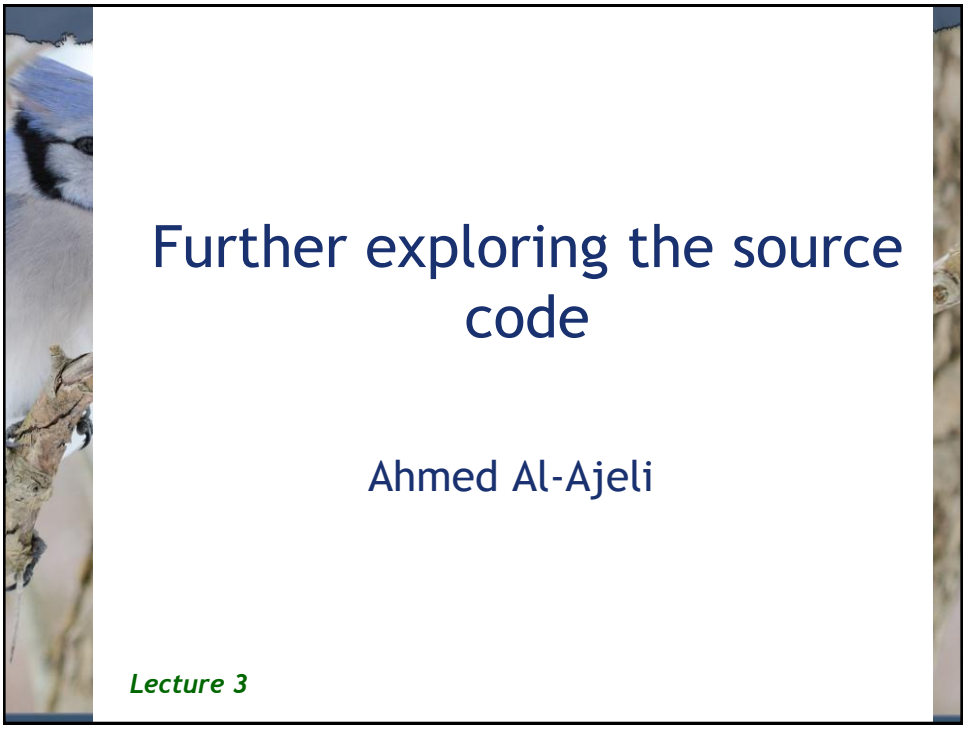
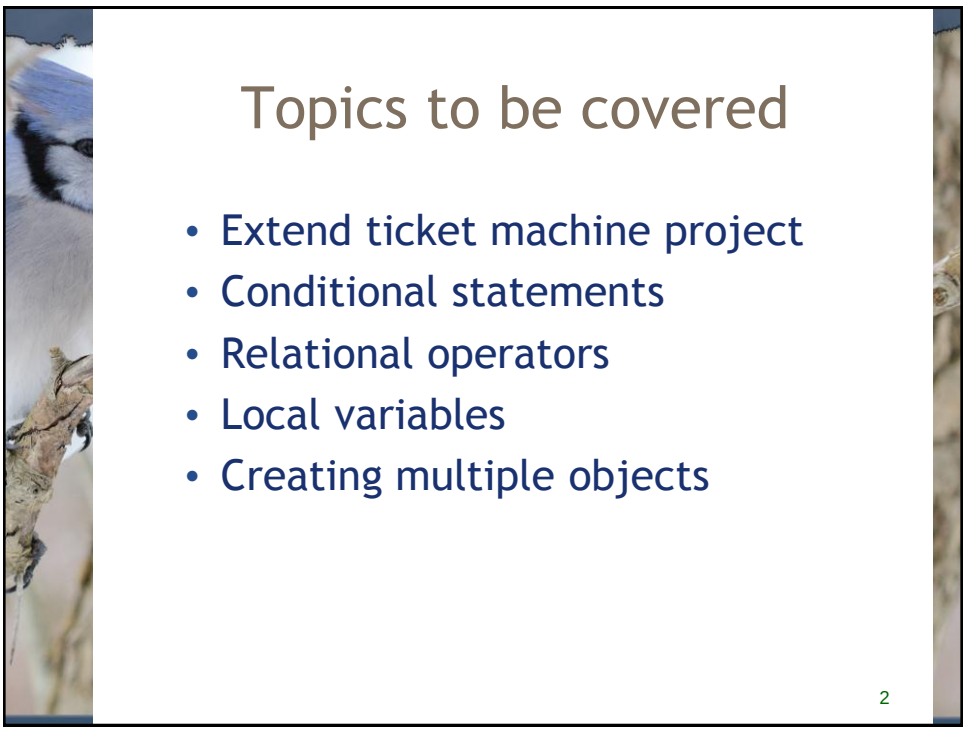


