2D Graphics & Shapes Intro

CPSC 1181 – O.O.

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THE COLLEGE OF HIGHER LEARNING.

Outline

- Containers
- Graphics
- Shapes
- Basic Input

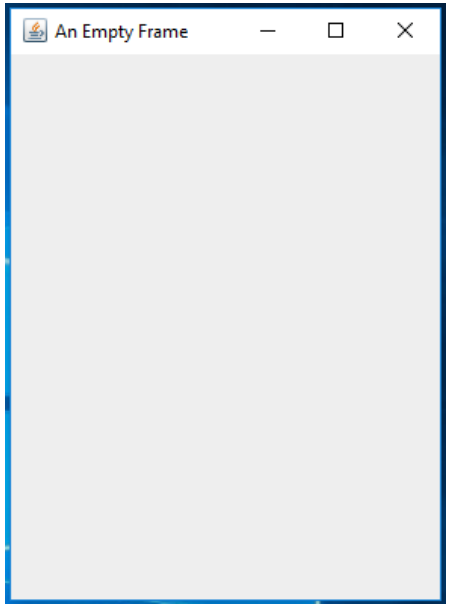
Top-Level Containers

- **JFrame**
- JDialog
- JApplet

- Android:
  - Activity
  - Fragment

Frames

```
1    import javax.swing.*;
2
3    public class EmptyFrame {
4      public static void main(String[] args){
5        JFrame frame = new JFrame();
6        final int FRAME_WIDTH = 300;
7        final int FRAME_HEIGHT = 400;
8
9        frame.setSize(FRAME_WIDTH, FRAME_HEIGHT);
10       frame.setTitle("An Empty Frame");
11       frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
12
13       frame.setVisible(true);
14     }
15   }
16
```



Components

- Containers don't display anything
  - But they contain things that do
- In Swing, the basic unit of display is a **JComponent** (also a container)
  - paintComponent() called whenever the component needs repainting

```
1  public class DullComponent extends JComponent {
2    public void paintComponent(Graphics g) {
3      Graphics2D g2 = (Graphics2D) g;
4      // ...
5    }
6  }
7
```

Graphics

java.awt.Graphics

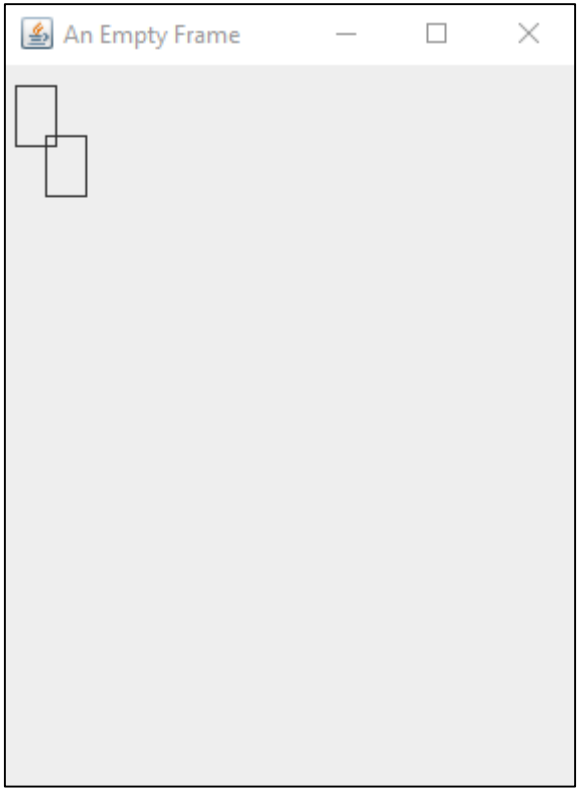
- Colour
- Font
- Drawing basic shapes
- Text
- Basic hit detection

