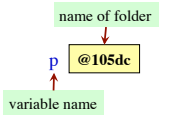
Readings for This Lecture

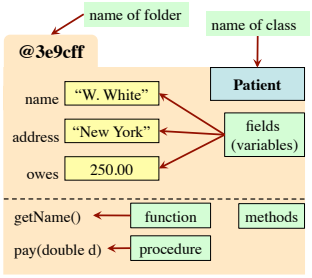
- Section 1.4, 1.5 in text
- Section 3.1 in text
- Plive activities referenced in the text

- Please look at lecture summaries online
  - Handouts are short version
  - Presentation is everything I do in class
- I correct slides after class
  - Fix errors in the slides
  - Clarify confusing points
- Always good to read my slides after class

Extended Review From Last Time

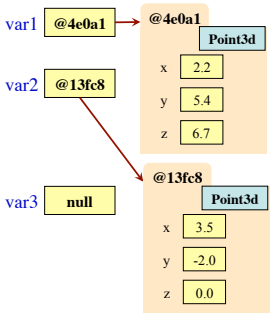


- p.getName()
  - Has value "W. White"
  - **Function**; gives value
- p.pay(250.00);
  - Sets owes to 0
  - **Procedure**; it does something



The Value `null`

- You can declare a class variable w/o using new
  - Example: Point3d var3;
- Value in variable is **null**
  - **null**: Absence of a name
- var3.getX() gives error!
  - There is no name in var3
  - Does not know which Point3d to access
  - **NullPointerException**



Class Definition

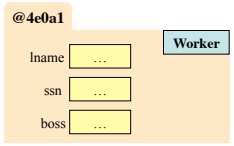
- Describes the format of a folder (instance, object) of the class.

```
/**
 * Description of what the class is for
 */
public class <class-name> {
    declarations of fields and methods (in any order)
}
```

This is a **comment**
It does nothing.
It is a note to yourself

- The class and every method has a comment of the form
  / specification */**
- **This is a Javadoc comment** (Part of Lab next week).

Field: A Variable in each Folder of a Class



Declarations of fields

Invariants: Properties that are always true

```
/** An instance is a worker in a certain organization. */
public class Worker {
    private String lname;   // Last name ("" if none; never null)
    private int ssn;        // Social security #: in 0..999999999
    private Worker boss;    // Immediate boss (null if none)
}
```

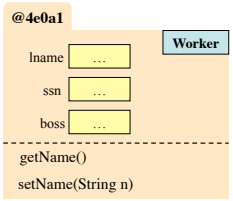
Note the **private** and **public** keywords.
They are important but we will explain them later.

Getter and Setter Methods

```
/** Yields: worker's last name*/
public String getName() {
    return lname;
}
/** Set worker's last name to n
  * Cannot be null; can be "" */
public void setName(String n) {
    lname= n;
}
/** Yields: last 4 SSN digits, as int *
```

value of function

procedure; no value



- *Try writing it yourself.*
- Full code on website

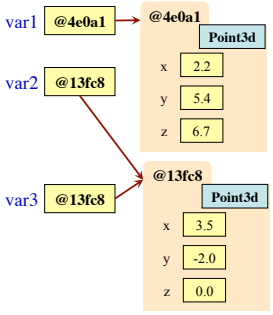
Getter methods (functions) **get** or retrieve values from a folder.

Setter methods (procedures) **set** or change fields of a folder

How Methods Work

Memorize This!
Write it down several times.

- **Example**: var1.getX()
  - Gets object (folder) name from the variable
  - Searches class (file drawer) for object (folder)
  - Executes commands inside the method on that object
- Methods apply to the **object** (folder), not the variable!
  - Execute var2.setX(8.2);
  - Makes var3.getX() == 8.2



Initializing the Fields of an Object (Folder)

- Creating a new Worker is now a multi-step process:
  - Worker w = new Worker();
  - w.setName("White");
  - …

lname is **null** *violates* invariant

- We would like to be able to use something like

  Worker w = new Worker("White", 1, null);
  - Create a new Worker, sets the last name to "White", the SSN to 0000000001, and the boss to **null**.
  - Need a special kind of method: **the constructor**

Initializing the Fields of an Object (Folder)

Memorize This!
Write it down several times.

- Creating a new Worker is now a mult
  - Worker w = new Worker();
  - …
- W
  - …

Invariants must always be true. **Always.**

Purpose of the Constructor

- Initialize the fields of a newly created object
- Make sure that the invariants are true

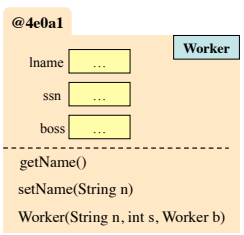
e",
the SSN to 0000000001, and the boss to **null**.
- Need a special kind of method: **the constructor**

Example Constructor

```
/**
 * Constructor: an instance with last
 * name n (can't be null, can be ""),
 * SSN s (an int in 0..999999999), and
 * boss b (null if none)
 */
public Worker(String n, int s,
              Worker b) {
  lname = n;
  ssn   = s;
  boss  = b;
}
```

name of constructor = name of class

no void or type!

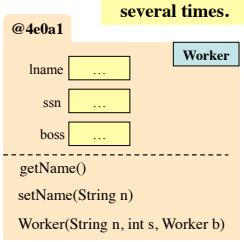


How "new" Is Evaluated

Memorize This!
Write it down several times.

new Worker("White", 1, null)

- Create a new object (folder) of class Worker
  - Initializes fields to default values
  - e.g. 0 for int, null for String
- Put the folder in file drawer
- Execute the constructor call Worker("White", 1, null)
  - Executes the (assignment) commands in constructor body
- Uses **the name** of the object as the final value of this expression



Quiz Next Week

- All about definitions; taken from these slides
  - Everything that says "Memorize This!"
  - Want English descriptions of the steps
- How do method calls work?
  - Handout slide 7
- What is the purpose of the constructor?
  - Handout slide 9
- How is **new** evaluated?
  - Handout slide 11