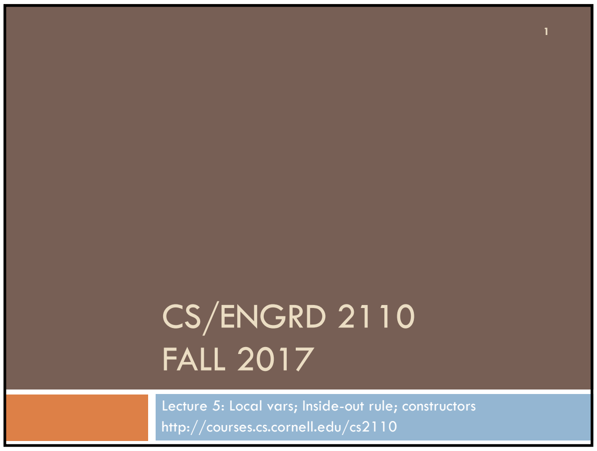
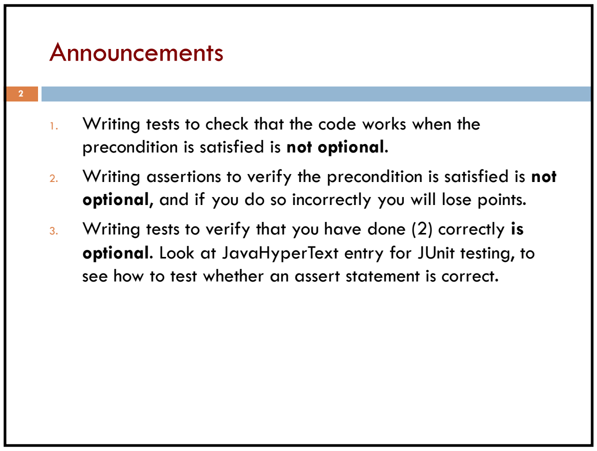


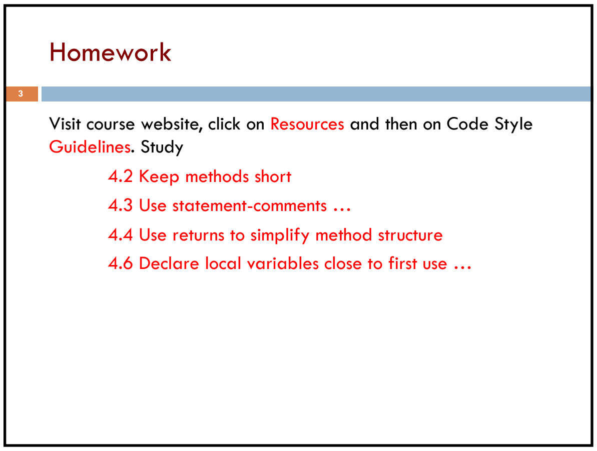
CS/ENGRD 2110
FALL 2017

Lecture 5: Local vars; Inside-out rule; constructors
http://courses.cs.cornell.edu/cs2110



Announcements

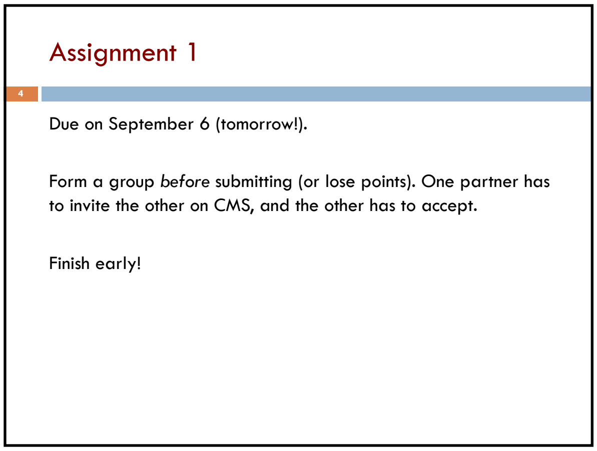
1. Writing tests to check that the code works when the precondition is satisfied is **not optional.**
2. Writing assertions to verify the precondition is satisfied is **not optional**, and if you do so incorrectly you will lose points.
3. Writing tests to verify that you have done (2) correctly **is optional.** Look at JavaHyperText entry for JUnit testing, to see how to test whether an assert statement is correct.



