

Discussion of Methods: Executing method calls. If-statements. The return statement in a function. Local variables.

Read chapter 2, but NOT 2.3.8!!!!
 Inside-out rule; use of **this**, **super**

Sit next to someone.
 Today, we do some work in pairs.
 Get out a blank sheet of paper.

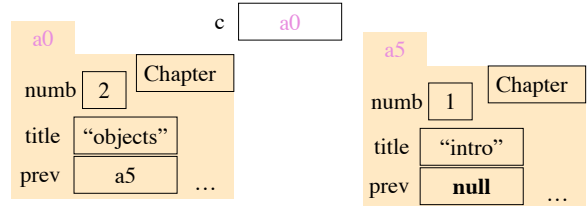
Instant replay...see videos of lectures for CS1110 on www.VideoNote.com. Log in with your Cornell NetID.

Rsrecah on spleing

Aoccdnrig to a rscheearch at Cmabirgde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the only iprmoentn thng is that the frsit and lsat ltteer be at the rghit pclae. The rset can be a total mses and you can sitll raed it wouthit porbelm.Tihs is bcuseae the huamn mnid deos not raed ervey lteer by istlef, but the wrod as a wlohe.

```

/** An instance keeps information about a book chapter */
public class Chapter {
    // class invariant: meanings of fields and constraints on them
    private int number; // the chapter number, in range 0..100
    private String title; // chapter title
    private Chapter prev; // instance for the previous chapter
                          // (null if no previous chapter)
}
    
```



We write programs in order to do things.
 Methods are the key "doers".

*/** Constructor: a chapter with title t, number n, and previous chapter null.*/*

```

public Chapter(String t, int n) {
    title= t;
    number= n;
    previous= null;
}
    
```

declaration of parameter t

parameters: t and n

Within the **body** (between { }) is the sequence of statements to execute when the method is called. ("Follow the recipe.")

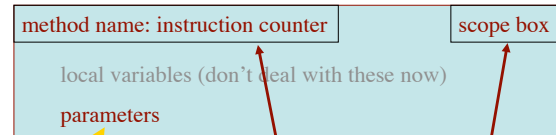
Memorize: a parameter is a variable that is declared within the parentheses of a method header.

But how is a method call executed?
 How do parameters and arguments work?

The frame (the box) for a method call

Draw template on a piece of paper

Remember: Every method is in a folder (object) or in a file-drawer.



Draw the parameters as variables.

number of the statement of method body to execute next. Start with 1. Helps you keep track of what statement to execute next.

scope box contains the name of entity that contains the method — a file drawer or object.

The scope box contains:

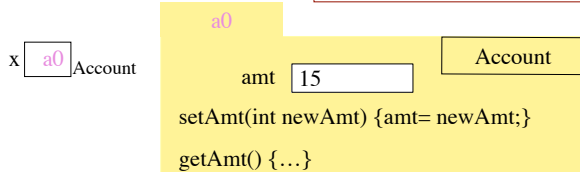
For an instance method, the name of the object in which it resides
 For a static method, the name of the class in which it is defined

To execute the call **x.setAmt(50);**

1. Draw a frame for the call.
2. Assign the value of the argument to the parameter (in the frame).
3. Execute the method body. (Look for variables in the frame; if not there, look in the place given by the scope box.)
4. Erase the frame for the call.

```

public void setAmt(int newAmt) {
    amt= newAmt;
}
    
```

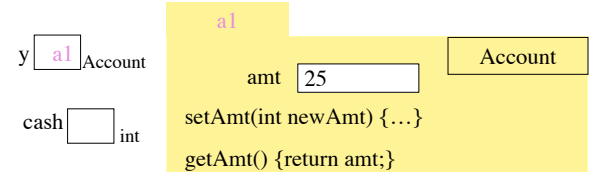


To execute the call **cash= y.getAmt();**

1. Draw frame for call.
2. Assign value of argument to parameters (in the frame).
3. Execute method body. (Look for variables in the frame; if not there, look in the place given by the scope box.)
4. Erase the frame for call; use value of return-statement expression as function-call value.

```

public int getAmt() {
    return amt;
}
    
```

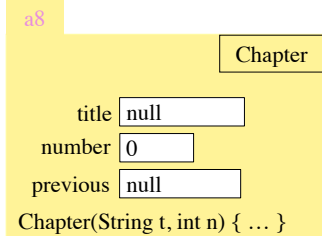


new Chapter("Intro", 1)

1. Draw a frame for the call.
2. Assign arg values to pars.
3. Execute the method body.
4. Erase the frame for the call.

```
Chapter(String t, int n) {  
    String d;  
    1: d= n + ":" + t;  
    2: title= d;  
    3: number= n;  
    4: previous= null;  
}
```

Note *local* variable *d* declared within method body. It should be drawn in frame for call.



