Java Puzzle Ball
Nick Ristuccia

Lesson 2-2
Static vs Instance Variables
In this lesson, we'll be using the term **variable**.

Like a variable in mathematics, a Java variable represents a value.

**Fields utilize variables:**

- In Lab 1, the variable `balance` represents the amount of money in an account.
- The value of `balance` may change.
- There are different ways fields can utilize variables. We'll explore this in this lesson.

```java
public class SavingsAccount {
    //Fields
    private String accountType;
    private String accountOwner;
    private double balance;
    private double interestRate;
    ...
}
```
Exercise 2

• Play **Basic Puzzles 8 through 11**.

• Consider the following:
  – What happens when you rotate the BlueWheel?
  – How else can you affect the rotation of bumpers?
Java Puzzle Ball Debriefing

• What happens when you rotate the BlueWheel?
  – The orientation of all BlueBumpers change.
  – All BlueBumpers share the orientation property.
  – Orientation can be represented by a static variable.

• How else can you affect the rotation of bumpers?
  – After the ball strikes a rotation wall, the rotation of an individual bumper changes.
  – Rotation can be represented by an instance variable.
Static Variable: Orientation

• This static variable is shared by all instances.
• Static variables apply to the class, not to any individual instance.
• Therefore, a static variable needs to be changed only once for every instance to be affected.
• In Basic Puzzle 11, rotating the RedWheel changes the orientation of all RedBumper objects.
Static Variables with No Instances

- Static variables can be accessed, even if no objects have been instantiated.
- In Basic Puzzle 11, the BlueWheel can be rotated to change the orientation property of all BlueBumpers.
  - There just aren’t any BlueBumpers to show the effects of this change.
Instance Variables: Rotation

• Unique instance variables exist for every instance of an object.
• Therefore, instance variables need to be changed for each individual object.
• In Basic Puzzle 11, an individual RedBumper's rotation changes after being struck by the ball.
Static Vs Instance

• A Static Variable...
  – Applies to the entire class.
  – Exists once.
  – Needs to be changed once to affect all instance.
  – Example: The orientation of all Bumpers

• An Instance Variables...
  – Applies to a particular instance.
  – Exists for every instance.
  – Is changeable one-at-a-time for every instance.
  – Example: The additional rotation applied to an individual Bumper.
Static or Instance?

• Which BlueBumper fields could be represented by static variables? Which could be represented by instance variables?

  – Color (???)
  – Shape (???)
  – Orientation (static)
  – Rotation (instance)
  – x-position (???)
  – y-position (???)
Translating into Java Syntax

• A variable is used
• To make a field static, simply include the static keyword when the variable is declared.

```java
public class BlueBumper {
    private static Color color = Color.BLUE;
    private static Shape shape = Shape.RECT;
    private static double orientation = 0;
    private double rotation;
    private int xPosition;
    private int yPosition;

    ...
}
```