**CS100J 8 February 2005**

Congratulations!! You now know the basics of OO (object-orientation). There are more odds and ends, which we will be discussing, but the basics have been covered. We now turn to:

**Discussion of Methods:** Functions, procedures, constructors. The return statement in a function. Executing method calls.

For this and next lecture: **Read section 2.3 but NOT 2.3.8!!!!**
**Do the self-review exercises in 2.3.4**

Oxymoron: a combination for epigrammatic effect of contradictory or incongruous words (as *cruel kindness, laborious idleness* )

| | |
|---|---|
| airline food | State worker |
| military intelligence | peace force |
| Microsoft Works | computer security |
| sanitary landfill | tight slacks |
| religious tolerance | business ethics |



**Method body: sequence of statements (interspersed with declarations) to execute, in the order in which they appear**

```
/** Constructor: a chapter with title t, number n,
                 previous chapter p */
public Chapter(String t, int n, Chapter p) {
    title= t;
    number= n;
    previous= p;
}
```

Execute the three assignments in the order in which they appear. Same scheme is used when a cook uses a recipe.



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

**if statement**

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 {
    z= y;
}
```

**if-else statement**

Syntax:
**if** (<boolean expression)
    <statement1>
**else** <statement2>

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



**A procedure does something**

```
/** print the smallest of b, c, d */
public static void smallest(int b, int, c, int d) {
        if (b <= c  && b <= d) {
            System.out.println(b);
            return ;
        }
        // { The smallest is either c or d }
        if (c <= d) {
            System.out.println(c);
            return;
        }
        // { the smallest is d }
        System.out.println(d);
}
```

Execution of statement **return;** terminates execution of the procedure body.

Nothing else is done in the procedure body.

**Assertions**

**System.out.println(exp);**

Print the value of exp on the console; then skip to next line



**A function produces a result**

```
/** = 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

**Assertions**

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



**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** <exp> ;", where the <exp> has the <result type>.

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

Exec. of a constructor body initializes a new object of class <class-name>.

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

<arguments>:  <expression>, <expression>, …, <expression>

### Local variable: a variable declared in a method body

*Scope of local variable:* the sequence of statements following it.

```
/** s contains a name in the form exemplified by "David  Gries".
      Return the corresponding String "Gries, David".
      There may be 1 or more blanks between the names. */
  public static String switchFormat(String s) {
    // Store the first name in variable f and remove f from s
declaration  int k;       // Index of the first blank in s
assignment   k= s.indexOf(' ');
             String f;  // The first name in s.
             f= s.substring(0, k);
             s= s.substring(k);

    // Remove the blanks from s
         s= s.trim();

    return s + ", " + f;
  }
```

scope of k

scope of f

Numbering of characters in a String:
012345
"abcdef"

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### Local variable: a variable declared in a method body

*Scope of local variable:* the sequence of statements following it.

```
/** = 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;
        temp= x;
        x= y;
        y= temp;
    }

    return x;
}
```

scope of temp

You can't use temp down here

This is an error.

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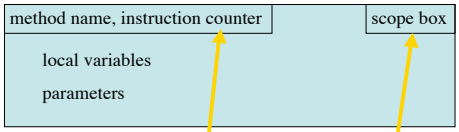
### The frame (the box) for a method call

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




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

scope box contains the name of the file-drawer or the name of the object that contains the method

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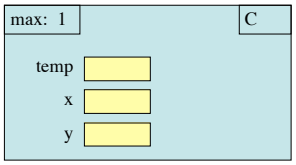
### frame for a call

```
/** = the max of x and y */
public static int max(int x, int y) {
1   if (x < y) {
2       int temp;
3       temp= x;
4       x= y;
5       y= temp;
    }

6   return x;
}
```

Assume this method is in class C




**frame for a call on max**

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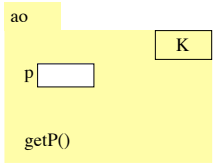
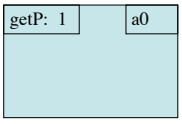
### frame for a call

```
public class K {
  int p ;
  public int getP() {
    1  return p;
    }
}
```




**frame for a call on getP of a0**

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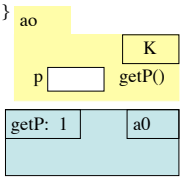
### frame for a call

```
public class K {
  int p ;
  public int getP() {
    1  return p;
    }
}
```







**frame for a call on getP of a0**

**Execution of a method call:**

1. **Draw the frame for the call** (method name, 1 for instruction counter, scope box, local vars, and parameters).
2. **Assign argument values to parameters.**
3. **Execute method body.** Look in frame for names; if not there, use scope box to see where to look next.
4. **Erase frame** (and, if it is a function, use the value of the return exp as the value of the call).

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