannonsModel model;
	@Before
	public void setUp() throws Exception {
		model = new ShannonsModel();
	}
	@After
	public void tearDown() throws Exception {
		model = null;
	}
	@Test
	public void testThatBandwidthAccessorAndMutatorWorks(){
		/* Your code here */
		double bandwidth = 3000.0D
		double delta = 0.01D
		model.setBandwidth(bandwidth);
		assertEquals(
			"get or set Bandwidth test failed",
			bandwidth,
			model.getBandwidth(),
			delta);
	}
}
```

Question 4: [8 points]

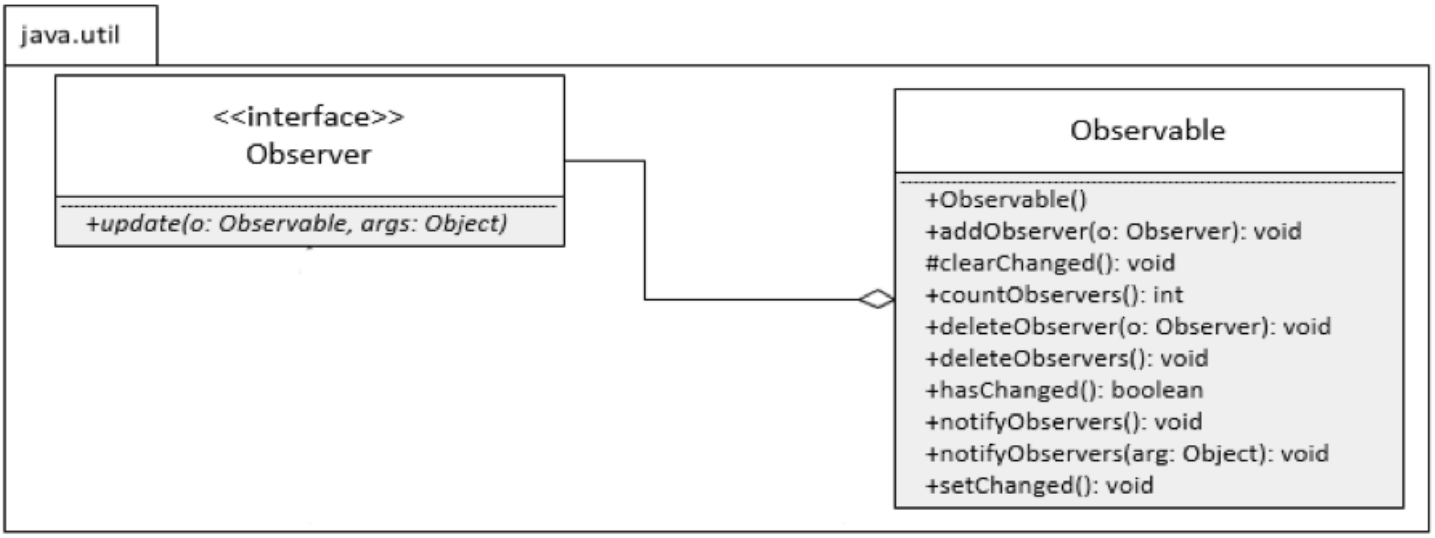
- Using the starter code below add three JButtons to the JFrame to get a similar layout as shown in the screen shot.
- Use the default layout manager for JFrame.




```
import java.awt.BorderLayout;
import javax.swing.JButton;
import javax.swing.JFrame;
public class ButtonsJFrame extends JFrame {
	private JButton oneJButton;
	private JButton twoJButton;
	private JButton threeJButton;
	public ButtonsJFrame(){
		super("Buttons");
		this.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

		configureButtons();

		this.pack();
		this.setVisible(true);
	}

	private void configureButtons(){
		/* Your Code Here */
		oneJButton = new JButton("West");
		twoJButton = new JButton("Center");
		threeJButton = new JButton("East");
		this.add(oneJButton, BorderLayout.WEST);
		this.add(twoJButton, BorderLayout.CENTER);
		this.add(threeJButton, BorderLayout.EAST);
	}









