C12-JavaFX:Advanced Controls

Programming in Java

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Topics

- Styling JavaFX Applications with CSS
- `RadioButton` Controls
- `CheckBox` Controls
- `ListView` Controls
- `ComboBox` Controls
- `Slider` Controls
- `TextArea` Controls
- Menus
- The `FileChooser` Class
- Using Console Output to Debug a GUI Application

Styling JavaFX Applications with CSS(1 of 3)

- CSS: Cascading Style Sheets
- A simple language that specifies how a user interface should appear
- CSS was originally created for the Web
- You can use CSS to style a JavaFX user interface

Styling JavaFX Applications with CSS (2 of 3)

- You typically create one or more *style sheets* to accompany your JavaFX application.
- A style sheet is a text file containing one or more style definitions, written in the following general format:

```
selector {
   property: value;
   property: value;
}
```

Styling JavaFX Applications with CSS (3 of 3)

- *selector* – a name that determines the node or nodes that are affected by the style definition
- *property* – the name of a property
- *value* – a value to assign to the property

```
selector {
   property: value;
   property: value;
}
```

Example Style Definition (1 of 2)

- `.label` – specifies that this style definition applies to `Label` controls
- The style rule specifies that the `-fx-font-size` property should be set to 20pt.
- As a result, this style definition specifies that `Label` controls should display their text in a 20-point font.

```
.label {
   -fx-font-size: 20pt;
}
```

Example Style Definition (2 of 2)

- This style definition specifies that `Label` controls should display their text in a cursive, 14-point, italic, bold font, with a dotted border around the control.

```
.label {
   -fx-font-family: cursive;
   -fx-font-size: 14pt;
   -fx-font-style: italic;
   -fx-font-weight: bold;
   -fx-border-style: dotted;
}
```

Type Selectors

Class Name in JavaFX	Corresponding Type Selector
Button	.button
CheckBox	.check-box
CheckMenuItem	.check-menu-item
ComboBox	.combo-box
ImageView	.image-view
Label	.label
ListView	.list-view
Menu	.menu
MenuBar	.menu-bar
MenuItem	.menu-item
RadioButton	.radio-button
RadioMenuItem	.radio-menu-item
Slider	.slider
TextArea	.text-area
TextField	.text-field

Properties

- JavaFX supports a large number of CSS properties.
- Part of the process of creating stylesheets is determining which properties are available for the nodes in your application.
- Oracle publishes a comprehensive CSS reference guide documenting all the available properties: https://docs.oracle.com/javase/8/javafx/api/javafx/scene/doc-files/cssref.html

Applying a Stylesheet to a JavaFX Application (1 of 2)

- A stylesheet is a text file containing style definitions.
- Stylesheets are usually saved with the `.css` file extension.
- To apply a stylesheet to a JavaFX application:
  - Save the stylesheet in the src directory as the JavaFX application
  - Use the scene object's `getStylesheets().add()` method to apply the stylesheet

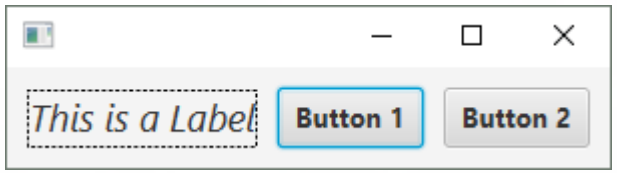
Applying a Stylesheet to a JavaFX Application (2 of 2)

- Example:
  - We have a stylesheet named `mystyles.css`
  - In our Java code, the `scene` variable references the Scene object
  - We would use the following statement to add the stylesheet to the scene:

```
scene.getStylesheets().add("mystyles.css");
```

demo2.css

```
.label {
    -fx-font-family: cursive;
    -fx-font-size: 14pt;
    -fx-font-style: italic;
    -fx-border-style: dashed;
}

.button {
    -fx-font-size: 10pt;
    -fx-font-weight: 900;
}
```




```
@Override
public void start(Stage primaryStage)
{
    // Create a Label and some Buttons.
    Label label = new Label("This is a Label");
    Button button1 = new Button("Button 1");
    Button button2 = new Button("Button 2");

    // Put the controls in an HBox.
    HBox hbox = new HBox(10, label, button1, button2);
    hbox.setAlignment(Pos.CENTER);
    hbox.setPadding(new Insets(10));

    // Create a Scene and display it.
    Scene scene = new Scene(hbox);
    scene.getStylesheets().add("demo2.css");
    primaryStage.setScene(scene);
    primaryStage.show();
}
```

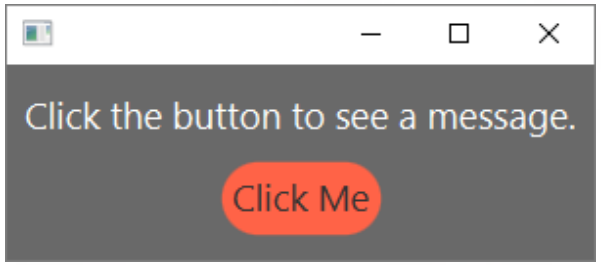
Applying Styles to the Root Node

- To apply styles to all of the nodes in a scene, use the `.root` selector.

```
.root {
    -fx-background-color: dimgrey;
    -fx-font-size: 14pt;
}
```

mystyle.css

```
.root {
    -fx-background-color: dimgrey;
    -fx-font-size: 14pt;
}

.label {
    -fx-text-fill: white;
}

.button {
    -fx-background-color: tomato;
    -fx-border-radius: 20;
    -fx-background-radius: 20;
    -fx-padding: 5;
}
```




```
// Put the Label and Button in a Vbox...
VBox vbox = new VBox(10, myLabel, myButton);
vbox.setAlignment(Pos.CENTER);

// Create a Scene and display it.
Scene scene = new Scene(vbox, 300, 100);
scene.getStylesheets().add("mystyle.css");
primaryStage.setScene(scene);
primaryStage.show();
```

Working with RGB Colors (1 of 7)

- An RGB color is specified in the following format:

  `#RRGGBB`

  Where RR, GG, and BB are hexadecimal numbers (in the range of 0-255) representing the intensity of the color's red, green, and blue channels.

Working with RGB Colors (2 of 7)

- Example:

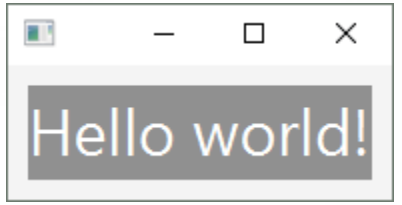
  `#007fff`

  - `00` is the red intensity
  - `7f` is the green intensity
  - `ff` is the blue intensity

Working with RGB Colors (3 of 7)

demo6.css

```
1  .label {
2      -fx-font-size: 24pt;
3      -fx-text-fill: #FFFFFF;
4      -fx-background-color: #909090;
5  }
```



Working with RGB Colors (4 of 7)

- You can also use *functional RGB notation* to specify colors.
- The general format is:

  `rgb(`*`red, green, blue`*`)`

  - The *red*, *green*, and *blue* values can be:
  - an integer in the range of 0 through 255, or
  - a percentage in the range of 0 percent through 100 percent

Working with RGB Colors (5 of 7)

- Example:

```
rgb(200, 0, 100)
```

  - `200` is the red intensity
  - `0` is the green intensity
  - `100` is the blue intensity

Working with RGB Colors (6 of 7)

- Example:

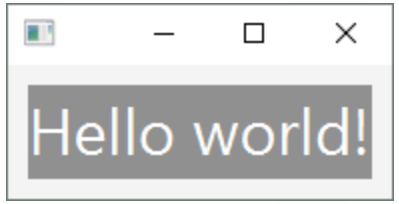
```
rgb(10%, 100%, 50%)
```

  - `10%` is the percentage of red intensity
  - `100%` is the percentage of green intensity
  - `50%` is the percentage of blue intensity

Working with RGB Colors (7 of 7)

demo7.css

```
1  .label {
2      -fx-font-size: 24pt;
3      -fx-text-fill: rgb(255, 255, 255);
4      -fx-background-color: rgb(144, 144, 144);
5  }
```



Named Colors (1 of 3)

- CSS provides numerous predefined names that represent colors.
- These are known as the *named colors*. Here are a few of them:

antiquewhite	aqua	black	blue
chocolate	crimson	darkgray	darkgreen
gold	gray	green	lavender
maroon	olive	orange	plum
purple	red	sandybrown	tan
teal	violet	white	yellow

Named Colors (2 of 3)

- You can use these names just as you would use a hexadecimal color number, or a functional RGB expression.
- JavaFX currently supports 148 named colors.
- See the entire list in Appendix K, or refer to the official CSS reference guide at: https://docs.oracle.com/javase/8/javafx/api/javafx/scene/doc-files/cssref.html

Named Colors (3 of 3)

- Example:

demo8.css

```
1 .label {
2     -fx-text-fill: white;
3     -fx-background-color: blue;
4 }
```

Creating a Custom Style Class Name (1 of 2)

- Suppose you want some of the Buttons in an application to appear with a black background and white text, and you want other Buttons to appear with a white background and black text.
- You create two custom style classes:
  - one for the black buttons
  - another for the white buttons

Creating a Custom Style Class Name (2 of 2)

- Example:

demo9.css

```
1  .button-black {
2      -fx-background-color: black;
3      -fx-text-fill: white;
4  }
5
6  .button-white {
7      -fx-background-color: white;
8      -fx-text-fill: black;
9  }
```

To apply the `.button-black` style definition to a control named `button1`:

```
button1.getStyleClass().add("button-black");
```

ID Selectors (1 of 3)

- Each node in the scene graph can optionally be assigned a unique identifier known as an *ID*.
- A node's ID is a string that can be used to identify the node in a style sheet.
- This is useful when you want to apply a style to one specific node.

ID Selectors (2 of 3)

- You assign an ID to a node with the node's `setId` method:

```
Label outputLabel = new Label("File not found!");
outputLabel.setId("label-error");
```

- This assigns `label-error` as the ID for the `outputLabel` control.

ID Selectors (3 of 3)

- Next, we create a style definition with the selector `#label-error` in our style sheet:

```
#label-error {
   -fx-background-color: red;
   -fx-text-fill: white;
}
```

- The # character indicates this is an ID selector.

- This style definition will be applied only to the node with the ID `label-error`.