Further exploring the source code

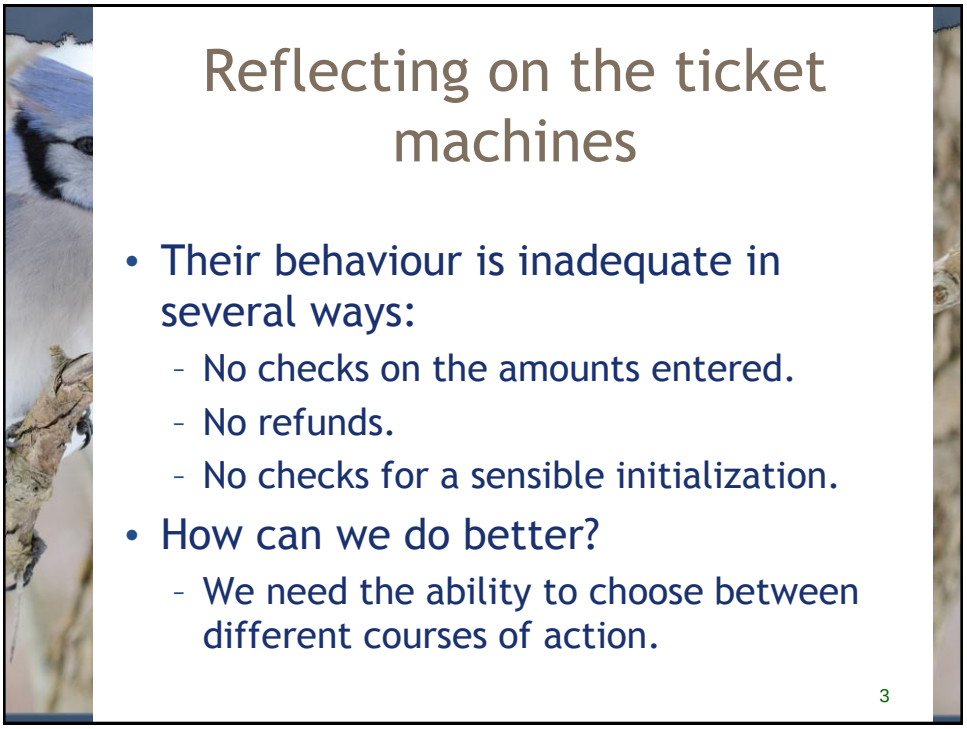
Ahmed Al-Ajeli

Lecture 3



Topics to be covered

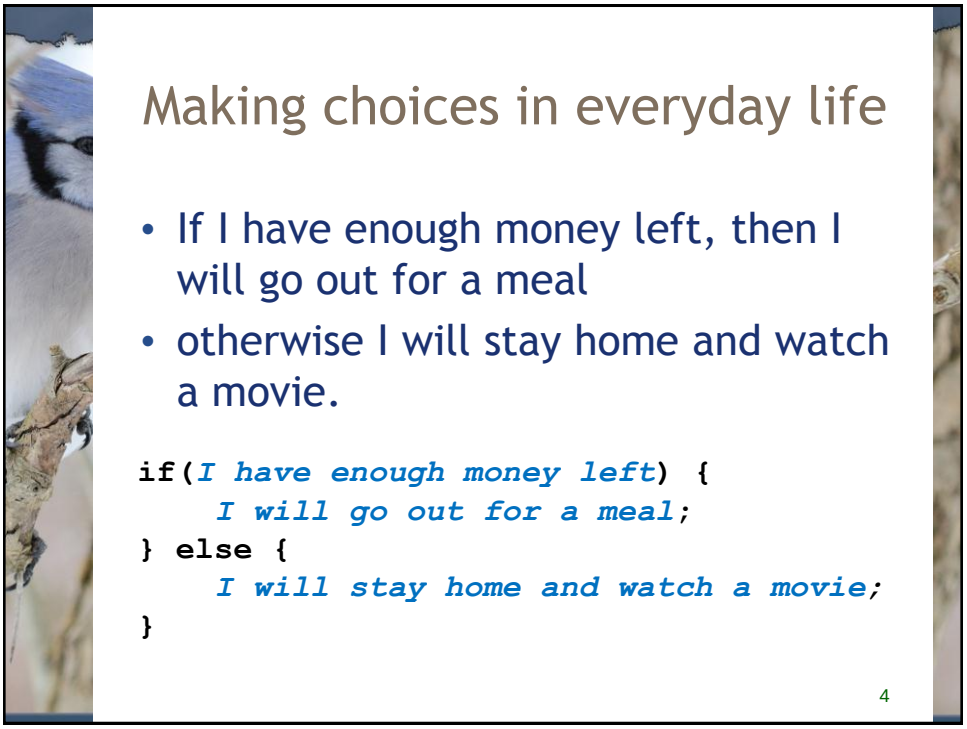
- Extend ticket machine project
- Conditional statements
- Relational operators
- Local variables
- Creating multiple objects