java.awt.Graphics2D

- Stroke
- Paint
- Rotation
- Scaling
- Images
- Better hit detection

```
1   import java.awt.Graphics;
2   import java.awt.Graphics2D;
3   import java.awt.Rectangle;
4   import javax.swing.JPanel;
5   import javax.swing.JComponent;
6
7   /**
8      A component that draws two rectangles.
9   */
10  public class RectComponent extends JComponent {
11    public void paintComponent(Graphics g) {
12      Graphics2D g2 = (Graphics2D) g; // Recover Graphics2D
13      // Construct a rectangle and draw it
14      Rectangle box = new Rectangle(5, 10, 20, 30);
15      g2.draw(box);
16      // Move rectangle 15 units to the right and 25 units down
17      box.translate(15, 25);
18      // Draw moved rectangle
19      g2.draw(box);
20    }
21  }
22
```

```
1   import javax.swing.*;
2
3   public class RectView {
4     public static void main(String[] args){
5       JFrame frame = new JFrame();
6       final int FRAME_WIDTH = 300;
7       final int FRAME_HEIGHT = 400;
8
9       frame.setSize(FRAME_WIDTH, FRAME_HEIGHT);
10      frame.setTitle("An Empty Frame");
11      frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
12
13      // add the rectangle component
14      RectComponent component = new RectComponent();
15      frame.add(component);
16
17      frame.setVisible(true);
18    }
19  }
20
```


An Empty Frame

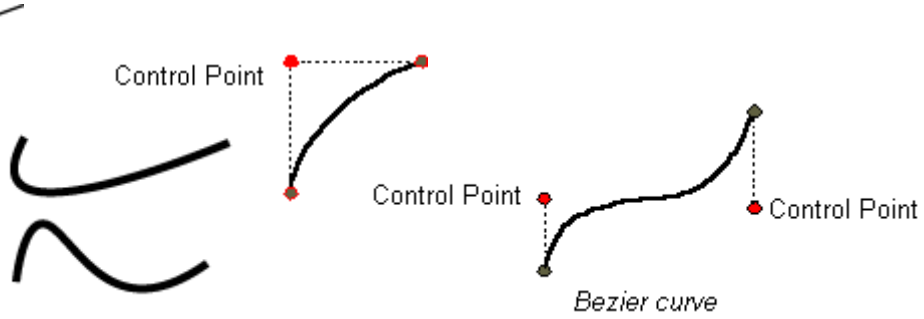
Applets

- They are a way to embed your Java application in a web browser.
- Works similar to a Component, but harder to launch.
  - Recall: a component is also a container

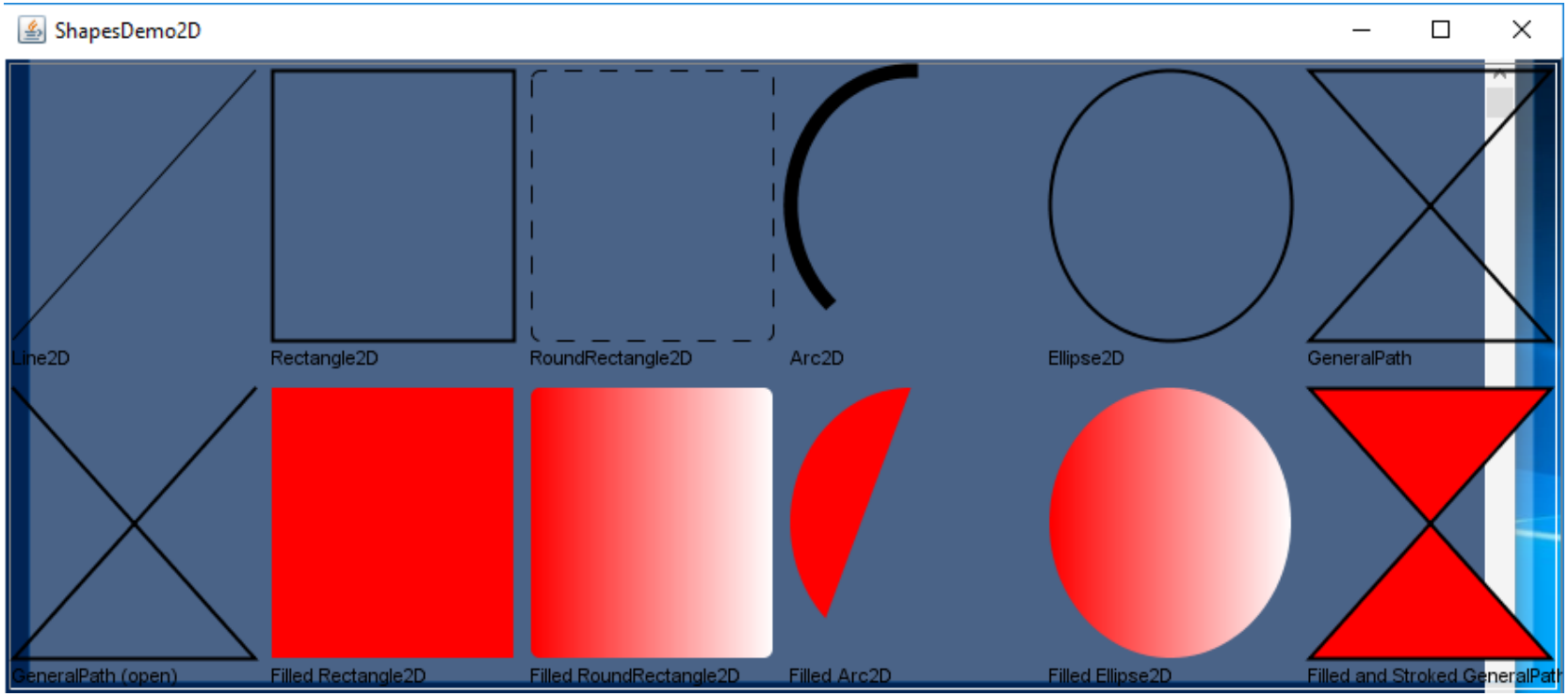
- Can be contained by Frames.