Homework

Visit course website, click on Resources and then on Code Style Guidelines. Study

4.2 Keep methods short
4.3 Use statement-comments …
4.4 Use returns to simplify method structure
4.6 Declare local variables close to first use …

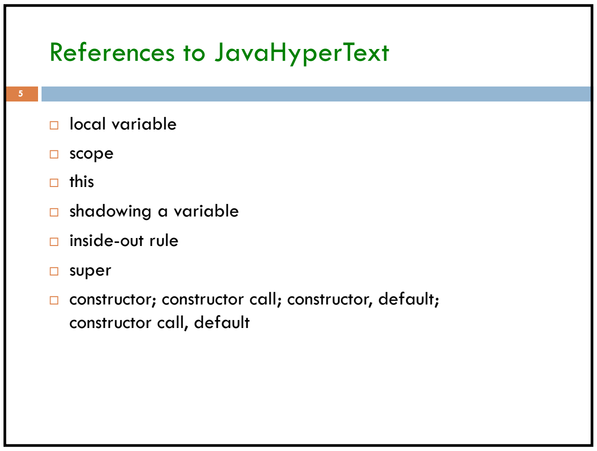


Assignment 1

Due on September 6 (tomorrow!).

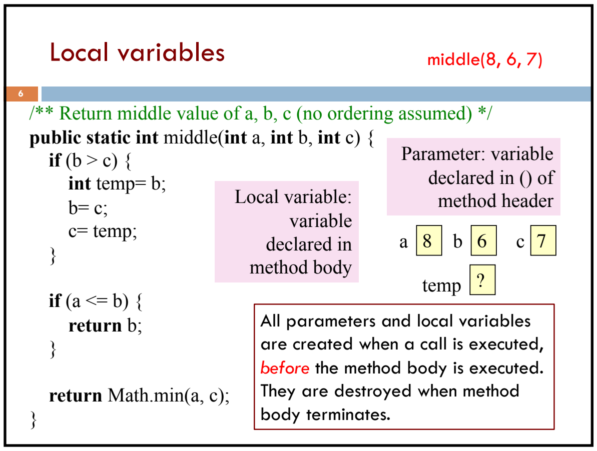
Form a group *before* submitting (or lose points). One partner has to invite the other on CMS, and the other has to accept.

Finish early!



References to JavaHyperText

- local variable
- scope
- this
- shadowing a variable
- inside-out rule
- super
- constructor; constructor call; constructor, default; constructor call, default



Local variables

6

middle(8, 6, 7)

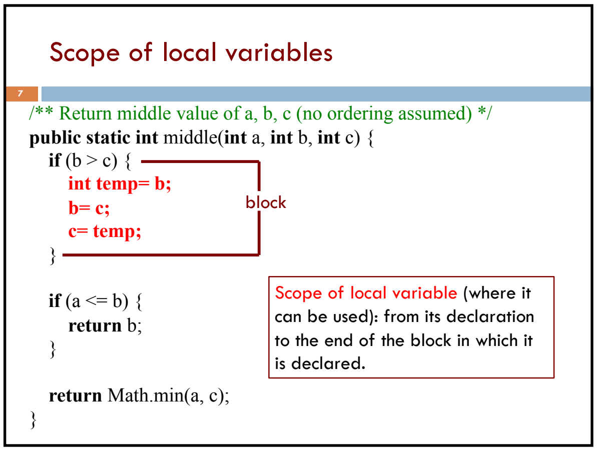
```
/** Return middle value of a, b, c (no ordering assumed) */
public static int middle(int a, int b, int c) {
   if (b > c) {
      int temp= b;
      b= c;
      c= temp;
   }

   if (a <= b) {
      return b;
   }

   return Math.min(a, c);
}
```

Parameter: variable declared in () of method header

Local variable: variable declared in method body

a 8
b 6
c 7
temp ?

All parameters and local variables are created when a call is executed, *before* the method body is executed. They are destroyed when method body terminates.



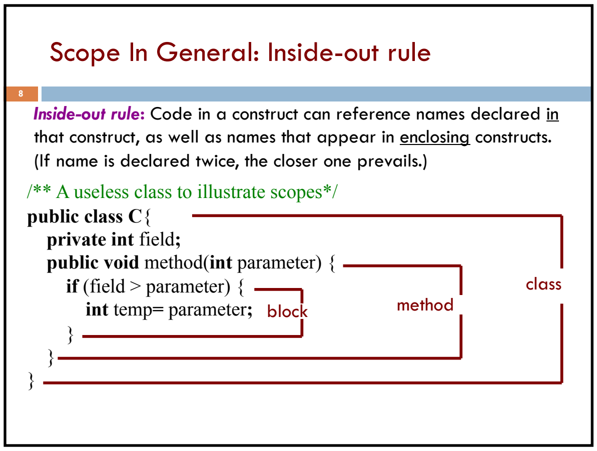
Scope of local variables

7

```
/** Return middle value of a, b, c (no ordering assumed) */
public static int middle(int a, int b, int c) {
   if (b > c) {
      int temp= b;
      b= c;
      c= temp;
   }

   if (a <= b) {
      return b;
   }

   return Math.min(a, c);
}
```

block

Scope of local variable (where it can be used): from its declaration to the end of the block in which it is declared.



