

Understanding Classes and Objects



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Overview



Declaring classes

Class members

Working with objects

Encapsulation and access modifiers

Field accessors and mutators



Java Is an Object-oriented Language



Objects encapsulate data, operations, and usage semantics



Allow storage and manipulation details to be hidden



Separates what is to be done from how it is done

A Class Is a Template for Creating Objects

Flight.java

```
class Flight  
    // class members  
}
```

Declared with class keyword followed by the class name

Body of the class is contained within brackets

Java source file name normally has same name as class

Classes

A class is made up of both state and executable code



Fields

Store object state



Classes

A class is made up of both state and executable code



Fields

Store object state



Methods

Executable code that
manipulates state and
performs operations

Flight.java

```
class Flight {  
    int passengers;  
    int seats;  
  
    void add1Passenger() {  
        if(passengers < seats)  
            passengers += 1;  
    }  
}
```

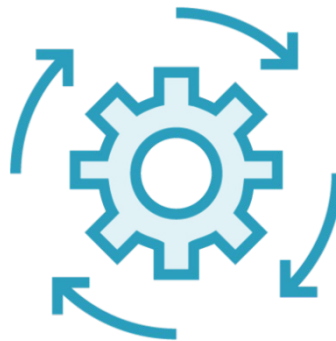

Classes

A class is made up of both state and executable code



Fields

Store object state



Methods

Executable code that manipulates state and performs operations



Constructors

Executable code used during object creation to set initial state

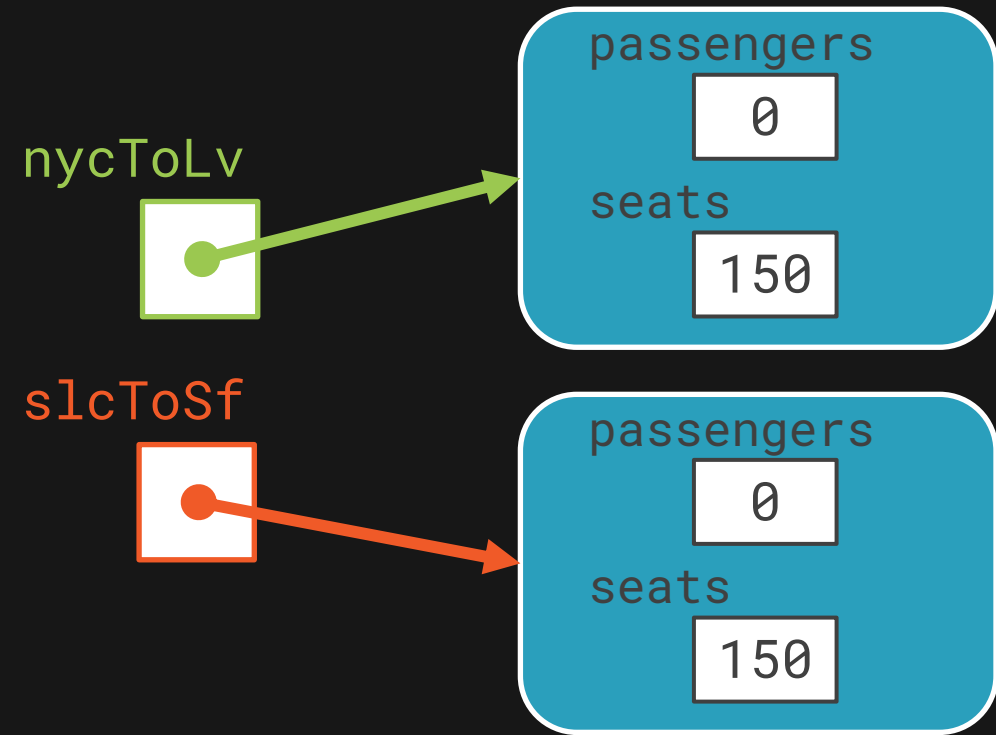


```
class Flight {  
    int passengers;  
    int seats;  
  
    Flight() {  
        seats = 150;  
        passengers = 0;  
    }  
  
    void add1Passenger() {  
        if(passengers < seats)  
            passengers += 1;  
    }  
}
```

```
Flight nycToLv;
```

```
nycToLv = new Flight();
```

```
Flight slcToSf = new Flight();
```



