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Part#1 keyboard simulator:

Keyboard.java

Keyboard.java × QWERTY.java × Calculator.java × Testing.java ×

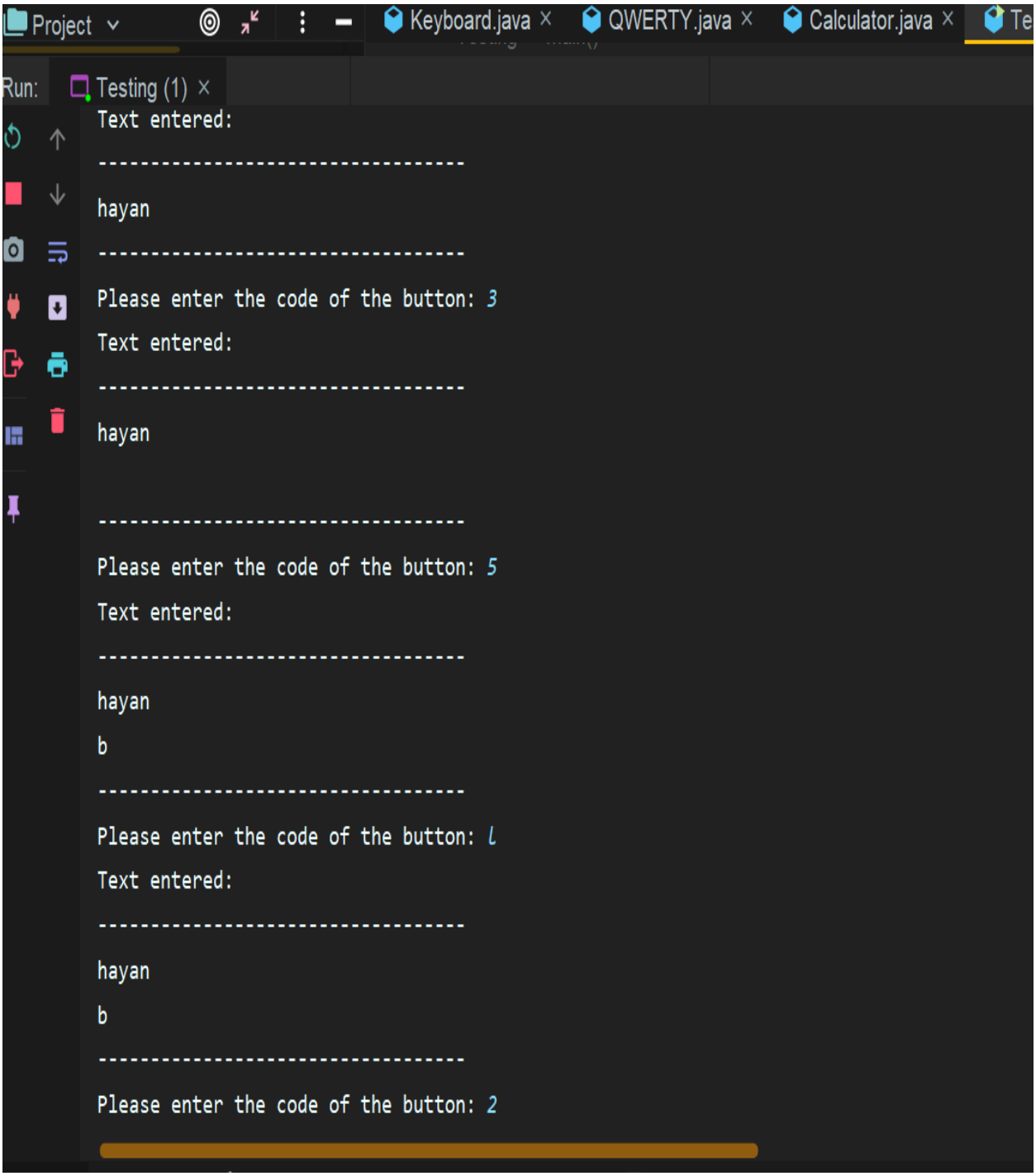
```java
package lab2;
import java.util.ArrayList;

public class Keyboard{

    private ArrayList<String> buttonCodeList;
    private ArrayList<String> buttonValueList;
    private String displayedText = "";

    public enum SpecialButtons{
        Space,
        Backspace,
        Enter
    }

    public Keyboard(ArrayList<String> codes, ArrayList<String> values){
        buttonCodeList = codes;
        buttonValueList = values;

        if(buttonCodeList.size() == 39){
            buttonValueList.add( index: 0,  element: "" + SpecialButtons.Space);
            buttonValueList.add( index: 1,  element: "" + SpecialButtons.Backspace);
            buttonValueList.add( index: 2,  element: "" + SpecialButtons.Enter);
        }
        else{
            buttonValueList.add("" + SpecialButtons.Space);
            buttonValueList.add("" + SpecialButtons.Backspace);
            buttonValueList.add("" + SpecialButtons.Enter);
        }
    }
```

```
    public int getButtonCodeIndex(String code) { return buttonCodeList.indexOf(code); }
    public void buttonPressed(String button) {
        int index = getButtonCodeIndex(button);
        if(index != -1) {
            String value = getAllButtonValue().get(index);
            if("Space".equals(value)) { space();
            }else if ("Backspace".equals(getAllButtonValue().get(index))){ backspace();
            }else if ("Enter".equals(getAllButtonValue().get(index))) { newLine();
            }else { addToDisplayedText(value); }
        }
    }
    public void backspace() { addToDisplayedText("\b"); }
    public void space() { addToDisplayedText(" "); }
    public void newLine() { addToDisplayedText("\n"); }
    public ArrayList<String> getAllButtonCode() { return buttonCodeList; }
    public ArrayList<String> getAllButtonValue() { return buttonValueList; }
    public String getDisplayedText() { return displayedText; }
    public void addToDisplayedText(String text) { displayedText += text; }
}
```