7

```
/* swap x, y to put larger  
   in y */  
if (x > y) {  
    int t;  
    t= x;    if statement  
    x= y;  
    y= t;  
}
```

Syntax:
if (<boolean expression>)
 <statement>
Execution: if the <boolean expression> is true, then execute the <statement>

```
/* Put smaller of x, y in z */  
if (x < y) {  
    z= x;  
} else { if-else statement  
    z= y;  
}
```

Syntax:
if (<boolean expression>)
 <statement1>
else <statement2>
Execution: if the boolean expression is true, then execute <statement1>; otherwise, execute <statement2>

8

Idiom: if statements and multiple return statements

*/** = smallest of b, c, d */*

```
public static int smallest(int b, int c, int d) {  
    if (b <= c && b <= d) {  
        return b;  
    }  
    // { The smallest is either c or d }  
    if (c <= d) {  
        return c;  
    }  
    // { the smallest is d }  
    return d;  
}
```

Execution of statement
return <expr> ;
terminates execution of the procedure body and yields the value of <expr> as result of function call

Assertion comment

Execution of function body must end by executing a return statement. 9

Syntax of procedure/function/constructor and calls

public <result type> <name> (<parameter declarations>) { ... } **function**
public void <name> (<parameter declarations>) { ... } **procedure**
public <class-name> (<parameter declarations>) { ... } **constructor**

Exec. of a function body *must* terminate by executing a statement "**return** <expr> ;", where the <expr> has the <result type>.

Exec. of a proc body *may* terminate by executing statement "**return** ;"

Exec. of a constructor body initializes fields of a new object in order to make the class invariant true.

<name> (<arguments>) **function call**
<name> (<arguments>); **procedure call**
new <class-name> (<arguments>) **constructor call**

<arguments>: <expression>, <expression>, ..., <expression>

10

Scope of local variable is the places where it can be used. The scope is the sequence of statements following it within the containing "block".

*/** = the max of x and y */*

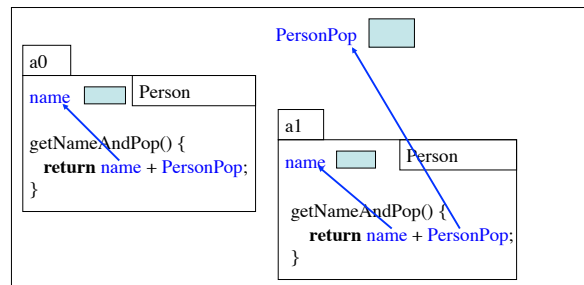
```
public static int max(int x, int y) {  
    // Swap x and y to put the max in x  
    if (x < y) {  
        int temp; scope of temp  
        temp= x;  
        x= y;  
        y= temp;  
    }  
    return x;  
}
```

You can't use temp down here.
It is an error!

11

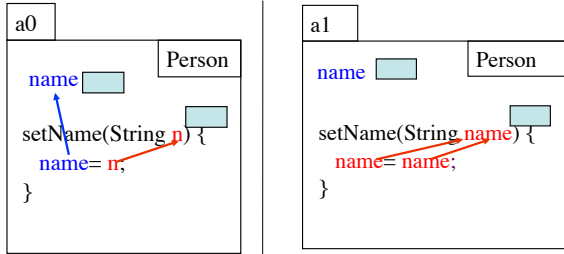
The inside-out rule (see p. 83)

Code in a construct can reference any of the names declared or defined in that construct, as well as names that appear in enclosing constructs. (If a name is declared twice, the closer one prevails.)



12

Method parameters participate in the inside-out rule: remember the frame.



Parameter **n** would be found in the frame for the method call.

Parameter **name** “blocks” the reference to the field **name**.

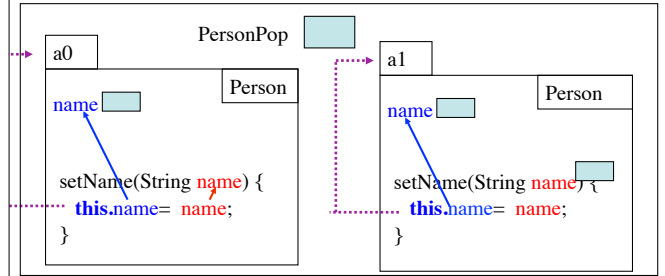
13

A solution: **this** and **super**

Within an object, **this** evaluates to the name of the object.

In folder a0, **this** evaluates to a0

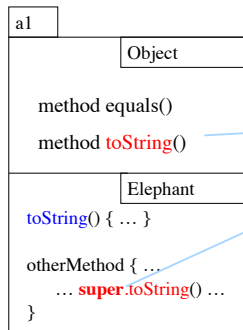
In folder a1, **this** evaluates to a1



14

About **super**

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



Because of the keyword **super**, this calls **toString** in the **Object** partition.

15