Shapes

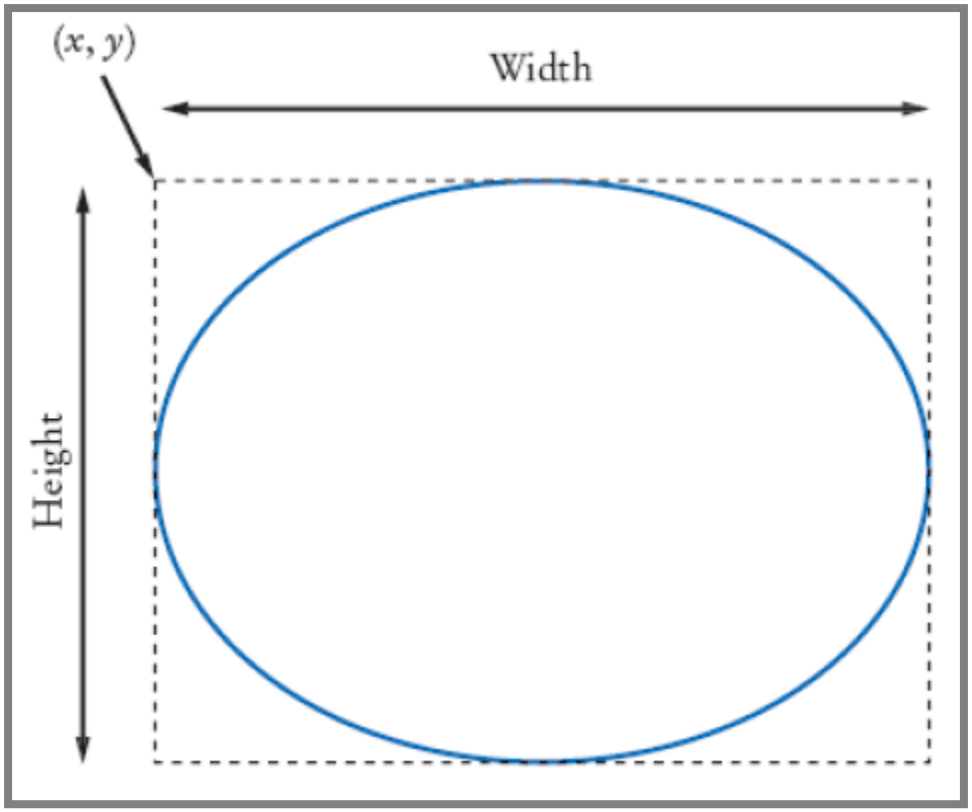
- Point2D.Double
- Line2D.Double
- QuadCurve2D.Double
- CubicCurve2D.Double
- Rectangle2D.Double
- RoundRectangle2D.Double
- Ellipse2D.Double
- Arc2D.Double



