

CS100J 13 Sept 2007

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

1

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.

2

<pre>/* swap x, y to put larger in y */ if (x < y) { int t; t= x; x= y; y= t; }</pre>	<pre>/* Put smaller of x, y in z */ if (x < y) { z= x; } else { z= y; }</pre>
---	--

Syntax:
if (<boolean expression>
<statement>

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

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

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

3

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

4

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.

5

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>

6

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"

7

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;
}
```

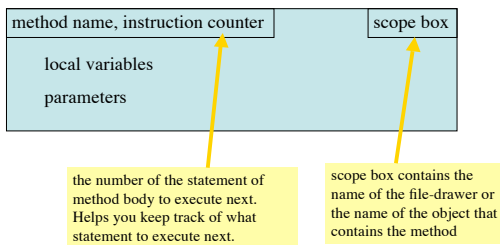
scope of temp

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

8

The frame (the box) for a method call

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



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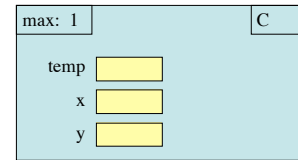
frame for a call

/** = 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

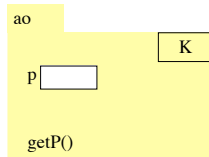


frame for a call on max

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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

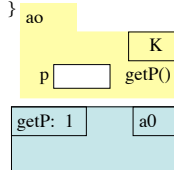
11

frame for a call

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

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).



frame for a call on getP
of a0

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