QWERTY.java

Keyboard.java × QWERTY.java × Calculator.java × Testing.java ×

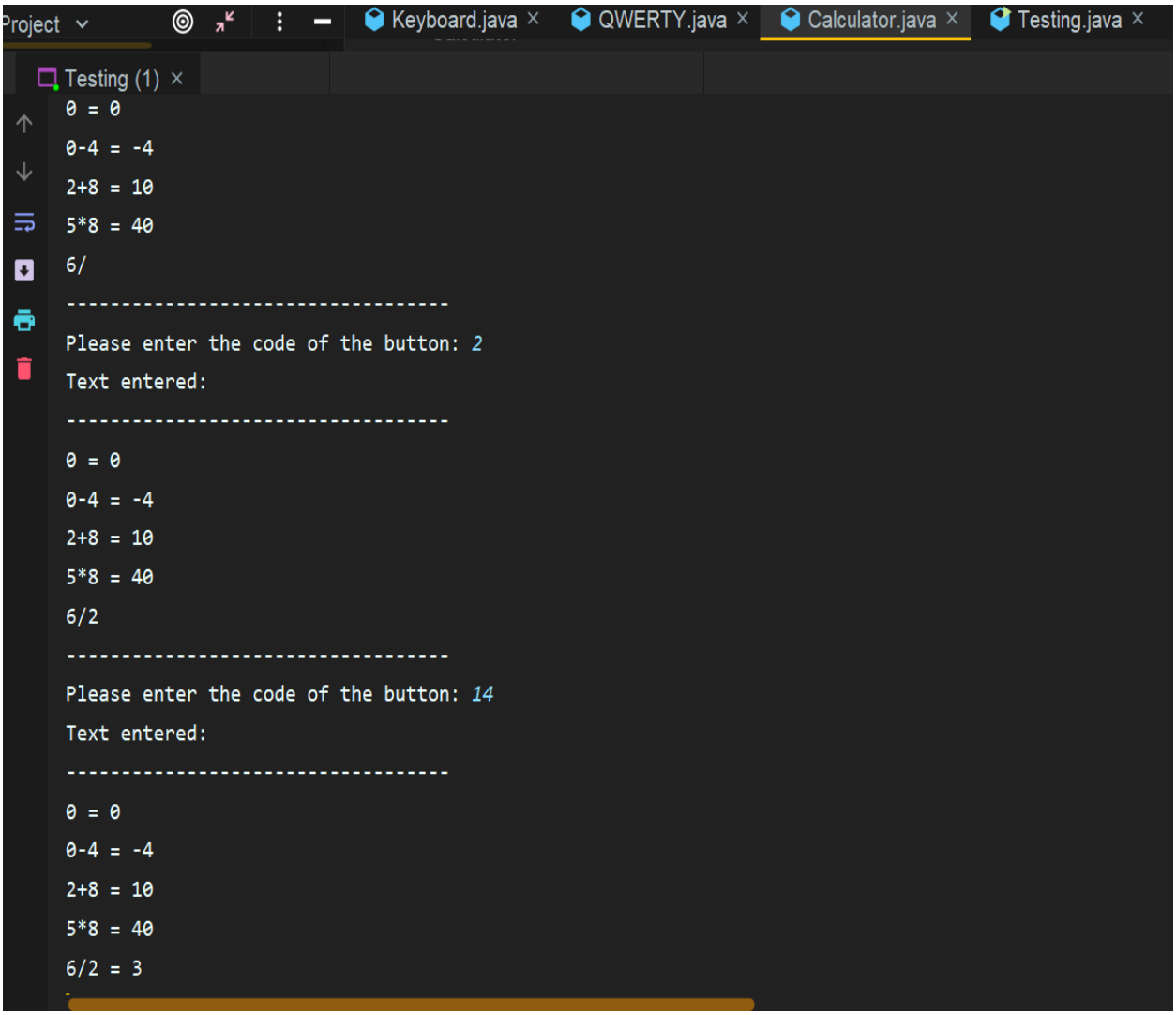
```
package lab2;
import java.util.ArrayList;

public class QWERTY{

    private Keyboard mainKeyboardObj;
    private ArrayList<String> buttonCodeList;
    private ArrayList<String> buttonValueList;

    public QWERTY(){
        buttonCodeList = new ArrayList<>(){{
            for(int i = 1; i <= 39; i++) {
                add("" + i);
            }
        }};
        buttonValueList = new ArrayList<>(){{
            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 i = 0; i <= 9; i++) {
                add("" + i);
            }
        }};
        mainKeyboardObj = new Keyboard(getAllButtonCode(), getAllButtonValue());
    }
    public void buttonPressed(String button) { mainKeyboardObj.buttonPressed(button); }
    public ArrayList<String> getAllButtonCode() { return buttonCodeList; }
    public ArrayList<String> getAllButtonValue() { return buttonValueList; }
    public String getDisplayedText() { return mainKeyboardObj.getDisplayedText(); }
}
```


Project
Keyboard.java
QWERTY.java
Calculator.java
Run:
Testing (1)
Text entered:
hayan
Please enter the code of the button: 3
Text entered:
hayan
Please enter the code of the button: 5
Text entered:
hayan
b
Please enter the code of the button: l
Text entered:
hayan
b
Please enter the code of the button: 2