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 initialization.
- How can we do better?
  - We need the ability to choose between different courses of action.

3



Making choices in everyday life

- If I have enough money left, then I will go out for a meal
- otherwise I will stay home and watch a movie.

```
if(I have enough money left) {
    I will go out for a meal;
} else {
    I will stay home and watch a movie;
}
```

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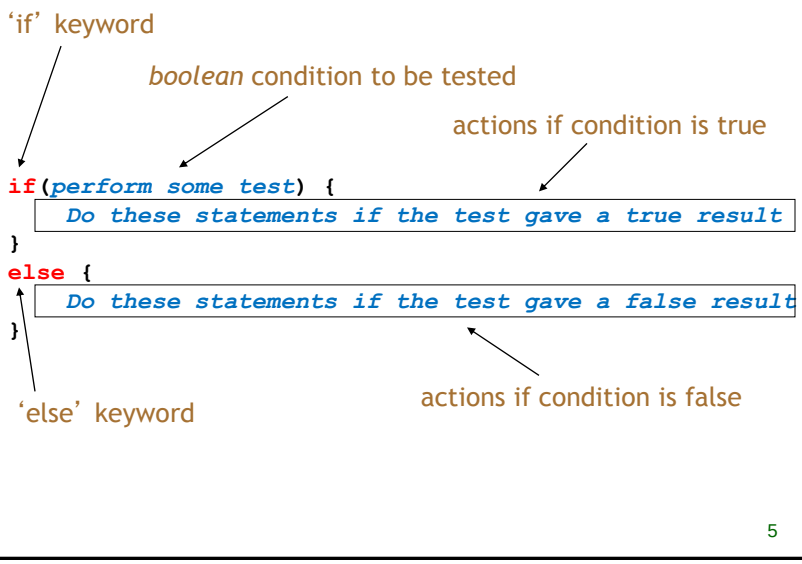
Making choices in Java



