CMSC 131

Object-Oriented Programming I

Classes Introduction II

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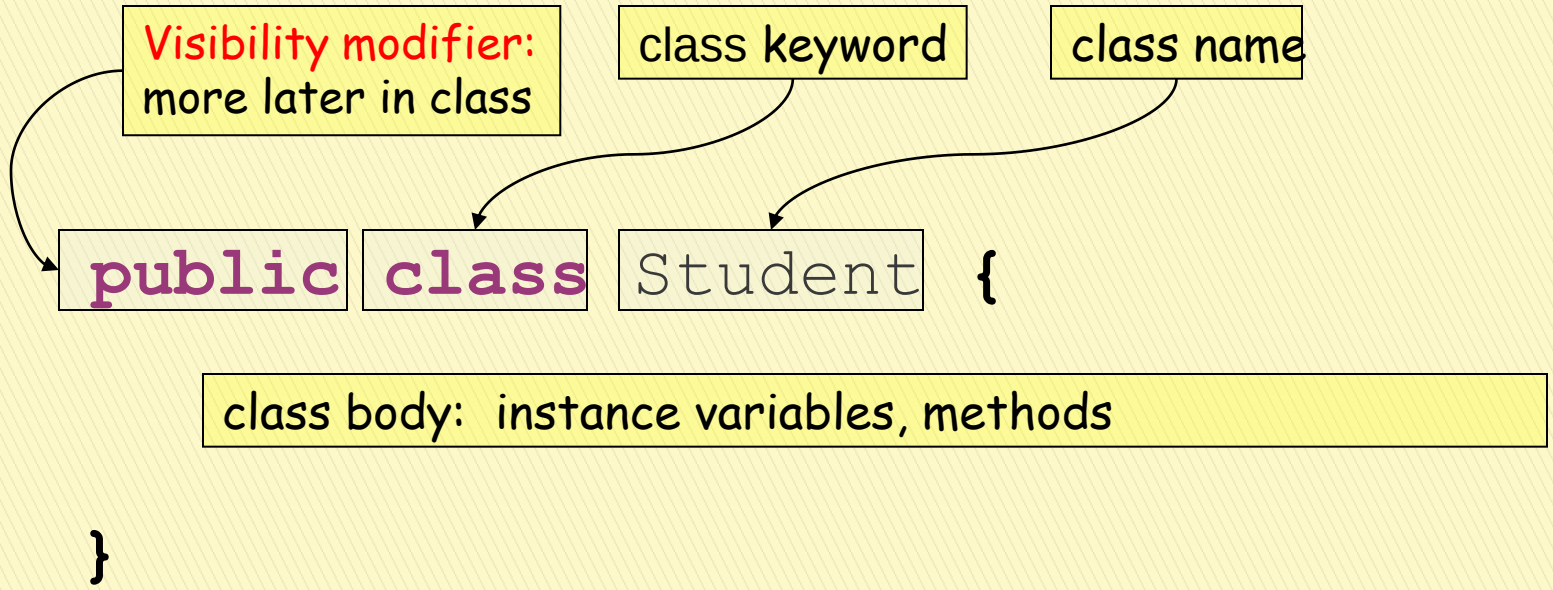
This material is based on material provided by Ben Bederson, Bonnie Dorr, Fawzi Emad, David Mount, Jan Plane

Overview

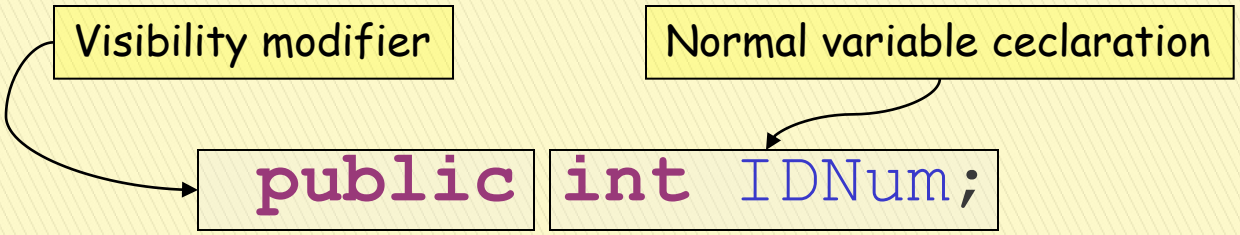
- Class Declaration
- Equals
- toString method

Classes in Java

- Class declarations have the following form in Java:



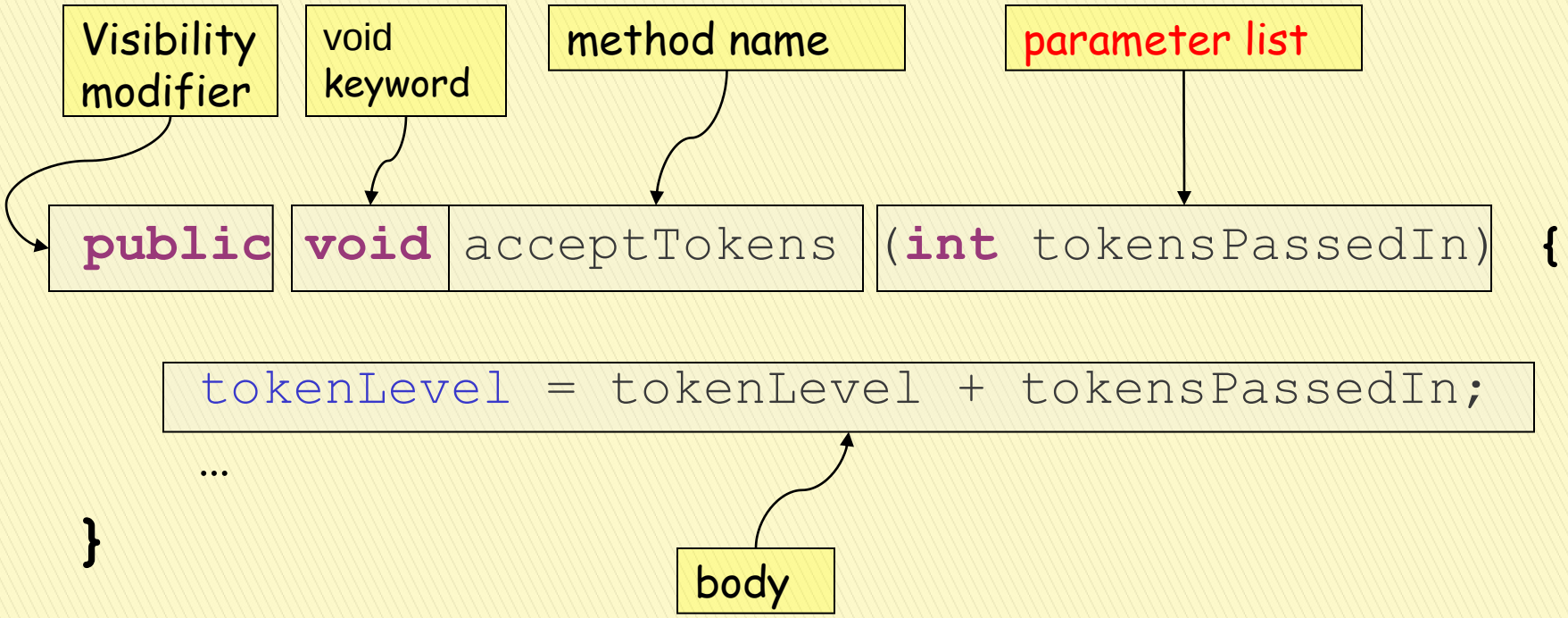
Anatomy of an Instance Variable Declaration



- We will see later that we can have private as visibility modifier
- What is the default value?
  - Boolean → false
  - Number → 0
  - Reference → null
- null → represents “no address”