Calculator.java

Keyboard.java × QWERTY.java × Calculator.java × Testing.java ×

```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<>(){{
            for(int i = 0; i <= 19; i++) {
                add("" + i);
            }
        }};
        buttonValueList = new ArrayList<>(){{
            for(int i = 0; i <= 9; i++) {
                add("" + i);
            }
            add("+");add("-");add("/");
            add("*");add("=");add("(");add(")");
        }};
        mainKeyboardObj = new Keyboard(getAllButtonCode(), getAllButtonValue());
    }
    public void buttonPressed(String button){
        int index = mainKeyboardObj.getButtonCodeIndex(button);
        if(index != -1){
            String value = mainKeyboardObj.getAllButtonValue().get(index);
            if("=".equals(value)){
                String[] text = mainKeyboardObj.getDisplayedText().split( regex: "\n");
                int ans = EvaluateString.evaluate(text[text.length - 1]);
                mainKeyboardObj.addToDisplayedText(" = " + ans + "\n");
            }
            else{
                mainKeyboardObj.buttonPressed(button);
            }
        }
    }
    public String getDisplayedText(){ return mainKeyboardObj.getDisplayedText(); }
    public ArrayList<String> getAllButtonValue(){ return buttonValueList; }
    public ArrayList<String> getAllButtonCode(){ return buttonCodeList; }
}
```


