EE364 – Advanced Programming

LAB#2 Assignment

Student Name	ID	Section	Submission Date
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Part#1 keyboard simulator:

Keyboard.java

```
package LAB2;
import java.util.ArrayList;

public class Keyboard {
    private ArrayList<String> buttonCodeList;
    private ArrayList<String> buttonValueList;
    private String displayedText = "";

    public enum SpecialButtons{
        Space,
        Backspace,
        Enter
    }
    public Keyboard(ArrayList<String> s1, ArrayList<String> s2){
        buttonCodeList = s1;
        buttonValueList = s2;
        if(buttonCodeList.size() == 39){
            buttonValueList.add(0, ""+SpecialButtons.Space);
            buttonValueList.add(1, ""+SpecialButtons.Backspace);
            buttonValueList.add(2, ""+SpecialButtons.Enter);
        }else{
            buttonValueList.add(""+SpecialButtons.Space);
            buttonValueList.add(""+SpecialButtons.Backspace);
            buttonValueList.add(""+SpecialButtons.Enter);
        }

    }

    public int getButtonCodeIndex(String s){
        int index = buttonCodeList.indexOf(s);
        return index;
    }

    public void buttonPressed(String s){
```

```
        int index = getButtonCodeIndex(s);

        if(index != -1) {
             String value = getAllButtonsValue().get(index);
             if("Space".equals(value)){
                   space();
             }else if("Backspace".equals(getAllButtonsValue().get(index))){
                   backspace();
             }else if("Enter".equals(getAllButtonsValue().get(index))){

                   newLine();

               }else{
                    addToDisplayedText(value);
               }
        }
    }

    public void backspace(){
        int textLen = getDisplayedText().length();
       if(textLen > 0) {
             StringBuffer sb = new StringBuffer(getDisplayedText());
             sb.deleteCharAt(sb.length()-1);
             displayedText = sb.toString();
       }    }

    public void space(){
        addToDisplayedText(" ");
    }

    public void newLine(){
        addToDisplayedText("\n");
    }

    public ArrayList<String> getAllButtonsValue(){
        return buttonValueList;
    }

    public ArrayList<String> getAllButtonsCode(){
        return buttonCodeList;
    }

    public String getDisplayedText(){
        return displayedText;
    }

    public void addToDisplayedText(String s){
        displayedText += s;
    }
}
```

QWERTY.java

```
package LAB2;
import java.util.ArrayList;

public class QWERTY {
    private Keyboard mainKeyboardObj;
    private ArrayList<String> buttonValueList;
    private ArrayList<String> buttonCodeList;

    public QWERTY(){
            buttonCodeList = new ArrayList<String>(){{
            for(int x = 1; x <= 39; x++){
                add(""+x);
            }

        }};

        buttonValueList = new ArrayList<String>(){{
            add("a");
            add("b");
            add("c");
            add("d");
            add("e");
            add("f");
            add("g");
            add("h");
            add("i");
            add("j");
            add("k");
            add("l");
            add("m");
            add("n");
            add("o");
            add("p");
            add("q");
            add("r");
            add("s");
            add("t");
            add("u");
            add("v");
            add("w");
            add("x");
            add("y");
            add("z");
            for(int x = 0; x<=9; x++){
                add(""+x);
            }
        }};
```

