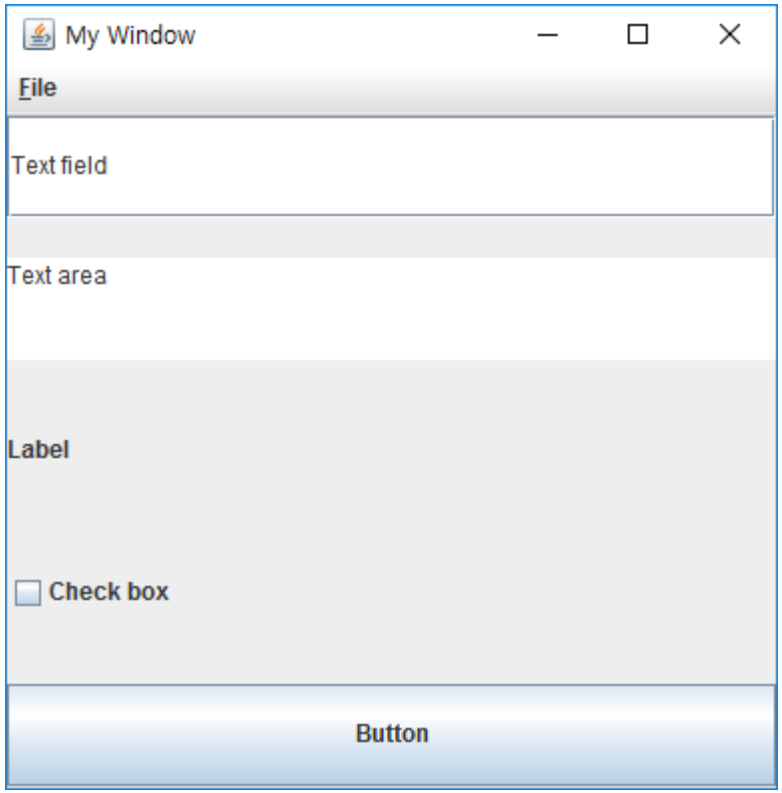
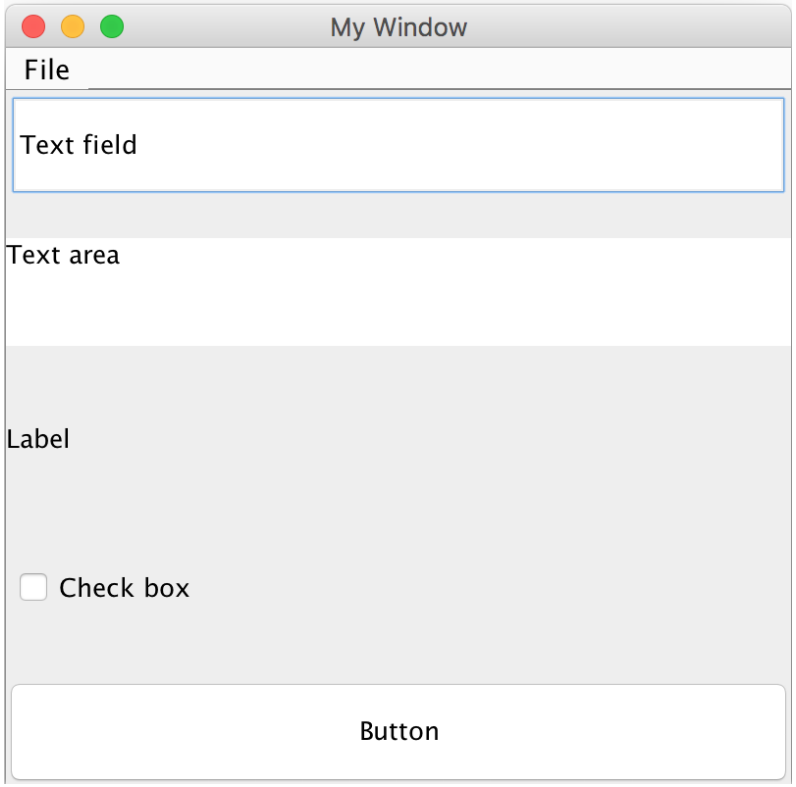
컴퓨터 프로그래밍