Inline Style Rules (1 of 2)

- Style rules can be applied directly to a node in the application's Java code, using the node's `setStyle` method:

```
Label outputLabel = new Label("Hello world!");
outputLabel.setStyle("-fx-font-size: 24pt");
```

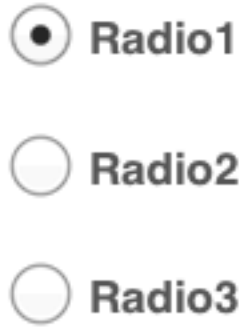
Inline Style Rules (2 of 2)

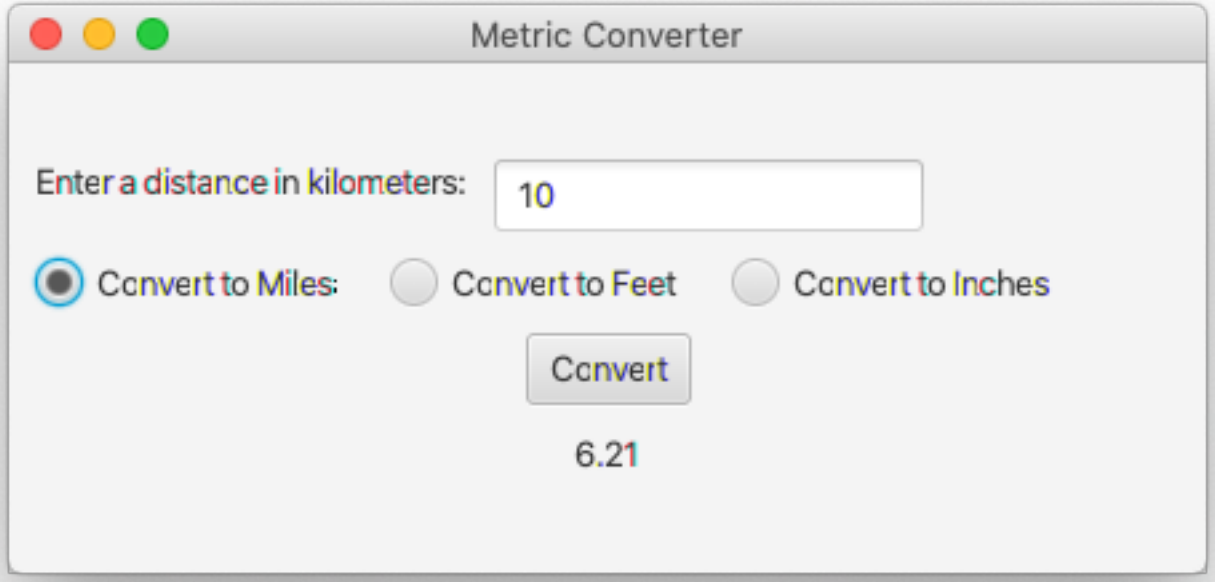
- To apply multiple style rules to a node, separate them with a semicolon:

```
Label outputLabel = new Label("Hello world!");
outputLabel.setStyle("-fx-font-size: 24pt; -fx-font-weight: bold");
```

RadioButton Controls (1 of 7)

- RadioButton controls allow the user to select one choice from several possible options.





RadioButton Controls (2 of 7)

- The `RadioButton` class is in the `javafx.scene.control` package.
- The following statement shows an example of creating a RadioButton object that displays the text *Choice 1*:

```
RadioButton radio1 = new RadioButton("Choice 1");
RadioButton radio2 = new RadioButton("Choice 2");
RadioButton radio3 = new RadioButton("Choice 3");
```

- Notice we pass the string we want displayed next to the RadioButton as an argument to the RadioButton class's constructor. Optionally, you can omit the string argument to create a RadioButton control with no text displayed next to it. Here is an example:

```
RadioButton radio1 = new RadioButton();
```

RadioButton Controls (3 of 7)

- RadioButton controls are normally grouped together in a *toggle group*.
- Only one of the RadioButton controls in a toggle group may be selected at any time.
- Clicking on a RadioButton selects it and automatically deselects any other RadioButton in the same toggle group.

RadioButton Controls (4 of 7)

- To create a toggle group, you use the `ToggleGroup` class, which is in the `javafx.scene.control` package:

```
ToggleGroup myToggleGroup = new ToggleGroup();
```

- After creating a `ToggleGroup` object, you call each `RadioButton` control's `setToggleGroup` method to add them to the `ToggleGroup`.

RadioButton Controls (5 of 7)

```
// Create some RadioButtons.
RadioButton radio1 = new RadioButton("Option 1");
RadioButton radio2 = new RadioButton("Option 2");
RadioButton radio3 = new RadioButton("Option 3");

// Create a ToggleGroup.
ToggleGroup radioGroup = new ToggleGroup();

// Add the RadioButtons to the ToggleGroup.
radio1.setToggleGroup(radioGroup);
radio2.setToggleGroup(radioGroup);
radio3.setToggleGroup(radioGroup);
```

RadioButton Controls (6 of 7)

- To determine whether a `RadioButton` is selected, you call the `RadioButton` class's `isSelected` method.

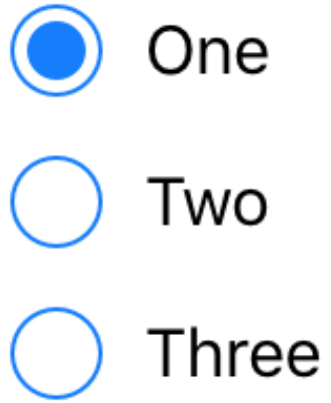
```
if (radio1.isSelected())
{
    //  Code here executes if the radio
    //  button is selected.
}
```

RadioButton Controls (7 of 7)

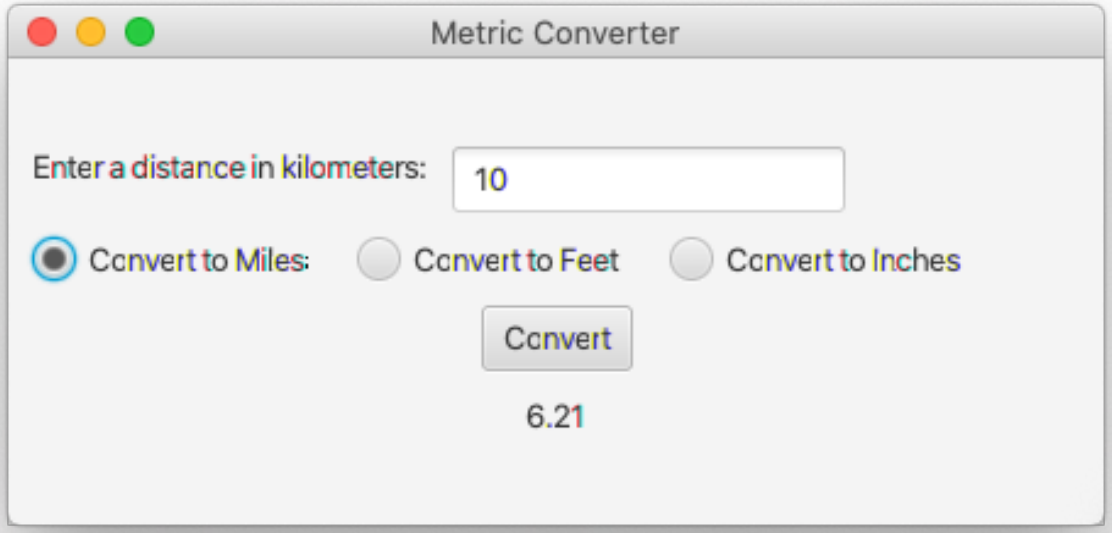
- You usually want one of the `RadioButtons` in a group to be initially selected.

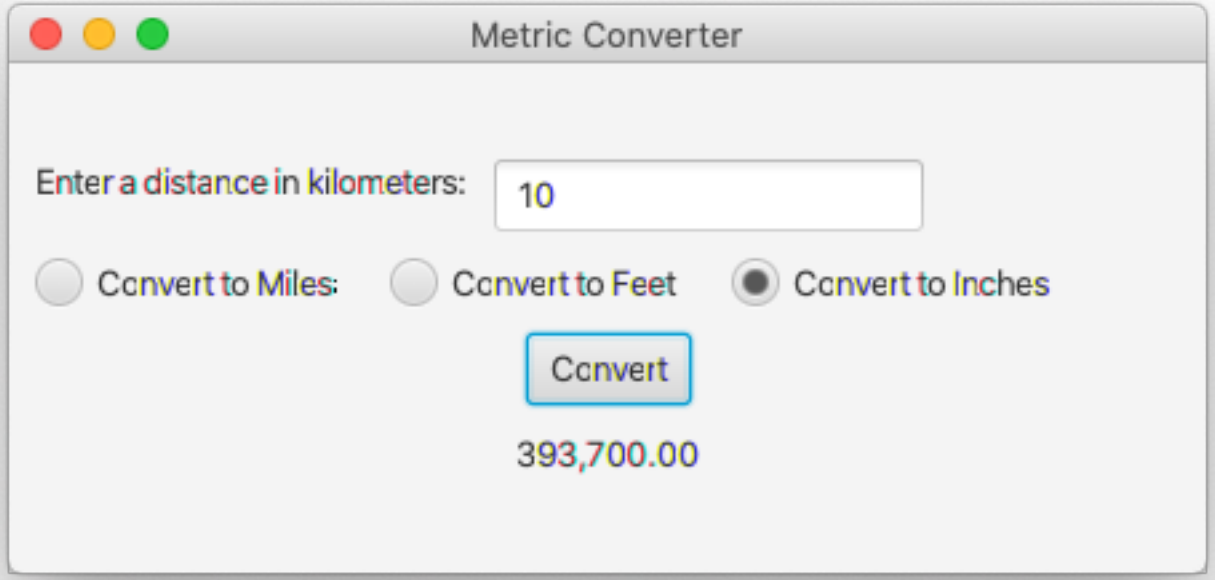
- You can select a `RadioButton` in code with the `RadioButton` class's `setSelected` method:

```
One.setSelected(true);
```



The Metric Converter application with conversions displayed





MetricConverter.java

```
import javafx.application.Application;
import javafx.stage.Stage;
import javafx.scene.Scene;
import javafx.scene.layout.HBox;
import javafx.scene.layout.VBox;
import javafx.geometry.Pos;
import javafx.geometry.Insets;
import javafx.scene.control.Label;
import javafx.scene.control.TextField;
import javafx.scene.control.Button;
import javafx.scene.control.RadioButton;
import javafx.scene.control.ToggleGroup;
import javafx.event.EventHandler;
import javafx.event.ActionEvent;

/**
 *  Metric Converter application
 */

public class MetricConverter extends Application
{
  // Fields
  private TextField kiloTextField;
  private Label resultLabel;
  private RadioButton milesButton;
  private RadioButton feetButton;
  private RadioButton inchesButton;
```

```
public static void main(String[] args)
 {
   // Launch the application.
   launch(args);
 }

 @Override
 public void start(Stage primaryStage)
 {
   // Create a Label to display a prompt.
   Label promptLabel = new Label("Enter a distance in kilometers:");

   // Create a TextField for input.
   kiloTextField = new TextField();

   // Create the RadioButton controls.
   milesButton = new RadioButton("Convert to Miles");
   feetButton = new RadioButton("Convert to Feet");
   inchesButton = new RadioButton("Convert to Inches");

   // Select the milesButton control.
   milesButton.setSelected(true);

   // Add the RadioButton controls to a ToggleGroup.
   ToggleGroup radioGroup = new ToggleGroup();
   milesButton.setToggleGroup(radioGroup);
   feetButton.setToggleGroup(radioGroup);
   inchesButton.setToggleGroup(radioGroup);
```