Scope In General: Inside-out rule

8

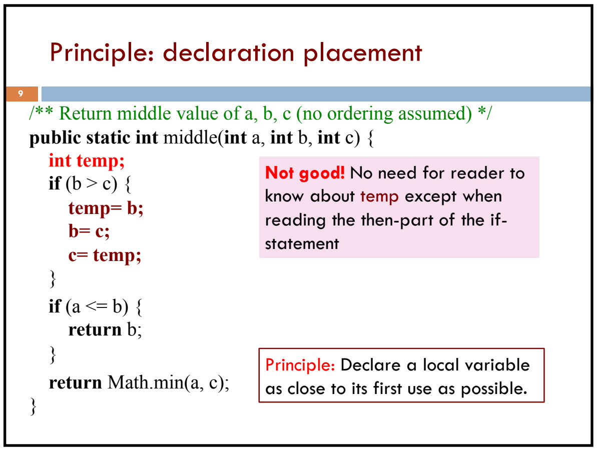
Inside-out rule: Code in a construct can reference names declared in that construct, as well as names that appear in enclosing constructs. (If name is declared twice, the closer one prevails.)

```
/** A useless class to illustrate scopes*/
public class C{
   private int field;
   public void method(int parameter) {
      if (field > parameter) {
         int temp= parameter;
      }
   }
}
```

block

method

class



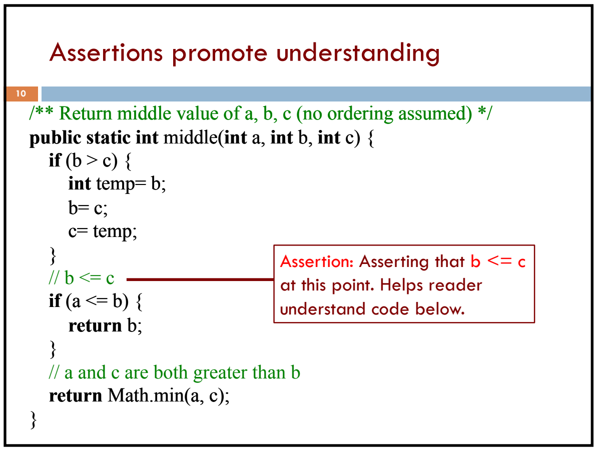
Principle: declaration placement

9

```
/** Return middle value of a, b, c (no ordering assumed) */
public static int middle(int a, int b, int c) {
   int temp;
   if (b > c) {
      temp= b;
      b= c;
      c= temp;
   }
   if (a <= b) {
      return b;
   }
   return Math.min(a, c);
}
```

Not good! No need for reader to know about temp except when reading the then-part of the if-statement

Principle: Declare a local variable as close to its first use as possible.

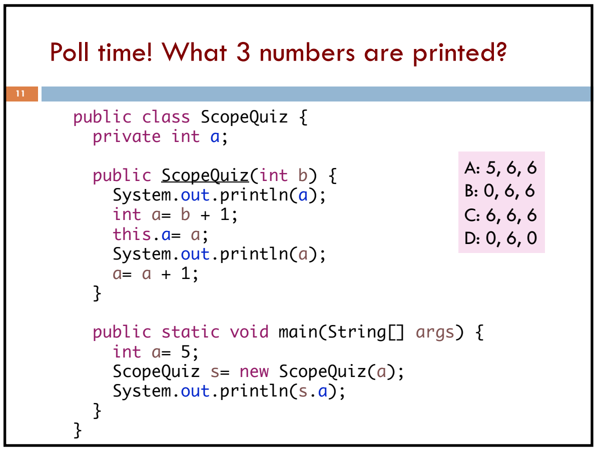


Assertions promote understanding

10

```
/** Return middle value of a, b, c (no ordering assumed) */
public static int middle(int a, int b, int c) {
   if (b > c) {
      int temp= b;
      b= c;
      c= temp;
   }
   // b <= c
   if (a <= b) {
      return b;
   }
   // a and c are both greater than b
   return Math.min(a, c);
}
```

Assertion: Asserting that b <= c at this point. Helps reader understand code below.