GUI

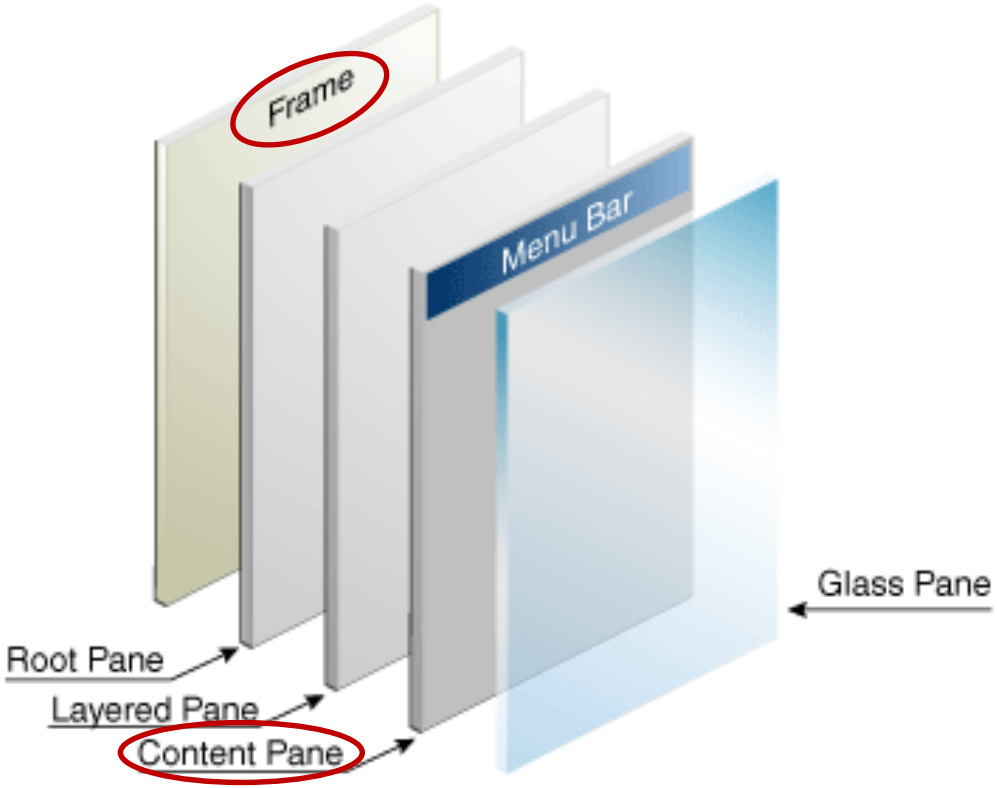
class for GUI

- AWT (Abstract Window Toolkit)
  - Standard API for providing a GUI for a Java program
- Swing
  - Provides a more sophisticated set of GUI components



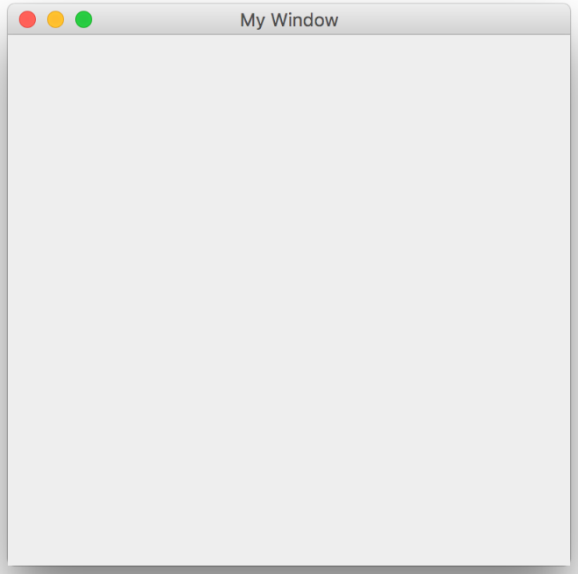


Structure


Frame
Menu Bar
Glass Pane
Root Pane
Layered Pane
Content Pane

Frame

```
class MainFrame {
    public static void main(String[] args) {
        JFrame frame = new JFrame();
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setTitle("My Window");
        frame.setSize(400, 400);
        frame.setVisible(true);
    }
}
```



content Pane

```
class MainFrame {
    public static void main(String[] args) {
        JFrame frame = new JFrame();
        frame.setDefaultcloseOperation(JFrame.EXIT_ON_CLOSE);
        container contentPane = frame.getcontentPane();
        frame.setTitle("My Window");
        frame.setSize(400, 400);
        frame.setVisible(true);
    }
}
```