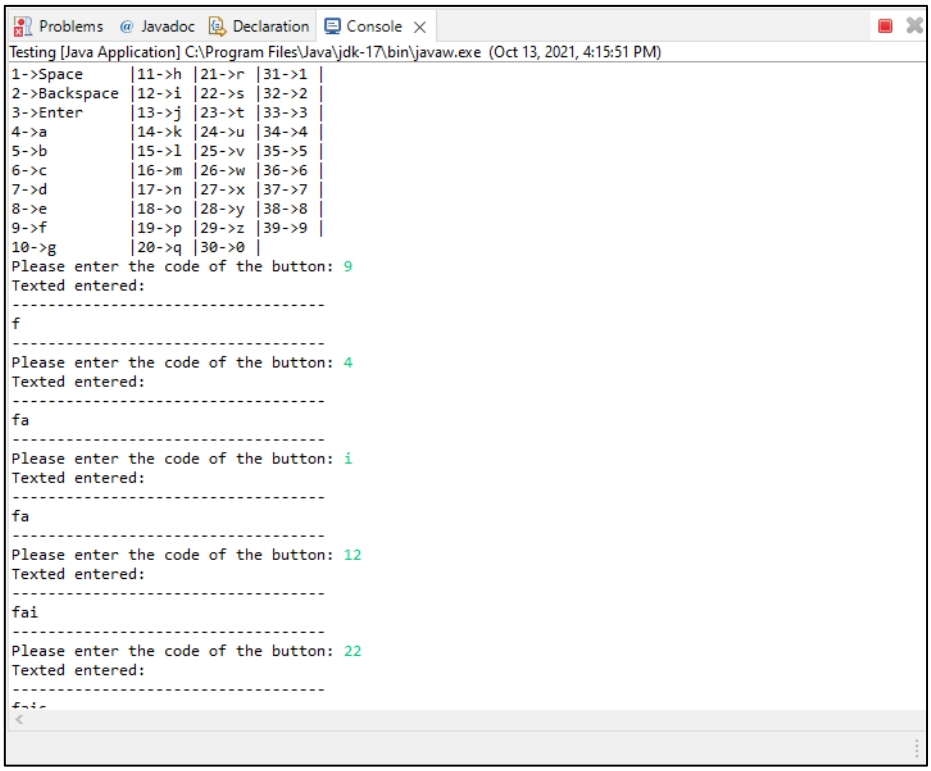
```
        mainKeyboardObj = new Keyboard(getAllButtonsCode(),
        getAllButtonsValue());
    }

    public void buttonPressed(String s){
        mainKeyboardObj.buttonPressed(s);
    }

    public String getDisplayedText(){
        return mainKeyboardObj.getDisplayedText();
    }

    public ArrayList<String> getAllButtonsValue(){
        return buttonValueList;
    }

    public ArrayList<String> getAllButtonsCode(){
        return buttonCodeList;
    }
}
```

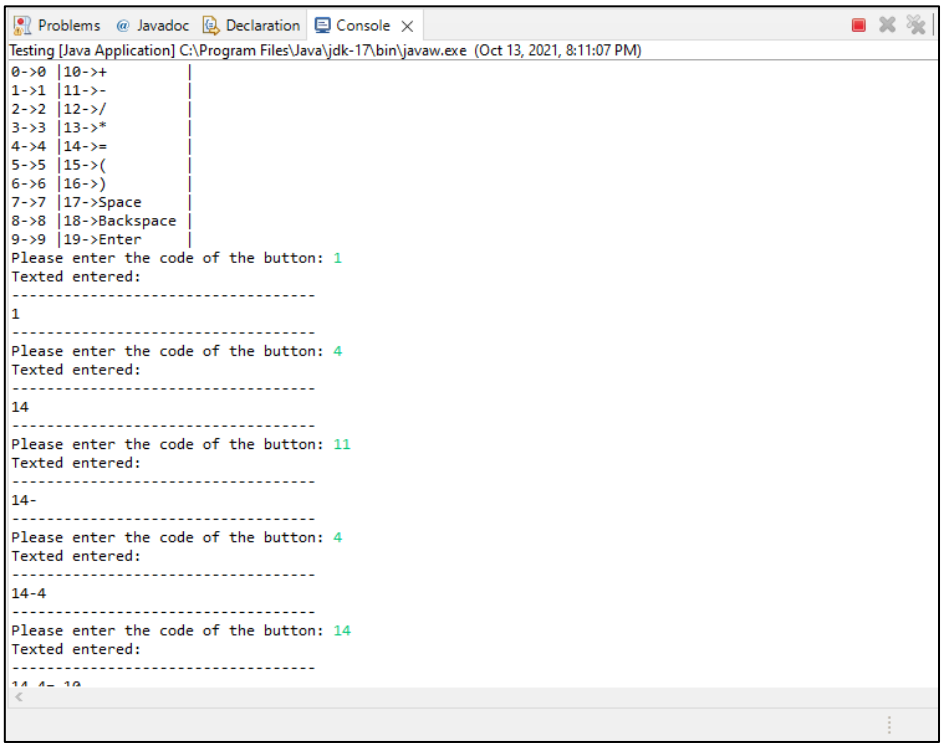
Calculator.java

```
package LAB2;
import java.util.ArrayList;

public class Calculator {
    private Keyboard mainKeyboardObj;
    public ArrayList<String> buttonCodeList;
    public ArrayList<String> buttonValueList;

    public Calculator(){
        buttonCodeList = new ArrayList<String>(){{
            for(int x = 0; x <= 19; x++){
                add(""+x);
            }

        }};
        buttonValueList = new ArrayList<String>(){{
            for(int x = 0; x<=9; x++){
                add(""+x);
            }
            add("+");
            add("-");
            add("/");
            add("*");
            add("=");
            add("(");
            add(")");
        }};
```

```
        mainKeyboardObj = new Keyboard(getAllButtonsCode(),
        getAllButtonsValue());
    }

    public void buttonPressed(String s){
         int index = getButtonCodeIndex(s);
        if(index != -1) {
String value = mainKeyboardObj.getAllButtonsValue().get(index);
               if("=".equals(value)){
                String text = mainKeyboardObj.getDisplayedText().toString();
                    String[] arr = text.split("\n");
                    if(arr != null){
                        int result = EvaluateString.evaluate(arr[arr.length-
        1]);
                        mainKeyboardObj.addToDisplayedText("= " + result +
        "\n");
                    }
               }else{
                    mainKeyboardObj.buttonPressed(s);
               }
         }
    }
    public String getDisplayedText(){
        return mainKeyboardObj.getDisplayedText();
    }
    public ArrayList<String> getAllButtonsValue(){
        return buttonValueList;
    }
    public ArrayList<String> getAllButtonsCode(){
        return buttonCodeList;
    }
}
```