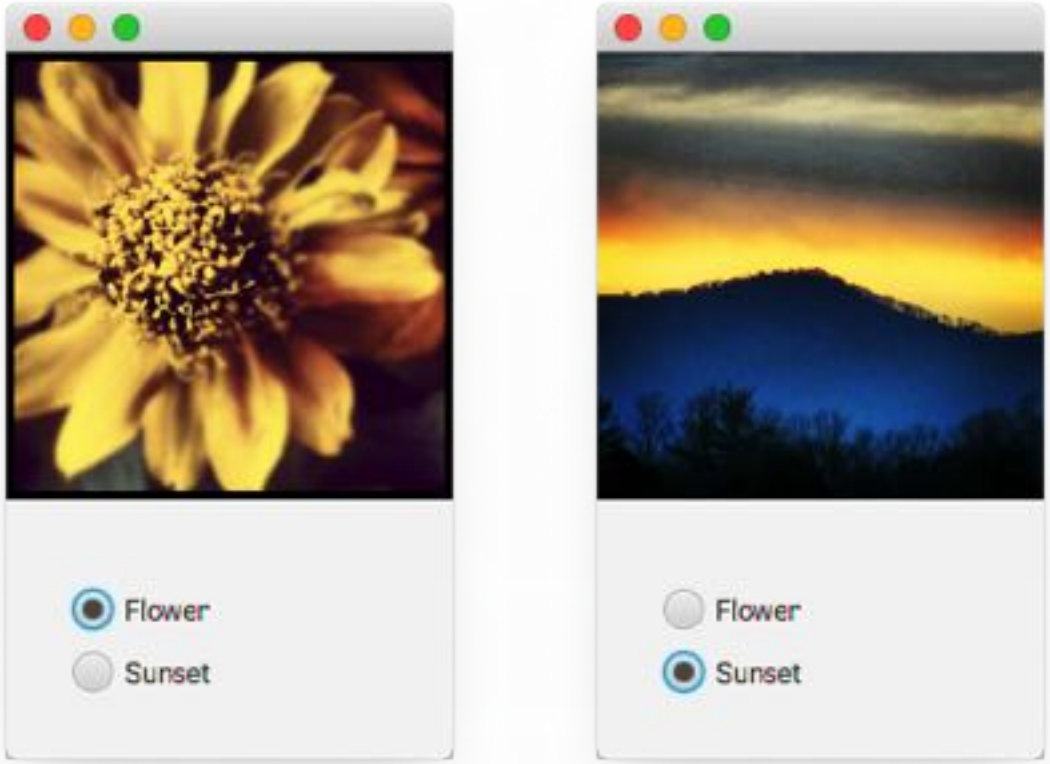
```
// Perform the selected conversion.
      if (milesButton.isSelected())
        result = kilometers * MILES_CONVERSION;

      if (feetButton.isSelected())
        result = kilometers * FEET_CONVERSION;

      if (inchesButton.isSelected())
        result = kilometers * INCHES_CONVERSION;

      // Display the results.
      resultLabel.setText(String.format("%,.2f", result));
    }
  }
}
```

Responding to `RadioButton` Clicks

- If you want an action to take place immediately when the user clicks a `RadioButton`, register an `ActionEvent` handler with the `RadioButton` control.
- The process is the same as with the `Button` control.
- See `RadioButtonEvent.java` in your textbook.

The RadioButtonEvent application

- When the program runs, it displays the window shown on the left in Figure. Initially the image of a flower is displayed. When the user clicks the Sunset RadioButton, the image immediately changes as shown in the window on the right. The user can click the RadioButton controls to display either the flower or the sunset.



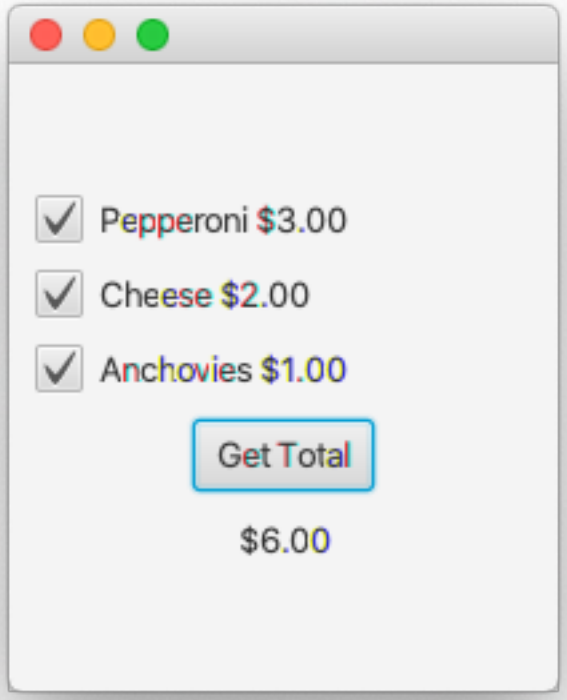
RadioButtonEvent.java

```
import javafx.application.Application;
import javafx.stage.Stage;
import javafx.scene.Scene;
import javafx.scene.layout.HBox;
import javafx.scene.layout.VBox;
import javafx.geometry.Pos;
import javafx.geometry.Insets;
import javafx.scene.image.Image;
import javafx.scene.image.ImageView;
import javafx.scene.control.RadioButton;
import javafx.scene.control.ToggleGroup;
import javafx.event.EventHandler;
import javafx.event.ActionEvent;

/**
 *  A RadioButton ActionEvent Demo
 */

public class RadioButtonEvent extends Application
{
  public static void main(String[] args)
  {
    // Launch the application.
    launch(args);
  }

@Override
  public void start(Stage primaryStage)
  {
    // Create two Image objects.
    Image flowerImage = new Image("file:Flower.jpg");
    Image sunsetImage = new Image("file:Sunset.jpg");

    // Create an ImageView object.
    ImageView imageView = new ImageView(flowerImage);

    // Resize the ImageView, preserving its aspect ratio.
    imageView.setFitWidth(200);
    imageView.setPreserveRatio(true);

    // Put the ImageView in an HBox.
    HBox imageHBox = new HBox(imageView);

    // Center the HBox contents.
    imageHBox.setAlignment(Pos.CENTER);

    // Create the RadioButtons.
    RadioButton flowerRadio = new RadioButton("Flower");
    RadioButton sunsetRadio = new RadioButton("Sunset");

    // Select the flowerRadio control.
    flowerRadio.setSelected(true);

    // Add the RadioButtons to a ToggleGroup.
    ToggleGroup radioGroup = new ToggleGroup();
    flowerRadio.setToggleGroup(radioGroup);
    sunsetRadio.setToggleGroup(radioGroup);
```

```
 // Register an ActionEvent handler for the flowerRadio.
    flowerRadio.setOnAction(event ->
    {
      imageView.setImage(flowerImage);
    });

    // Register an event handler for the sunsetRadio.
    sunsetRadio.setOnAction(event ->
    {
      imageView.setImage(sunsetImage);
    });

    // Add the RadioButtons to a VBox.
    VBox radioVBox = new VBox(10, flowerRadio, sunsetRadio);

    // Give the radioVBox some padding.
    radioVBox.setPadding(new Insets(30));

    // Add everything to a VBox.
    VBox mainVBox = new VBox(10, imageHBox, radioVBox);

    // Create a Scene with the HBox as its root node.
    Scene scene = new Scene(mainVBox);

    // Add the Scene to the Stage.
    primaryStage.setScene(scene);

    // Show the window.
    primaryStage.show();
  }
}
```

CheckBox Controls (1 of 4)

- CheckBox controls allow the user to make yes/no or on/off selections.



CheckBox Controls (2 of 4)

- The `CheckBox` class is in the `javafx.scene.control` package.

```
CheckBox choice1 = new CheckBox("Choice 1");
CheckBox choice2 = new CheckBox("Choice 2");
CheckBox choice3 = new CheckBox("Choice 3");
```

CheckBox Controls (3 of 4)

- To determine whether a `CheckBox` is selected, you call the `CheckBox` class's `isSelected` method:

```
if (check1.isSelected())
{
    // Code here executes if the check
    // box is selected.
}
```

CheckBox Controls (4 of 4)

- You can select a CheckBox in code with the CheckBox class's `setSelected` method:

```
check1.setSelected(true);
```

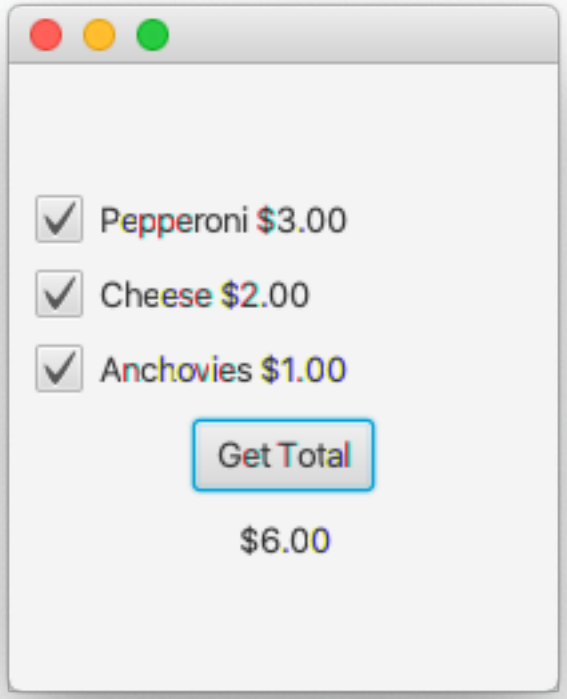
Responding to CheckBox Clicks

- If you want an action to take place immediately when the user clicks a `CheckBox`, register an `ActionEvent` handler with the `CheckBox` control.

