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Java Foundations

9-2
Colors and Shapes

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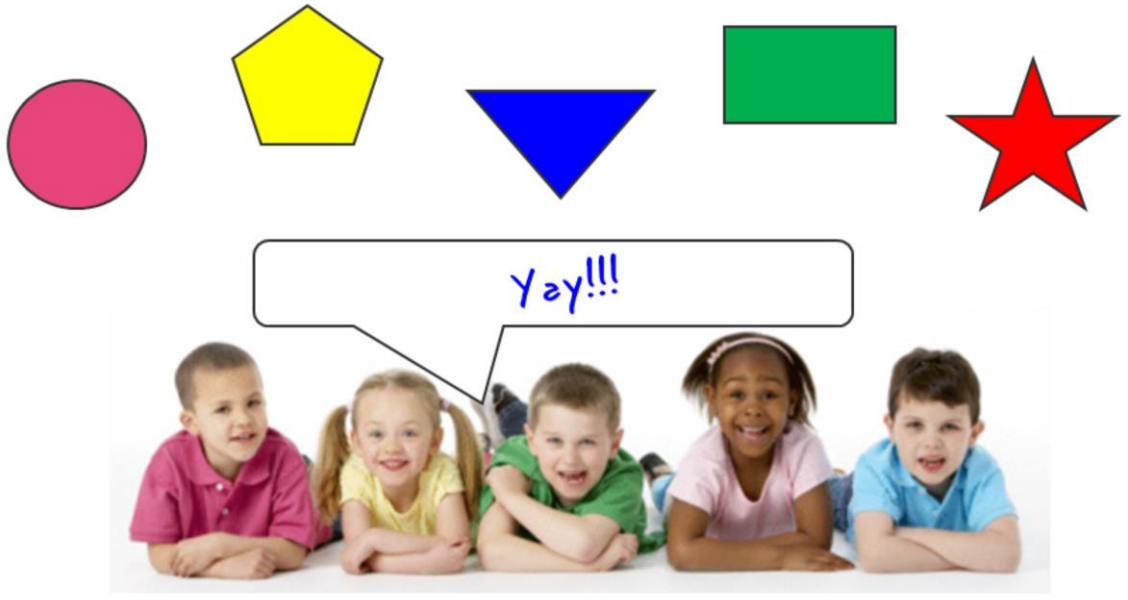
Guess What, Boys and Girls?!

Today we're going to learn about **colors** and **shapes!**



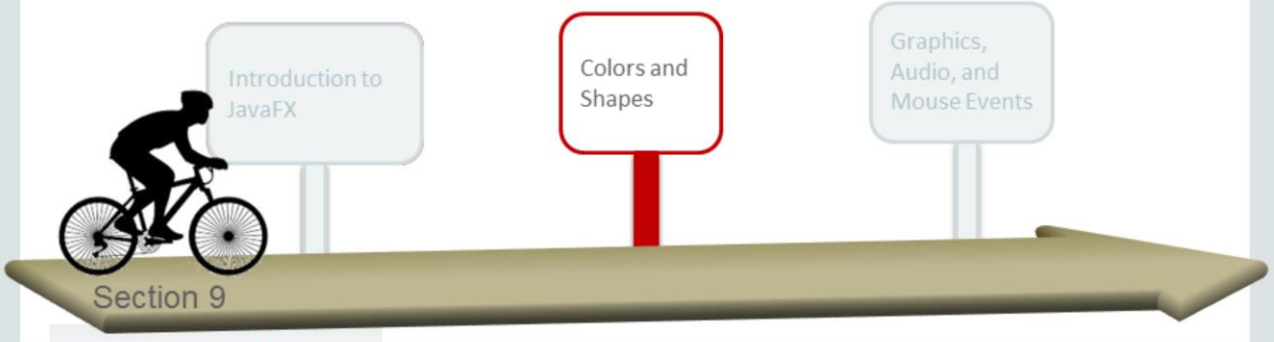
Objectives

This lesson covers the following objectives:

- Create and use custom colors
- Create shapes and explain their properties and behaviors
- Reference the JavaFX Ensemble

