

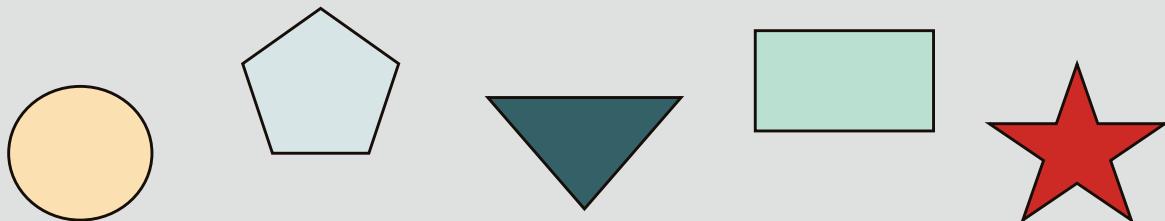
Java Foundations

Colors and Shapes



Guess What, Boys and Girls?!

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



Yay!!!



Objectives

- This lesson covers the following objectives:
 - Create and use custom colors
 - Create shapes and explain their properties and behaviors
 - Reference the JavaFX Ensemble



What Can I Do with Colors in JavaFX?

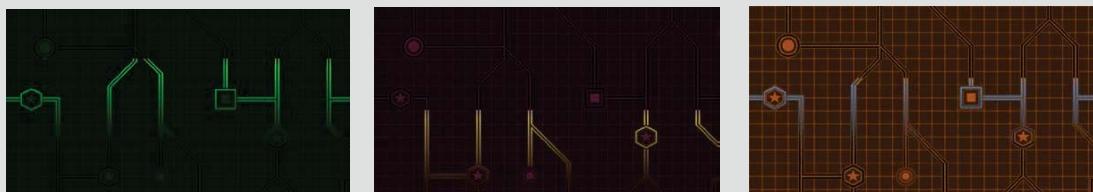
- Color shapes



- 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 ...

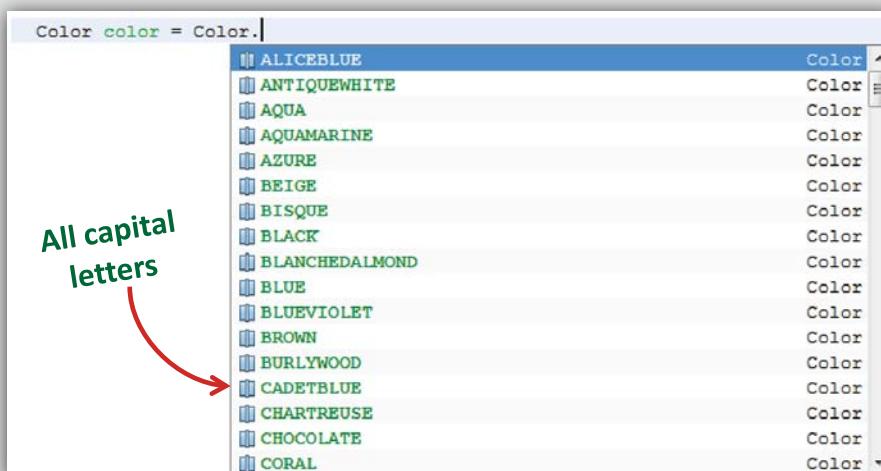
- You'll first need to make the following import:

```
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:

```
Color cusotmColor = Color.rgb|  
    |  ● rgb(int i, int i1, int i2)          Color  
    |  ● rgb(int i, int i1, int i2, double d) Color
```

red green blue opacity

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

The Range of Color Components

red green blue opacity

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);
```

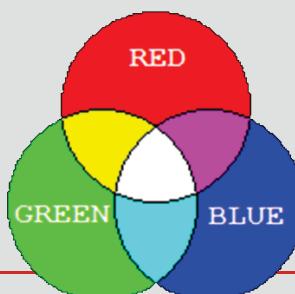
- As much Red as possible
- As much Green as possible
- Only a little Blue