}
```

Question 5: [8 points] in two parts 4 points each

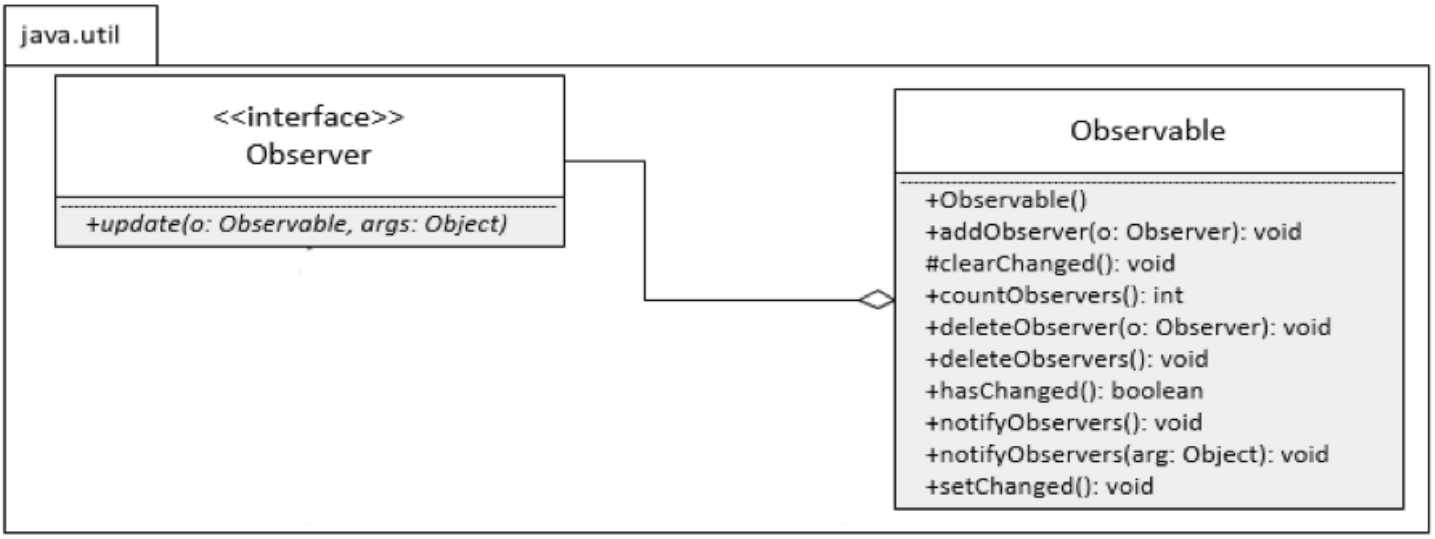
- Part 1:
- Using the UML Diagram provided as a reference Write the code for:
- a class named PersonSubject (extends java.util.Observable)
    - add one field firstName with a get and set method and notify any observers that the firstName changed when setFirstName(String firstName) is called.
    - Tip: There is no need to write a constructor for this class in the test.




```
import java.util.Observable;
public class PersonSubject extends Observable {
	private String firstName;
	public String getFirstName(){return firstName;}
	public void setFirstName(String firstName){
		this.firstName = firstName;
		setChanged();
		notifyObservers();
	}
}
```

Question 5: [8 points] in two parts 4 points each

- Part 2:
- Using the UML Diagram provided as a reference Write the code for:
- a class named PersonObserver (implements java.util.Observer)
- Override method update and print out the first name from the PersonSubject (System.out…)




```
import java.util.Observable;
import java.util.Observer;
public class PersonObserver implements Observer {
	@Override
	public void update(Observable o, Object arg) {
		if(o instanceof PersonSubject){
			PersonSubject person = (PersonSubject)o;
			System.out.println(person.getFirstName());
		}
	}
}
```

Scrap Paper: Name _____

CST8288 15W Multiple Choice Question Answer Sheet: Term Test 1 A

Note: Question numbers are vertical down the page

Full Name: _____

Question Number	Letter Answer
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Question Number	Letter Answer
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	