Project
Keyboard.java
QWERTY.java
Calculator.java
Testing.java
Testing (1)
0 = 0
0-4 = -4
2+8 = 10
5*8 = 40
6/
Please enter the code of the button: 2
Text entered:
0 = 0
0-4 = -4
2+8 = 10
5*8 = 40
6/2
Please enter the code of the button: 14
Text entered:
0 = 0
0-4 = -4
2+8 = 10
5*8 = 40
6/2 = 3

Part#2 Using inheritance concept:

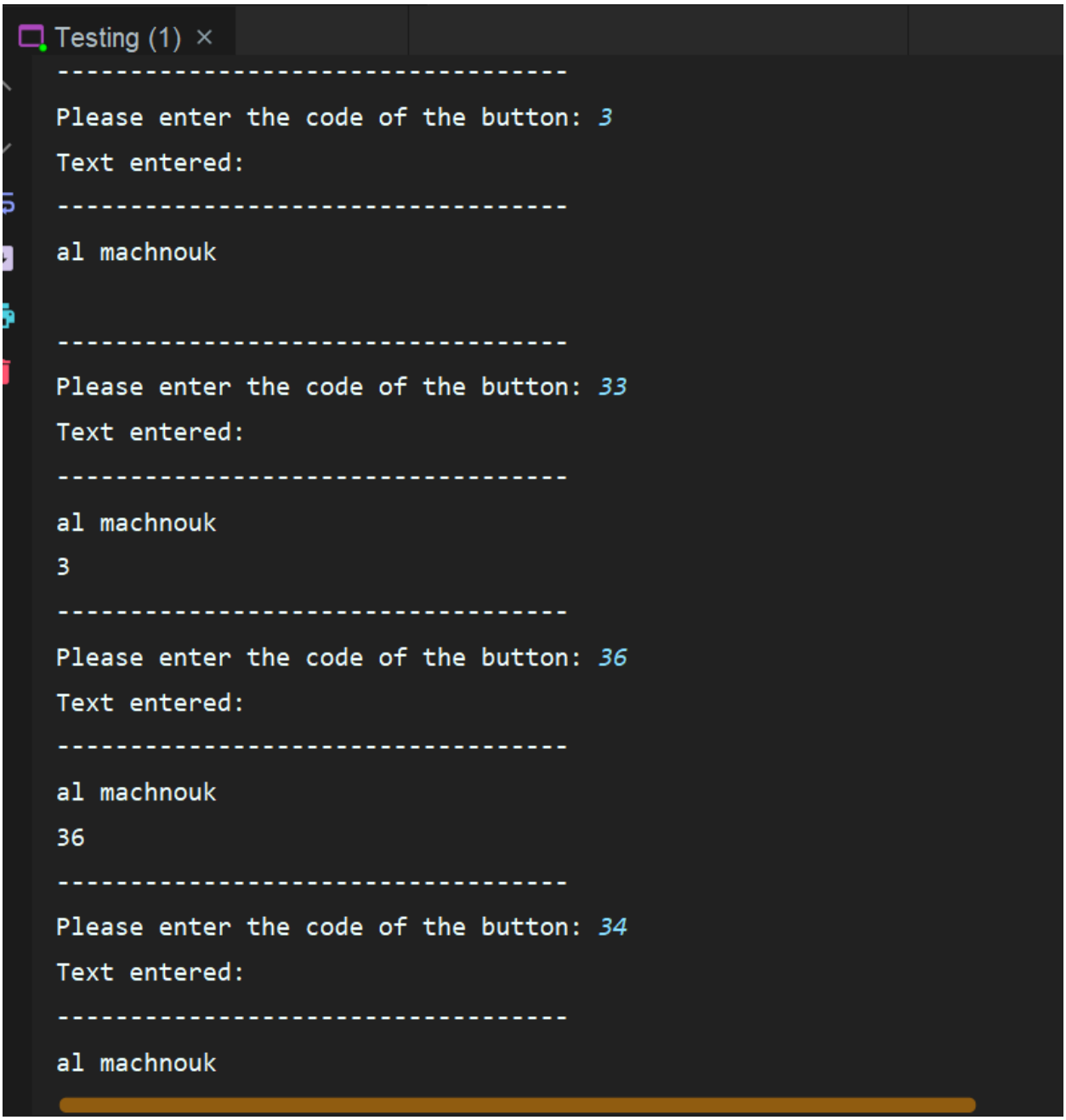
Keyboard.java

Keyboard.java × QWERTY2.java × Calculator2.java × Tes

```java
package lab2;
import java.util.ArrayList;

public class Keyboard{

    protected ArrayList<String> buttonCodeList;
    protected ArrayList<String> buttonValueList;
    protected String displayedText = "";

    public Keyboard() {}
    protected enum SpecialButtons{Space, Backspace, Enter}

    protected int getButtonCodeIndex(String code) { return buttonCodeList.indexOf(code); }
    protected void buttonPressed(String button) {
        int index = getButtonCodeIndex(button);
        if(index != -1) {
            String value = getAllButtonValue().get(index);
            if("Space".equals(value)) { space();
            }else if ("Backspace".equals(getAllButtonValue().get(index))){ backspace();
            }else if ("Enter".equals(getAllButtonValue().get(index))) { newLine();
            }else { addToDisplayedText(value); }
        }
    }
    protected void backspace() { addToDisplayedText("\b"); }
    protected void space() { addToDisplayedText(" "); }
    protected void newLine() { addToDisplayedText("\n"); }

    protected ArrayList<String> getAllButtonCode() { return buttonCodeList; }
    protected ArrayList<String> getAllButtonValue() { return buttonValueList; }

    protected String getDisplayedText() { return displayedText; }
    protected void addToDisplayedText(String text) { displayedText += text; }
}
```

QWERTY.java

```java
package lab2;
import java.util.ArrayList;

public class QWERTY2 extends Keyboard{
    public QWERTY2() {
        buttonCodeList = new ArrayList<>() {{
            for (int i = 1; i <= 39; i++) {
                add("" + i);
            }
        }};
        buttonValueList = new ArrayList<>() {{
            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 i = 0; i <= 9; i++) {
                add("" + i);
            }
        }};
    }
}
```


Testing (1)

