Introduction to Software Development

by Derek Peacock
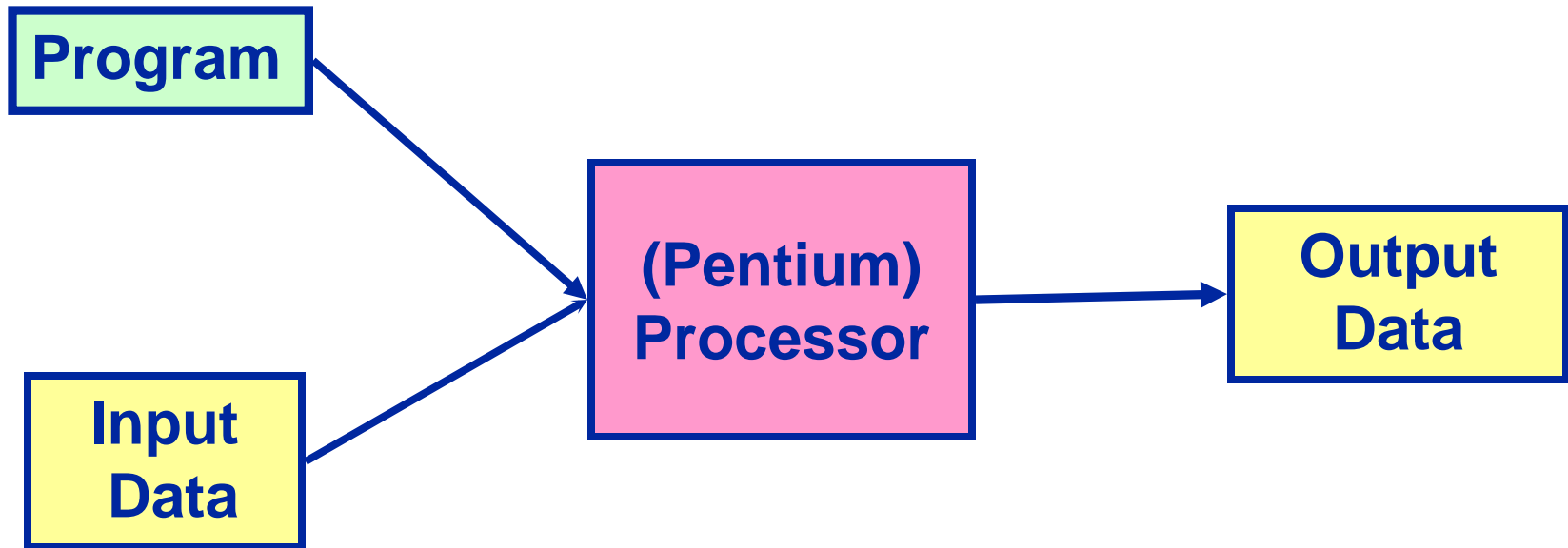
What is a Computer ?
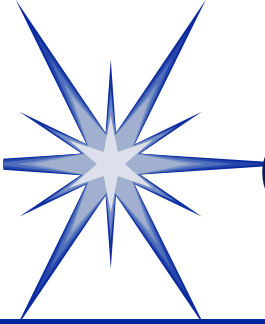
- Electronic
- Information
- Processing
- Machine

Basic System

Program

Input Data

(Pentium) Processor

Output Data

Computer Programs

ᎧA sequence of **coded instructions** fed into a computer to enable it to perform specified operations upon data

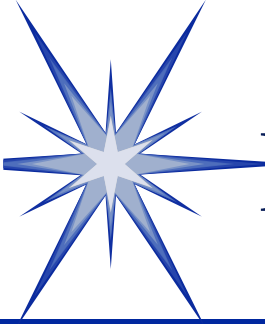**Program = Set of cooperating Classes**

Class = Operations and Data

Operations

ꙮ Procedures for the solution to a problem in a finite number of steps

1. Get the amount in GBP
2. Get the exchange rate
3. Calculate the amount in Euros
4. Display the result in Euros

Data & Data Structures

- Observations
- Facts
- Measurements
- Attributes
- Values
- Real or imaginary

- Lists
- Queues
- Stacks
- Tables
- Records
- Trees

Program Languages

- Machine Code
- C/C++
- Visual Basic
- Java
- Delphi (Pascal)
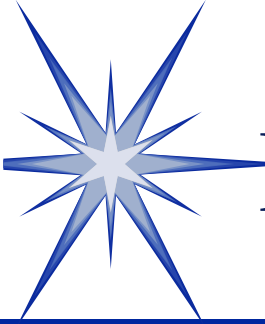- COBOL
- SQL

