Part 1:

Button not found

Keyboard.class

```
}
protected String getButtonValue(String code) {
    for(KeyboardButton button : buttons) {
        if(code.equals(Integer.toString(button.getCode()))) {
            return button.getName();
        }
    } return null;
}
public void buttonPressed(String press) {
    String val = getButtonValue(press);
    if(val != null) {
        int index = Integer.parseInt(press);
        KeyboardButton button = buttons.get(index-1);
        if (button instanceof NamedButtons) {
            this.displayedText += ((NamedButtons) button).getAction();
        } else if (button instanceof SpecialActionButton) {
            this.displayedText += ((SpecialActionButton) button).act(val);
        } else {
            this.displayedText += button.getName();
        }
    }
    else {
        System.out.println("Button pressed isn't on keyboard");
    }
    this.showDisplayedText();
```

```
10->j |20->t |30->3 |
Please enter the code of the button or -1 to exit: 44
Button pressed isn't on keyboard
Text entered:
-----------------------------------


-----------------------------------
Please enter the code of the button or -1 to exit: vv
Button pressed isn't on keyboard
Text entered:
-----------------------------------


-----------------------------------
Please enter the code of the button or -1 to exit: 1
Text entered:
-----------------------------------
a
-----------------------------------
Please enter the code of the button or -1 to exit:
```

Backspace

SpecialActionButton.class

```
public class SpecialActionButton extends KeyboardButton {

    private SpecialButtons buttonType;

    public SpecialActionButton(SpecialButtons button, int code) {
        super(button.name(), code);
        buttonType = button;
    }
    public String act(String value) {
        if (buttonType.name().equals(value)) {
            return backSpace(value);
        }
        return "$%&";
    } //if there was another special button it would be here in switch case
    private String backSpace(String value) {
        if (buttonType.name().equals(value)) {
            return "\b";
        }
        return "$%&";
    }
```

```
-----------------------------------
Please enter the code of the button or -1 to exit: 1
Text entered:
-----------------------------------
a
-----------------------------------
Please enter the code of the button or -1 to exit: 39
Text entered:
-----------------------------------

-----------------------------------
Please enter the code of the button or -1 to exit: 39
Text entered:
-----------------------------------

-----------------------------------
Please enter the code of the button or -1 to exit:
```

Choose Keyboard

OperatingSystem.class

```
while (true) {
//ask the user which keyboard to run
    System.out.println("1-QWERTY");
    System.out.println("2-Calculator");
    System.out.println("Please choose one of the two keyboards to run: ");
    String x = input.next();
    //make the keyboard object.
    Keyboard keyboard;
    if (x.equals("1")) { keyboard = new QWERTY( firstCode: 1, qwertyButtonsValues, generalButtonsValues,
                generalButtonsActions, SpecialButtonsList); }
    else if (x.equals("2")) { keyboard = new Calculator( firstCode: 0, calculatorButtonsValues, generalButtonsValues,
                generalButtonsActions, SpecialButtonsList); }
    else { continue; }
    String inputTxt;
    while (true) {
        System.out.print("Please enter the code of the button or -1 to exit: ");
        inputTxt = input.next();
        if (inputTxt.equals(-1 + "")) break;
        keyboard.buttonPressed(inputTxt);
    }
}
```

```
"C:\Program Files\Java\jdk-15.0.2\bin\java.exe" -Didea.la
1-QWERTY
2-Calculator
Please choose one of the two keyboards to run:
0
1-QWERTY
2-Calculator
Please choose one of the two keyboards to run:
ww
1-QWERTY
2-Calculator
Please choose one of the two keyboards to run:
1
1->a  |11->k |21->u |31->4          |
2->b  |12->l |22->v |32->5          |
3->c  |13->m |23->w |33->6          |
4->d  |14->n |24->x |34->7          |
```

Part 2:

Division by zero

Calculator.class

```
try {
int ans = EvaluateString.evaluate(text[text.length - 1]);
super.displayedText += (" = " + ans + "\n");
super.showDisplayedText(); }
catch (UnsupportedOperationException e1) {
    System.out.println("*Unacceptable expression!, I will delete it*");
    Pattern pattern = Pattern.compile("\n");
    Matcher matcher = pattern.matcher(super.displayedText);
    if (matcher.find()) {
        int ind = super.displayedText.lastIndexOf( str: "\n" + 1);
        super.displayedText = super.displayedText.substring(0, ind) + "\n";
    } else {
        super.displayedText = "";
    }
}
```

```
-----------------------------------
1+1 = 2
1/
-----------------------------------
Please enter the code of the button or -1 to exit: 0
Text entered:
-----------------------------------
1+1 = 2
1/0
-----------------------------------
Please enter the code of the button or -1 to exit: 14
*Unacceptable expression!, I will delete it*
Please enter the code of the button or -1 to exit: 4
Text entered:
-----------------------------------
1+1 = 2
4
```