Screenshots of the output:





A txt file with full output is attached

Part#2 Using inheritance concept:

Keyboard.java

```
package LAB2;
import java.util.ArrayList;

public class Keyboard {
    public ArrayList<String> buttonCodeList;
    public ArrayList<String> buttonValueList;
    public String displayedText = "";

    public enum SpecialButtons{
        Space,
        Backspace,
        Enter
    }
    public int getButtonCodeIndex(String s){
        int index = buttonCodeList.indexOf(s);
        return index;
    }

    public void buttonPressed(String s){
        int index = getButtonCodeIndex(s);
        if(index != -1) {
            String value = getAllButtonsValue().get(index);
              if("Space".equals(value)){
                  space();
              }else
if("Backspace".equals(getAllButtonsValue().get(index))){
                  backspace();
              }else if("Enter".equals(getAllButtonsValue().get(index))){
                  newLine();
              }else{
                          addToDisplayedText(value);
              }
        }
    }

    public void backspace(){
       int textLen = getDisplayedText().length();
       if( textLen > 0) {
             StringBuffer sb = new StringBuffer(getDisplayedText());
             sb.deleteCharAt(sb.length()-1);
             displayedText = sb.toString();
       }
    }

    public void space(){
        addToDisplayedText(" ");
    }

    public void newLine(){
        addToDisplayedText("\n");
    }
```

```
    public ArrayList<String> getAllButtonsValue(){
        return buttonValueList;
    }

    public ArrayList<String> getAllButtonsCode(){
        return buttonCodeList;
    }

    public String getDisplayedText(){
        return displayedText;
    }

    public void addToDisplayedText(String s){
        displayedText += s;
    }
}
```

QWERTY.java

```
package LAB2;
import java.util.ArrayList;

public class QWERTY extends Keyboard {
    public QWERTY(){
        buttonCodeList = new ArrayList<String>(){{
            for(int x = 1; x <= 39; x++){
                add(""+x);
            }

        }};

        buttonValueList = new ArrayList<String>(){{
             add(""+SpecialButtons.Space);
             add(""+SpecialButtons.Backspace);
             add(""+SpecialButtons.Enter);
            add("a");
            add("b");
            add("c");
            add("d");
            add("e");
            add("f");
            add("g");
            add("h");
            add("i");
            add("j");
            add("k");
            add("l");
            add("m");
            add("n");
            add("o");
            add("p");
            add("q");
            add("r");
            add("s");
            add("t");
            add("u");
```