- Assembler
- PL/1
- ADA
- Small Talk
- SNOBOL
- FORTRAN
- LISP

Machine Code (Low Level)

```
0E E8 D9 01

0E E8 45 02

B8 3E 01 1E

50 1E 50 B8


'Assembler
  LD A, 01
  LD B, 02
  Add A, B
```

- Total Flexibility
- Very Fast
- Many Instructions
- Difficult to read
- Difficult to Debug

Operations in English

- Work out the equivalent amount in Euros for a given amount in GBP

English

- Imprecise
- Ambiguous
- Very Large Dictionary
- Same word can have different meanings
- Rules of grammar complex and inconsistent

Visual Basic.NET

- Easier to Learn
- Visual Design
- Object Oriented
- Microsoft Support
- .NET support
- Visual Studio

Visual Basic Operation

```
Private sub Calculate_Euros

    inputAmount = txtInput.Text
    exchangeRate = txtRate.Text

    Euros = inputAmount * exchangeRate

    txtOutputAmount.Text = euros

End sub
```
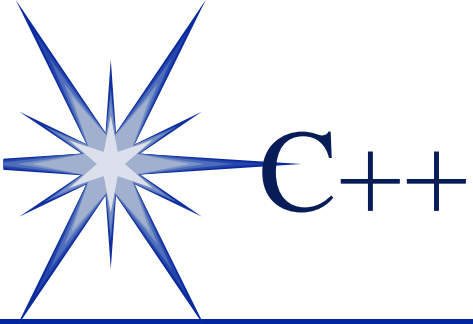
Java

- Platform Independent
- Not by Microsoft (by Sun)
- Object Oriented
- Web integration
- Visual IDEs
- Enterprise Level and Mobile device support

Java Operation

```
private void calculate_Euros()
{
    inputAmount = txtInput.getText()
    exchangeRate = txtRate.getText()

    Euros = inputAmount * exchangeRate

    txtOutputAmount.setText(euros)

}
```
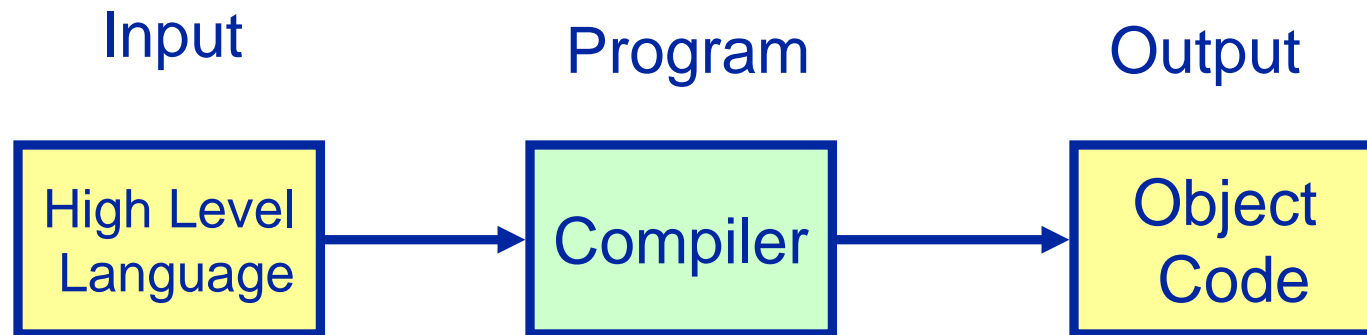
C++