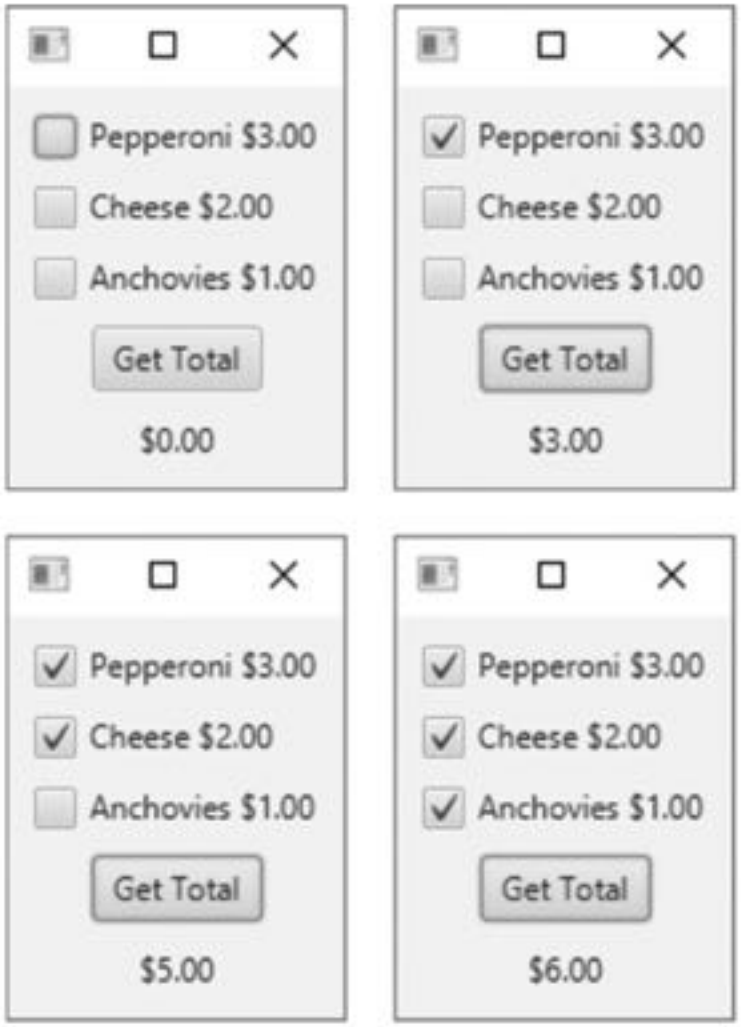
- The process is the same as with the `Button` control.

The Pizza Toppings application running

- The user checks the pizza topping items, then clicks the Button control to see the total cost of the selected items.



The Pizza Toppings application running



```
import javafx.application.Application;
import javafx.stage.Stage;
import javafx.scene.Scene;
import javafx.scene.layout.HBox;
import javafx.scene.layout.VBox;
import javafx.geometry.Pos;
import javafx.geometry.Insets;
import javafx.scene.control.Label;
import javafx.scene.control.CheckBox;
import javafx.scene.control.Button;
import javafx.event.EventHandler;
import javafx.event.ActionEvent;

/**
 *  CheckBox Demo application
 */

public class PizzaToppings extends Application
{
  // Fields
  CheckBox pepperoniCheckBox;
  CheckBox cheeseCheckBox;
  CheckBox anchoviesCheckBox;
  Label totalLabel;

  public static void main(String[] args)
  {
    // Launch the application.
    launch(args);
  }
```

```
@Override
  public void start(Stage primaryStage)
  {
    // Create the CheckBoxes.
    pepperoniCheckBox = new CheckBox("Pepperoni $3.00");
    cheeseCheckBox = new CheckBox("Cheese $2.00");
    anchoviesCheckBox = new CheckBox("Anchovies $1.00");

    // Create the Button control.
    Button totalButton = new Button("Get Total");

    // Register the event handler.
    totalButton.setOnAction(new TotalButtonHandler());

    // Create a Label for the total.
    totalLabel = new Label("$0.00");

    // Put the CheckBoxes in a VBox.
    VBox checkBoxVBox = new VBox(10, pepperoniCheckBox,
                          cheeseCheckBox, anchoviesCheckBox);

    // Create another VBox to use as the root node.
    VBox mainVBox = new VBox(10, checkBoxVBox, totalButton,
                        totalLabel);

    // Set the main VBox's alignment to center.
    mainVBox.setAlignment(Pos.CENTER);

    // Set the main VBox's padding to 10 pixels.
    mainVBox.setPadding(new Insets(10));
```

```
// Set the main VBox's padding to 10 pixels.
    mainVBox.setPadding(new Insets(10));

    // Create a Scene.
    Scene scene = new Scene(mainVBox);

    // Add the Scene to the Stage.
    primaryStage.setScene(scene);

    // Show the window.
    primaryStage.show();
  }

  /*
   * Event handler class for totalButton
   */

  class TotalButtonHandler implements EventHandler<ActionEvent>
  {
    @Override
    public void handle(ActionEvent event)
    {
      // Variable to hold the result
      double result = 0;

      // Add up the toppings.
      if (pepperoniCheckBox.isSelected())
        result += 3.0;

      if (cheeseCheckBox.isSelected())
        result += 2.0;

 if (anchoviesCheckBox.isSelected())
          result += 1.0;

        // Display the results.
        totalLabel.setText(String.format("$%,.2f", result));
      }
    }
  }
```

ComboBox Controls (1 of 7)

- A ComboBox presents a drop-down list of items that the user may select from.

- Use the ComboBox class (in the `javafx.scene.control` package) to create a ComboBox control:

```
ComboBox<String> nameComboBox = new ComboBox<>();
```

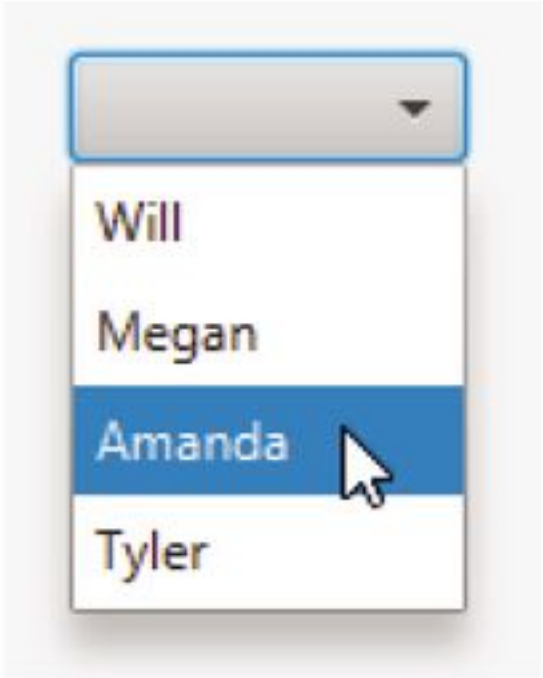
- Once you have created a ComboBox control, you are ready to add items to it:

```
nameComboBox.getItems().addAll("Will", "Megan",
  "Amanda", "Tyler");
```

ComboBox Controls (2 of 7)

The ComboBox's initial appearance

When the user clicks the ComboBox, a list of items drops down.



The selected item is displayed by the ComboBox.

ComboBox Controls (3 of 7)

Some of the ComboBox Methods

Method	Description
getValue()	Returns the item that is currently selected in the ComboBox.
setValue(value)	Selects value in the ComboBox.
setVisibleRowCount(count)	The count argument is an int. Sets the number of rows, or items, to display in the drop-down list.
setEditable(value)	The value argument is a boolean. If value is true, the ComboBox will be editable. If value is false, the ComboBox will be uneditable.
show()	Displays the drop-down list of items.
hide()	Hides the drop-down list of items.
isShowing()	Returns true or false to indicate whether the dropdown list is visible.

ComboBox Controls (4 of 7)

- You can use the ComboBox class's `getValue()` method get the item that is currently selected:

```
String selected = comboBox.getValue();
```

- If no item is selected in the ComboBox, the method will return `null`.

- See ComboBoxDemo1.java

The ComboBoxDemo1.java application

- It displays a list of countries in a ComboBox control. The user selects a country, then clicks the Button control. The Button's event handler gets the selected country and displays it in a Label control. Figure shows the program running.

ComboBoxDemo1.java

```
import javafx.application.Application;
import javafx.stage.Stage;
import javafx.scene.Scene;
import javafx.scene.control.ComboBox;
import javafx.scene.control.Label;
import javafx.scene.control.Button;
import javafx.scene.layout.VBox;
import javafx.geometry.Pos;
import javafx.geometry.Insets;

public class ComboBoxDemo1 extends Application
{
  public static void main(String[] args)
  {
    // Launch the application.
    launch(args);
  }

  @Override
  public void start(Stage primaryStage)
  {
    // Create a ComboBox.
    ComboBox<String> comboBox = new ComboBox<>();
    comboBox.getItems().addAll("England", "Scotland",
                               "Ireland", "Wales");

    // Create a Label.
    Label outputLabel = new Label("Select a Country");

    // Create a Button.
    Button button = new Button("Get Selection");
    button.setOnAction(event ->
    {
      outputLabel.setText(comboBox.getValue());
    });

    // Add the controls to a VBox.
    VBox vbox = new VBox(10, comboBox, outputLabel, button);
    vbox.setPadding(new Insets(10));
    vbox.setAlignment(Pos.CENTER);

    // Create a Scene and display it.
    Scene scene = new Scene(vbox);
    primaryStage.setScene(scene);
    primaryStage.show();
  }
}
```

ComboBox Controls (5 of 7)

- When the user selects an item in a `ComboBox`, an `ActionEvent` occurs.
- To immediately perform an action when the user selects an item in a ListView, write an event handler that responds to the `ActionEvent`:

```
comboBox.setOnAction(event ->
{
   //  Write event handling code here...
});
```

- See `ComboBoxDemo2.java`

The ComboBoxDemo2.java application

- This version of the application does not have a Button control. Instead, the selected item is displayed immediately after the user makes his or her selection. An example of the program's output is shown in Figure.