ShapesDemo2D



An Ellipse



```
import java.awt.geom.Ellipse2D; // no .Double
```

```
Ellipse2D.Double ellipse = new Ellipse2D.Double(x, y, width, height);
g2.draw(ellipse);
```

```
Line2D.Double segment = new Line2D.Double(x1, y1, x2, y2);
```

```
Point2D.Double from = new Point2D.Double(x1, y1);
Point2D.Double to = new Point2D.Double(x2, y2);
Line2D.Double segment = new Line2D.Double(from, to);
```

```
g2.drawString("Message", 50, 100);
```

Colours

- java.awt.Color
  - .black
  - .blue
  - .cyan
  - .darkGray
  - .gray
  - .green
  - .lightGray
  - .magenta
  - .orange
  - .pink
  - .red
  - .white
  - .yellow

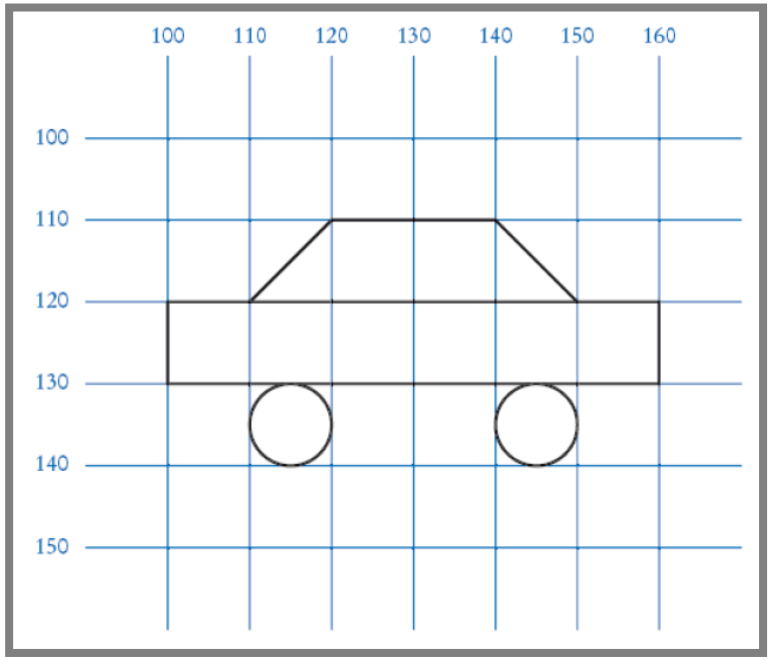
- Or specify RGB as float

  new Color(1.0f, 0.0f, 1.0f);

- g2.setColor(Color.blue);
- g2.fill(rectangle);

