Introduction to Software Development

by Derek Peacock

What is a Computer ?

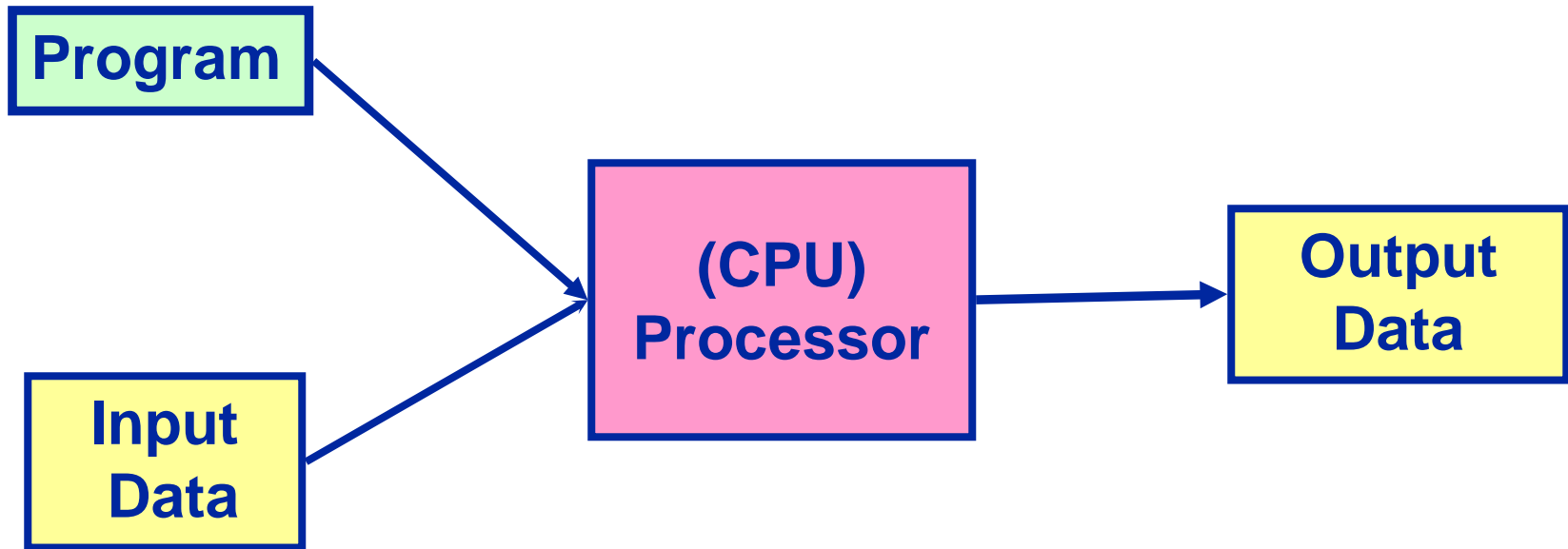- Electronic
- Information
- Processing
- Machine

Basic System

```
┌─────────────┐
│  Program    │
└─────────────┘
                ╲
                 ╲         ┌──────────────┐          ┌──────────────┐
                  ➤        │   (CPU)      │   ──➤     │   Output     │
                 ╱         │  Processor   │           │   Data       │
                ╱         └──────────────┘          └──────────────┘
┌─────────────┐
│   Input     │
│   Data      │
└─────────────┘
```

Computer Programs

೧A 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

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
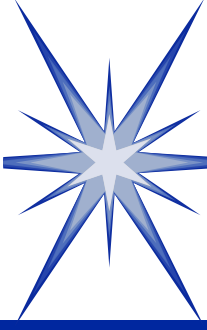- Measurements
- Attributes
- Values
- Real or imaginary

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

Program Languages

- Machine Code
- C/C++/C#
- Visual Basic
- Java
- Pascal(Delphi)
- 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
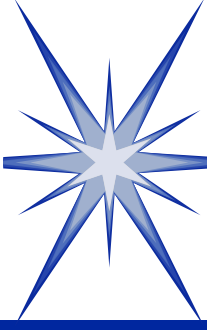- Very Fast
- Many Instructions
- Difficult to read
- Difficult to Debug

Operations in English
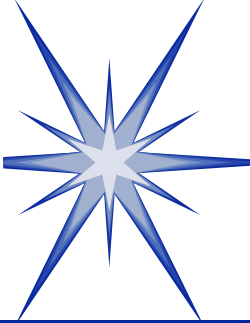
 Work out the equivalent amount in Euros for a given amount in GBP

English

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

C#.NET

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

C# Operation or Method

```csharp
Console.WriteLine("Starting Convert Pounds to Euros!");
Console.WriteLine();

Console.Write("Enter amount in British Pounds  £ >");
string value = Console.ReadLine();
pounds = Convert.ToDecimal(value);
euros = pounds * 1.2471m;

Console.WriteLine("Euros = {0}", euros);
Console.WriteLine();
Console.WriteLine("Ending Convert Pounds to Euros!");
```
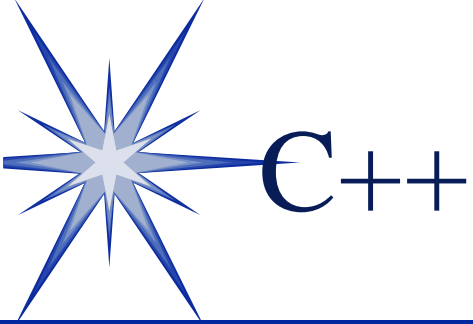
Java