Topics

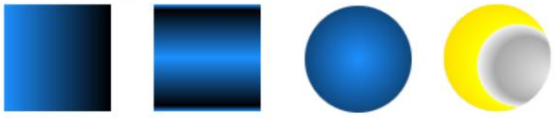
- Colors
- Shapes
- The JavaFX Ensemble



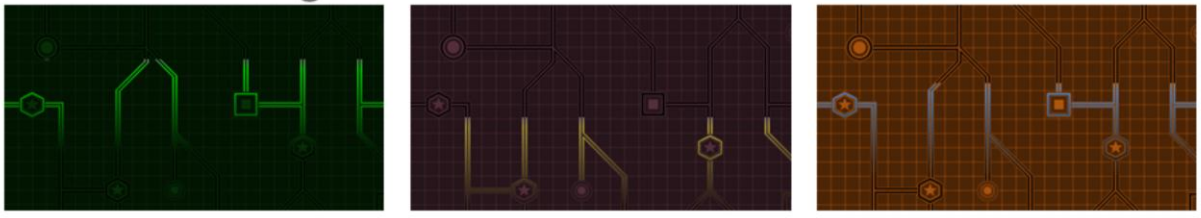
What Can I Do with Colors in JavaFX?

- Color shapes

- Create gradients



- Colorize images



JavaFX Contains a Color Class

- Colors can be stored as variables:

```
Color color = Color.BLUE;
```

- Colors can be passed in methods:

```
Scene scene = new Scene(root, 300, 250, Color.BLACK);
```

  – This example makes the scene's background black.

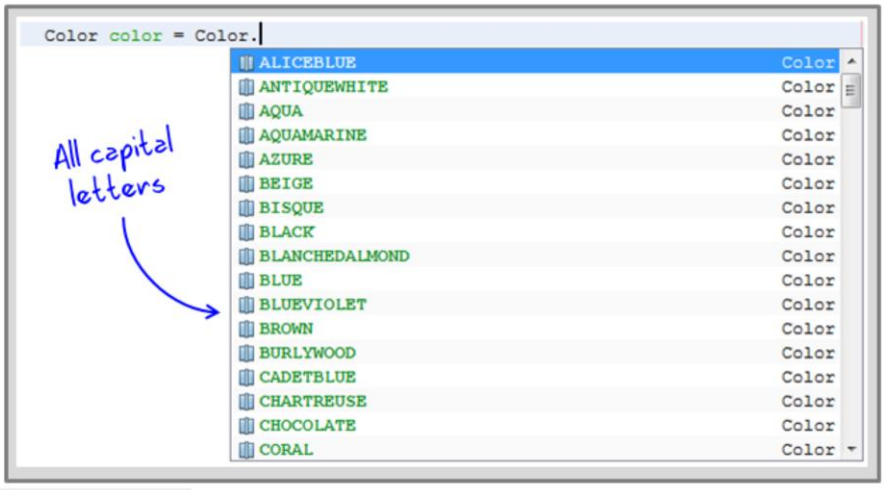
- But before using any Color …
  – You'll first need to make the following import:

```
import javafx.scene.paint.Color;
```

  – Ignore NetBeans' other Color import suggestions.

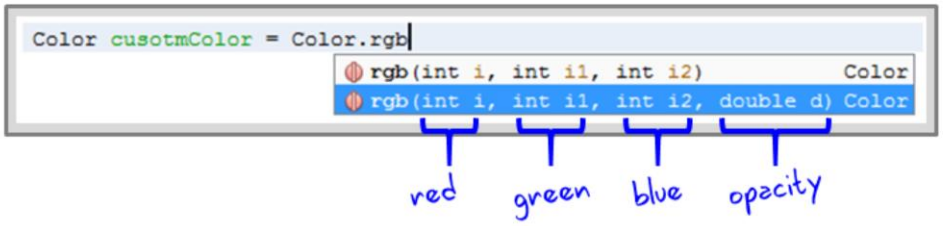
Referencing a Color

- There are many colors in JavaFX.
- Typing `Color.` in NetBeans reveals the entire list of possible colors.



Customizing a Color

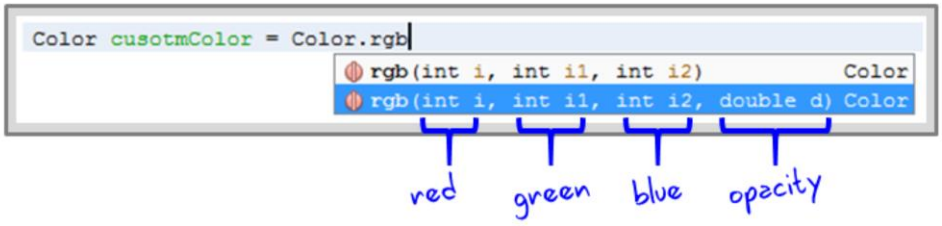
- If you're unhappy with the colors that JavaFX provides, there are ways to customize your own color.
- The Color class contains methods to do this:



  - Customize a color by mixing red, green, and blue components.
  - Opacity can also be controlled.