Layout Managers

- Each container can have a layout manager
- determines the size and position of the components within a container

- FlowLayout
- BorderLayout
- GridLayout
- ...
- https://docs.oracle.com/javase/tutorial/uiswing/layout/visual.html

Layout Managers

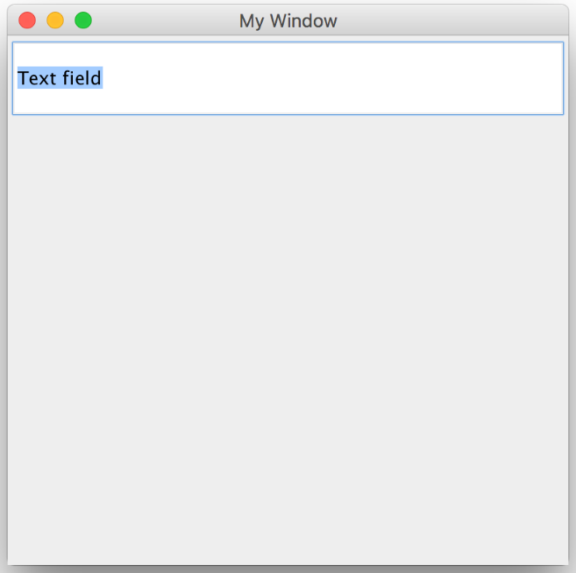
```
class MainFrame {
    public static void main(String[] args) {
        JFrame frame = new JFrame();
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        container contentPane = frame.getcontentPane();
        contentPane.setLayout(new GridLayout(5, 1, 0, 20));
        frame.setTitle("My Window");
        frame.setSize(400, 400);
        frame.setVisible(true);
    }
}
```

components

- JLabel
  - displays unselectable text and images
- JTextField
  - enables the user to type a single line text
- JTextArea
  - displays multiple lines of text and optionally allows the user to edit the text
- JCheckBox
  - provides a check box button
- JButton
  - provides a common button
- JPanel
  - generic container
- JSlider, JSpinner, JcomboBox, JProgressBar, ...

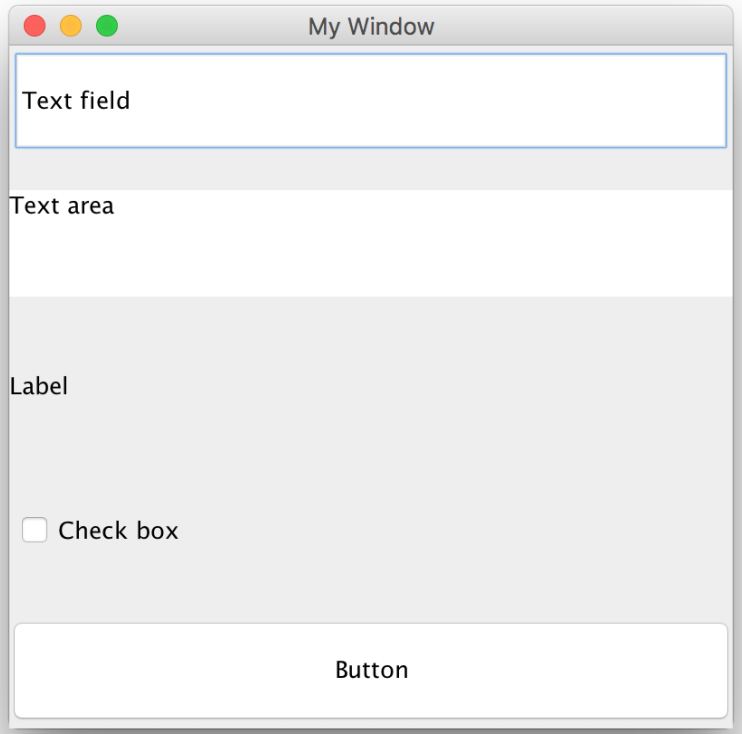
components

```
class MainFrame {
    public static void main(String[] args) {
        JFrame frame = new JFrame();
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        container contentPane = frame.getcontentPane();
        contentPane.setLayout(new GridLayout(5, 1, 0, 20));
        JTextField textField = new JTextField("Text field");
        contentPane.add(textField);
        frame.setTitle("My window");
        frame.setSize(400, 400);
        frame.setVisible(true);
    }
}
```



