Comments, Stack, Memory Maps, Parameter Passing

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This material is based on material provided by Ben Bederson, Bonnie Dorr, Fawzi Emad, David Mount, Jan Plane
Overview

- Comments
- Stack
- Memory Maps
- Parameter Passing
- Copy Constructor
About Google

- What do you get when you google “Tim”
- What do you get when you google “Recursion”
Comments

- Should make it easy for someone to look at your code and very quickly understand how it works
- Good style translates to less commenting is necessary
- Comment areas
  - Comment at the top of class → describes class purpose
  - Comment above every method → describes the contract (pre/post conditions) associated with the method and algorithms used (if any). These comments are usually very detailed
    - Pre-conditions → what must be true for the method to work
    - Post-conditions → given pre-conditions are met what will be the result of executing the method
Comments Styles

- /* block comments */
  - Usually above methods or big chunks of code
- // one line comments
  - Usually in the middle of methods or for instance variables
- /** Javadoc */
  - Notice two ** at the beginning
  - Represents comments to be processed by an utility called javadoc
  - Descriptions of classes/methods in projects usually generated using javadoc
Call Stack

- Stack ➔ Abstract data type that allows insertions/removals only from one end
  - Example: stack of clean plates in a dinner
  - Operations:
    - Push ➔ add an element to the stack
    - Pop ➔ remove an element from the stack
    - Follows a LIFO (Last-In-First-Out) policy
- Java call stack
  - Each time a method is called an entry in this stack is added
  - The entry is called a frame
  - The frame has local variables, parameters and other data
  - Also referred to as the Activation Record Stack
public static void A(int x) {
    int y = x + 2;
    B(y);
}
public static void B(int w) {
    int k = 3;
    System.out.println(k + w);
}
public static void main(String[] args) {
    int k = 10;
    A(k);
}
Memory Maps

- Memory maps will be used to represent the state of the call stack and the heap
- You need to know how to draw memory maps 😊

**Call Stack**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>30</td>
</tr>
<tr>
<td>c</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>754</td>
</tr>
<tr>
<td>q</td>
<td></td>
</tr>
<tr>
<td>f</td>
<td></td>
</tr>
<tr>
<td>args</td>
<td>null</td>
</tr>
</tbody>
</table>

**Heap**

- "first"
- "second"
Call Stack

- The call stack makes it possible for:
  - Local variables to be created/destroyed
    - Variables are created when frame is created and placed in the stack
    - Variables are destroyed when frame is removed from the stack
  - The order in which methods are called to be respected
    - If A, calls B, and B calls C, then C’s frame must be removed before B’s, and B’s before A’s
  - Us to use the same name for local variables in different methods
    - Each frame “hides” the variable
- In our examples, the frame will include local variables and parameters
In many languages there are different ways to pass parameters:

- **By value**
- **By reference**

In Java ALL parameters are passed by value:

- A copy of the argument is used to initialize the parameter.
- If you change the value assigned to a parameter that will not change the value of the argument.

**IMPORTANT:** It is the nature of what you pass what makes a difference:

- If you pass a primitive type value, nothing can change the argument.
- If you pass a reference then we may change the object associated with the reference in the method that has been called.

  - Remember that the reference variable does not store the object (it stores an address).
Passing Parameters

- **Primitive Types**
  - Let’s see passing parameters when dealing with primitive types
  - Let’s draw a memory map for the code in Swapping.java

- **Reference Types**
  - Let’s see passing parameters when dealing with reference types
  - Let’s draw a memory map for the code in Increasing.java
  - You MUST DOCUMENT if your method is going to change a value passed via a parameter
    - Some call it a destructive method
    - How would we prevent a parameter from being modified?
      - Copy constructor
  - Let’s draw a memory map for objects of a class named **Radio** that has the fields name (String) and year (int).
  - Note: although the examples rely on static methods all these ideas also apply to non-static methods
Copy Constructor

- Constructor that takes as parameter an instance of the same class
  - Uses the data from the parameter object to initialize the data of the new object
- Example: HighDefTv.java
- Let’s create a memory map for this example
  - Do we need to duplicate the String field?
  - Immutable class → cannot change state
- Object duplication usually involves a method called clone()