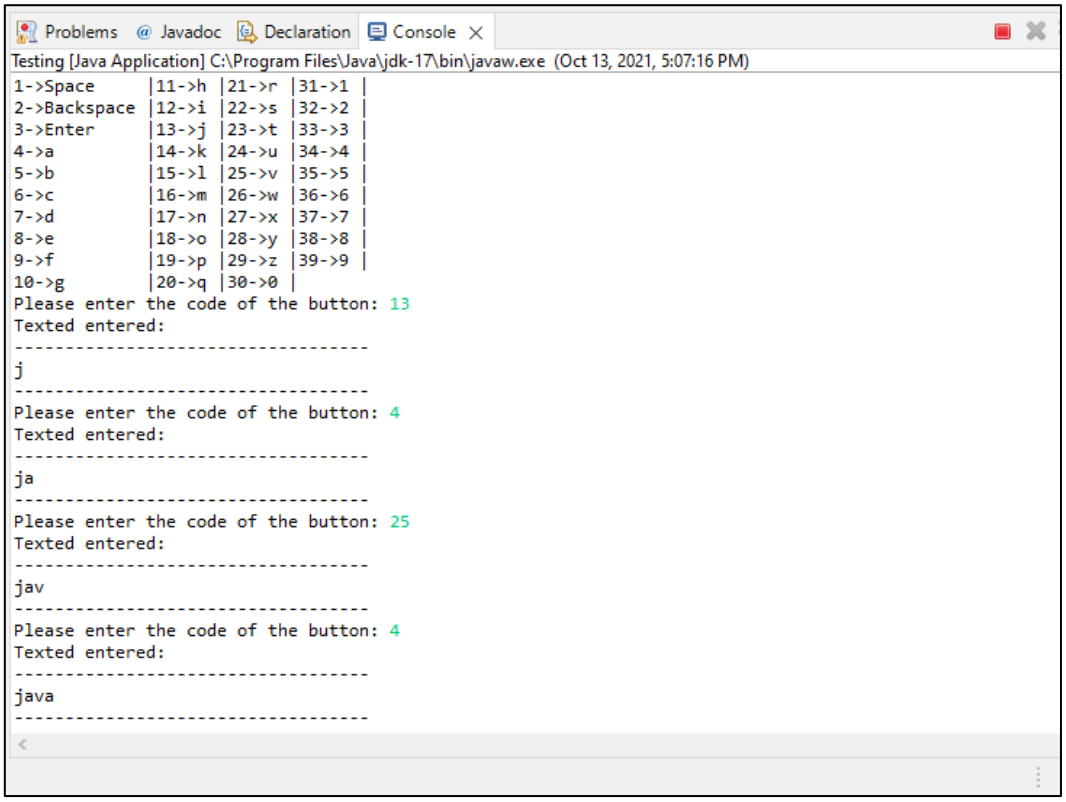
```
            add("v");
            add("w");
            add("x");
            add("y");
            add("z");
            for(int x = 0; x<=9; x++){
                add(""+x);
            }
        }};

    }



}
```

