Understanding class definitions

Looking inside classes
(based on lecture slides by Barnes and Kölling)

Main Concepts

- fields
- constructors
- methods
- parameters
- assignment statements

Ticket Machines (an external view)

- Exploring the behaviour of a typical ticket machine.
  - Use the *naive-ticket-machine* project.
  - Machines supply tickets of a fixed price.
    - How is that price determined?
  - How is 'money' entered into a machine?
  - How does a machine keep track of the money that is entered?

Ticket machines

Demo

Ticket machines (an internal view)

- Interacting with an object gives us clues about its behaviour.
- Looking inside allows us to determine how that behaviour is provided or implemented.
- All Java classes have a similar-looking internal view.

Basic class structure

```
public class TicketMachine
{
    Inner part of the class omitted.
}
```

The outer wrapper of TicketMachine

```
public class ClassName
{
    Fields
    Constructors
    Methods
}
```

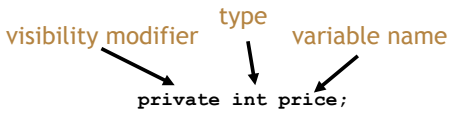
The contents of a class

Fields

- Fields store values for an object.
- They are also known as instance variables.
- Use the *Inspect* option to view an object's fields.
- Fields define the state of an object.

```
public class TicketMachine
{
    private int price;
    private int balance;
    private int total;

    Further details omitted.
}
```

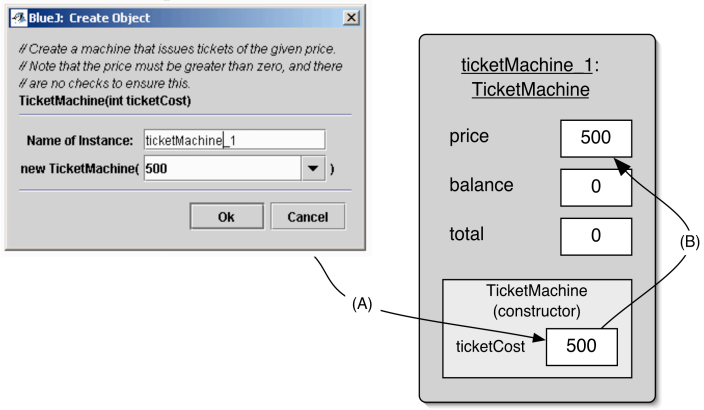


Constructors

- Constructors initialise an object.
- They have the same name as their class.
- They store initial values into the fields.
- They often receive external parameter values for this.

```
public TicketMachine(int ticketCost)
{
    price = ticketCost;
    balance = 0;
    total = 0;
}
```

Passing data via parameters



Assignment

- Values are stored into fields (and other variables) via assignment statements:
  - *variable* = *expression;*
  - `price = ticketCost;`
- A variable stores a single value, so any previous value is lost.

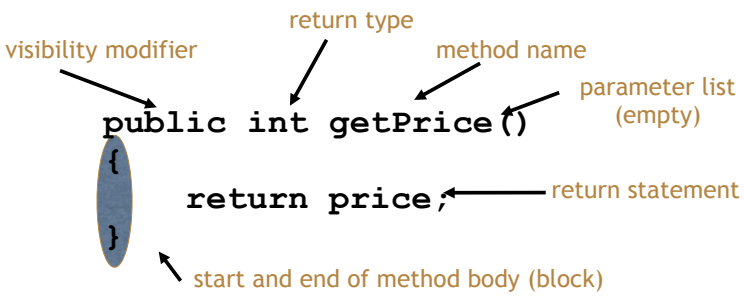
Main Concepts

- mutator and accessor methods
- conditional statements
- local variables
- string concatenation

Accessor methods

- Methods implement the behaviour of objects.
- Accessors provide information about an object.
- Methods have a structure consisting of a header and a body.
- The header defines the method's *signature*.
  `public int getPrice()`
- The body encloses the method's statements.

Accessor methods



Test

```
public class CokeMachine
{
    int
    private price;

    public CokeMachine()
    {
        price = 3(  ;
    }

    public int getPric  ()
    {
        retu  -  rice;
    }
}
```

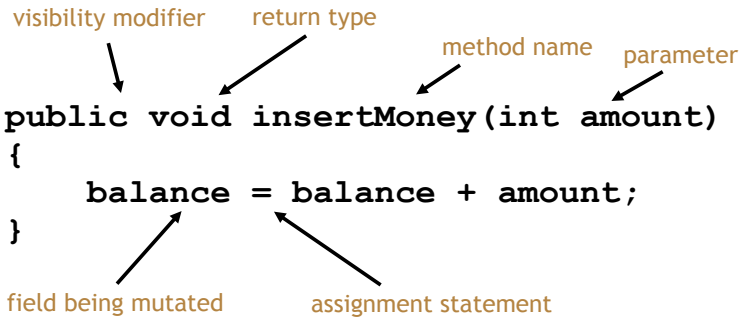
- What is wrong here?

