CS100J 17 February 2005

More on Methods. Functions, procedures, constructors. The return statement in a function. Static vs non-static methods. More on executing method calls.

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

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 proc-edure body.

Nothing else is done in the procedure body.

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;
}
```

Assertions

Execution of statement

return <expr> ;

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

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**

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 "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
       int k;       // Index of the first blank in s
       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

Local variable: a variable declared in a method body

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

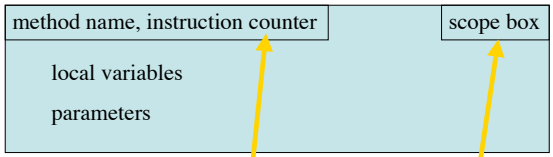
```
/** = the max of x and y */
public static int max(int x, int y) {
    // Swap x and y to put the max in x
    if (x < y) {
        int temp;
        temp= x;
        x= y;
        y= temp;
    }

    return x;
}
```

scope of temp

You can't use temp down here

The frame (the box) for a method call

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



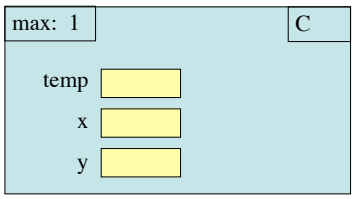
the number of the statement of method body to execute next. Helps you keep track of what statement to execute next.

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

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;
  }
```

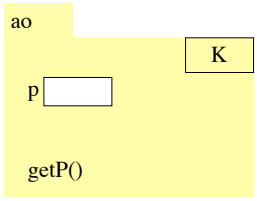
Assume this method is in class C

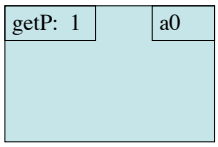


frame for a call on max

frame for a call

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

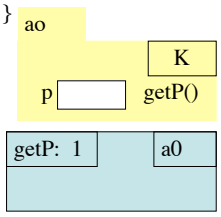




frame for a call on getP of a0

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 arg values to pars.**
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, give the value of the return exp as the value of the call).