JavaFX provides other methods for creating colors. You're welcome to use them in your programs, but we'll cover only the red-green-blue (RGB) method in this lesson.

The Range of Color Components



Component	Range of values
Red	0–255
Green	0–255
Blue	0–255
Opacity	0.0–1.0

Color Example

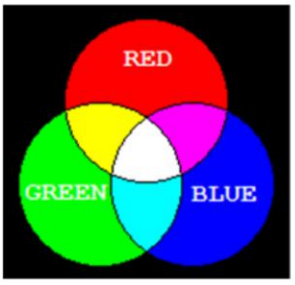
- In this example, the resulting color contains …

```
Color color = new Color.rgb(255, 255, 20);
```

  - As much Red as possible
  - As much Green as possible
  - Only a little Blue

- The resulting color is very close to yellow.
  - But how do we know this?
  - For the most part, finding the perfect color is "guess and check," but there are guiding principles.

Rules of Additive Color Mixing



Examples:

Code	Color	
`Color.rgb(255, 0, 0);`	red	Pure red
`Color.rgb(0, 255, 0);`	green	Pure green
`Color.rgb(0, 0, 255);`	blue	Pure blue
`Color.rgb(255, 255, 0);`	yellow	No blue
`Color.rgb(0, 0, 0);`	black	No color
`Color.rgb(255, 255, 255);`	white	All color

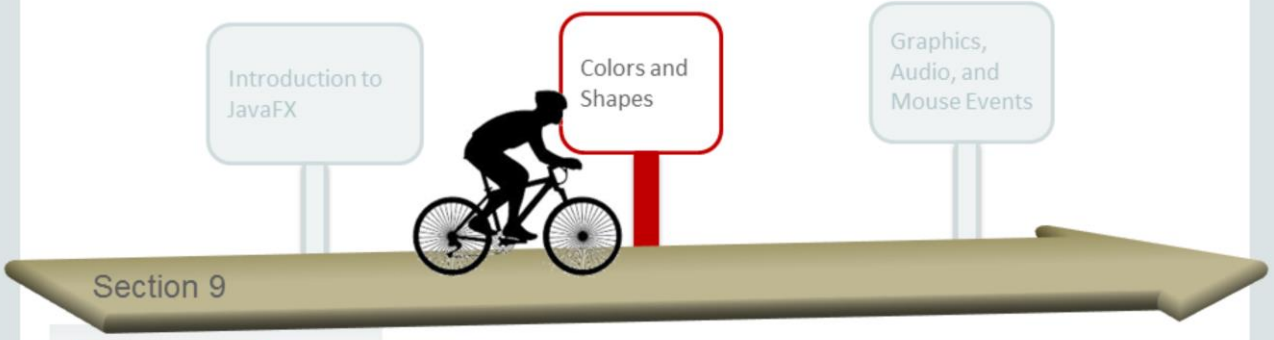
Colors are created according to the rules of additive color mixing.

Exercise 1

- Create a new JavaFX project.
  - Change the Root Node to a `Group` type.
  - Remove the button and any other unnecessary code relating to the button.
- Experiment with customizing colors.
  - Create a few custom colors.
  - Admire your custom colors through the scene's background by providing a `Color` argument when the `Scene` is instantiated.

Topics

- Colors
- Shapes
- The JavaFX Ensemble



This Is a Rectangle

- This is how to instantiate a JavaFX Rectangle:

```
Rectangle rect = new Rectangle(20, 20, 100, 200);
```

x-position, y-position, width, height

- You'll first need to make the following import:

```
import javafx.scene.shape.Rectangle;
```

  – Ignore NetBeans' other Rectangle import suggestions.

Important Methods for Rectangles

- We can get a sense of a Rectangle's properties from the constructor and the following methods:
  - `setX(double d)`
  - `setY(double d)`
  - `setWidth(double d)`
  - `setHeight(double d)`
  - `setFill(Paint paint)`
  - `setStroke(Paint paint)`
  - `setStrokeWidth(double d)`

  These can accept a color as an argument.