5

Making a choice in the ticket machine

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

conditional statement avoids an inappropriate action

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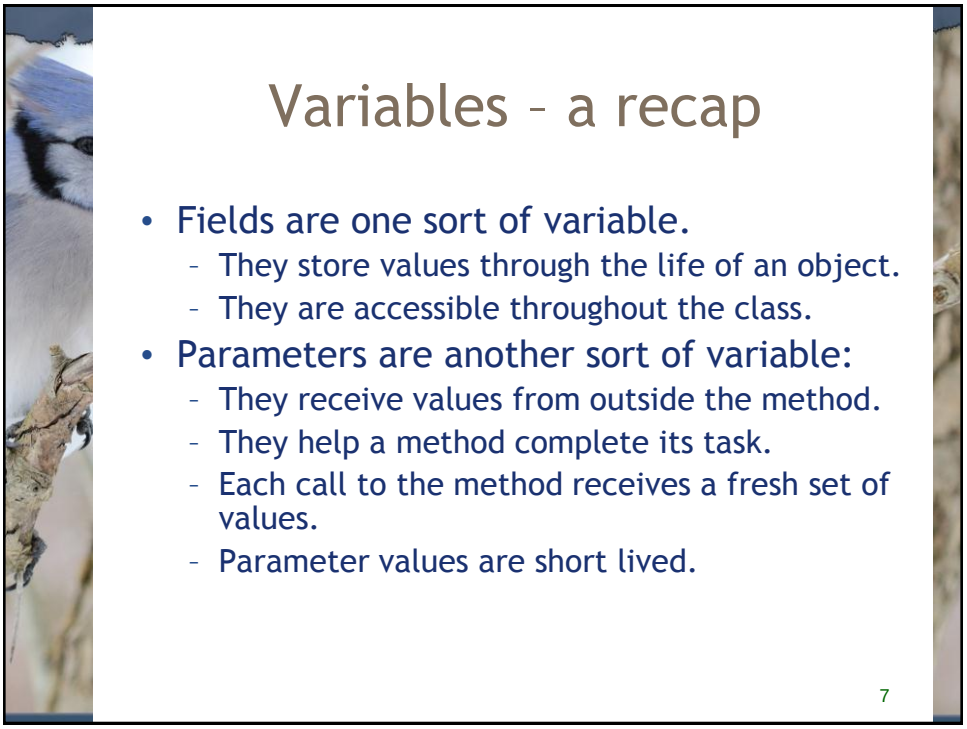
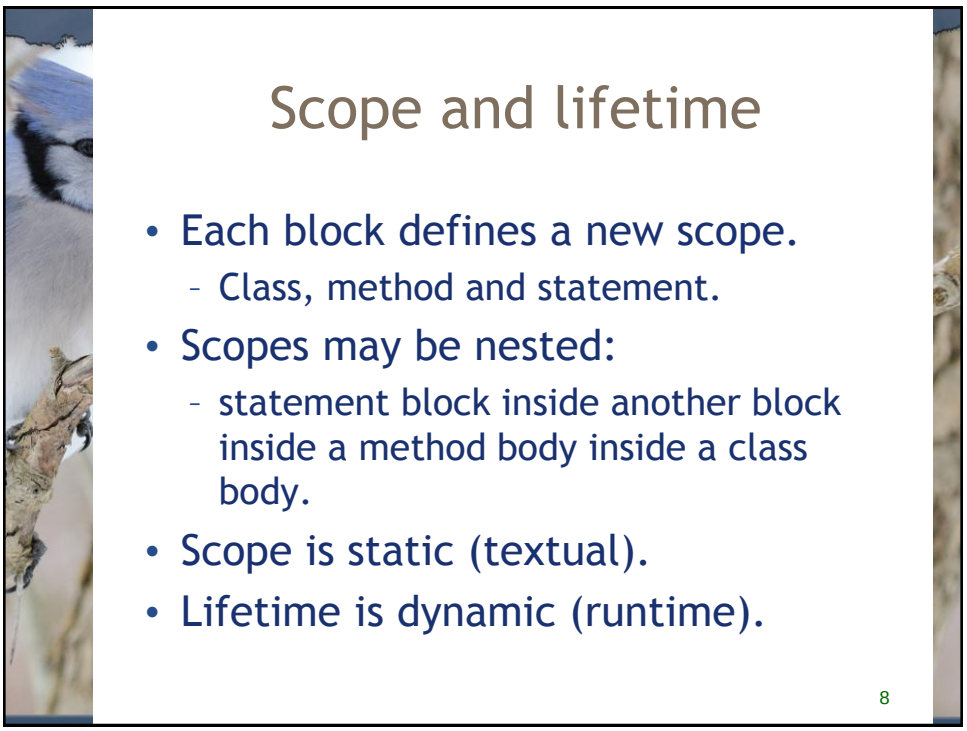

Variables – a recap
• Fields are one sort of variable.
– They store values through the life of an object.
– They are accessible throughout the class.
• Parameters are another sort of variable:
– They receive values from outside the method.
– They help a method complete its task.
– Each call to the method receives a fresh set of values.
– Parameter values are short lived.
7


Scope and lifetime
• Each block defines a new scope.
– Class, method and statement.
• Scopes may be nested:
– statement block inside another block inside a method body inside a class body.
• Scope is static (textual).
• Lifetime is dynamic (runtime).
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printTicket method

```
public void printTicket()
{
   if(balance >= price) {
       // Simulate the printing of a ticket.
       System.out.println("###################");
       System.out.println("# The Eclipse Line");
       System.out.println("# Ticket");
       System.out.println("# " + price + " cents.");
       System.out.println("###################");
       System.out.println();
       // Update the total collected with the price.
       total = total + price;
       // Reduce the balance by the price.
       balance = balance - price;
   }
   else {
       System.out.println("You must insert at least: " +
       (price - balance) + " cents.");
   }
}
```