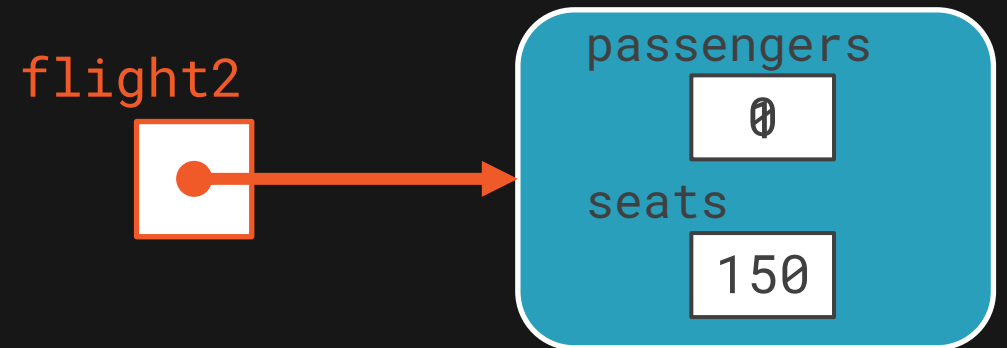
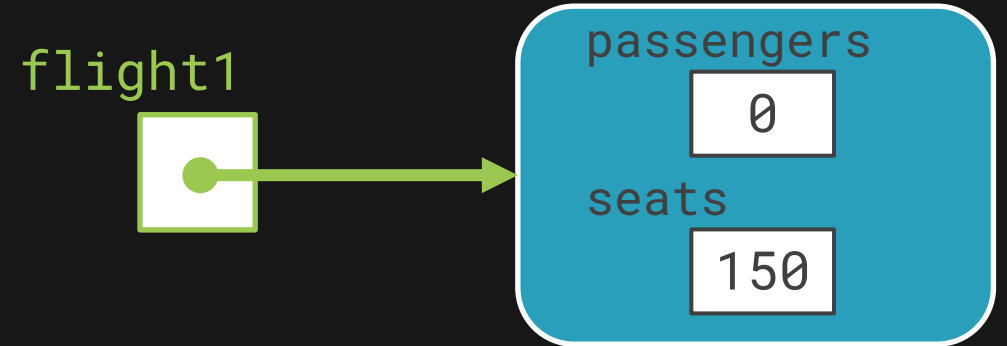
Using Classes

Use the new keyword to create a class instance (a.k.a. an object)

- Allocates the memory described by the class, and runs the constructor
- Returns a reference to the allocated memory

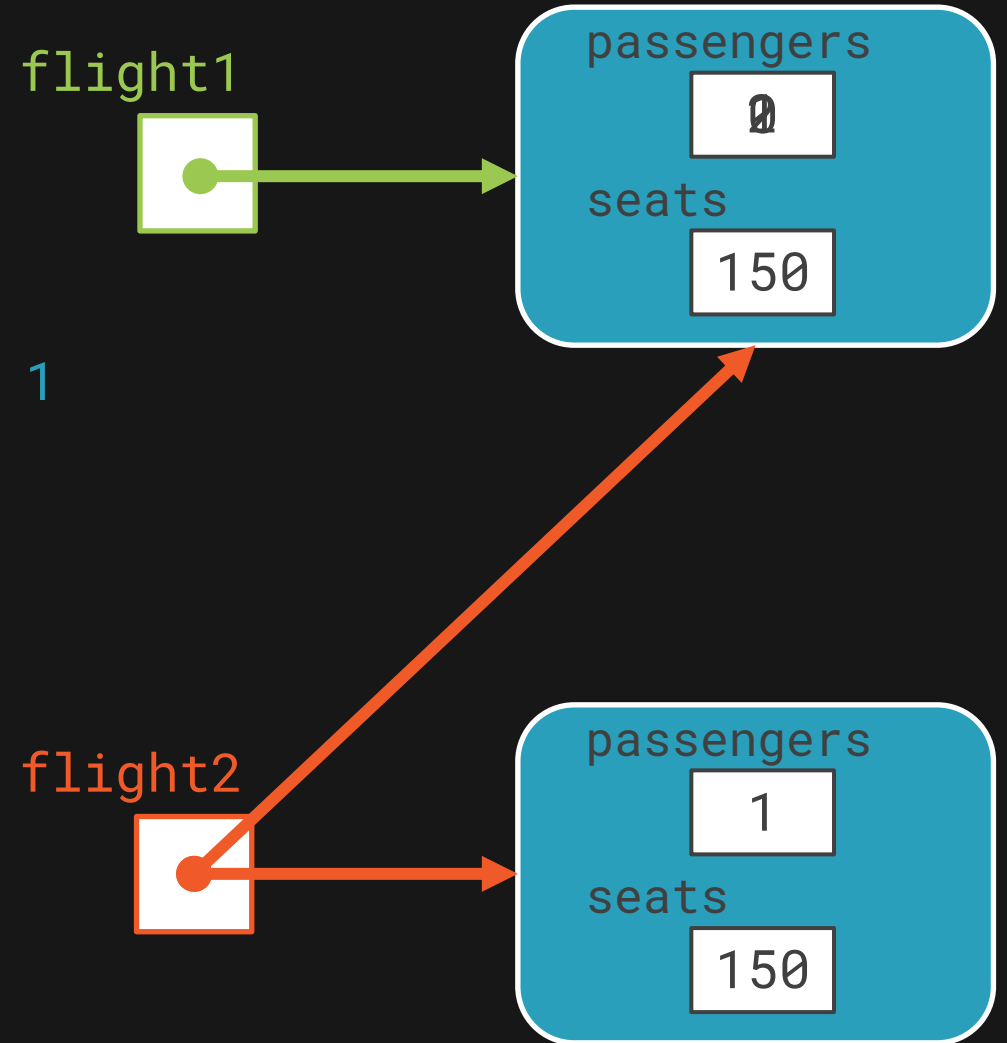
Understanding Classes as Reference Types

```
Flight flight1 = new Flight();  
Flight flight2 = new Flight();  
flight2.add1Passenger();  
System.out.println(flight2.passengers);
```