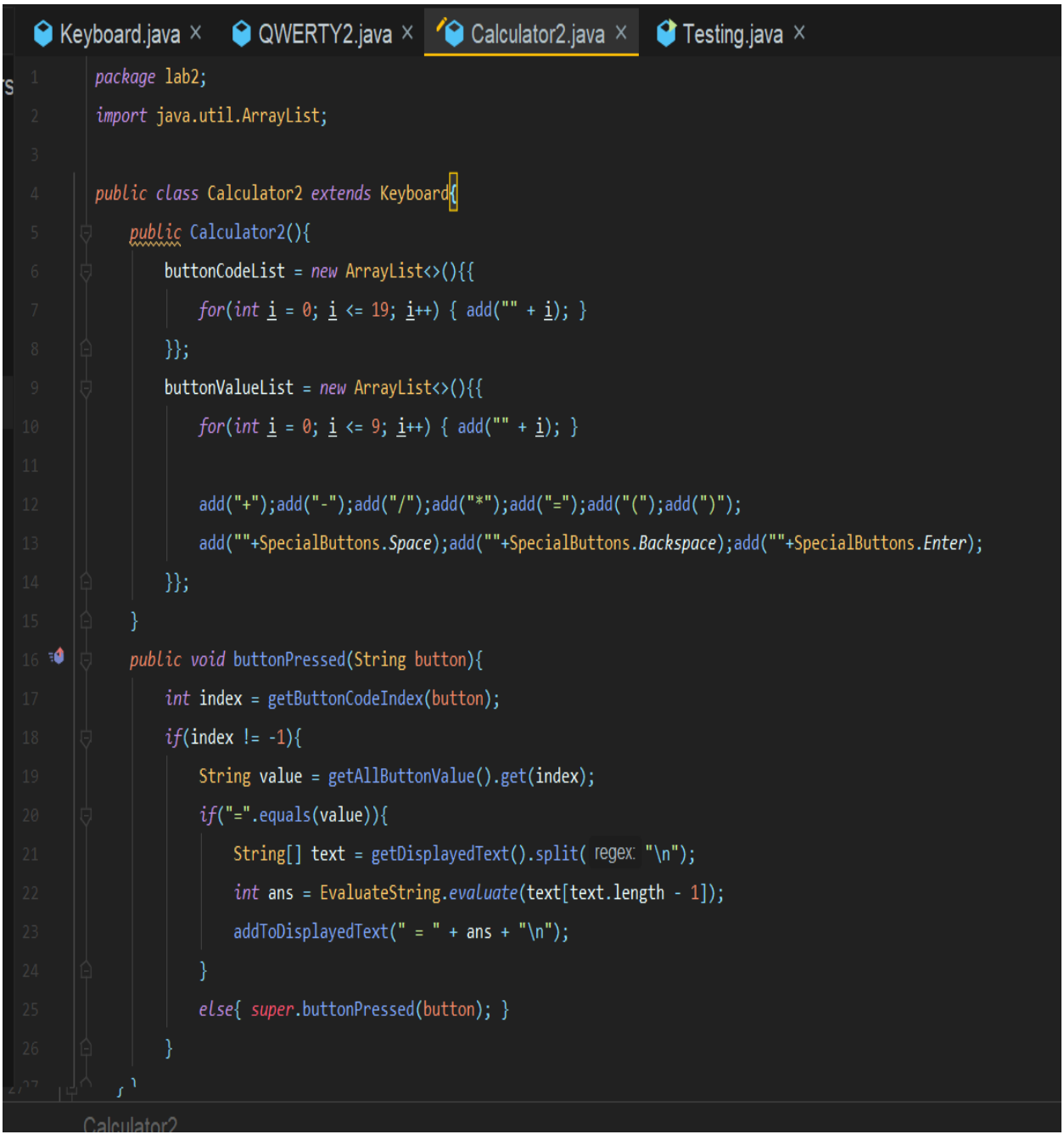
Please enter the code of the button: 3
Text entered:
---
al machnouk