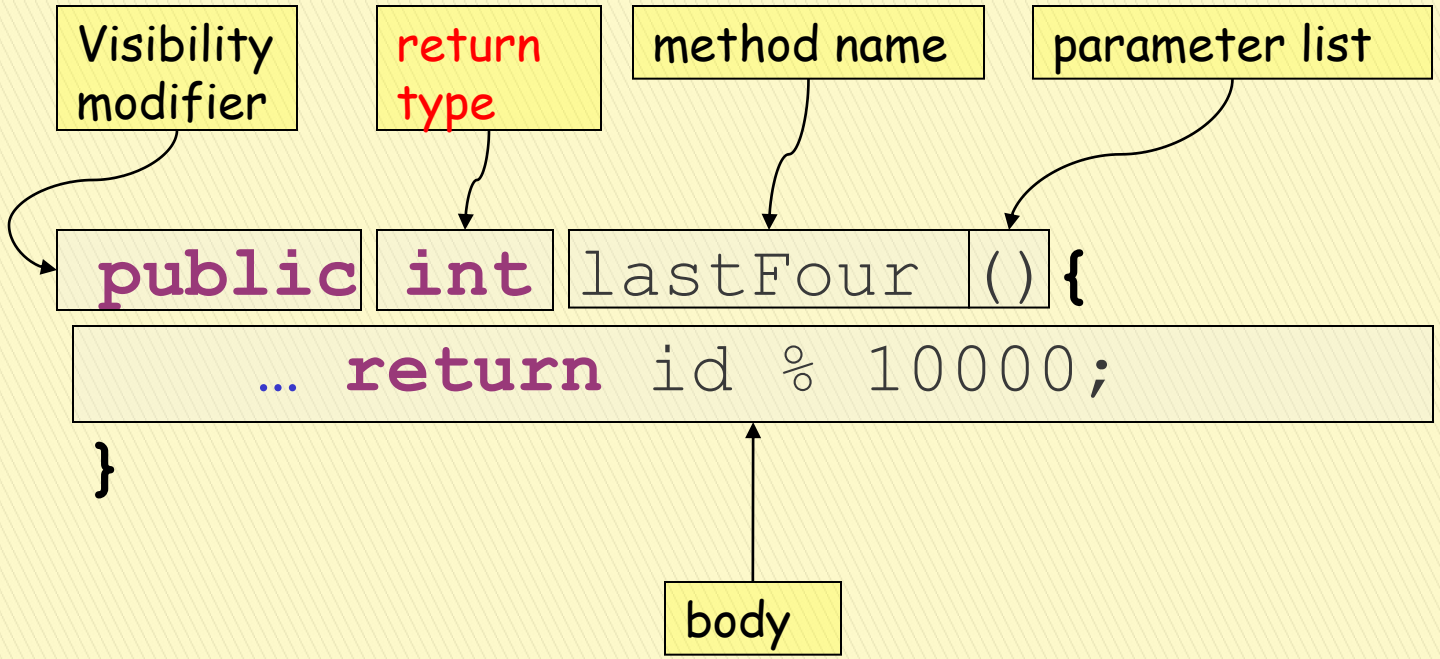
Anatomy of a Method Declaration for …

methods that do not return values



Anatomy of a Method Declaration for …

methods that return values



Return Type

- Methods that return values must specify the type of the value to be returned
- The bodies of these methods use `return` to indicate when a value is to be returned
- The value being returned must have the same type as the return type
- Notice that return can be used anywhere in the method
- For a method with no return type “return;” will end the method

Object Creation

- Once a class is defined, objects based on that class can be created using new:

  new Student()

- We are "creating an instance of class Student"
- To assign an object to a variable, the variable's type must be the class of the object

  Student s = new Student();
- Each object has its own copies of all the instance variables in the class
- Instance variables and methods in an object can be accessed using "." or using setter (mutator) methods

  s.IDNum = 123456789;

  s.setIDNum(123456789);

Constructors

- Special "methods" in class definitions to specify how objects are initialized
- Form of a constructor definition:

```
Student (String nameDesired, int IDDesired) {
    name = nameDesired;
    id = IDdesired;
}
```

- Can have more than one constructor, provided argument lists are different

```
Student (int IDDesired) {
    id = IDDesired;
}
```

- Java includes *default* constructor (no arguments), which you can redefine (overriding the default)

```
Student () {
    tokenLevel = 3;
}
```

Equality Testing

```
public boolean equals(Student otherStudent) {
    if (otherStudent == null) {
        return false;
    } else if (id == otherStudent.id) {
        return true;
    } else {
        return false;
    }
}
```

IMPORTANT: For now we will have a parameter different from Object but the correct approach to define equals is to use Object as a parameter

Objects to Strings

- What happens if we try to print a Student object?
  - Invoke println using a Student object as an argument?

    Student s1 = new Student ();

    System.out.println (s1);
- Something like this prints:

  Student@82ba41

Java Knows "How" To Print Any Object

- Why?
  - Every class has a default toString method
  - toString converts objects into strings
  - System.out.println calls this method to print an object
  - Default: object type and address

- toString can be overridden!

```
// The method for converting Students to strings

public String toString() {
    return (name + ": " + id);
}
```

Example

- Let's expand our SuperHero class
- Add two constructors
  - One with name and strength as parameters
  - One with just name
  - One with no name
- Let's add a set method
- Let's add a toString() method
- Let's add an equals method
- Let's add a method that takes an int and increases the strength
- Let's add a method that given a number of villains tells us whether the SuperHero can defeat them.
- Suggest your own … ☺