ComboBoxDemo2.java

```
      import javafx.application.Application;
import javafx.stage.Stage;
import javafx.scene.Scene;
import javafx.scene.control.ComboBox;
import javafx.scene.control.Label;
import javafx.scene.layout.VBox;
import javafx.geometry.Pos;
import javafx.geometry.Insets;

public class ComboBoxDemo2 extends Application
{
  public static void main(String[] args)
  {
    // Launch the application.
    launch(args);
  }

  @Override
  public void start(Stage primaryStage)
  {
    // Create a ComboBox.
    ComboBox<String> comboBox = new ComboBox<>();
    comboBox.getItems().addAll("England", "Scotland",
                               "Ireland", "Wales");

    // Create a Label.
    Label outputLabel = new Label("Select a Country");

    // Register an event handler for the ComboBox.
    comboBox.setOnAction(event ->
    {
      outputLabel.setText(comboBox.getValue());
    });

    // Add the controls to a VBox.
    VBox vbox = new VBox(10, comboBox, outputLabel);
    vbox.setPadding(new Insets(10));
    vbox.setAlignment(Pos.CENTER);

    // Create a Scene and display it.
    Scene scene = new Scene(vbox);
    primaryStage.setScene(scene);
    primaryStage.show();
  }
}
```

ComboBox Controls (6 of 7)

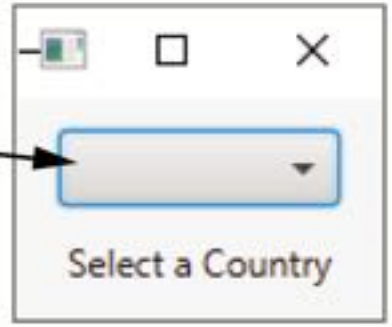
- By default, `ComboBox` controls are uneditable
  - The user cannot type input into the control; he or she can only select items from a drop-down list.
- An editable `ComboBox` allows the user to select an item, *or* type input into a field that is similar to a `TextField`.
- Use the `setEditable` method to make a `ComboBox` editable:

```
ComboBox<String> comboBox = new ComboBox<>();
comboBox.setEditable(true);
comboBox.getItems().addAll("England", "Scotland",
                           "Ireland", "Wales");
```

ComboBox Controls (7 of 7)

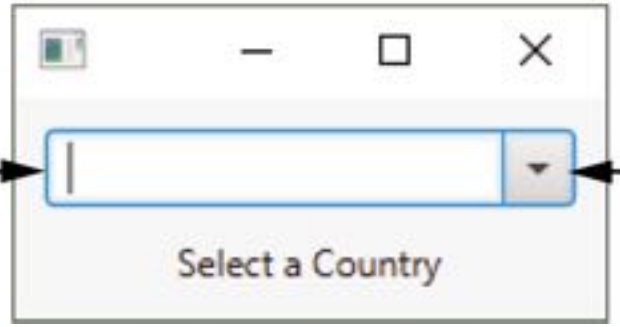
Uneditable ComboBox

The user may only click the ComboBox button and select an item from the dropdown list.



Editable ComboBox

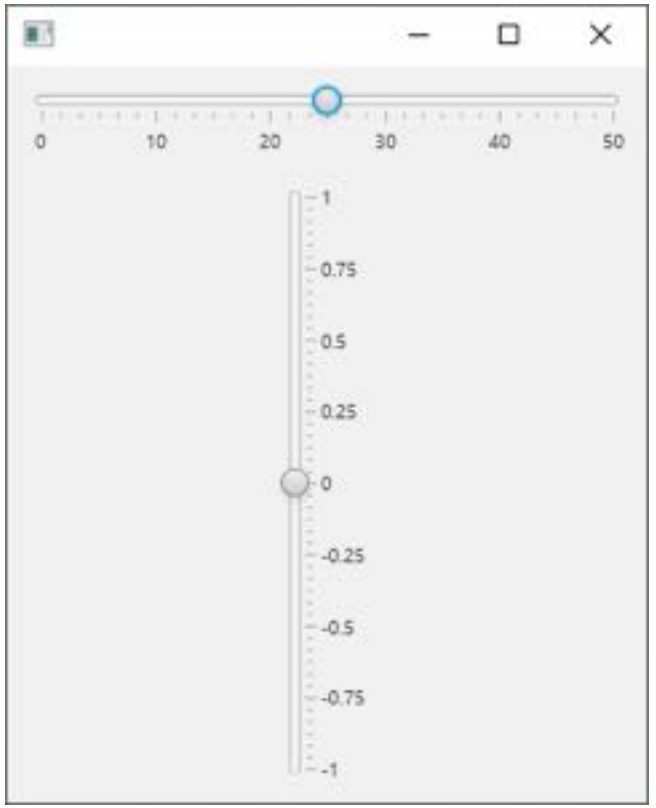
The user can type input here.



Alternatively, the user can click here to select an item from the dropdown list.

Slider Controls (1 of 5)

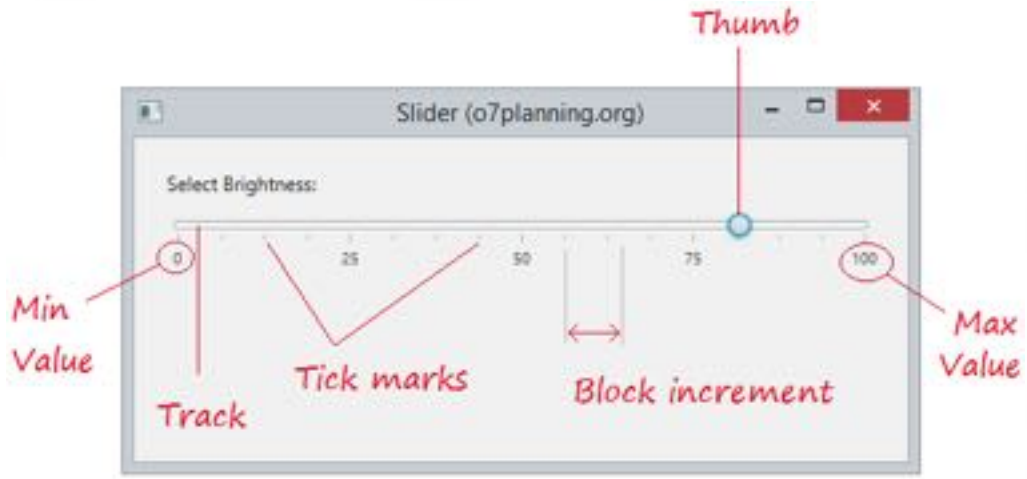
- A `Slider` allows the user to graphically adjust a number within a range.
- `Sliders` are created from the `Slider` class (in the `javafx.scene.control` package)
- They display an image of a “slider knob” that can be dragged along a track.

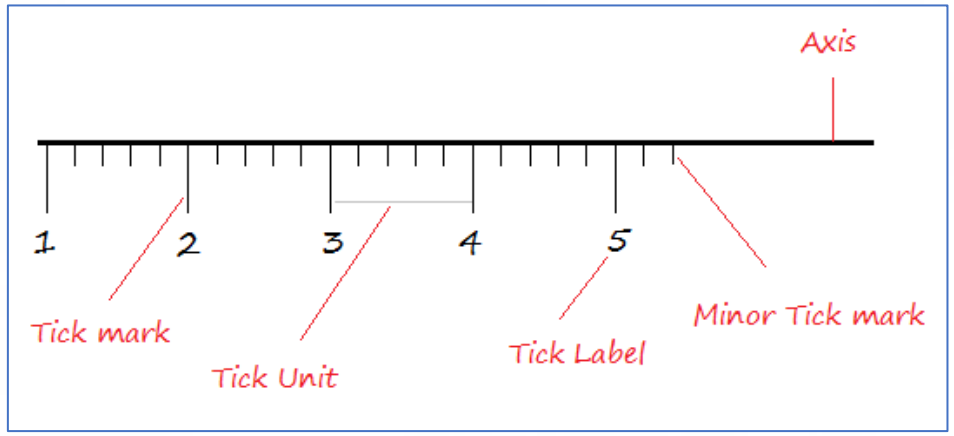


A horizontal and a vertical Slider

`Slider` Controls (2 of 5)

- A `Slider` is designed to represent a range of numeric values.
- As the user moves the knob along the track, the numeric value is adjusted accordingly.
- Between the minimum and maximum values, major tick marks are displayed with a label indicating the value at that tick mark.
- Between the major tick marks are minor tick marks.





`Slider` Controls (3 of 5)

- The `Slider` class has two constructors. No-arg:

```
Slider slider = new Slider();
```

- Creates a `Slider` with a minimum value of 0, and a maximum value of 100.

- The `Slider`'s initial value will be set to 0, and no tick marks will be displayed.

`Slider` Controls (4 of 5)

- The second constructor accepts three `double` arguments:
  - the minimum value
  - the maximum value
  - the initial value

```
Slider slider = new Slider(0.0, 50.0, 25.0);
```

  - See Table 12-7 for a list of many of the `Slider` class methods

`Slider` class methods

Method	Description
setOrientation(orientation)	Sets the Slider's orientation. The argument should be one of the following enum constants: Orientation.HORIZONTAL or Orientation.VERTICAL.
setShowTickMarks(*value*)	The *value* argument is a boolean value. If you pass true, the Slider will display tick marks. If you pass false, no tick marks will be displayed. (By default, no tick marks are displayed.)
setMajorTickUnit(*value*)	The *value* argument is a double. Sets the major tick mark spacing. (The default value is 25.)
setMinorTickCount(*value*)	The *value* argument is an int. Sets the number of minor tick marks to place between the major tick marks. (The default value is 3.)
setMax(*value*)	The *value* argument is a double. Sets the Slider's maximum value. (By default, the maximum value is 100.)
setMin(*value*)	The *value* argument is a double. Sets the Slider's minimum value. (By default, the minimum value is 0.)

`Slider` class methods

Method	Description
setSnapToTicks(*value*)	The *value* argument is a boolean value. If you pass true, the Slider knob will always snap to the nearest tick mark when it is moved. If you pass false, the Slider knob will not snap to tick marks. (By default, the Slider knob does not snap.)
setShowTickLabels(*value*)	The *value* argument is a boolean value. If you pass true, numeric labels are displayed at the major tick marks. If you pass false, no labels will be displayed. (By default, no labels are displayed.)
setBlockIncrement(*value*)	The *value* argument is a double. Sets the amount by which the Slider's knob is moved when the user clicks the Slider's track, or uses the keyboard to move the knob. (The default value is 10.)
setValue(*value*)	The *value* argument is a double. Sets the Slider's current value.
getValue()	Returns the Slider's current value, as a double.

