# Model 1 Variable Scope

As a team, review and discuss the provided *SwapCircle.java* and *SwapDriver.java* source files. Then identify the ***scope*** of each variable (i.e., where it can base used) based on the table below.

| | **Where declared?** | **Where used?** | **Example** |
|---|---|---|---|
| **static variables** ("class variables") | declared outside of all methods (typically at the start of the class) | anywhere in the class (or in other classes if also `public`) | `circleCount` in the `SwapCircle` class |
| **instance variables** ("attributes") | declared outside of all methods (typically after any static variables) | any non-static method (or in static methods when another object has been created) | `radius` in the `SwapCircle` class |
| **parameters** | declared inside the ()'s of a method signature | anywhere within the method where they are declared | `radius` in the `SwapCircle` constructor |
| **local variables** | declared inside a method (or inside another block of code, like a `for` loop) | anywhere within the method or code block after they are declared | `temp` in the `swapInts` method |

## Questions (20 min) Start time:

**1.** Identify one static variable from the `SwapCircle` class.

a) What is the name and purpose of the variable?

`circleCount` – tracks the number of `SwapCircle` objects that have been created

b) What is the scope of the variable?

`private static` – it can be used anywhere within the `SwapCircle` class only

c) What is one example of somewhere it cannot be used?

`SwapDriver.main`

**2.** Identify one instance variable from the `SwapCircle` class.

a) What is the name and purpose of the variable?

`radius` – stores the radius of `this` SwapCircle

b) What is the scope of the variable?

`private` and non-`static` – it can only be used in `SwapCircle` in non-static contexts

c) What is one example of somewhere it cannot be used?

`SwapDriver.main`

3. Identify one parameter from the `SwapCircle` class.

   a) What is the name and purpose of the variable?

   Possible answers include: `radius` (in the constructor), `x` and `y`, `c1` and `c2`

   b) What is the scope of the variable?

   The variable exists throughout the entire method (but not other methods).

   c) Where can the variable not be used?

   It can't be used in other methods, e.g., you can't refer to `x` in `swapCircles`.

4. Identify one local variable from the `SwapCircle` class.

   a) What is the name and purpose of the variable?

   Possible answers include: `temp` and `r` (both used for swapping values)

   b) What is the scope of the variable?

   The variable exists from when it's declared until the end of the method.

   c) Where can the variable not be used?

   It cannot be used in other methods and/or before it has been declared.

5. Run the `SwapDriver` program and summarize what you learn based on the output.

Answers will vary. The primitive integers were not swapped, but the attributes of the `Circle` objects were. The `static circleCount` kept track of how many objects were created.

6. Notice that `getRadius` returns `this.radius` (from `this` object). In contrast, `getCircleCount` does not use the keyword `this`. Why not?

getCircleCount is a static method, so there is no object. If you try to use `this`, you will get a compiler error that says, "non-static variable this cannot be referenced from a static context".

7. Identify an example of where an instance variable is used within a static method.

   a) In which method does this occur?

   `radius` is used in the `swapCircles` method

   b) Why is the method able to access these instance variables, even though they are private?

   `swapCircles` belongs to the `SwapCircle` class

   c) Explain how this method is not a violation of the rule that instance variables cannot be accessed inside a static method.

   You can't use `this.radius` in a `static` method, but it's okay to use `c1.radius`