Empty stack

Calculator.class

```
public void buttonPressed(String button) {
    int index = Integer.parseInt(button);
    if(index != -1) {
        String value = super.getAllButtonValue().get(index);
        if("=".equals(value)) {
            String[] text = getDisplayedText().split( regex: " ");
            try {
            int ans = EvaluateString.evaluate(text[text.length - 1]);
            super.displayedText += (" = " + ans + "\n");
            super.showDisplayedText(); }
            catch (UnsupportedOperationException e1) {
                System.out.println("*Unacceptable expression!, I will delete it*");
                Pattern pattern = Pattern.compile("\n");
                Matcher matcher = pattern.matcher(super.displayedText);
                if (matcher.find()) {
                    int ind = super.displayedText.lastIndexOf( str: "\n" + 1);
                    super.displayedText = super.displayedText.substring(0, ind) + "\n";
                } else {
                    super.displayedText = "";
                }
            }
            catch (EmptyStackException e2) {
                System.out.println("*Invalid expression!, enter a valid expression*");
            }
        } else {
            super.buttonPressed(Integer.toString( i: index + 1));
        }
    }
```

```
9->9 |19->Backspace |
Please enter the code of the button or -1 to exit: 14
*Invalid expression!, enter a valid expression*
Please enter the code of the button or -1 to exit: 1
Text entered:
-----------------------------------
1
-----------------------------------
Please enter the code of the button or -1 to exit: 10
Text entered:
-----------------------------------
1+
-----------------------------------
Please enter the code of the button or -1 to exit: 14
*Invalid expression!, enter a valid expression*
Please enter the code of the button or -1 to exit: 4
Text entered:
-----------------------------------
1+4
-----------------------------------
Please enter the code of the button or -1 to exit: 14
Text entered:
-----------------------------------
1+4 = 5
```

Part 3:

Keyboard.class

```
        this.displayedText += ((NamedButtons) button).getAction();
    } else if (button instanceof SpecialActionButton) {
        try {
            this.displayedText += ((SpecialActionButton) button).act(val, displayedTe
        }
        catch (OSTaskException ex) {
            Scanner input = new Scanner(System.in);
            System.out.println("Keyboard: Please enter the file path: ");
            String path = input.nextLine();
            System.out.println("OS: I will handle this: ");
            if (ex.getOperation().equals("Load")) {
                System.out.println("********LOADED********");
                String content = getLoadedContent(path);
                System.out.println(content);
                System.out.println("********DONE********");
                addLoadedContent(content);
            }
            else {
                saveContent(path ,displayedText);
                System.out.println("writing...");
                System.out.println("********SAVED*********");
                System.out.println(displayedText);
                System.out.println("********DONE********");
                displayedText = "";
            }
        }
    } else {
        this.displayedText += button.getName();
    }
else {
    System.out.println("Button pressed isn't on keyboard");

his.showDisplayedText();
```

```
}

private void saveContent(String path, String content) throws IOException {
    path += ".txt";
    BufferedWriter output = null;
    try {
        File file = new File(path);
        output = new BufferedWriter(new FileWriter(file));
        output.write(content);
    } catch ( IOException e ) {
        e.printStackTrace();
    } finally {
        if (output != null) {
            output.close();
        }
    }
}

private String getLoadedContent(String path) throws IOException {
    try {
        path += ".txt";
        BufferedReader reader = new BufferedReader(new FileReader(path));
        String currentLine = reader.readLine();
        reader.close();
        return currentLine;
    }
    catch (FileNotFoundException ex) {
        return ("No such file exists, enter a valid path");
    }
}
```

```
    protected void addLoadedContent(String content) {
        System.out.println("Keyboard: What do you want to do with the loaded text?");
        System.out.println("1-append.");
        System.out.println("2-replace.");
        System.out.println("3-ignore.");
        Scanner input = new Scanner(System.in);
        String decision = input.nextLine();
        switch (decision) {
            case "1":
                displayedText += content;
                break;
            case "2":
                 displayedText = content;
                break;
            case "3":
                break;
            default:
                System.out.println("wrong decision");
        }
    }
}
```

SpecialButtons.class

```
    private SpecialButtons buttonType;

    public SpecialActionButton(SpecialButtons button, int code) {
        super(button.name(), code);
        buttonType = button;
    }
    public String act(String value, String text) throws OSTaskException{
        if (buttonType.name().equals(value)) {
            switch (value) {
                case "Load":
                    throw new OSTaskException(value, text);
                case "Save":
                    throw new OSTaskException(value, text);
                default:
                    return backSpace(value);
            }
        }
        return "This special button has no operation";
    }
    private String backSpace(String value) {
        return "\b";
    }
}
```

OSTaskException.class

```java
public class OSTaskException extends Exception {

    private long serialVersionUID;
    private String operation;
    private File file;

    public OSTaskException(String operation, String path) {
        super(operation);
        this.operation = operation;
    }

    public File getFile() { return file; }

    public String getOperation() {
        return operation;
    }
}
```

Save

```
OperatingSystem ×
haya
------------------------------------
Please enter the code of the button or -1 to exit: 14
Text entered:
------------------------------------
hayan
------------------------------------
Please enter the code of the button or -1 to exit: 41
Keyboard: Please enter the file path:
myname
OS: I will handle this:
writing...
********SAVED*********
hayan
********DONE********
Text entered:
------------------------------------


------------------------------------
Please enter the code of the button or -1 to exit: 8
Text entered:
------------------------------------
h
```

Load

```
hello
-----------------------------------
Please enter the code of the button or -1 to exit: 40
Keyboard: Please enter the file path:
myname
OS: I will handle this:
********LOADED********
hayan
********DONE********
Keyboard: What do you want to do with the loaded text?
1-append.
2-replace.
3-ignore.
1
Text entered:
-----------------------------------
hello hayan
-----------------------------------
Please enter the code of the button or -1 to exit: 38
Text entered:
-----------------------------------
hello hayan
```