



CMSC 131

Object-Oriented Programming I

Comments, Stack, Memory Maps,

Parameter Passing

Dept of Computer Science

University of Maryland College Park

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

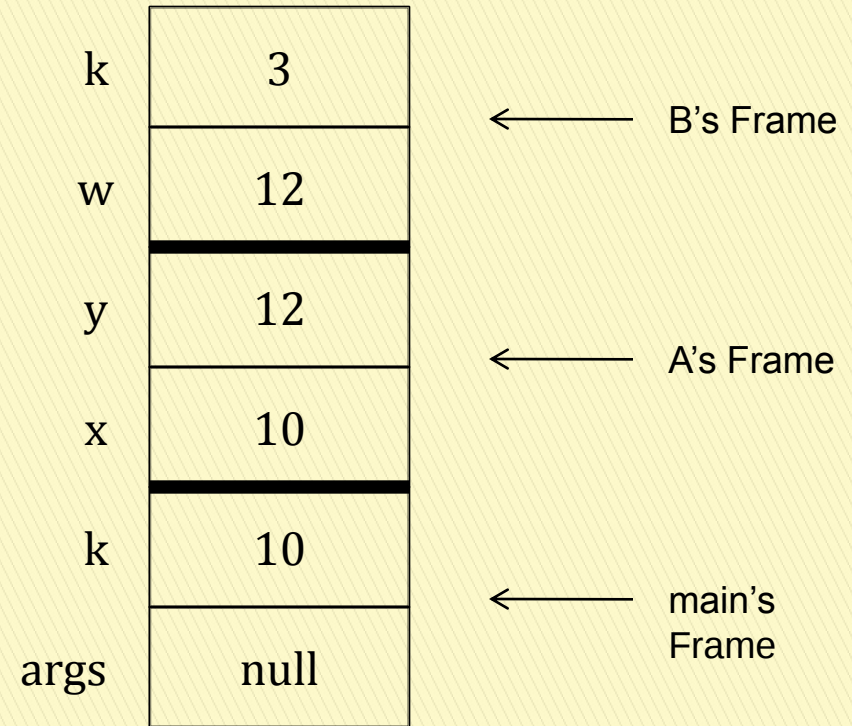
- ▶ */* block comments */*
 - Usually above methods or big chunks of code
- ▶ *// one line comments*
 - Usually in the middle of methods or for instance variables
- ▶ */** Javadoc */*
 - Notice two ****** at the beginning
 - Represents comments to be processed by an utility called javadoc.
 - Descriptions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

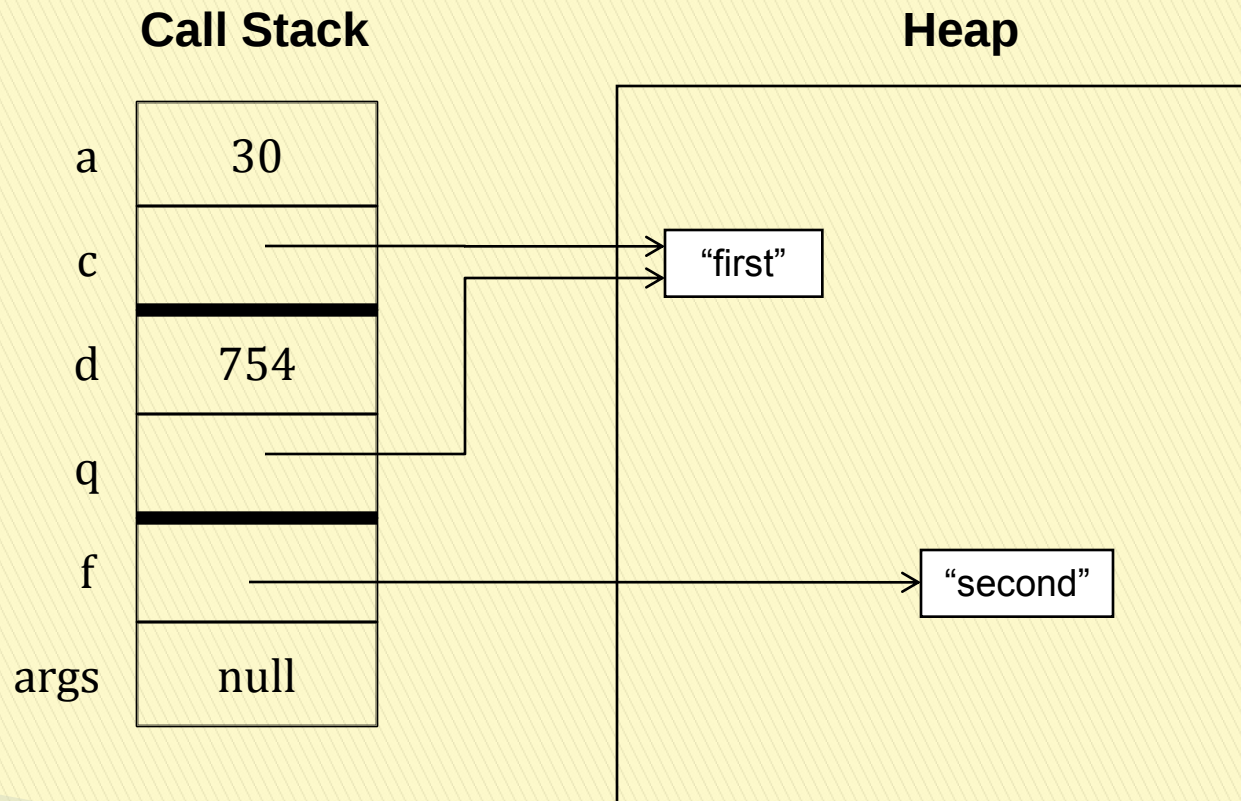
Call Stack/Example

```
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

- ▶ 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

Passing 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 that 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 you 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()

Drawing Board (Honors)

- ▶ Let's take a look at some code that can draw for us
- ▶ Example: `DrawingBoard.java`