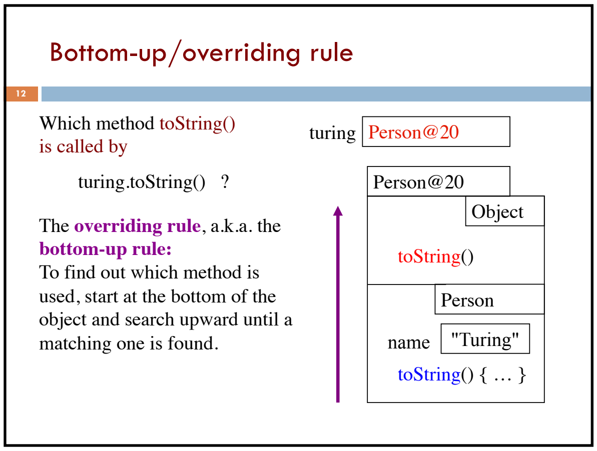


Poll time! What 3 numbers are printed?

11

```
public class ScopeQuiz {
  private int a;

  public ScopeQuiz(int b) {
    System.out.println(a);
    int a= b + 1;
    this.a= a;
    System.out.println(a);
    a= a + 1;
  }

  public static void main(String[] args) {
    int a= 5;
    ScopeQuiz s= new ScopeQuiz(a);
    System.out.println(s.a);
  }
}
```

A: 5, 6, 6
B: 0, 6, 6
C: 6, 6, 6
D: 0, 6, 0



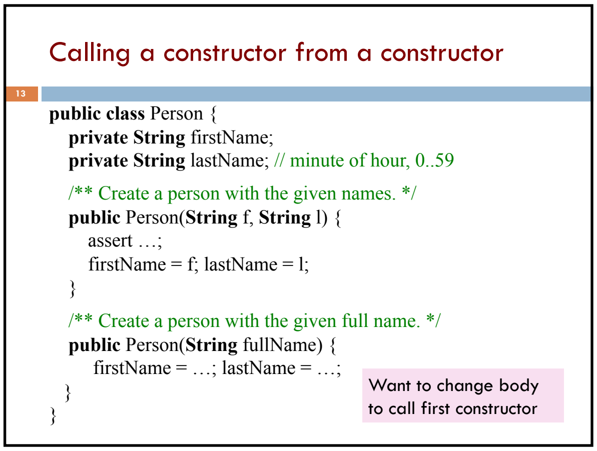
Bottom-up/overriding rule

12

Which method toString() is called by

turing.toString() ?

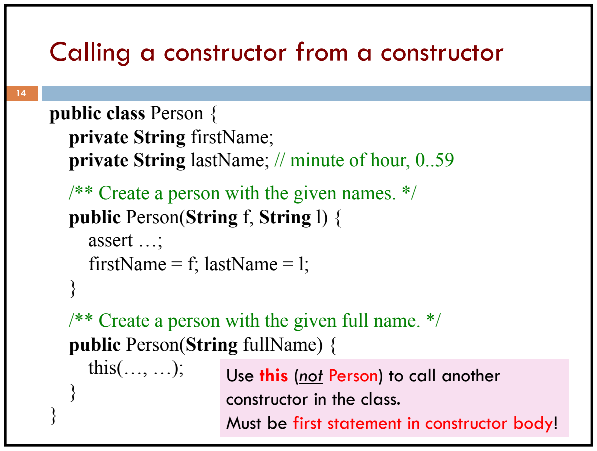
The **overriding rule**, a.k.a. the **bottom-up rule:** To find out which method is used, start at the bottom of the object and search upward until a matching one is found.



Calling a constructor from a constructor

```
public class Person {
    private String firstName;
    private String lastName; // minute of hour, 0..59

    /** Create a person with the given names. */
    public Person(String f, String l) {
        assert …;
        firstName = f; lastName = l;
    }

    /** Create a person with the given full name. */
    public Person(String fullName) {
        firstName = …; lastName = …;
    }
}
```

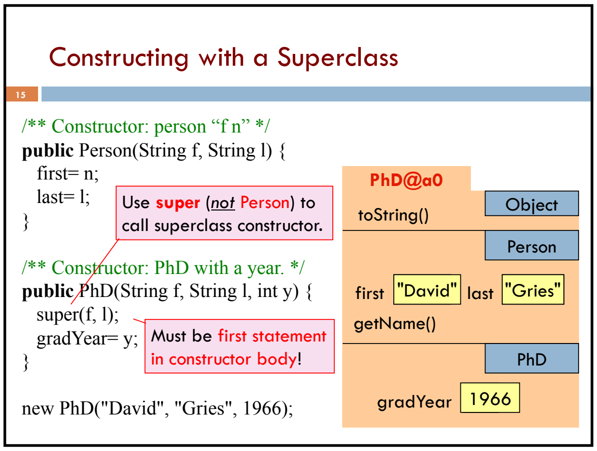
Want to change body to call first constructor