Composite Shapes

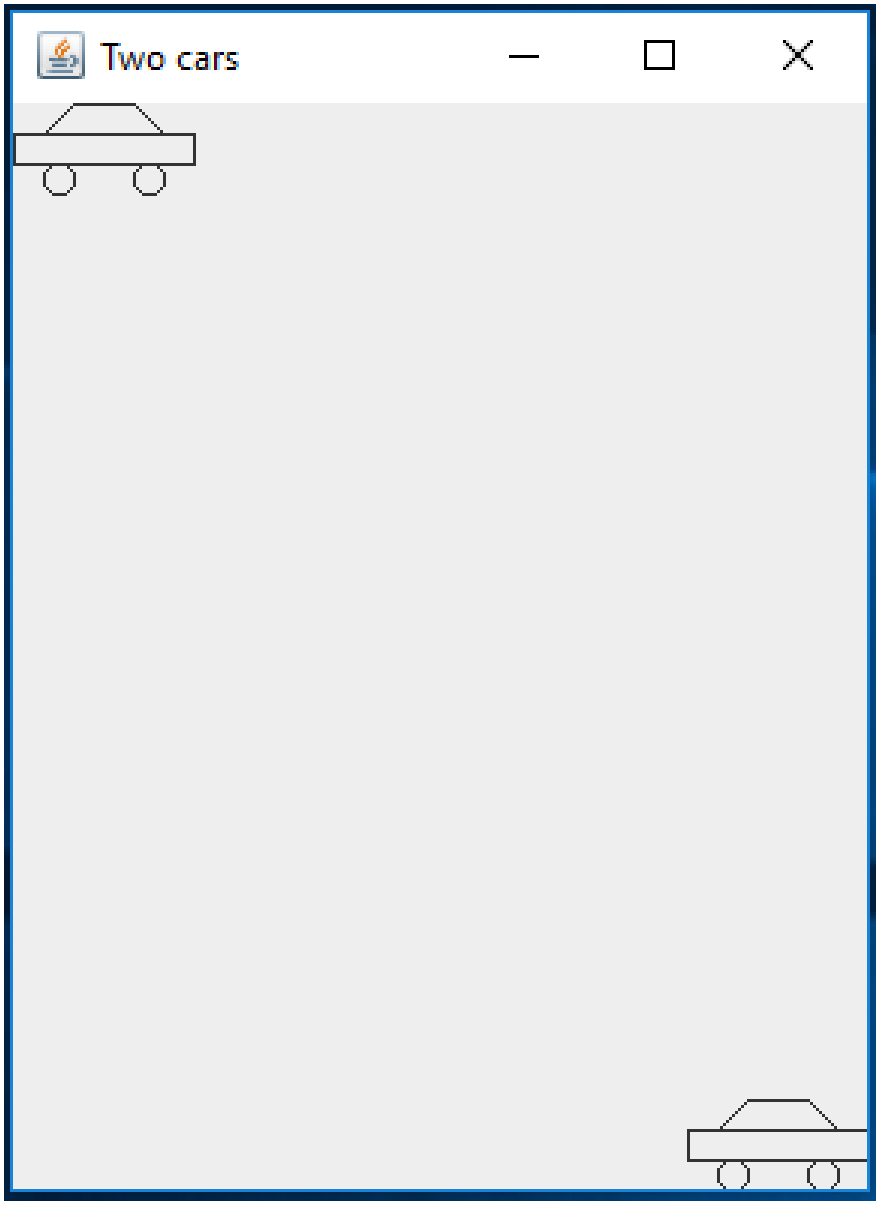
- Sketch (on paper)
- Make a class to draw it



```
1  public class Car { // model
2      // ...
3      public void drawMe(Graphics2D g2) {
4        // body
5        g2.draw(new Rectangle(xLeft, yTop + 10, 60, 10));
6        // front tire
7        g2.draw(new Ellipse2D.Double(xLeft + 10, yTop + 20, 10, 10));
8        // rear tire
9        g2.draw(new Ellipse2D.Double(xLeft + 40, yTop + 20, 10, 10));
10
11       // front windsheild
12       g2.draw(new Line2D.Double(
13         new Point2D.Double(xLeft + 10, yTop + 10),
14         new Point2D.Double(xLeft + 20, yTop)));
15       // roof
16       g2.draw(new Line2D.Double(
17         new Point2D.Double(xLeft + 20, yTop),
18         new Point2D.Double(xLeft + 40, yTop)));
19       // rear windsheild
20       g2.draw(new Line2D.Double(
21         new Point2D.Double(xLeft + 40, yTop),
22         new Point2D.Double(xLeft + 50, yTop + 10)));
23     }
24 }
25
```

```
1   import java.awt.Graphics;
2   import java.awt.Graphics2D;
3   import javax.swing.JComponent;
4
5   /**
6      This component draws two car shapes.
7   */
8   public class CarComponent extends JComponent {
9      public void paintComponent(Graphics g) {
10        Graphics2D g2 = (Graphics2D) g;
11
12        Car car1 = new Car(0, 0);
13
14        int x = getWidth() - 60;
15        int y = getHeight() - 30;
16
17        Car car2 = new Car(x, y);
18
19        car1.drawMe(g2);
20        car2.drawMe(g2);
21     }
22  }
23
```

