Abstract Classes
Suppose we have class Student which is a subclass of class Person.
Q1: Can we assign a Student object to a variable of type Person?
Q2: Can we assign a Person object to a variable of type Student?

A. yes yes
B. yes no
C. no yes
D. no non
Answer B: yes-no

You can assign student to a Person variable (because you can assign any Person to a Person variable and a Student is a Person) but you can’t assign a Person to a Student variable because that person might not be a Student.
Abstract Methods

• A company has two kinds of employees – hourly workers who work 40 hours a week at a certain wage per hour, and salaried workers who work for an annual salary. The hourly workers get paid every week; the salaried workers once a month -- let’s say every fourth week.
• I want to write a system that has a list of the company’s employees; each week it runs through the list looking at each employee’s data and printing a statement about how much that person should be paid.

• How do we arrange the classes to make this easy?
• Answer: Make a parent class Employee, with subclasses HourlyWorker and SalariedWorker. The staff list can be an ArrayList<Employee> or even Employee[].

• Our payEveryone method will have a loop like this:
  
  for (Employee x: staffList) 
    ( <cast x into its right type>).pay()
• If we give Employee a pay( ) method that the two subclasses override, then we don’t have to cast the list variable into appropriate subclass; the runtime environment will call the subclass’s method automatically.
Now, what body do we give the pay() method in class Employee?
• Answer: we DON’T give it a body. This company has no generic employees, so we should never construct an element of the employee class. We make pay() an *abstract* method of the Employee class, which makes the class itself abstract.

The declaration in the abstract class is

```java
public abstract void pay();
```
• If a class is abstract it must be declared so: public abstract class Employee
You cannot construct an object of an abstract class.

• An abstract class must be extended by subclasses that override its abstract methods.

• A class is abstract (and must be declared as such) if it has at least one abstract method.
• See example:

• Class Employee, SalariedWorker, HourlyWorker and StaffExample
Advantages of abstract classes:

1. They provide a common parent class for similar but distinct classes.
2. They force the subclasses to instantiate essential methods.
3. They provide a template that can be instantiated in very different ways for very different extending classes.