Calling a constructor from a constructor

```
public class Person {
    private String firstName;
    private String lastName; // minute of hour, 0..59

    /** Create a person with the given names. */
    public Person(String f, String l) {
        assert …;
        firstName = f; lastName = l;
    }

    /** Create a person with the given full name. */
    public Person(String fullName) {
        this(…, …);
    }
}
```

Use **this** (*not* Person) to call another constructor in the class.
Must be first statement in constructor body!

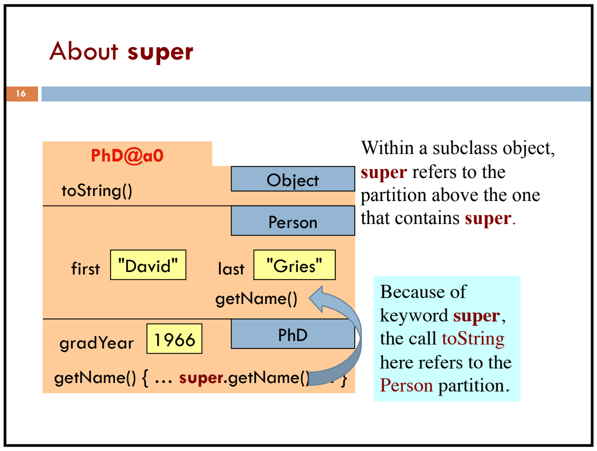


Constructing with a Superclass

```
/** Constructor: person “f n” */
public Person(String f, String l) {
    first= n;
    last= l;
}

/** Constructor: PhD with a year. */
public PhD(String f, String l, int y) {
    super(f, l);
    gradYear= y;
}

new PhD("David", "Gries", 1966);
```

Use **super** (*not* Person) to call superclass constructor.

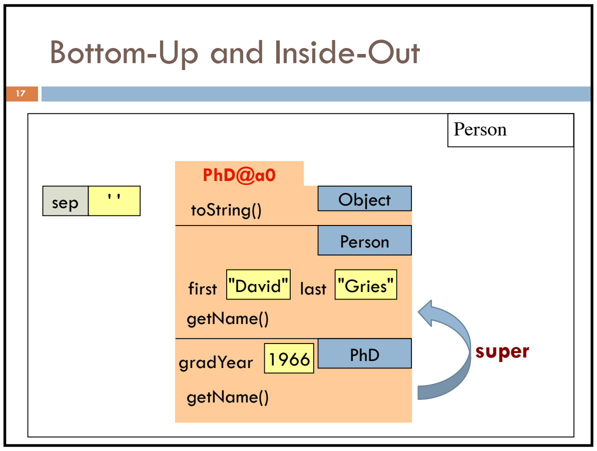
Must be first statement in constructor body!



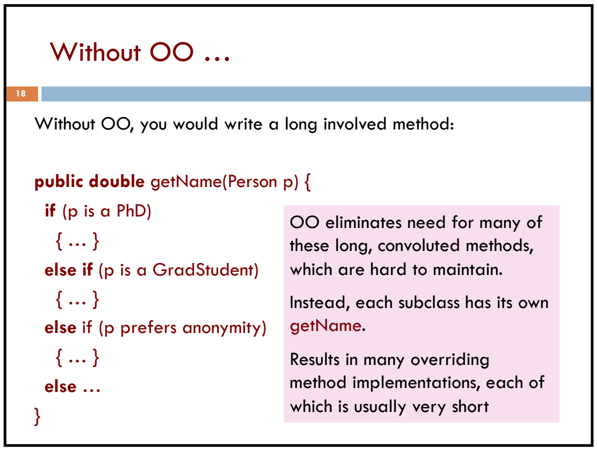
About **super**

Within a subclass object, **super** refers to the partition above the one that contains **super**.

Because of keyword **super**, the call toString here refers to the Person partition.



Bottom-Up and Inside-Out



Without OO …

Without OO, you would write a long involved method:

```
public double getName(Person p) {
  if (p is a PhD)
    { … }
  else if (p is a GradStudent)
    { … }
  else if (p prefers anonymity)
    { … }
  else …
}
```

OO eliminates need for many of these long, convoluted methods, which are hard to maintain.

Instead, each subclass has its own getName.

Results in many overriding method implementations, each of which is usually very short