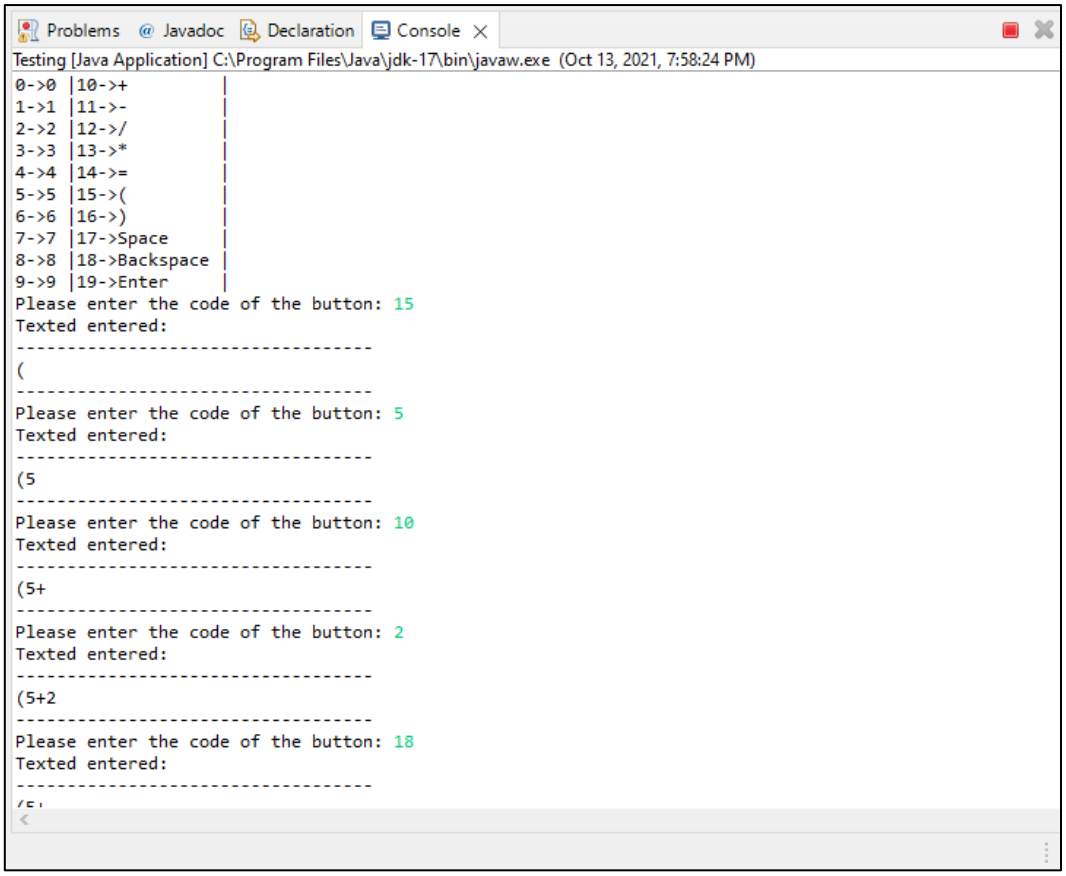
Calculator.java

```
package LAB2;
import java.util.ArrayList;
/**
 *
 * @author faisa
 */
public class Calculator extends Keyboard {

    public Calculator(){
        buttonCodeList = new ArrayList<String>(){{
            for(int x = 0; x <= 19; x++){
                add(""+x);
            }

        }};

        buttonValueList = new ArrayList<String>(){{
            for(int x = 0; x<=9; x++){
                add(""+x);
            }
            add("+");
            add("-");
            add("/");
            add("*");
            add("=");
            add("(");
            add(")");
            add(""+SpecialButtons.Space);
            add(""+SpecialButtons.Backspace);
            add(""+SpecialButtons.Enter);
        }};
    }

    public void buttonPressed(String s){
       int index = getButtonCodeIndex(s);
        if(index != -1) {
               String value = getAllButtonsValue().get(index);
               if("=".equals(value)){
                   String text = getDisplayedText().toString();
                   String[] arr = text.split("\n");
```

```
                    if(arr != null){
                        int result = EvaluateString.evaluate(arr[arr.length-
1]);
                        addToDisplayedText("= " + result + "\n");
                    }
                }else{
                    super.buttonPressed(s);
                }
            }
        }

}
```

Screenshots of the output:





A txt file with full output is attached

Part#3 What is the difference?

I think the main difference is that inheritance gives more flexibility to the code. In the first part we used the (mainKeyboardObj) instance to interact with the Keyboard class, but we had to write more lines of codes in both QWERTY and Calculator classes, while we could extend the methods directly from the super class with inheritance. The main reason for using inheritance is to make our code more organized and to follow the rules of OOP coding style. One of the examples that shows the power of inheritance is when a programmer uses an external framework or API that built by other developers for certain purposes. The API is constructed of multiple classes and available for the programmer to use. However, the programmer is not allowed to manipulate these classes but only to extend from these classes as he need. This will allow for more stability in the code. Another example is when you have a database modal, you can create a main class that deals with the functionality related to the database such as, creating tables, deleting tables,

inserting new rows, etc. so, these methods are available in the main modal class and can be extended by individual modals.