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Relational operators

Standard relational operators are provided for the *if* test

- < less than
- > greater than
- <= less than or equal to
- >= greater than or equal to
- == equal to
- != not equal to

a comparison using a relational operator is known as a *Boolean expression*, since it evaluates to a *Boolean* (true or false) value

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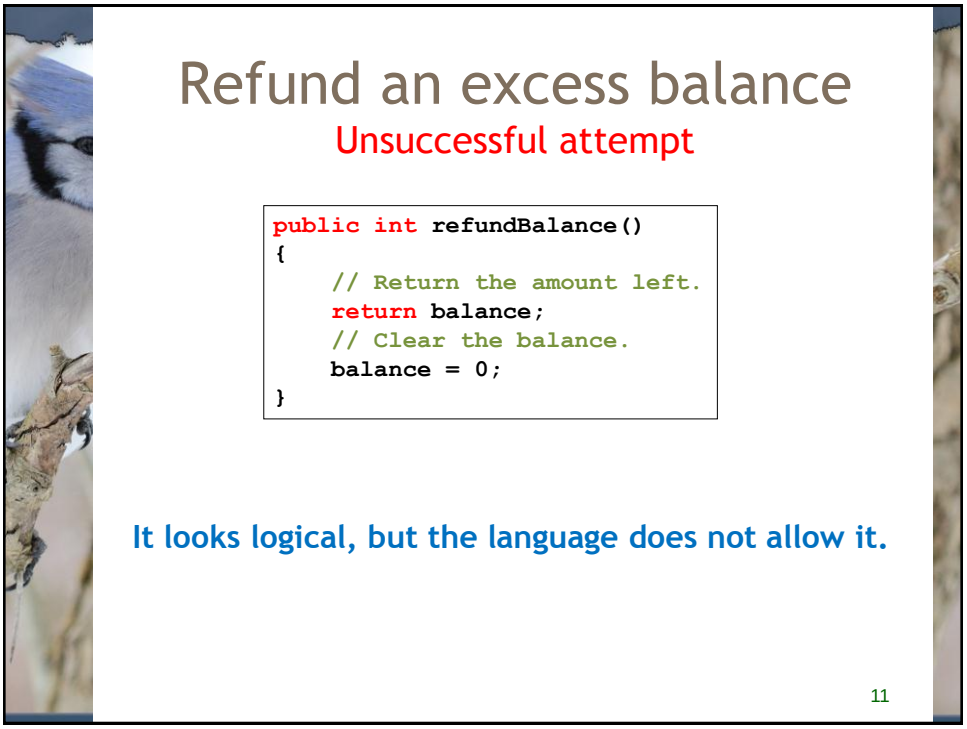

Refund an excess balance

Unsuccessful attempt

```
public int refundBalance()
{
    // Return the amount left.
    return balance;
    // Clear the balance.
    balance = 0;
}
```

It looks logical, but the language does not allow it.

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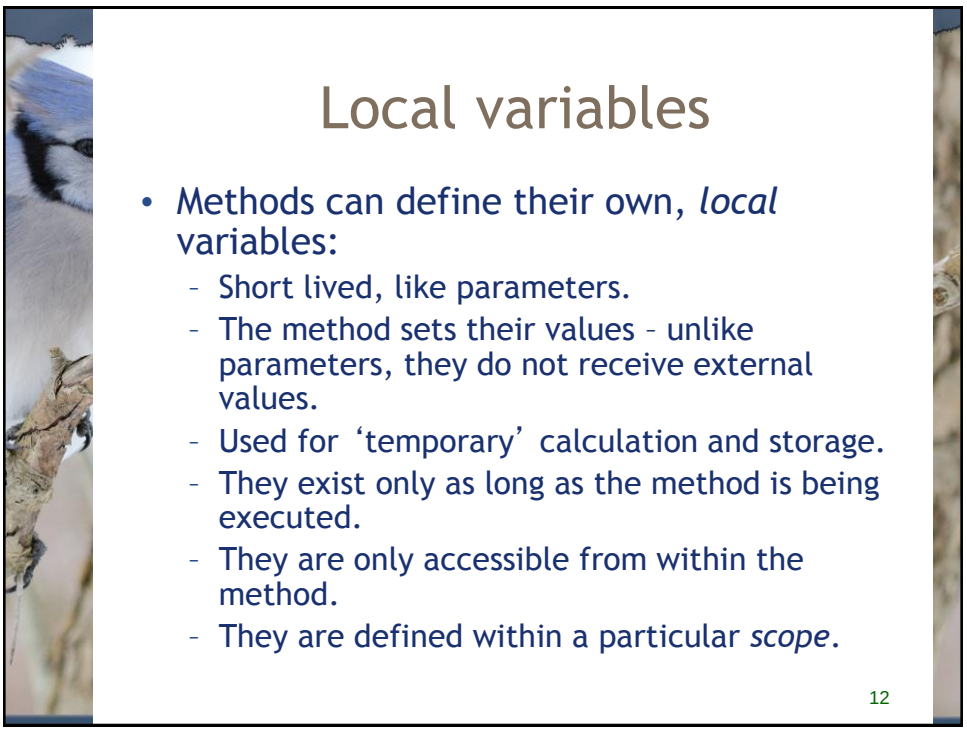