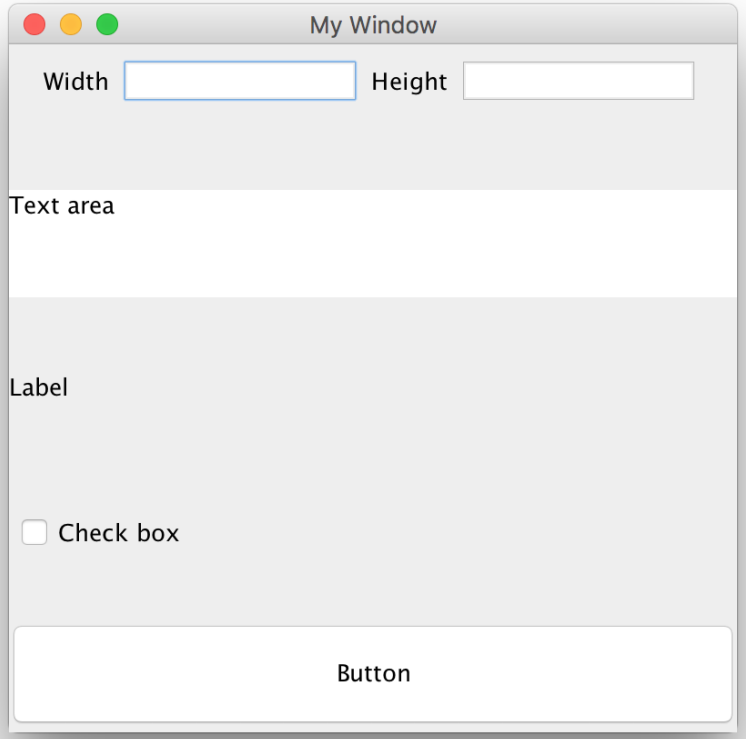
실습

- component들을 추가하여 아래 화면과 같이 UI를 구성하시오



실습

- component들을 추가하여 아래 화면과 같이 UI를 구성하시오
  - JPanel



Event-driven Programming

- Event
  - 사용자가 UI component에 취하는 행위
- 이벤트의 발생에 의해 프로그램의 흐름이 결정되는 방식
  - 이벤트를 받아 처리하고자 하는 컴포넌트에 event listener 등록
  - 이벤트가 발생하면 event listener 실행

Event Listener

- JDK에서 interface 제공

```
public interface KeyListener extends EventListener {
    public void keyTyped(KeyEvent e);
    public void keyPressed(KeyEvent e);
    public void keyReleased(KeyEvent e);
}
```

```
public interface MouseListener extends EventListener {
    public void mouseclicked(MouseEvent e);
    public void mousePressed(MouseEvent e);
    public void mouseReleased(MouseEvent e);
    public void mouseEntered(MouseEvent e);
    public void mouseExited(MouseEvent e);
}
```