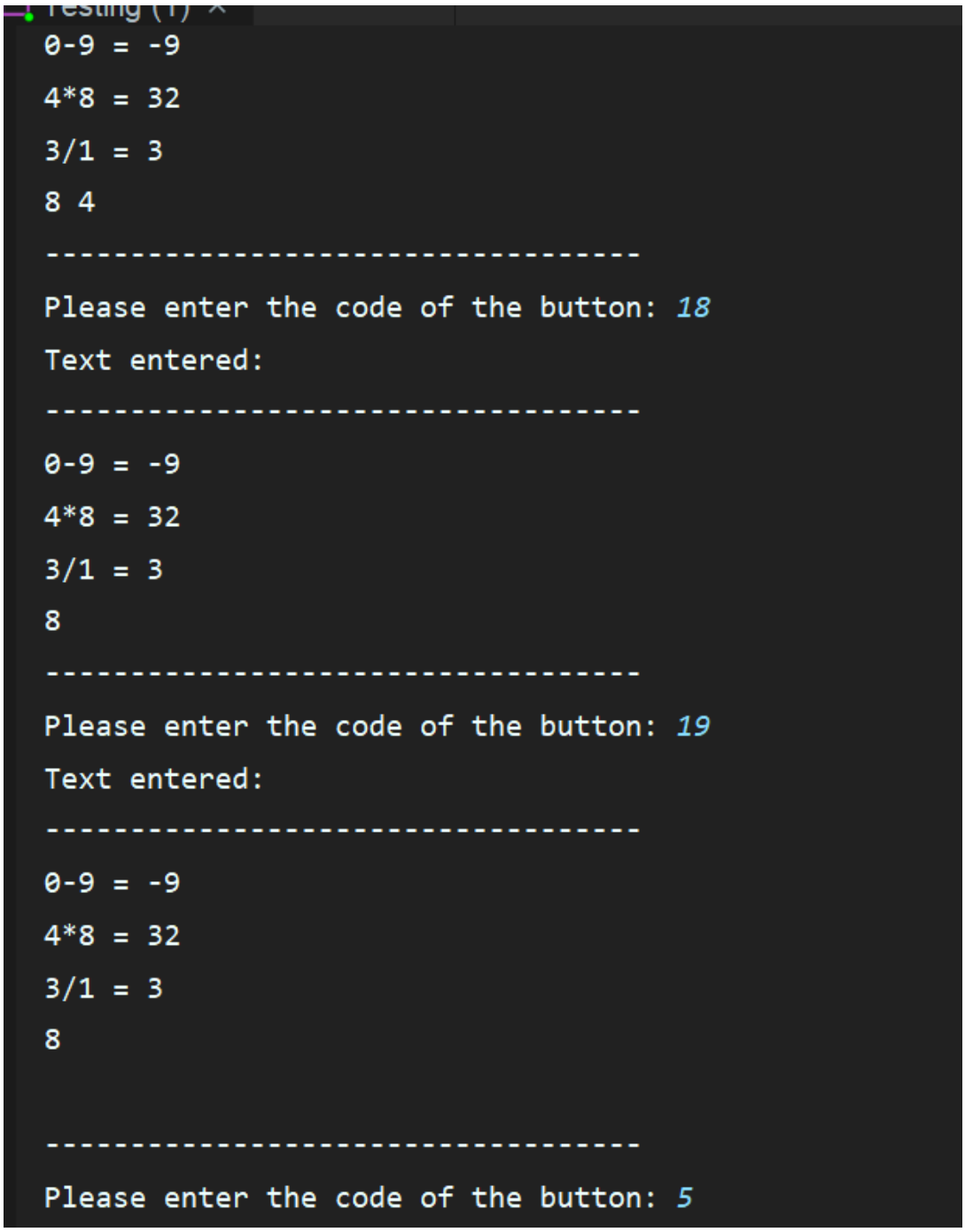
Please enter the code of the button: 33
Text entered:
---
al machnouk
3

Please enter the code of the button: 36
Text entered:
---
al machnouk
36

Please enter the code of the button: 34
Text entered:
---
al machnouk

Calculator.java




0-9 = -9
4*8 = 32
3/1 = 3
8 4
Please enter the code of the button: 18
Text entered:
0-9 = -9
4*8 = 32
3/1 = 3
8
Please enter the code of the button: 19
Text entered:
0-9 = -9
4*8 = 32
3/1 = 3
8
Please enter the code of the button: 5

Part#3 What is the difference?

The key distinction, is that inheritance allows the code to be more flexible. We interacted with the Keyboard class using the an instance object of itself in the first part, which had us write additional lines of code in both the QWERTY and Calculator classes, when we could just extend the methos directly from the super class via inheritance. The key rationale for using inheritance is to keep our code better organized and free from redundancy all of which, adhere to the OOP coding style's requirements.

When a programmer uses an external framework or API created by other developers for a specific purpose, that's an example of inheritance in action. However, the programmer is not permitted to change these classes and is only permitted to extend from them as needed. The code will be more stable as a result of this. Another example is that if you have a database model, you can design a main class that handles database-related tasks like adding tables, deleting tables, inserting new rows, and so forth. As a result, these methods are available in the super model class, and specific models can extend them.