  (There are many more Rectangle methods besides these seven.)
- But what exactly will these methods do?

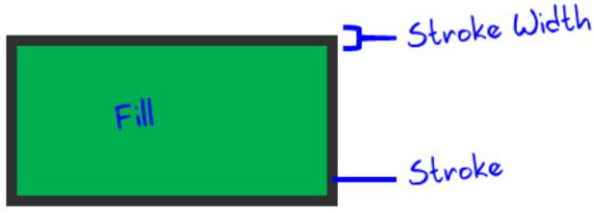
Exercise 2

- Continue editing the JavaFX project that you created in the previous exercise.

- Create a Rectangle and add it to the Root Node.
- Call each method outlined in the previous slide.
- Can you figure out what each method does?

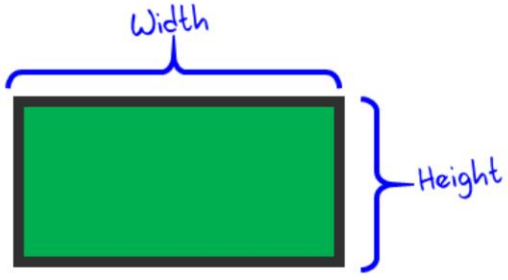
Method Descriptions, Part 1

- **`setFill(Paint paint)`**
  - Sets the color of the Rectangle
- **`setStroke(Paint paint)`**
  - Sets the color of the Rectangle's outline
- **`setStrokeWidth(double d)`**
  - Sets the width of the Rectangle's outline



Method Descriptions, Part 2

- **`setX(double d)`**
- **`setY(double d)`**
  - Sets the x or y position of the Rectangle
- **`setWidth(double d)`**
- **`setHeight(double d)`**
  - Sets the width or height of the Rectangle



Changing a Node's Position

- We've seen a couple ways to change a node's position … but which way is preferable?

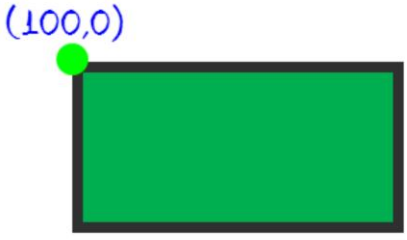
- **`setX(`**`double d`**`)`**
- **`setY(`**`double d`**`)`**
  - These are preferable in most cases.

- **`setLayoutX(`**`double d`**`)`**
- **`setLayoutY(`**`double d`**`)`**
  - Use these if your Node is locked in a Layout pane, such as a FlowPane.
  - Or if `setX()` is unavailable, which is the case with UI elements, such as Buttons.

setX() definitely won't work in this case.

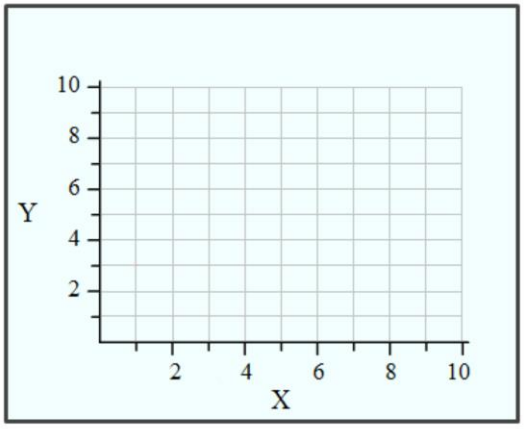
Positioning a Node

- Most Nodes are positioned with respect to their top-left corner.
  - And not with respect to their geographic center.
- If you call `setX(100)` on a Node …
  - The x-position of the Node's top-left corner is set to 100.



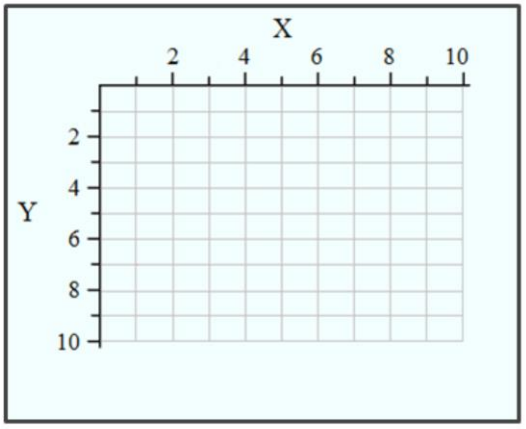
A JavaFX Circle is an exception to this rule. JavaFX Circles are positioned with respect to their center.