Add MouseListener to Button

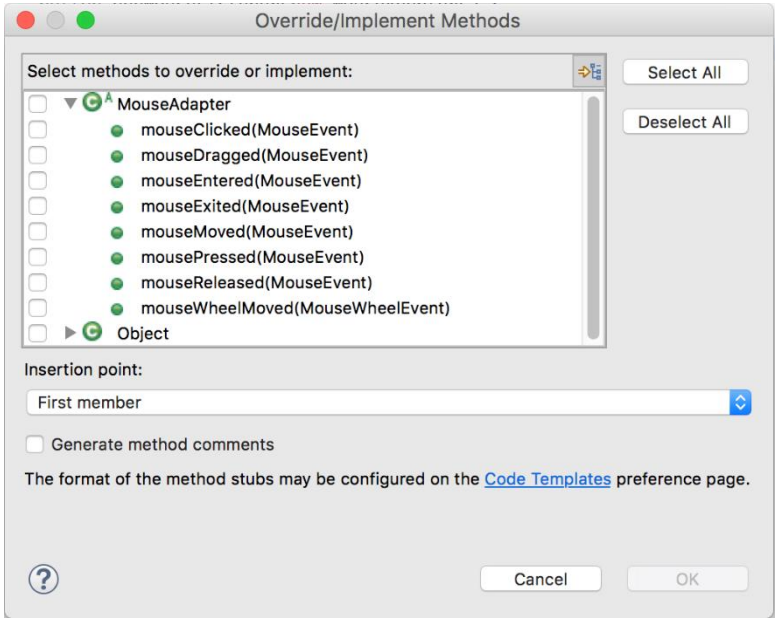
```
button.addMouseListener(new MouseListener() {
    @Override
    public void mouseClicked(MouseEvent e) {
    }
    @Override
    public void mousePressed(MouseEvent e) {
    }
    @Override
    public void mouseReleased(MouseEvent e) {
    }
    @Override
    public void mouseEntered(MouseEvent e) {
    }
    @Override
    public void mouseExited(MouseEvent e) {
    }
});
```

Add MouseListener to Button

```
button.addMouseListener(new MouseAdapter() {

});
```

- Set cursor into MouseAdapter body
- Source -> Override/Implement Methods...



Add MouseListener to Button

- MouseListener vs. MouseAdapter

```
public interface MouseListener extends EventListener {
    public void mouseClicked(MouseEvent e);
    public void mousePressed(MouseEvent e);
    public void mouseReleased(MouseEvent e);
    public void mouseEntered(MouseEvent e);
    public void mouseExited(MouseEvent e);
});
```

should implement all methods

```
public abstract class MouseAdapter implements MouseListener, MouseWheelListener,
                                               MouseMotionListener {
    public void mouseClicked(MouseEvent e) {}
    public void mousePressed(MouseEvent e) {}
    public void mouseReleased(MouseEvent e) {}
    public void mouseEntered(MouseEvent e) {}
    public void mouseExited(MouseEvent e) {}
    public void mouseWheelMoved(MouseWheelEvent e) {}
    public void mouseDragged(MouseEvent e) {}
    public void mouseMoved(MouseEvent e) {}
});
```

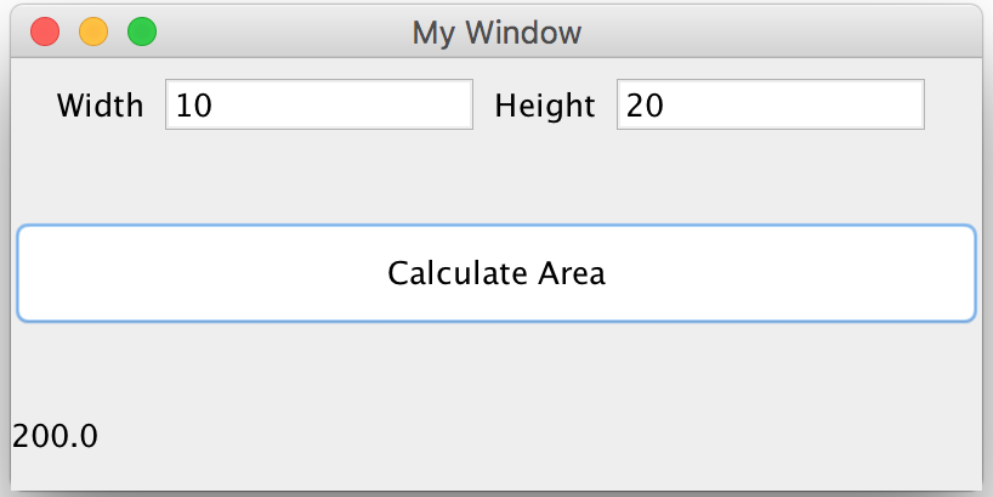
can implement what we need

Add MouseListener to Button

```
@Override
public void mouseclicked(MouseEvent e) {
    ((JButton)e.getSource()).setText("clicked");
}
@Override
public void mouseEntered(MouseEvent e) {
    ((JButton)e.getSource()).setForeground(color.RED);
}
@Override
public void mouseExited(MouseEvent e) {
    ((JButton).e.getSource()).setForeground(color.BLAck);
}
```