- 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

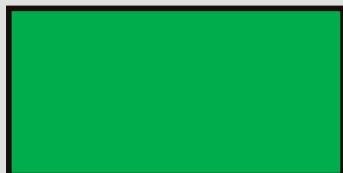


Exercise 1

- 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

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

These can accept a color as
an argument

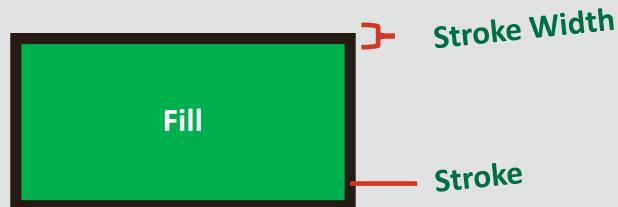
Exercise 2



- 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?

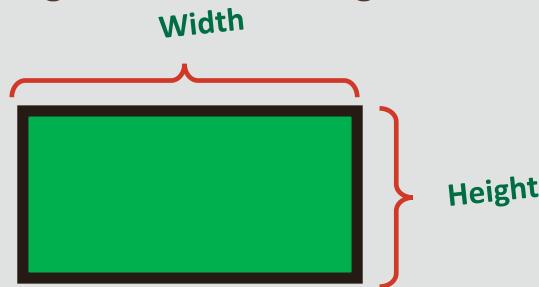
Method Descriptions, Part 1

- `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

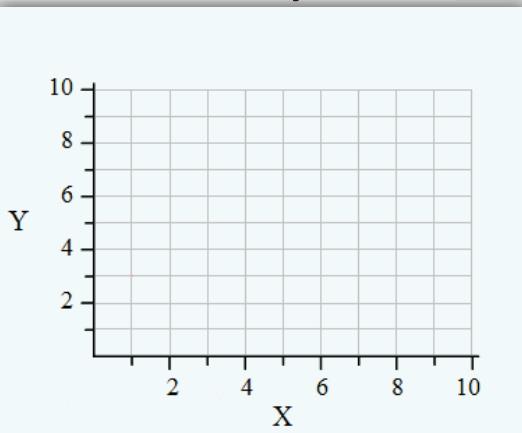
- We've seen a couple ways to change a node's position ... but which way is preferable?
 - `setX(double d)`
 - `setY(double d)`
 - These are preferable in most cases
 - `setLayoutX(double d)`
 - `setLayoutY(double d)`
 - Use these if your Node is locked in a Layout pane, such as a `FlowPane`
 - Or if `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