Slider Controls (5 of 5)

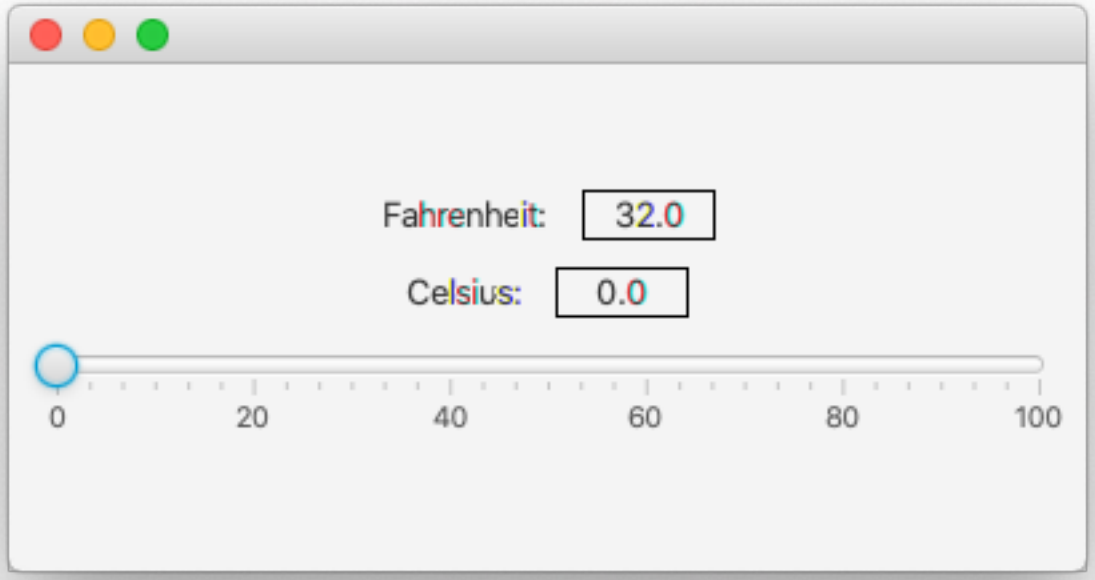
- When a `Slider`'s value changes, a *change event* occurs.
- To perform an action when the `Slider`'s value changes, write an event handler that responds to the change event:

```
slider.valueProperty().addListener((observeable, oldvalue, newvalue) ->
{
   // Write event handling code here...
});
```

- See `SliderDemo.java` in your textbook

The SliderDemo.java application

- This program displays the window shown in Figure below. Two temperatures are initially shown: 32.0 degrees Fahrenheit and 0.0 degrees Celsius. A Slider, which has the range of 0 through 100, allows you to adjust the Celsius temperature and immediately see the Fahrenheit conversion.



SliderDemo .java

```
import javafx.application.Application;
import javafx.stage.Stage;
import javafx.scene.Scene;
import javafx.scene.layout.VBox;
import javafx.scene.layout.HBox;
import javafx.scene.control.Label;
import javafx.scene.control.Slider;
import javafx.geometry.Pos;
import javafx.geometry.Insets;

public class SliderDemo extends Application
{
  public static void main(String[] args)
  {
    // Launch the application.
    launch(args);
  }

  @Override
  public void start(Stage primaryStage)
  {
    // Slider constants
    final double MIN = 0.0, MAX = 100.0, INITIAL = 0.0;
    final double MAJOR_TICK_UNIT = 20.0;
    final int MINOR_TICK_COUNT = 5;
    final double SLIDER_WIDTH = 300.0;
```

```
// Miscellaneous constants
    final double LABEL_WIDTH = 50.0;
    final double SPACING = 10.0;

    // Create the Fahrenheit controls.
    Label fDescriptor = new Label("Fahrenheit: ");
    Label fLabel = new Label("32.0");
    fLabel.setStyle("-fx-border-style: solid;" +
                    "-fx-alignment: center");
    fLabel.setPrefWidth(LABEL_WIDTH);
    HBox fHBox = new HBox(SPACING, fDescriptor, fLabel);
    fHBox.setAlignment(Pos.CENTER);

    // Create the Celsius controls.
    Label cDescriptor = new Label("Celsius: ");
    Label cLabel = new Label("0.0");
    cLabel.setStyle("-fx-border-style: solid;" +
                    "-fx-alignment: center");
    cLabel.setPrefWidth(LABEL_WIDTH);
    HBox cHBox = new HBox(SPACING, cDescriptor, cLabel);
    cHBox.setAlignment(Pos.CENTER);
```

SliderDemo .java

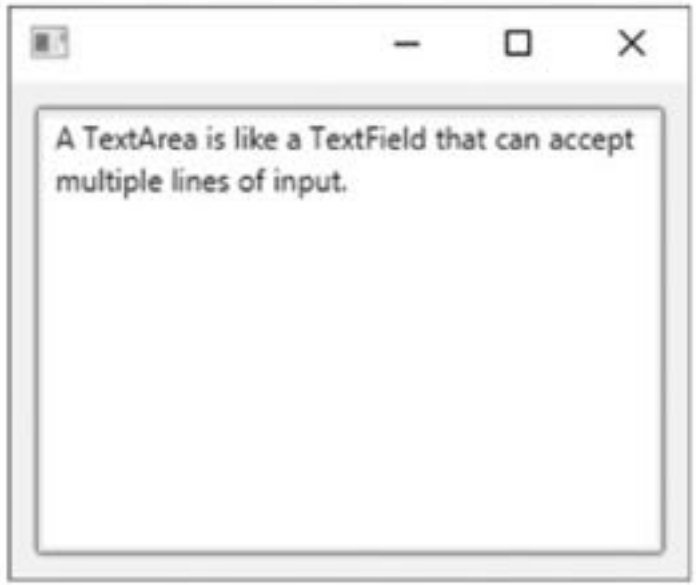
```
// Make the Slider.
    Slider slider = new Slider(MIN, MAX, INITIAL);
    slider.setShowTickMarks(true);
    slider.setMajorTickUnit(MAJOR_TICK_UNIT);
    slider.setMinorTickCount(MINOR_TICK_COUNT);
    slider.setShowTickLabels(true);
    slider.setSnapToTicks(true);
    slider.setPrefWidth(SLIDER_WIDTH);

    // Register an event handler for the Slider.
    slider.valueProperty().addListener(
      (observeable, oldvalue, newvalue) ->
      {
        // Get the Celsius temp from the Slider.
        double celsius = slider.getValue();

        // Convert Celsius to Fahrenheit.
        double fahrenheit = (9.0 / 5.0) * celsius + 32;

        // Display the Celsius and Fahrenheit temps.
        cLabel.setText(String.format("%.1f", celsius));
        fLabel.setText(String.format("%.1f", fahrenheit));
      });

     // Add the controls to an VBox.
    VBox vbox = new VBox(10, fHBox, cHBox, slider);
    vbox.setAlignment(Pos.CENTER);
    vbox.setPadding(new Insets(SPACING));

    // Create a Scene and display it.
    Scene scene = new Scene(vbox);
    primaryStage.setScene(scene);
    primaryStage.show();
  }
```

TextArea Controls (1 of 4)

- A `TextArea` is a multiline `TextField` that can accept several lines of text input, or display several lines of text.

- The `TextArea` class (in the `javafx.scene.control` package) has two constructors.

```
TextArea textArea = new TextArea();

TextArea textArea = new TextArea("This is the initial text.");
```



The `TextArea` control

TextArea Controls (2 of 4)

Some of the TextArea Class Methods

Methodo	Description
setPrefColumnCount(value)	The value argument is an int. Sets the preferred number of text columns. (The default value is 40.)
setPrefRowCount(value)	The value argument is an int. Sets the preferred number of text rows. (The default value is 10.)
setWrapText(value)	The value argument is a boolean. If the argument is true, then the TextArea will wrap a line of text that exceeds the end of a row. If the argument is false, then the TextArea will scroll when a line of text exceeds the end of a row. (The default value is false.)
getText()	Returns the contents of the TextArea as a String.
setText(value)	The value argument is a String. The argument becomes the text that is displayed in the TextArea control.

TextArea Controls (3 of 4)

- Example: Creating an empty TextArea control with a width of 20 columns and a height of 30 rows:

```
TextArea textArea = new TextArea();
textArea.setPrefColumnCount(20);
textArea.setPrefRowCount(30);
```

TextArea Controls (4 of 4)

- By default, `TextArea` controls do not perform text wrapping.
- To enable text wrapping, use the `setWrapText` method.
- The method accepts a `boolean` argument: `true` = text wrapping is enabled, `false` = text wrapping is disabled.

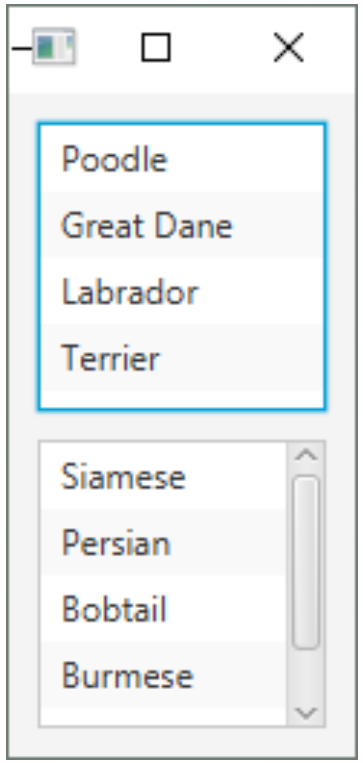
```
textInput.setWrapText(true);
```

- To retrieve the text the user has typed into a TextArea control, you call the control's getText method.

```
String input;
input = textArea.getText();
```

`ListView` Controls (1 of 14)

- The `ListView` control displays a list of items and allows the user to select one or more items from the list.



ListView Controls (2 of 14)

- The `ListView` class is in the `javafx.scene.control` package.

```
ListView<String> dogListView = new ListView<>();
```

- Adding items to the `ListView`:

```
dogListView.getItems().addAll(
   "Poodle", "Great Dane", "Labrador", "Terrier");
```

ListView Controls (3 of 14)

- Creating a `ListView` with a preferred size:

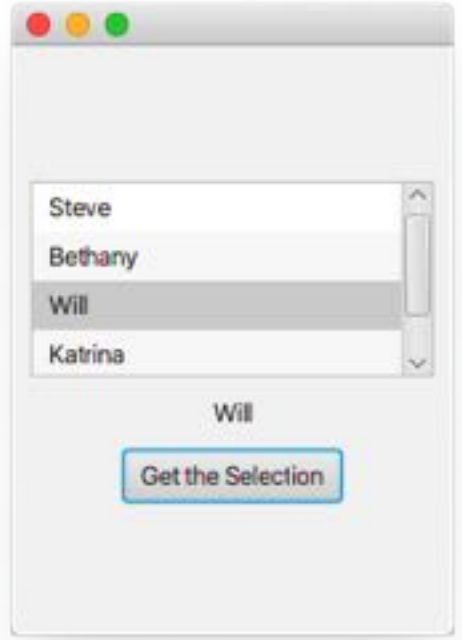
```
ListView<String> catListView = new ListView<>();
catListView.setPrefSize(120, 100);
catListView.getItems().addAll("Siamese", "Persian", "Bobtail",
                              "Burmese", "Tabby");
```

ListView Controls (4 of 14)