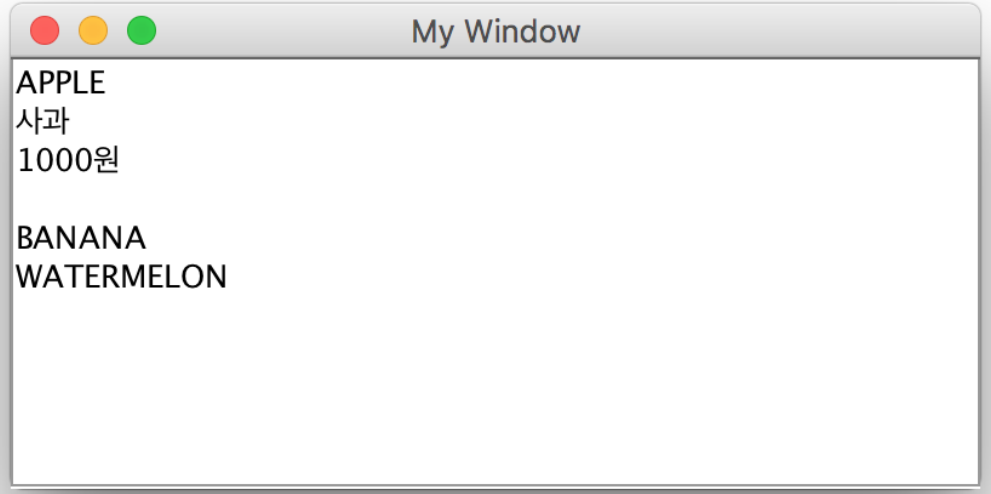
실습

- 사각형의 가로, 세로 값을 입력받고(JTextField) 버튼을 누르면 사각형의 넓이를 구하여 표시(JLabel)해주는 UI



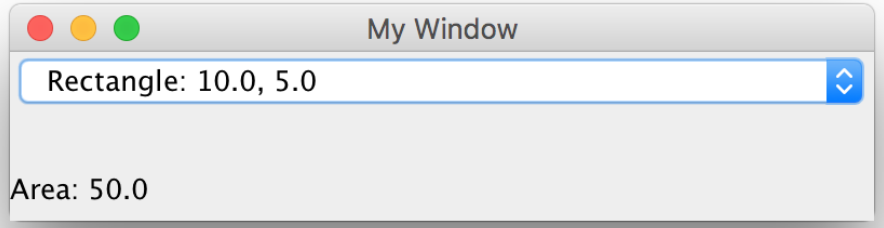
실습

- 문자열을 입력받고(JTextArea) 영어 소문자가 입력되면 대문자로 바꿔 표시해주는 UI



과제

- abstract class Shape 구현
  - public abstract double calcArea();
- Shape class를 상속하는 Rectangle, Triangle, circle class 구현
  - Rectangle class는 폭, 높이를 멤버로 가짐
  - Triangle class는 폭, 높이를 멤버로 가짐
  - circle class는 반지름을 멤버로 가짐
- JcomboBox와 JLabel로 구성된 GUI 구현
  - combo box에서 아이템 선택시 label에 해당 도형의 넓이 출력



과제

- JcomboBox
  - JcomboBox는 Object를 아이템으로 가질 수 있으며 toString() 메소드에 정의된 내용으로 표시
    - JcomboBox<Shape> comboBox = new JcomboBox();
    - comboBox.addItem(new Rectangle(10, 5));
  - ItemListener class를 사용하여 사용자가 선택한 아이템을 확인
  - comboBox.getSelectedItem()
    - Object 객체 반환 -> Shape 타입으로 변환하여 사용
    - e.g. ((Shape)comboBox.getSelectedItem()).calcArea()