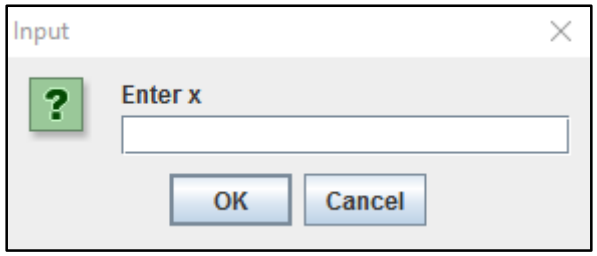
```
1   import javax.swing.JFrame;
2
3   public class CarViewer {
4      public static void main(String[] args) {
5         JFrame frame = new JFrame();
6
7         frame.setSize(300, 400);
8         frame.setTitle("Two cars");
9         frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
10
11        CarComponent component = new CarComponent();
12        frame.add(component);
13
14        frame.setVisible(true);
15     }
16  }
17
```

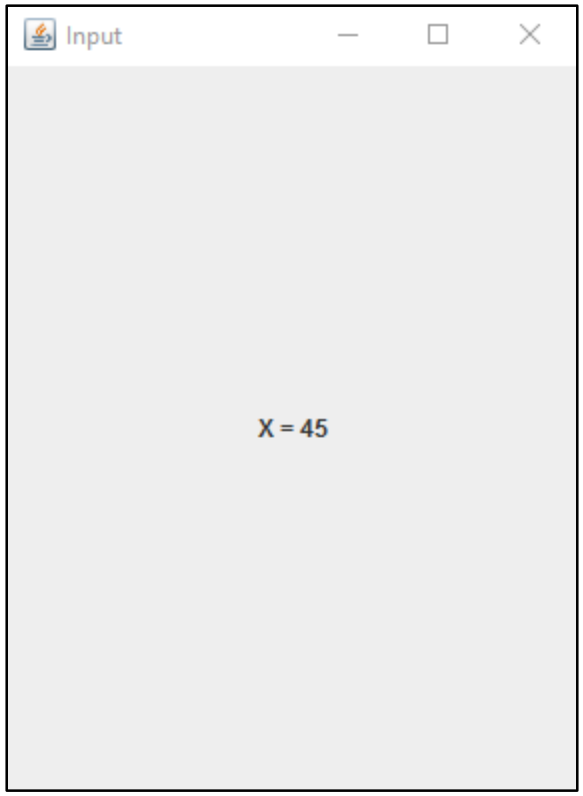

Two cars

Getting Input (Dialog)

```
1    import javax.swing.*;
2
3    public class InputViewer {
4        public static void main(String[] args) {
5            JFrame frame = new JFrame();
6
7            frame.setSize(300, 400);
8            frame.setTitle("Input");
9            frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
10
11           String in = JOptionPane.showInputDialog("Enter x");
12           JLabel out = new JLabel("X = " + in, SwingConstants.CENTER);
13           frame.add(out);
14
15           frame.setVisible(true);
16       }
17   }
18
```