Coordinate Systems



Mathematical Coordinate System

- The origin is located at the bottom-left corner.



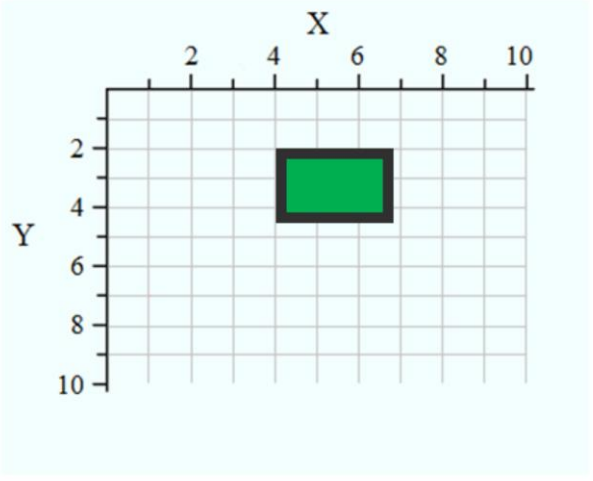
JavaFX Coordinate System

- The origin is located at the top-left corner.
- The y-axis is backward.

Positioning Example

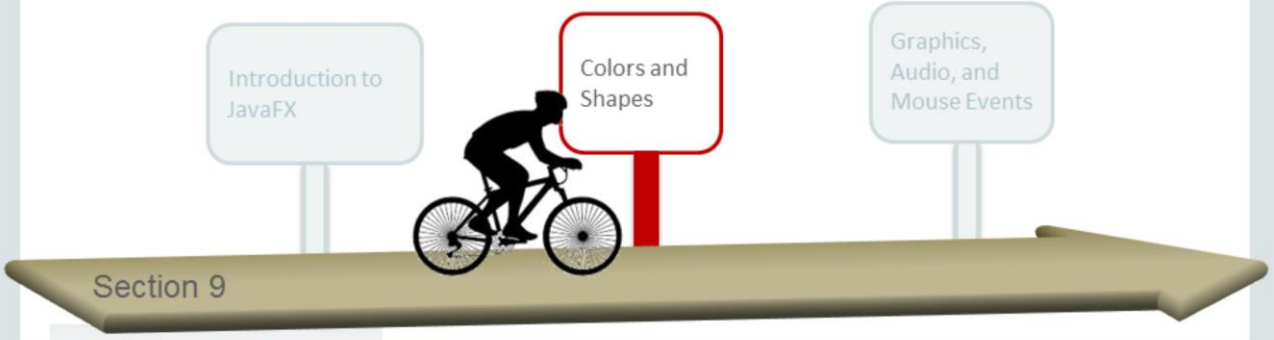
This Rectangle is positioned at (4,2) by calling:

- `setX(4);`
- `setY(2);`

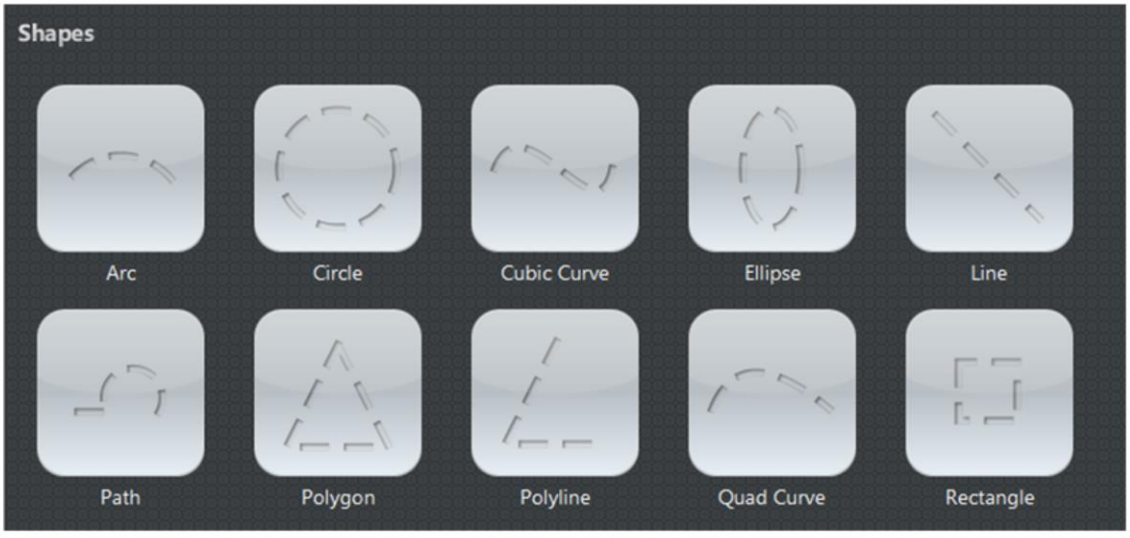


Topics

- Colors
- Shapes
- The JavaFX Ensemble

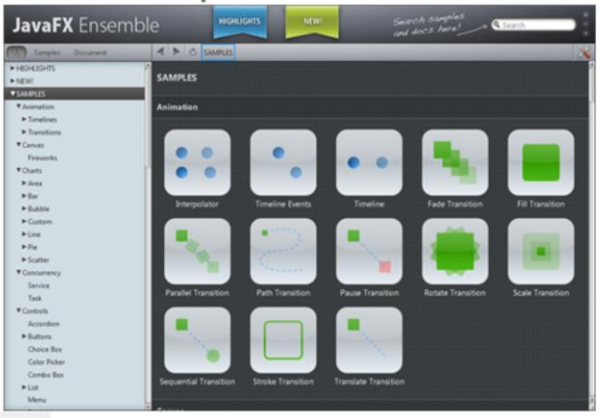


Many Shapes Are Available in JavaFX

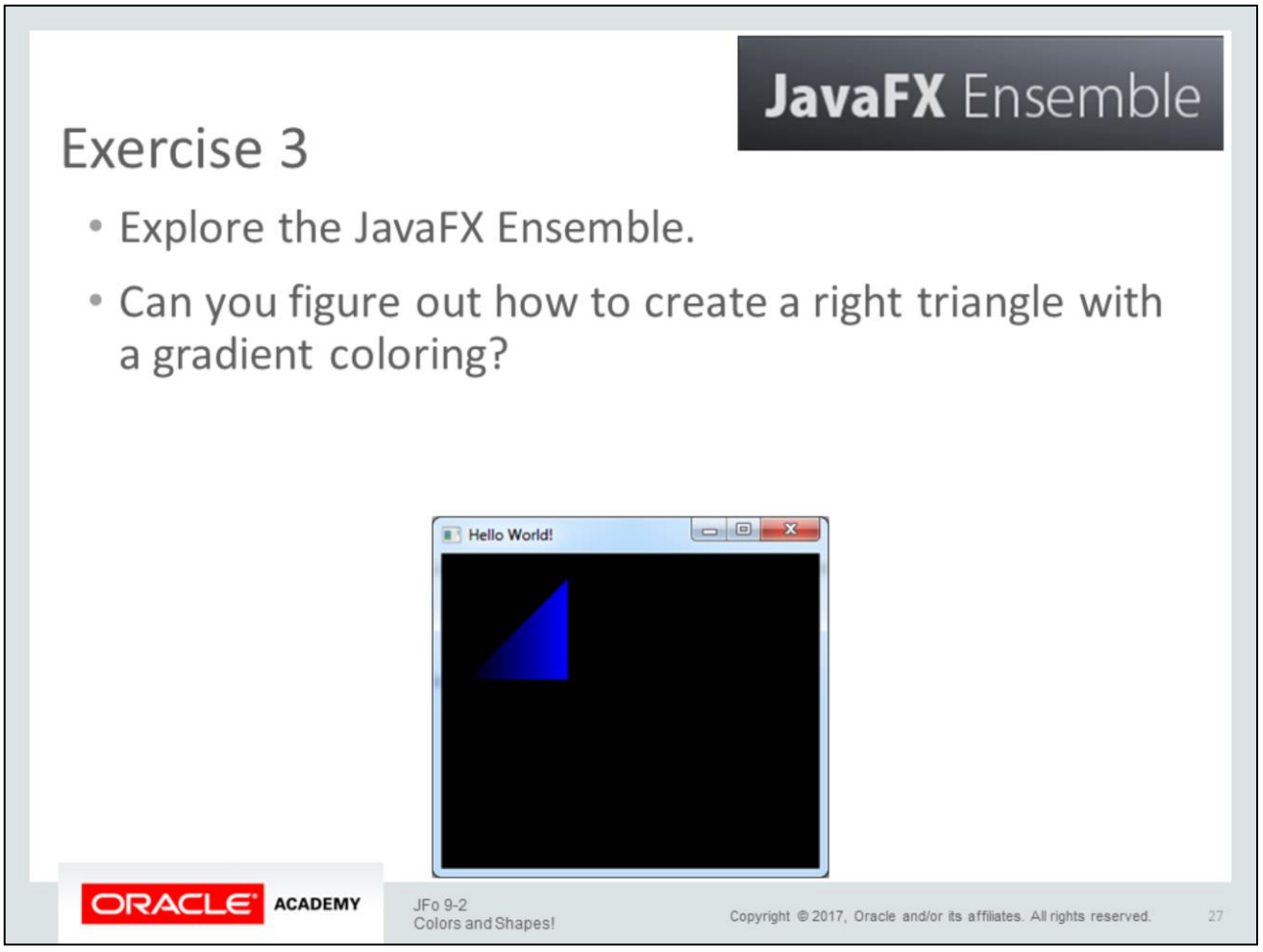


The JavaFX Ensemble

- This contains code examples of JavaFX features.
- We often consulted the Ensemble while developing Java Puzzle Ball.
- It's a helpful tool to explore and troubleshoot JavaFX.



We were learning JavaFX at the same time we were developing the game.



You can ignore the Ensemble's complaints about Internet access. We've provided the Ensemble `.jar` file from iLearning, and a version of the program may also be available online from Oracle at http://download.oracle.com/otndocs/products/javafx/2/samples/Ensemble/index.html.

Exploring the Ensemble: Linear Gradient Example

- The Linear Gradient example shows us …
  - How to create a gradient:

```
//create simple linear gradient
LinearGradient gradient1 = new LinearGradient(0, 0, 1, 0, true,
CycleMethod.NO_CYCLE, new Stop[] {
        new Stop(0, Color.DODGERBLUE),
        new Stop(1, Color.BLACK)
});
```

  - How to color a shape with a gradient:

```
//First rectangle
Rectangle rect1 = new Rectangle(0,0,80,80);

//set rectangle fill
rect1.setFill(gradient1);
```

  - Remember to make the proper imports.

Check the Source Code tabs to find the code mentioned in this slide. Searching the Java documentation for a description of the constructor's arguments may also be helpful.