- Leading Language
- Systems Language
- Fast Execution
- Object Oriented

```
Main()
{
    scanf("%d", &GBP);
    scanf("%d", &ERate);
    Euros = GBP * ERate
    printf("Euros = ");
    printf("%d", Euros);

}
```
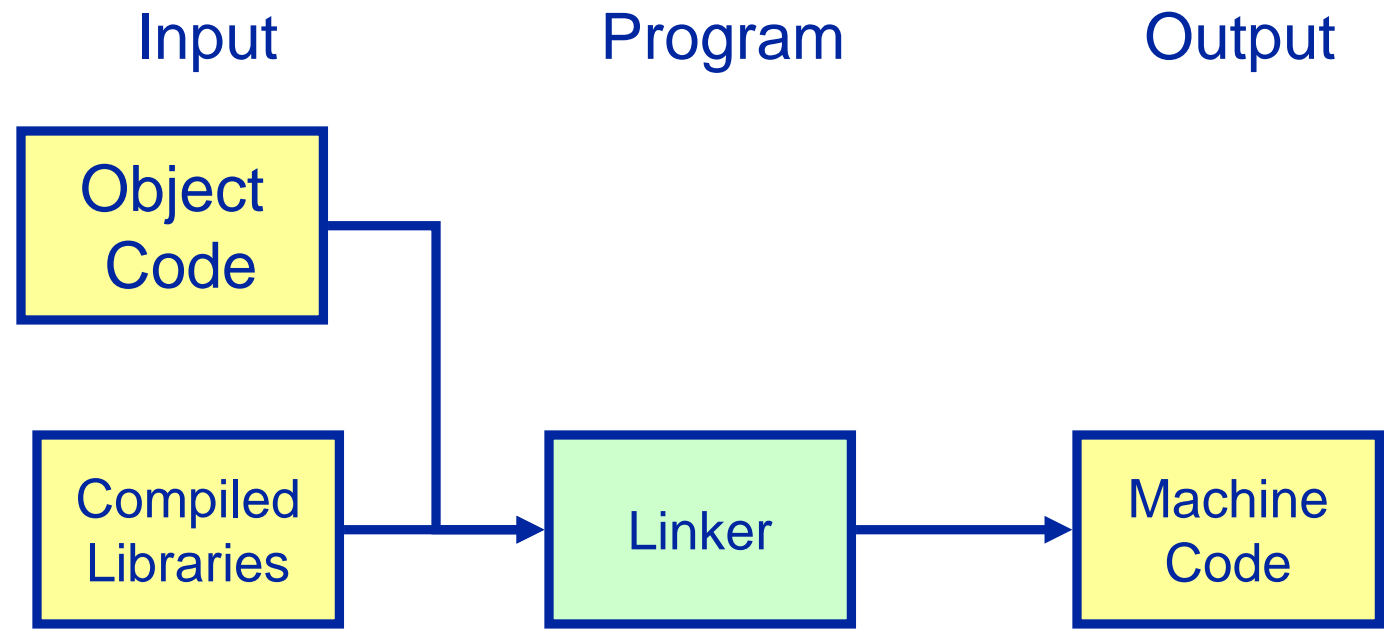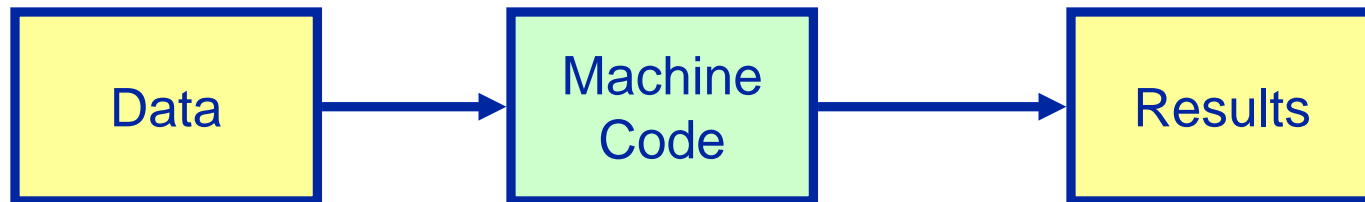
Compilation (translatation)

Input

Program

Output

High Level
Language

→

Compiler

→

Object
Code

Linking (using pre-built libraries)

Input   Program   Output

Object Code

Compiled Libraries   Linker   Machine Code

Execution (Run Program)

Input   Program   Output

| Data | | Machine Code | | Results |

Software Development Life Cycle

Terms of Reference

What ? (Outline)

Requirements Analysis

What ? (Detail)

Software Design

How ?