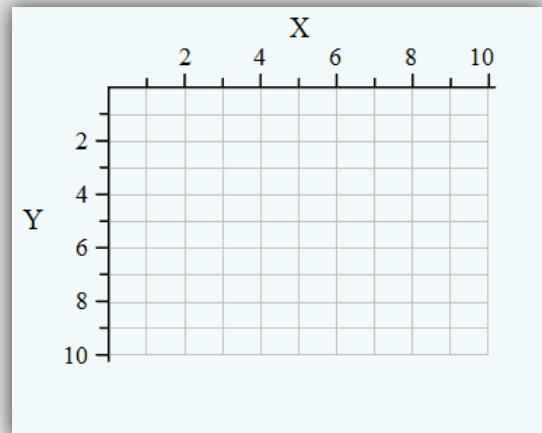


Coordinate Systems



Mathematical Coordinate System

- The origin is located at the bottom-left corner

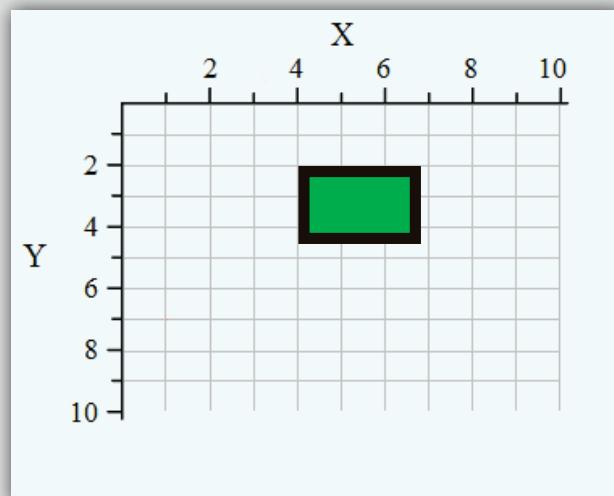


JavaFX Coordinate System

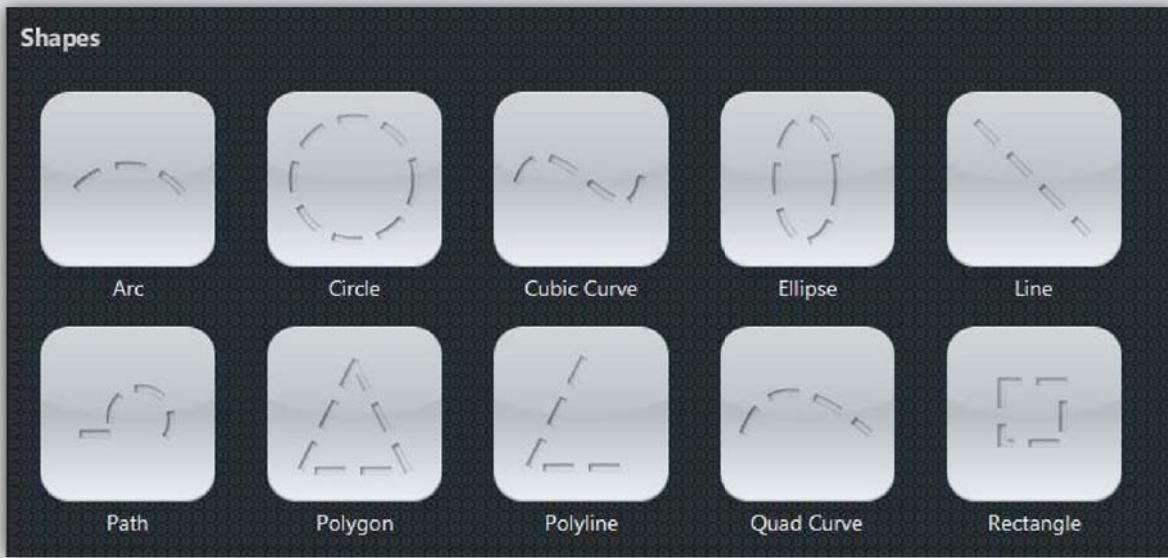
- The origin is located at the top-left corner
- The y-axis is backward

Positioning Example

- This Rectangle is positioned at (4,2) by calling:
 - `-setX(4);`
 - `-setY(2);`



Many Shapes Are Available in JavaFX



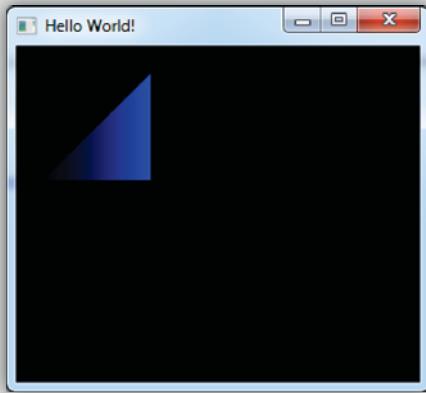
The JavaFX Ensemble

- 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



Exercise 3

- Explore the JavaFX Ensemble
- Can you figure out how to create a right triangle with a gradient coloring?



JavaFX Ensemble

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

Exploring the Ensemble: Polygon Example

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

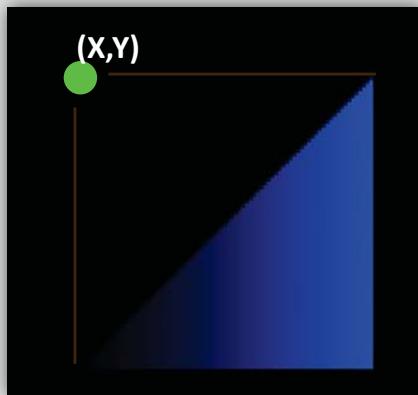


```
//Simple triangle  
Polygon polygon1 = new Polygon(new double[]{  
    45.0, 10.0,  
    10.0, 80.0,  
    80.0, 80.0,  
});
```

- 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

