1. Lab Objective: After this lab, the student should be able to:

- Declare a new class
- Write a constructor
- Write instance methods that return a value
- Write instance methods that take arguments
- Instantiate an object
- Use calls to instance methods to access and change the state of an object

2. Part A

In this part we want to model a television set using the concept of objects. First we need to construct a class which will be used to create instances (objects) each modeling a TV set. Most manufacturers fabricate their TV sets with the same basic elements and the same options. Therefore, you will use few basic elements that are common to all televisions. In general, a television has a brand name (i.e. it is made by a specific manufacturer). The television screen has a specific size. It has some basic controls. There is a control to turn the power on and off. There is a control to change the channel. There is also a control for the volume level and one to mute it. At a given time, the television's state can be described by how these controls are set.

You will define the television class, so that each object that is created from this class must gather the following attributes:

- **manufacturer**. The **manufacturer** attribute will hold the brand name. This cannot change once the television is created.
- **screenSize.** The **screenSize** attribute will hold the size in inches of the television screen. This also cannot change once the television has been created.
- **powerOn.** The **powerOn** attribute will hold the value true if the power is on, and false if the power is off.
- **muteOn.** The **muteOn** attribute will hold the value true if the volume level is not zero and false otherwise.
- **channel.** The **channel** attribute will hold the value of the station that the television is showing. Assume that one among a maximum of 500 stations can be selected. − **volume.** The **volume** attribute will hold a number value representing the loudness (0 being no sound). Assume that the maximum volume level is 100.

The television object will also be able to control the state of its attributes. So the following methods should be implemented.

- **setChannel.** The **setChanne**l method will store the desired station in the **channel** field.
- **togglePowerOnOff.** The **togglePowerOnOff** method will toggle the power between on and off, changing the value stored in the **powerOn** field from true to false or from false to true.
- **toggleMuteOnOff:** The **toggleMuteOnOff** reduces the volume level to 0 or if already at zero, sets it to its previously selected value.
- **increaseVolume.** The **increaseVolume** method will increase the value stored in the **volume** field by 1.

- **decreaseVolume.** The **decreaseVolume** method will decrease the value stored in the

volume field by 1.

- **getChannel.** The **getChannel** method will return the value stored in the **channel** field.
- **getVolume.** The **getVolume** method will return the value stored in the **volume** field. − **getManufacturer.** The **getManufacturer** method will return the value stored in the **manufacturer** field.
- **getScreenSize.** The **getScreenSize** method will return the value stored in the **screenSize** field.

You will also need a constructor method that will be used to create an instance of a Television.

2.1. Implementation of the Television class.
Implement in a new project the **Television** class as described above.

- You should decide on which of the data fields and which of the methods must be static.
- Put a program header (comments/documentation) at the top of the class file as:

```
// The purpose of this class is to model a
television // Your name and today's date
```

- Write a comment for each field indicating what it represents.
- Write comments describing the purpose of each method above the method header. − Inside the constructor, assign the values taken from the parameters to the corresponding fields. Initialize the **powerOn** field to false (power is off), the **muteOn** field to false, the **volume** to 20, and the **channel** to 2.

2.2. Compile and debug your class.
Create a TestTv class for testing your **Television** class. In the main method, make two instances of **Television** class call them respectively tv1and tv2. tv1 models a Thomson 55 inch television and tv2 models a LG 62 inch television. Change the state of the created object as follows :

```
tv2
:

tv1 : Television

manufacturer =
Thomson screenSize =
55
powerOn = true
muteOn = false
channel = 56
volume = 21

Televisionmanufacture
r = LG screenSize = 62
powerOn = true muteOn
= false channel = 7
volume = 18
```

Print the state of each object to check that the changes effectively occurred.

3.3. To test your class in a program, add a main method which produces the outputs shown in the 3 scenarios below.

- The user inputs are represented in bold underlined characters.
- Notice that a part of the same code is repeated and you should use a method to avoid this repetition.

Scenario 1

```
Television Demo
***************
Enter the brand Name : Toshiba
Enter the size (inch) : 55
Your TV is off would you like to turn it on? (Y/N):Y

Here is the state of your TV now:
*******************************************************
* manufacturer : Toshiba
screen Size : 55
it is powered on
mute : No
channel : 2
volume : 20
********************************************************

Enter the desired channel number : 3
Enter the desired volume level : 60

Here is the state of your TV now:
*******************************************************
* manufacturer : Toshiba
screen Size : 55
it is powered on
mute : No
channel : 3
volume : 60
*******************************************************

* Too loud!! I am lowering the volume.

Here is the state of your TV now:
********************************************************
```

```
manufacturer : Toshiba
screen Size : 55
it is powered on
mute : No
channel : 3
volume : 21
*******************************************************

* The phone is ringing!! I am muting your TV.

Here is the state of your TV now:
*******************************************************
* manufacturer : Toshiba
screen Size : 55
it is powered on
mute : Yes
channel : 3
volume : 21
*******************************************************

* Welcome back, I am resuming your sound level.

Here is the state of your TV now:
*******************************************************
* manufacturer : Toshiba
screen Size : 55
it is powered on
mute : No
channel : 3
volume : 21
********************************************************

Watching time exceeded 2 hours, turn your TV off (Y/N):

Y Bye!
```

Scenario 2

```
Television Demo
***************
Enter the brand Name : Toshiba
Enter the size (inch) : 55
Your TV is off would you like to turn it on? (Y/N):Y

Here is the state of your TV now:
*******************************************************
* manufacturer : Toshiba
screen Size : 55
it is powered on
mute : No
channel : 2
volume : 20
********************************************************
```

```
Enter the desired channel number : 3
Enter the desired volume level : 5

Here is the state of your TV now:
*******************************************************
* manufacturer : Toshiba
screen Size : 55
it is powered on
mute : No
channel : 3
volume : 5
*******************************************************

* Too low!! I am raising the volume.

Here is the state of your TV now:
*******************************************************
* manufacturer : Toshiba
screen Size : 55
it is powered on
mute : No
channel : 3
volume : 11
*******************************************************

* The phone is ringing!! I am muting your TV.

Here is the state of your TV now:
*******************************************************
* manufacturer : Toshiba
screen Size : 55
it is powered on
mute : Yes
channel : 3
volume : 11
```

```
********************************************************

* Welcome back, I am resuming your sound level.

Here is the state of your TV now:
********************************************************
* manufacturer : Toshiba
screen Size : 55
it is powered on
mute : No
channel : 3
volume : 11
*********************************************************

Watching time exceeded 2 hours, turn your TV off (Y/N):

N OK, may be later!
```

Scenario 3

```
Television Demo
***************
Enter the brand Name : Toshiba
Enter the size (inch)  : 55
Your TV is off would you like to turn it on?

(Y/N):N OK, may be later!
```

3. Part B

In this part we want to build a class to perform complex arithmetic (addition, subtraction, multiplication, and division) programmatically. Further we want two extra methods to determine the magnitude and the phase of a complex number.

3.1. Implement the class and clearly each data field and each method(constructors, setters, getters …).

3.2. Add to your class a main method to test the implemented operations as shown in the scenario below.

```
Complex Arithmetic
******************

Enter the first complex number (RelPart, ImgPart) :1.0
-1.0 Enter the second complex number (RelPart,
ImgPart):-3.0 2.5

Select one Operation
********************

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Magnitude and phase
```

```
Your choice : 1

Answer : -2.0 + j 1.5
```