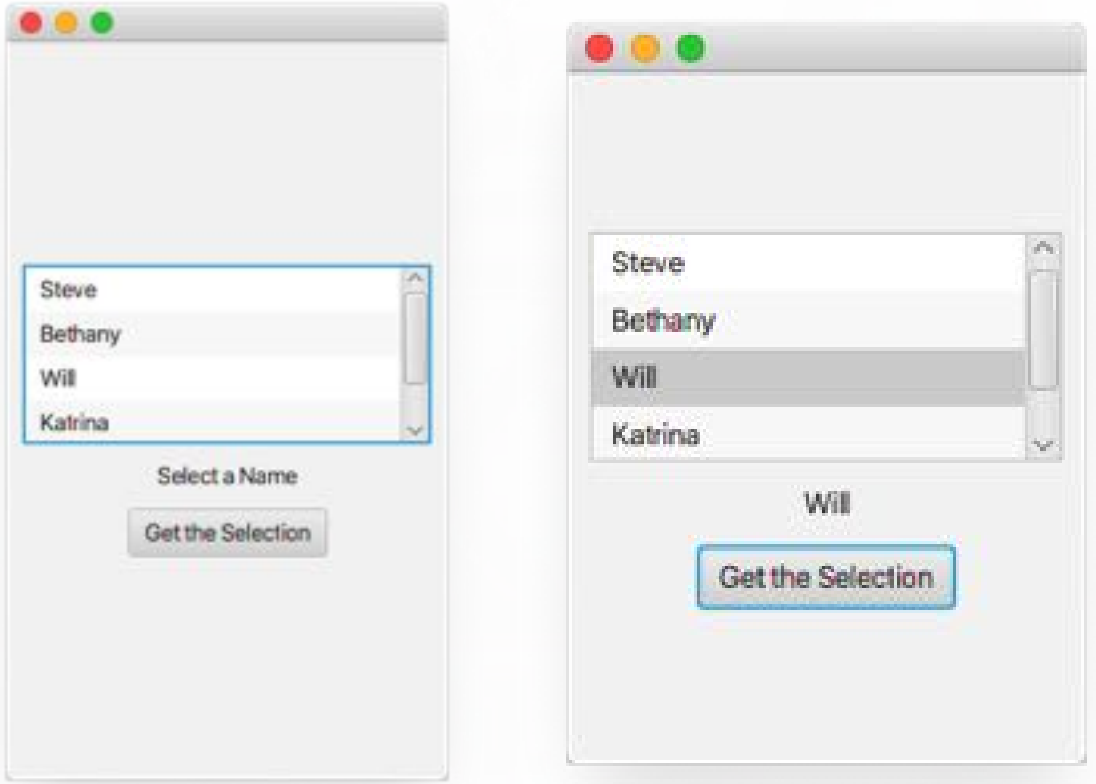
- Use the `ListView` class's `getSelectionModel().getSelectedItem()` method get the item that is currently selected.

```
String selected = listView.getSelectionModel().getSelectedItem();
```

- If no item is selected in the `ListView`, the method will return `null`.
- See `ListViewDemo1.java`



- It displays a list of names in a ListView control. When the user clicks the Button control, the program gets the selected name and displays it in a Label control. Figure shows the program running.



```
import javafx.application.Application;
import javafx.stage.Stage;
import javafx.scene.Scene;
import javafx.scene.control.ListView;
import javafx.scene.control.Label;
import javafx.scene.control.Button;
import javafx.scene.layout.VBox;
import javafx.geometry.Pos;
import javafx.geometry.Insets;

public class ListViewDemo1 extends Application
{
  public static void main(String[] args)
  {
    // Launch the application.
    launch(args);
  }

  @Override
  public void start(Stage primaryStage)
  {
    // Create a ListView of Strings.
    ListView<String> listView = new ListView<>();
    listView.setPrefSize(120, 100);
    listView.getItems().addAll("Steve", "Bethany", "Will", "Katrina");

    // Create a Label to display the selection.
    Label selectedNameLabel = new Label("Select a Name");

    // Create a Button to get the selection.
    Button getButton = new Button("Get the Selection");

    // Create an event handler for the Button.
    getButton.setOnAction(event ->
    {
      // Get the selected name.
      String selected = listView.getSelectionModel().getSelectedItem();

      // Display the selected name in the Label.
      selectedNameLabel.setText(selected);
    });

    // Add the controls to a VBox.
    VBox vbox = new VBox(10, listView, selectedNameLabel, getButton);
    vbox.setPadding(new Insets(10));
    vbox.setAlignment(Pos.CENTER);

    // Create a Scene and display it.
    Scene scene = new Scene(vbox);
    primaryStage.setScene(scene);
    primaryStage.show();
  }
}
```

```
// Set the main VBox's padding to 10 pixels.
    mainVBox.setPadding(new Insets(10));

    // Create a Scene.
    Scene scene = new Scene(mainVBox);

    // Add the Scene to the Stage.
    primaryStage.setScene(scene);

    // Show the window.
    primaryStage.show();
  }

  /*
   * Event handler class for totalButton
   */

  class TotalButtonHandler implements EventHandler<ActionEvent>
  {
    @Override
    public void handle(ActionEvent event)
    {
      // Variable to hold the result
      double result = 0;

      // Add up the toppings.
      if (pepperoniCheckBox.isSelected())
        result += 3.0;

      if (cheeseCheckBox.isSelected())
        result += 2.0;

 if (anchoviesCheckBox.isSelected())
          result += 1.0;

        // Display the results.
        totalLabel.setText(String.format("$%,.2f", result));
      }
    }
  }
```

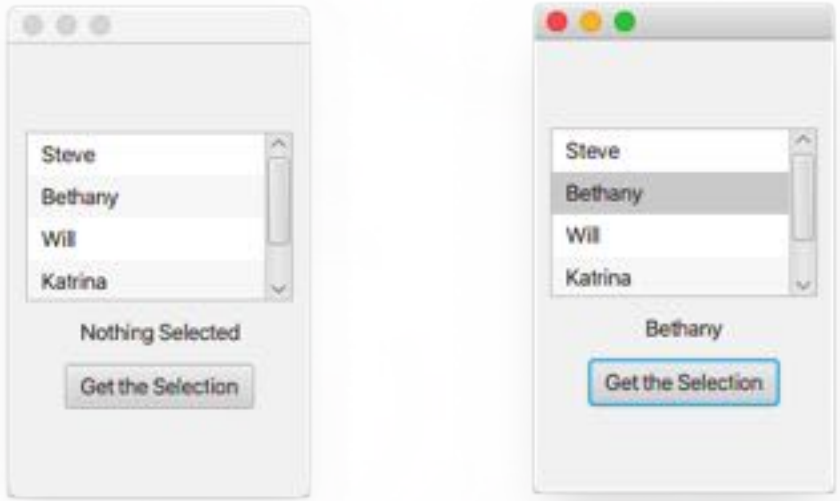
ListView Controls (5 of 14)

- Each item in a `ListView` control is assigned an index.
- The first item (at the top of the list) has the index 0, the second item has the index 1, and so forth.
- Use the `ListView` class's `getSelectionModel().getSelectedIndex()` method get the index of the item that is currently selected:

```
int index = lististView.getSelectionModel().getSelectedIndex();
```

- If no item is selected in the `ListView`, the method will return `-1`.
- See `ListViewDemo2.java` in your textbook

- In this version, the program displays the message “Nothing Selected” if the user clicks the Button control before he or she has selected an item in the ListView control. An example of this output is shown in Figure.



```
import javafx.application.Application;
import javafx.stage.Stage;
import javafx.scene.Scene;
import javafx.scene.control.ListView;
import javafx.scene.control.Label;
import javafx.scene.control.Button;
import javafx.scene.layout.VBox;
import javafx.geometry.Pos;
import javafx.geometry.Insets;

public class ListViewDemo2 extends Application
{
  public static void main(String[] args)
  {
    // Launch the application.
    launch(args);
  }

  @Override
  public void start(Stage primaryStage)
  {
    // Create a ListView of Strings.
    ListView<String> listView = new ListView<>();
    listView.setPrefSize(120, 100);
    listView.getItems().addAll("Steve", "Bethany", "Will", "Katrina");

    // Create a Label to display the selection.
    Label selectedNameLabel = new Label("Select a Name");

    // Create a Button to get the selection.
    Button getButton = new Button("Get the Selection");

    // Create an event handler for the Button.
    getButton.setOnAction(event ->
    {
      // Determine whether an item is selected.
      if (listView.getSelectionModel().getSelectedIndex() != -1)
      {
        // Get the selected name.
        String selected =
              listView.getSelectionModel().getSelectedItem();

        // Display the selected name in the Label.
        selectedNameLabel.setText(selected);
      }
      else
      {
        selectedNameLabel.setText("Nothing Selected");
      }
    });

    // Add the controls to a VBox.
    VBox vbox = new VBox(10, listView, selectedNameLabel, getButton);
    vbox.setPadding(new Insets(10));
    vbox.setAlignment(Pos.CENTER);

    // Create a Scene and display it.
    Scene scene = new Scene(vbox);
    primaryStage.setScene(scene);
    primaryStage.show();
  }
}
```

ListView Controls (6 of 14)

- When the user selects an item in a `ListView`, a *change event* occurs.
- To immediately perform an action when the user selects an item in a ListView, write an event handler that responds to the change event:

```
listView.getSelectionModel().selectedItemProperty().addListener(event ->
{
   // Write event handling code here ...
});
```

- See `ListViewDemo3.java` in your textbook

`ListView` Controls (7 of 14)

- The `ListView` control's `getItems().addAll()` method adds items to the `ListView`.
- If the `ListView` already contains items, the `getItems().addAll()` method will not erase the existing items, but will add the new items to the existing list.
- If you want to replace the existing items in a `ListView`, use the `getItems().addAll()` method instead.

`ListView` Controls (8 of 14)

- To initialize a `ListView` control with the contents of an array or an `ArrayList`:
  - Convert the array or `ArrayList` to an `ObservableList`. (This requires the `FXCollections` class, in the `javafx.collections` package)
  - Pass the `ObservableList` as an argument to the `ListView` class's constructor.

ListView Controls (9 of 14)

- Example: initializing a `ListView` control with the contents of an array:

```
// Create a String array.
String[] strArray = {"Monday", "Tuesday", "Wednesday"};

// Convert the String array to an ObservableList.
ObservableList<String> strList =
       FXCollections.observableArrayList(strArray);

// Create a ListView control.
ListView<String> listView = new ListView<>(strList);
```

ListView Controls (10 of 14)

- Example: initializing a `ListView` control with the contents of an `ArrayList`:

```
// Create an ArrayList of Strings.
ArrayList<String> strArrayList = new ArrayList<>();
strArrayList.add("Monday");
strArrayList.add("Tuesday");
strArrayList.add("Wednesday");

// Convert the ArrayList to an ObservableList.
ObservableList<String> strList =
       FXCollections.observableArrayList(strArrayList);

// Create a ListView control.
ListView<String> listView = new ListView<>(strList);
```

`ListView` Controls (11 of 14)

- The `ListView` control can operate in either of the following selection modes:
  - Single Selection Mode – The default mode. Only one item can be selected at a time.
  - Multiple Interval Selection Mode – Multiple items may be selected.
- You change the selection mode with the control's `getSelectionModel().setSelectionMode()`method.