Understanding Classes as Reference Types

```
Flight flight1 = new Flight();  
Flight flight2 = new Flight();  
flight2.add1Passenger();  
System.out.println(flight2.passengers); // 1  
  
flight2 = flight1;  
System.out.println(flight2.passengers);  
  
flight1.add1Passenger();  
flight1.add1Passenger();  
System.out.println(flight2.passengers);
```



Encapsulation and Access Modifiers

The implementation details of a class are generally hidden



This concept is known
as **encapsulation**



Java uses **access modifiers**
to achieve encapsulation

Basic Access Modifiers

Modifier	Visibility	Usable on Classes	Usable on Members
		*	


* As private applies to top-level classes; private is available to nested-classes



Applying Access Modifiers

Main.java

```
Flight flight1  
System.out.println(  
    flight1.passengers);  
flight1.add1Passenger();
```



Flight.java

```
class Flight {  
    int passengers;  
    int seats;  
    Flight(){...}  
    void add1Passenger(){...}  
}
```



```
public class Flight {  
    // other members elided for clarity  
    public void add1Passenger() {  
        if(passengers < seats)  
            passengers += 1;  
        else  
            handleTooMany();  
    }  
    private void handleTooMany() {  
        System.out.println("Too many");  
    }  
}
```

Applying Access Modifiers

Main.java

```
Flight flight2 = new Flight();  
flight2.handleTooMany();  
flight2.add1Passenger();
```

Flight.java

```
public class Flight {  
    private int passengers;  
    private int seats;  
    public Flight(){...}  
    public void add1Passenger(){...}  
    private void handleTooMany(){...}  
}
```

Special References

this

Implicit reference to current object

Useful for reducing ambiguity

Allows an object to pass itself
as a parameter

null

Represents an uncreated object

Can be assigned to any reference variable



Special Reference: this

```
public class Flight {  
    private int passengers;  
    private int seats;  
  
    // other members elided for clarity  
    public boolean hasRoom(Flight f2) {  
        int total = passengers + f2.passengers;  
        return total <= seats;  
    }  
}
```



Special Reference: null

```
Flight lax1 = new Flight();  
Flight lax2 = new Flight();  
  
// add passengers to both flights  
  
Flight lax3  
  
if(lax1.hasRoom(lax2))  
    lax3 = lax1.createNewWithBoth(lax2);  
  
// do some other work  
  
if(lax3 != null)  
    System.out.println("Flights combined");
```



Field Encapsulation



The specific fields a class uses to manage data values is generally considered to be an implementation detail



In most cases these details should not be directly accessible outside the class



Use methods to control field access



Accessors and Mutators

Use the accessor/mutator pattern to control field access



Accessor retrieves field value

Also called getter

Method name: *getFieldName*



Mutator modifies field value

Also called setter

Method name: *setFieldName*

```
class Flight {  
    private int seats;  
    // other members elided for clarity  
    public int getSeats() {  
        return seats;  
    }  
  
    public void setSeats(int seats) {  
        seats = seats;  
    }  
}
```


Accessors and Mutators

Main.java

```
Flight slcToNyc = new Flight();  
slcToNyc.setSeats(200);  
System.out.println(slcToNyc.getSeats());
```

200

Summary



Class

- Template for creating objects

Object

- Instance of a class

Classes are reference types

- Class variables simply hold a reference
- Instances created with new keyword
- Multiple variables can reference the same instance



Summary



Fields

- Store object state

Methods

- Executable code
- Manipulate state
- Perform operations

Constructors

- Executable code
- Runs during object creation
- Sets initial state



Summary



this

- Implicit reference to current object

null

- Represents an uncreated object



Summary



Access modifiers

- Control class visibility
- Control member visibility
- Enable encapsulation

Fields not normally directly accessible

- Use methods to provide access
- Accessors retrieve field values
- Mutators modify field values