Exploring the Ensemble: Polygon Example

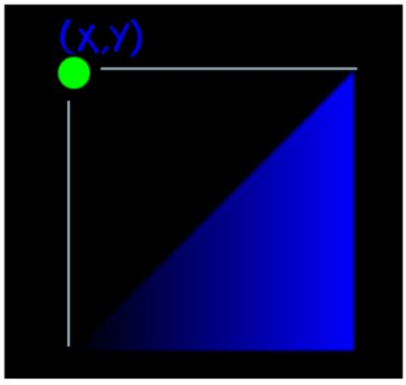
- The Polygon example shows us …
  - How to create a polygon from an array of points:

```
// Simple triangle
Polygon polygon1 = new Polygon(new double[]{
        45 , 10 ,
        10 , 80 ,
        80 , 80 ,
});
```

- Combine this with the gradient example, and you'll have your solution.
  - But even better, you'll understand how the Ensemble is a valuable resource.
  - This could prove very useful when you do the problem set.

The Polygon

- The Polygon has similar methods as a Rectangle.
  - Nodes share the same methods.
- If you experiment with `setLayoutX()`...
  - You'll notice that the Polygon is positioned with respect to where its top-left corner would be.



Secrets about Java Puzzle Ball

- We drew lines and polygons for collision detection
  - But these lines are hidden in the latest version.

- We also drew two octagons around each bumper.
  - An inner octagon handles collision detection.
  - An outer octagon detects if the ball is far enough away for the bumper to rotate.
- We had to do extra work to position and rotate Nodes the way we wanted.

Summary

In this lesson, you should have learned how to:

- Create and use custom colors
- Create shapes and explain their properties and behaviors
- Reference the JavaFX Ensemble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