Implementation

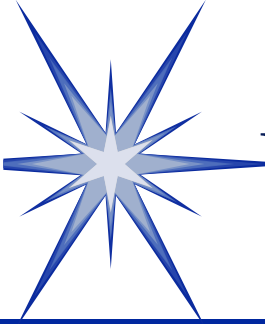**Testing**
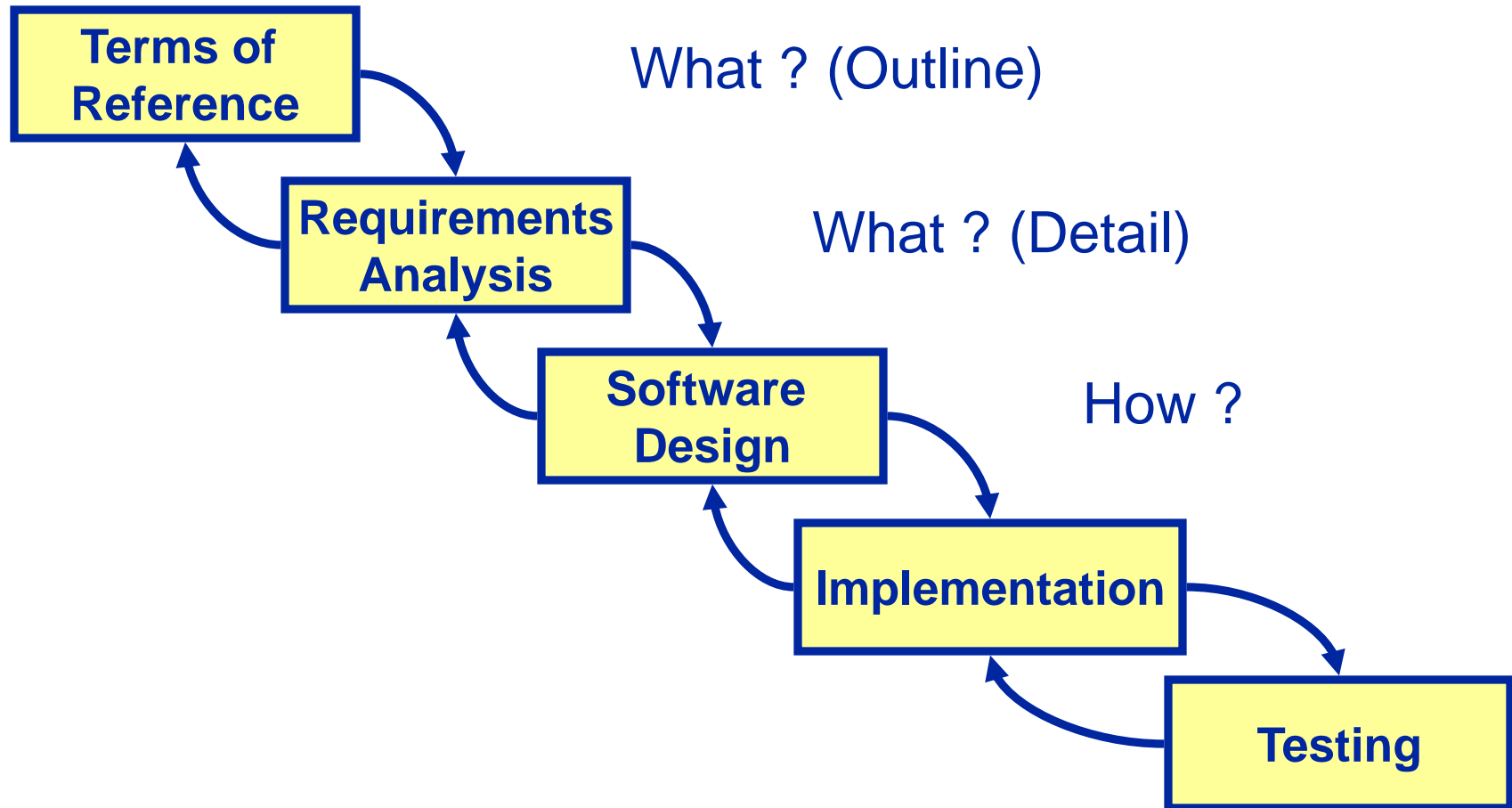
Terms of Reference

- I need a program that I can use to calculate how many euros I will get for a given amount of British currency.

