Intro to Programming II
Scope and Parameters

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Scope refers to the area of a program where a variable can be accessed.

Java has three types of scope:

- **Local scope** - the variable exists only within a method.
- **Object scope** - the variable can be accessed from any method belonging to an object.
- **Class scope** - the variable can be accessed by all instances of a class.
2-1: Local scope

6 Exists only when a method is executing
6 The garbage collector reclaims a local variable when the method ends.
6 Local variables are useful for temporary variables and counters.

/* raise x to the yth power */
public int exponentiate(int x, int y) {
    int total;
    int i;
    for (i = 0; i < y; i++) {
        total = total * x;
    }
    return total;
}
Variables are available anywhere within an object.
This is useful for data associated with an object that will be used by multiple methods.
This is also called instance data.

```java
public class circle {
    public int radius;
    public static final double pi = 3.14;

    public double getArea() {
        return pi * radius * radius;
    }
}
```
Class variables are available to all members of a class.
These are declared as static
This means that one copy of the variable is shared by all objects.
Useful for defining constants.
public class circle {
    public static final double pi = 3.14;
    public int radius;

    public double getArea() {
        return pi * radius * radius;
    }
}

circle c1 = new circle();
circle c2 = new circle();
c1.radius = 5;
c2.radius = 6;
System.out.println("c1’s area is: " + c1.getArea());
System.out.println("c2’s area is: " + c2.getArea());
In the previous example, each circle had its own copy of radius.

They all shared a copy of pi.

radius has object scope, whereas pi has class scope.

Identify variables in Bank account program.
Parameters are the variables passed into a method.

We can talk about:

- Formal parameters - these are the variables named in the method definition.
- Actual parameters - these are the variables in the method invocation.
/** This is a method definition */
    public double depositFunds(double amt) {
        balance = balance + amt;
        return balance;
    }

    ...  
    bankacct b = new bankacct();
    paycheck = 100.0
    /* this is a method invocation */
    b.depositFunds(paycheck);
Specifying the method signature:

- Type and order of input parameters
- Type of return variable

A method signature allows the compiler to uniquely identify a method.
Consider the following method declaration:

double calculate(double a1, double a2, double a3);

Which of the following are valid calls to this method?
- calculate(3, 52.0, -5.1);
- double y = calculate(0, 1.1, 2.2);
- calculate(1.1, 2.3);
- calculate(“Hello”, 4.4, 2);
- calculate();
- calculate(3.3);
What happens in this case?

```java
public class circle {
    public int radius = 5;

    public void printArea() {
        int radius = 4;
        System.out.println(``Area is '' + (radius * radius * 3.14));
    }
}
```
What happens in this case?

```java
public class bankacct {
    public double balance;
    public void updateBalance(double newAmount) {
        double newAmount = 12.0;
        balance += newAmount;
    }
}
```
What happens in this case?

```java
public class circle {
    public int radius = 5;

    public void printArea(int radius) {
        System.out.println(`Area is '' + (radius * radius * 3.14));
    }
...
    circle c = new circle()
    c.getArea(3);
}
```
In general, it’s a bad idea to give local variables the same name as an instance or class variable. Confusing, leads to bugs.

If it can’t be avoided, you can use “this” to indicate the instance variable should be used rather than the local variable.

You can use the class name (e.g. circle.pi) to indicate that a class variable should be used.