ListView Controls (12 of 14)

- To change to multiple interval selection mode:

```
listView.getSelectionModel().setSelectionMode(SelectionMode.MULTIPL
   E);
```

- To change back to single selection mode:

```
listView.getSelectionModel().setSelectionMode(SelectionMode.SINGLE)
   ;
```

`ListView` Controls (13 of 14)

- When a `ListView` control is in multiple selection mode, the user can select more than one item.
- To get all of the selected items and their indices, use the following methods:
  - `getSelectionModel().getSelectedItems()` — returns a read-only `ObservableList` of the selected items
  - `getSelectionModel().getSelectedIndices()` — returns a read-only `ObservableList` of the integer indices of the selected items

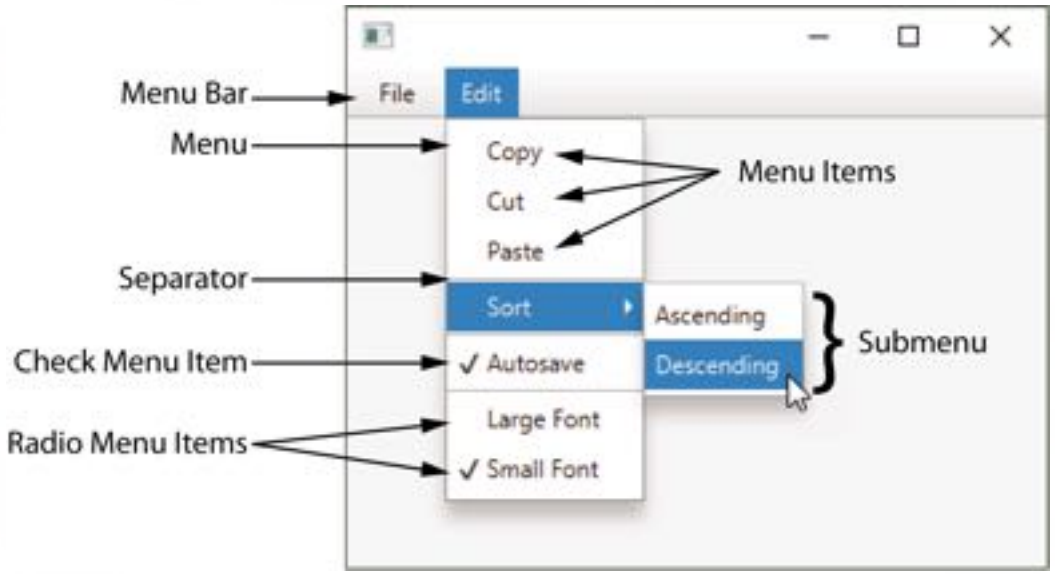
ListView Controls (14 of 14)

- By default, `ListView` controls are vertically oriented.
- You can set the orientation to either vertical or horizontal with the `ListView` class's `setOrientation` method.
- When you call the method, you pass one of the following enum constants:
  - `Orientation.VERTICAL`
  - `Orientation.HORIZONTAL`
  - (The `Orientation` enum is in the `javafx.geometry` package.)

```
ListView<String> listView = new ListView<>();
listView.getItems().addAll("Monday", "Tuesday", "Wednesday",
                           "Thursday", "Friday", "Saturday",
                           "Sunday");
listView.setOrientation(Orientation.HORIZONTAL);
listView.setPrefSize(200, 50);
```

Menus (1 of 5)

- A menu system is a collection of commands organized in one or more drop-down menus.



Menus (2 of 5)

- A menu system commonly consists of:
  - Menu Bar – lists the names of one or menus
  - Menu – a drop-down list of menu items
  - Menu Item – can be selected by the user
  - Check box menu item – appears with a small box beside it
  - Radio button menu item – may be selected or deselected
  - Submenu – a menu within a menu
  - Separator bar – used to separate groups of items

Menus (3 of 5)

- A menu system is constructed with the following classes:
  - MenuBar – used to create a menu bar
  - Menu – used to create a menu, containing:
    - MenuItem
    - CheckMenuItem
    - RadioMenuItem
    - other Menu objects
  - MenuItem – Used to create a regular menu, and generates an ActionEventwhen selected.

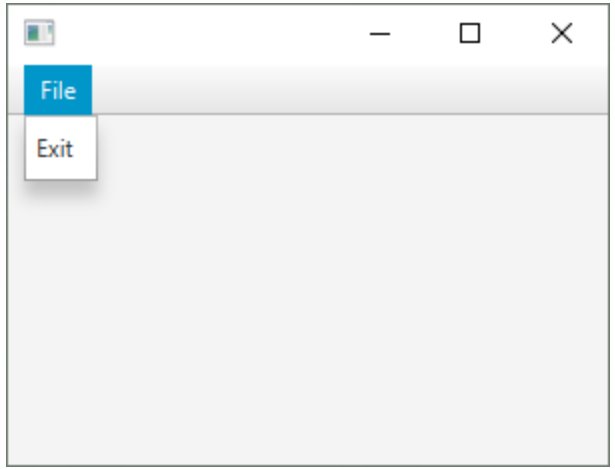
Menus (4 of 5)

- `CheckMenuItem` – Used to create a checked menu item.
  - The class's `isSelected` method returns `true` if the item is selected, or `false` otherwise.
  - A `CheckMenuItem` component generates an `ActionEvent` when selected.

- `RadioMenuItem` – Used to create a radio button menu item.
  - `RadioMenuItem` components can be grouped together in a `ToggleGroup` so that only one of them can be selected at a time.
  - The class's `isSelected` method returns `true` if the item is selected, or `false` otherwise.
  - A `RadioMenuItem` component generates an `ActionEvent` when selected

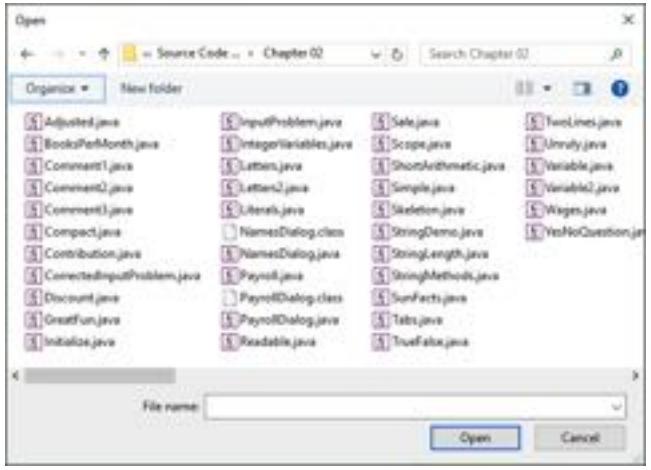
Menus (5 of 5)

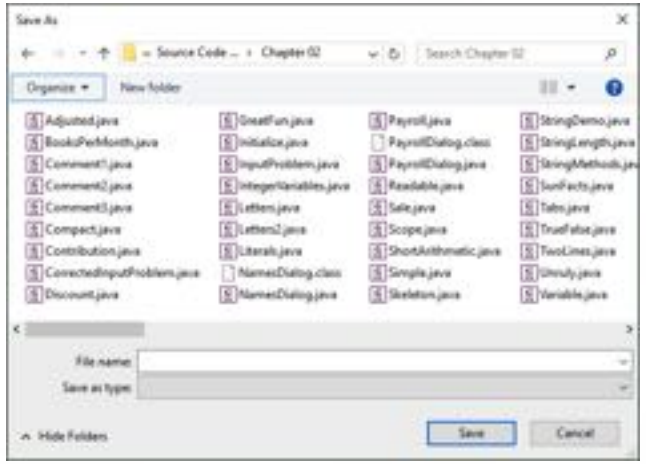
- See `SimpleMenu.java` in your textbook for an example



The `FileChooser` Class (1 of 3)

- The `FileChooser` class (in the `javafx.stage` package) displays a dialog box that allows the user to browse for a file and select it.
- The class can display two types of predefined dialog boxes:
  - open dialog box
  - save dialog box





The `FileChooser` Class (2 of 3)

- First, create an instance of the `FileChooser` class
- Then, call either the `showOpenDialog` method, or the `showSaveDialog` method
- With either method, you pass a reference to the application's stage as an argument

```
FileChooser fileChooser = new FileChooser();
File selectedFile = fileChooser.showOpenDialog(primaryStage);
```

The `FileChooser` Class (3 of 3)

- The `showOpenDialog` and `showSaveDialog` methods return a `File` object (in the `java.io` package) containing information about the selected file.
- If the user does not select a file, the method returns `null`.

```
FileChooser fileChooser = new FileChooser();
File selectedFile = fileChooser.showOpenDialog(primaryStage);
if (selectedFile != null)
{
   String filename = selectedFile.getPath();
   outputLabel.setText("You selected " + filename);
}
```

Using Console Output to Debug a GUI

- Use `System.out.println()` to display variable values, etc. in the console as your application executes to identify logic errors

```
// For debugging, display the text entered, and
// its value converted to a double.
System.out.println("Reading " + str +
                   " from the text field.");
System.out.println("Converted value: " +
                   Double.parseDouble(str));
```

- See `ConsoleDebugging.java` in your textbook


thank you
danke
謝謝
ngiyabonga
شكراً جزيلاً
рахмат
teşekkür ederim
gracias
merci
obrigado
dziękuję
bedankt
спасибо
Баярлалаа
go raibh maith agat
mochchakkeram
sukriya
kop khun krap
terima kasih
감사합니다
ありがとう
arigatô
dakujem
takk
grazie
tapadh leat
hvala
mauruuru
dank je
мерси
ευχαριστώ
tack
mersi
blagodaram
matondo
misaotra
paldies
хвала
asante
manana
enkosi
sobodi
dekuji
chnorakaloutioun
gracies
sulpáy
rahmet
tanemirt
diolch
dhanyavadagalu
shukriya
trugarez
xièxie
kam sah hamnida
najis tuke
rahmat
mèsi
faafetai lava
vinaka
kiitos
dankie
dhanyavad
mamnun
дякую
djiere dieuf
tau
obrigada
welalin
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kia ora
spas
спасибі
mahalo