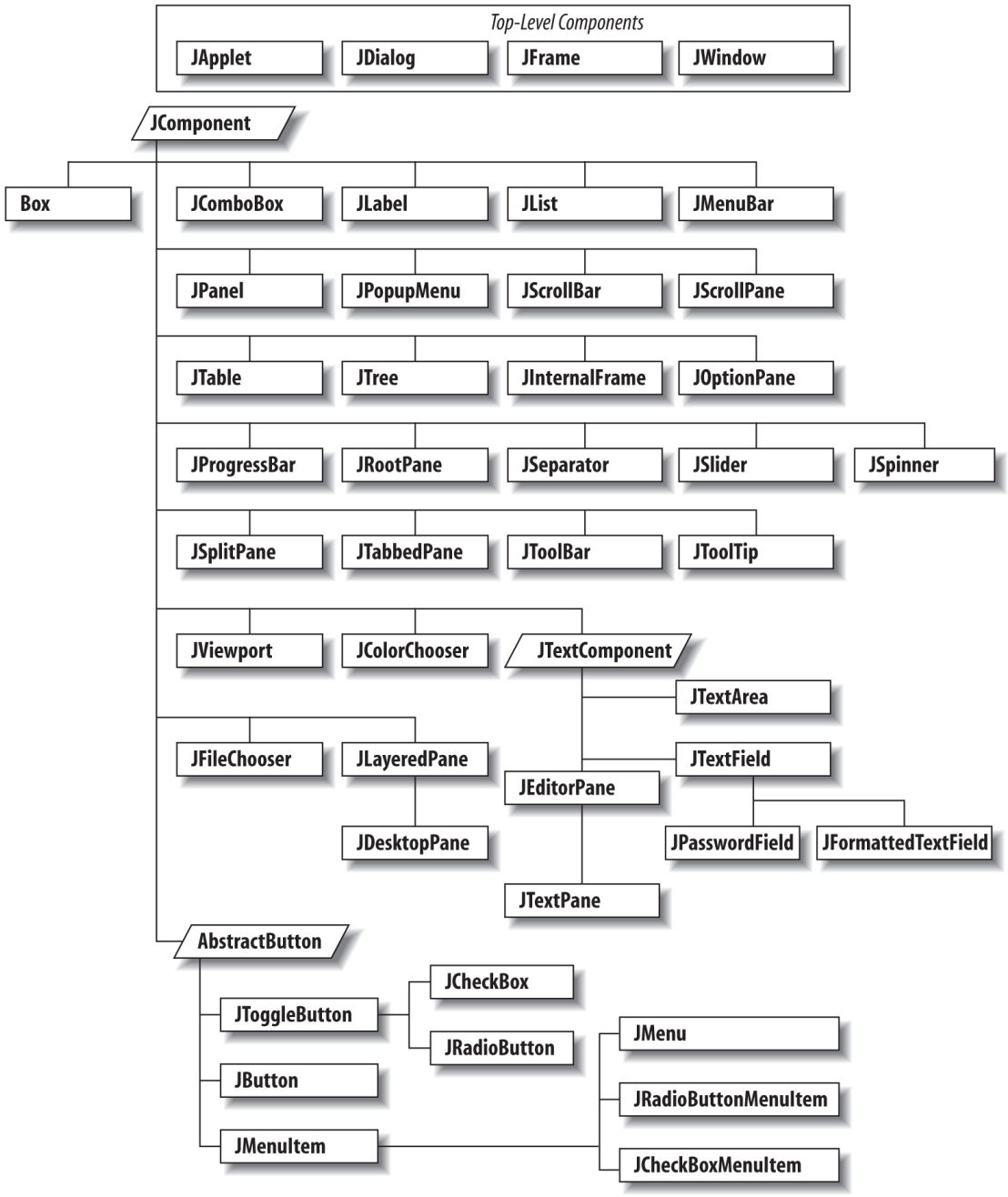
Getting Input (Dialog)





Recap

- Containers
  - JFrame
  - JComponent
- Graphics
  - paintComponent()
  - Graphics
  - Graphics2D
- Shapes
  - Built-in
  - Composites
    - Model
    - View
- Input
  - JOptionPane
    .showInputDialog()


Top-Level Components
JApplet
JDialog
JFrame
JWindow
JComponent
Box
JComboBox
JLabel
JList
JMenuBar
JPanel
JPopupMenu
JScrollBar
JScrollPane
JTable
JTree
JInternalFrame
JOptionPane
JProgressBar
JRootPane
JSeparator
JSlider
JSpinner
JSplitPane
JTabbedPane
JToolBar
JToolTip
JViewport
JColorChooser
JTextComponent
JTextArea
JFileChooser
JLayeredPane
JTextField
JEditorPane
JDesktopPane
JPasswordField
JFormattedTextField
JTextPane
AbstractButton
JCheckBox
JToggleButton
JRadioButton
JMenu
JButton
JRadioButtonMenuItem
JMenuItem
JCheckBoxMenuItem