User Requirements

Software Design
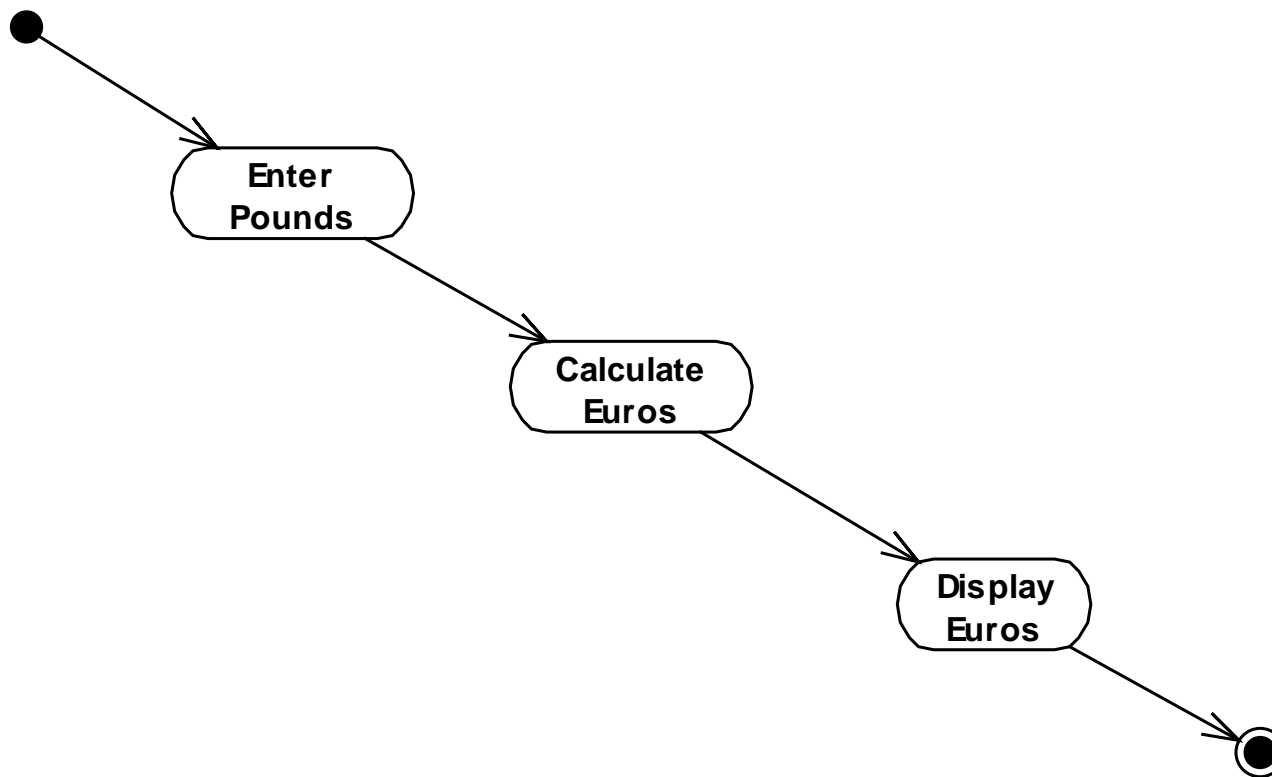
Implementation

```
procedure TfrmMain.btnCalculateClick(Sender: TObject);
var
  pounds : currency;
  euros  : currency;
  ERate  : Double;

begin

  btnCalculate.enabled := false;
  btnClear.Enabled     := true;

  pounds := strtofloat(edtGBP.Text);
  eRate  := strtofloat(edtERate.text);

  euros  := pounds * ERate;

  edtEuros.Text := floattostr(euros);

end;
```

Testing

Function	Data	Expected	Actual
Calculate	GBP = 400 Erate = 1.5	Euros = 600	Euros = 600
Calculate	GPB = Erate =	Error Message	Error Message
Calculate	GPB = -400 Erate = 1.5	Error Message	Euros = -600