Local variables

- Methods can define their own, *local* variables:
  - Short lived, like parameters.
  - The method sets their values – unlike parameters, they do not receive external values.
  - Used for 'temporary' calculation and storage.
  - They exist only as long as the method is being executed.
  - They are only accessible from within the method.
  - They are defined within a particular *scope*.

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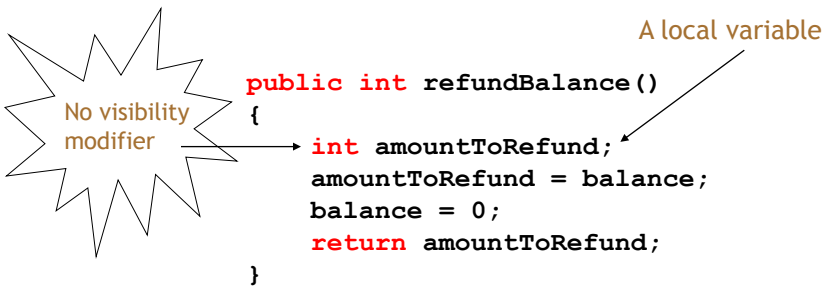
Local variables



you can declare and assign a local variable at the same time

```
int amountToRefund;

amountToRefund = balance;
```

```
int amountToRefund = balance;
```

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Scope and lifetime

- The scope of a field is its whole class.
- The lifetime of a field is the lifetime of its containing object.
- The scope of a local variable is the block in which it is declared.
- The lifetime of a local variable is the time of execution of the block in which it is declared.

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Creating multiple objects (1)

We can create multiple instances of the same class using the following pattern:

```
Classname  objname_1, objname_2, …, objname_n;

objname_1 = new Classname (parameters list_1);
objname_2 = new Classname (parameters list_2);
            .
            .
            .
Objname_n = new Classname (parameters list_n);
```

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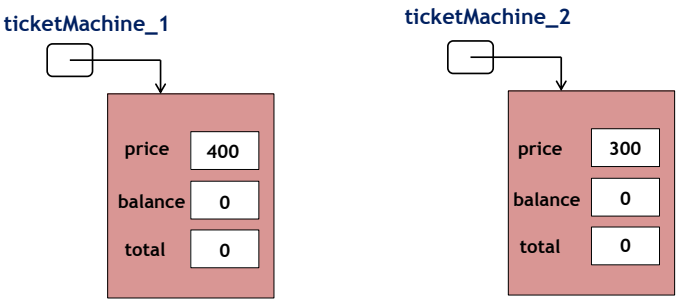
Creating multiple objects (2)

Example:

```
TicketMachine ticketMachine_1, ticketMachine_2;

ticketMachine_1 = new TicketMachine (400);
ticketMachine_2 = new TicketMachine (300);
```



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Reviewing a familiar example

```
public class Student
{
    private String name;
    private String id;
    private int credits;
    public Student(String fullName, String studentID)
    {
        name = fullName;
        id = studentID;
        credits = 0;
    }

    public String getName()
    {
        return name;
    }
```

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```
    public void changeName(String newName)
    {
        name = newName;
    }

    public String getStudentID()
    {
        return id;
    }
    public void addCredits(int newCreditPoints)
    {
        credits += newCreditPoints;
    }

    public int getCredits()
    {
        return credits;
    }
    public void print()
    {
        System.out.println(name + ", student ID: " + id +
                           ", credits: " + credits);
    }
}
```

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