Féidearthachtaí as Cuimse
Infinite Possibilities

Relationships between classes

Object Oriented programming

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So far.. classes have interacted in various ways with each other

- Classes can import each other
  - `import javax.swing.jframe`

    `i.e.` One class “uses” another class
- Classes can inherit from another class
  - “is a type of” “is-a”
- Classes can implement Interfaces

Importing a class

- Needed when you want to USE another class that is not in the same package.

- Means you don't have to put in the fully qualified name in.

  - `e.g. import java.util.scanner`

```
Scanner myInput = new Scanner(..)
```

(And not java.util.Scanner = new Scanner(..);

Extending (inheriting) a class

- Subclass inherits behaviour and attributes

```
public class HourslyEmployee extends Employee
```

etc

Implementing an interface

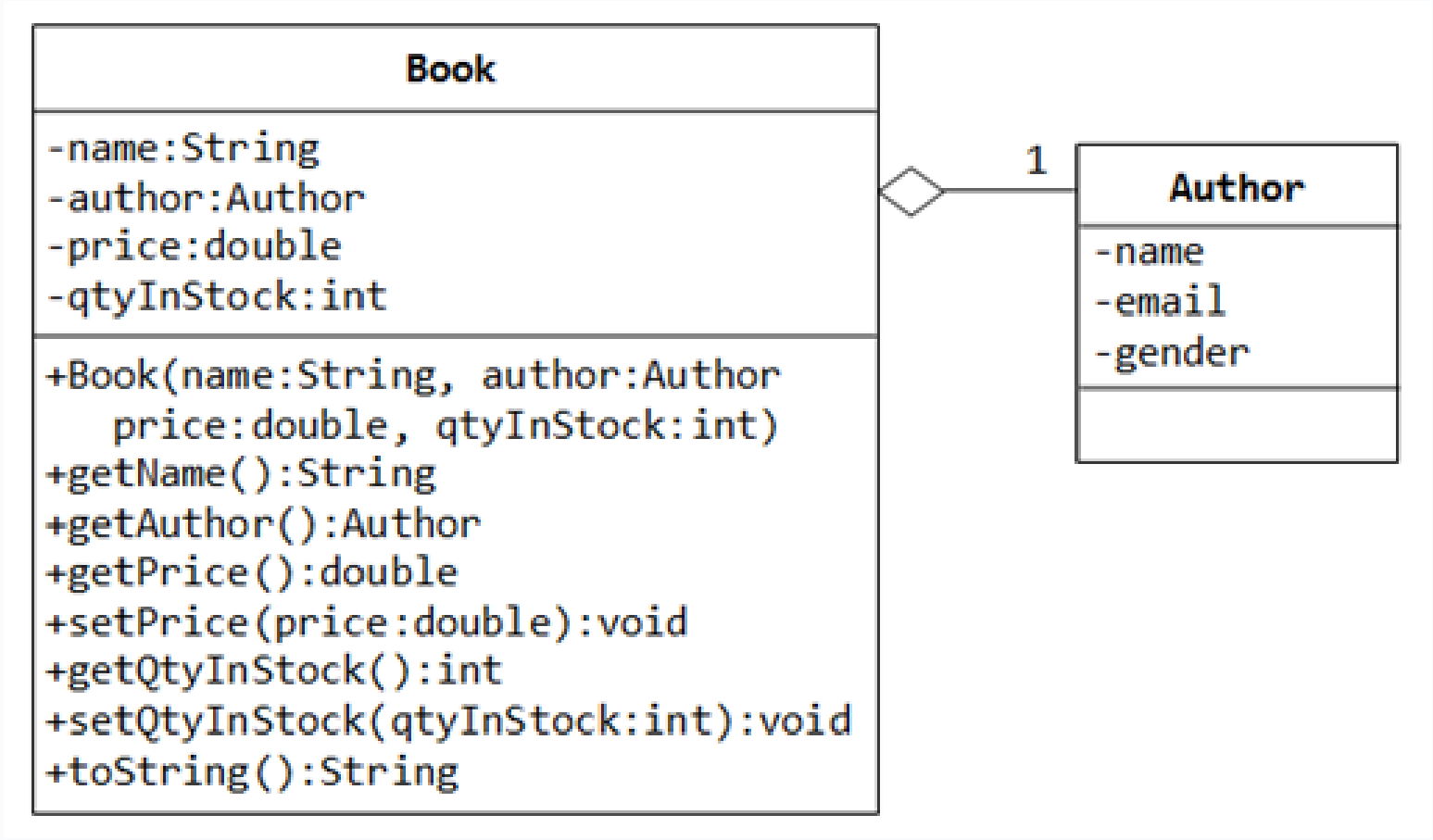
- Get a class to sign up to implementing particular behaviour (i.e. a set of methods in the interface)

- `class Employee implements Payable`

Classes have interacted in various ways with each other

- Classes can import functionality
  - `import javax.swing.jframe`
    "uses"
- Classes can inherit from another class
  - "is a type of" "is-a"
- Classes can implement Interfaces
- ***Classes can have references to other objects as members ("has-a")*** **= *Composition***

Classes can be composed of other classes (composition)



An important part of OO

- You’re tasked with developing an application
  - How should I divide up my classes?
  - What classes should I create?
  - Not a cut and dried process !
  - General process will be explained

Avoid just creating big long rambling class for your application!

How should I divide up my classes?”

This means:

What **parts** of the problem should become separate classes?

What **responsibility** does each class have?

How do they **talk to each other**?

You want:

- **High cohesion** – each class does one main job
- **Low coupling** – classes don’t depend too heavily on lots of other classes

What classes should I create?

Very simple starting rules:

Look for nouns in the problem description

“Book”, “Member”, “Loan”, “Account”, “Order”, “Product”, “Payment”

These often become classes.

Give each class clear responsibilities

Book → title, author, ISBN

Member → name, ID, list of borrowed books

Library → stores collections of books and members, handles borrowing/returning

Separate ‘things’ and ‘controllers’

“Things” (domain objects): Book, Student, Product

“Managers/Controllers”: Library, OrderManager, GameController

Don’t put everything in one class

If a class is doing too much, split it.

Not a cut and dried process!

There is **no single correct answer**.

Different programmers might design **slightly different class sets**.

You often:

- Start with a simple design
- Code a bit
- Realise a class is too big / badly named
- **Refactor** (split, rename, move methods)

Design improves **iteratively**, not in one perfect step.

General process

- Read the problem, underline nouns and verbs.
- Turn main nouns into candidate classes.
- Decide attributes and methods for each class.
- Draw a simple UML diagram (classes + relationships).
- Check: responsibilities clear? any class doing too much?
- Adjust and refine as you go while coding.