(there are five errors!)

Mutator methods

- Have a similar method structure: header and body.
- Used to *mutate* (i.e., change) an object's state.
- Achieved through changing the value of one or more fields.
  - Typically contain assignment statements.
  - Typically receive parameters.

Mutator methods



Printing from methods

```
public void printTicket()
{
    // Simulate the printing of a ticket.
    System.out.println("##################");
    System.out.println("# The BlueJ Line");
    System.out.println("# Ticket");
    System.out.println("# " + price + " cents.");
    System.out.println("##################");
    System.out.println();

    // Update the total collected with the balance.
    total = total + balance;
    // Clear the balance.
    balance = 0;
}
```

String concatenation

- 4 + 5 → overloading

  9
- "wind" + "ow"

  "window"
- "Result: " + 6

  "Result: 6"
- "# " + price + " cents"

  "# 500 cents"

Quiz

- System.out.println(5 + 6 + "hello");

  `11hello`
- System.out.println("hello" + 5 + 6);

  `hello56`

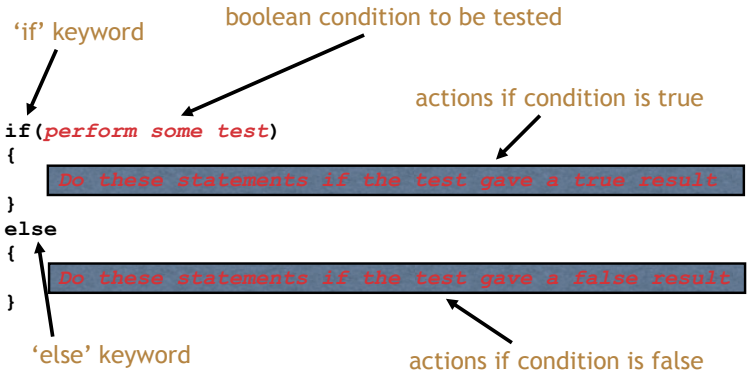
Reflecting on the ticket machines

- Their behaviour is inadequate in several ways:
  - No checks on the amounts entered.
  - No refunds.
  - No checks for a sensible initialisation.
- How can we do better?
  - We need more sophisticated behaviour.

Making choices

```
public void insertMoney(int amount)
{
    if(amount > 0)
    {
        balance = balance + amount;
    }
    else
    {
        System.out.println("Use a positive amount: "
                           + amount);
    }
}
```

Making choices



How do we write 'refundBalance'?

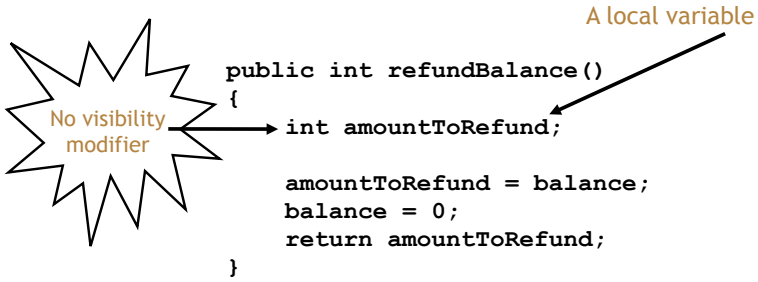
Local variables

- Fields are one sort of variable.
  - They store values through the life of an object.
  - They are accessible throughout the class.
- Methods can include shorter-lived variables.
  - They exist only as long as the method is being executed.
  - They are only accessible from within the method.

Scope and life time

- The scope of a local variable is the block it is declared in.
- The lifetime of a local variable is the time of execution of the block it is declared in.

Local variables



Review

- Class bodies contain fields, constructors and methods.
- Fields store values that determine an object's state.
- Constructors initialise objects.
- Methods implement the behaviour of objects.

Review

- Fields, parameters and local variables are all variables.
- Fields persist for the lifetime of an object.
- Parameters are used to receive values into a constructor or method.
- Local variables are used for short-lived temporary storage.

Review

- Objects can make decisions via conditional (if) statements.
- A true or false test allows one of two alternative courses of actions to be taken.