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

Java Operation

```
private void calculate_Euros()
{
  inputAmount = InputTextBox.getText()
  exchangeRate = RateTextBox.getText()

  Euros = inputAmount * exchangeRate

  OutputAmountTextBox.setText(euros)

}
```
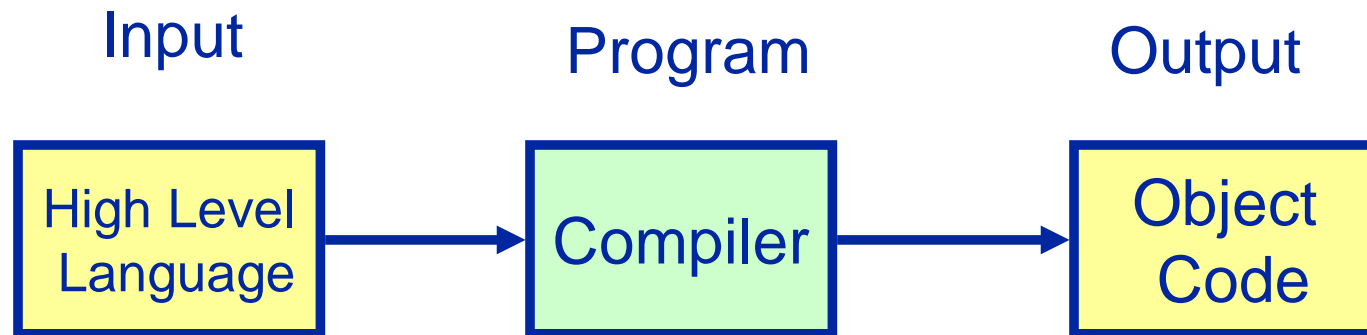
C++

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

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

}
```
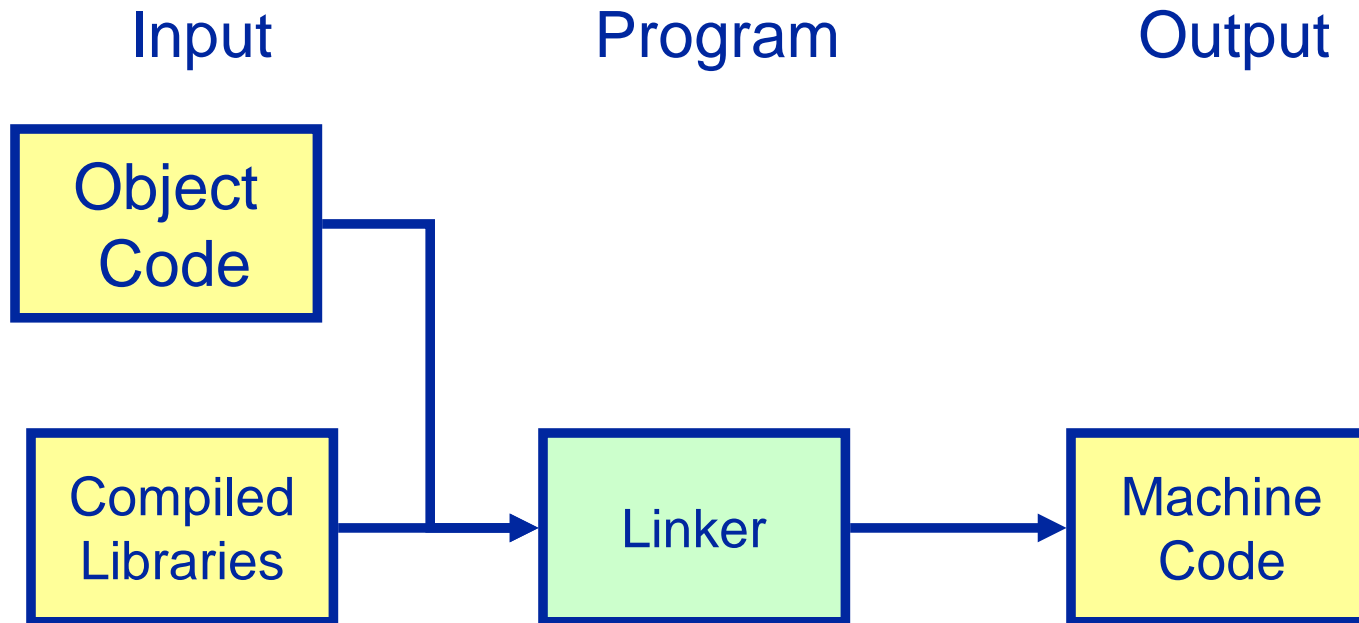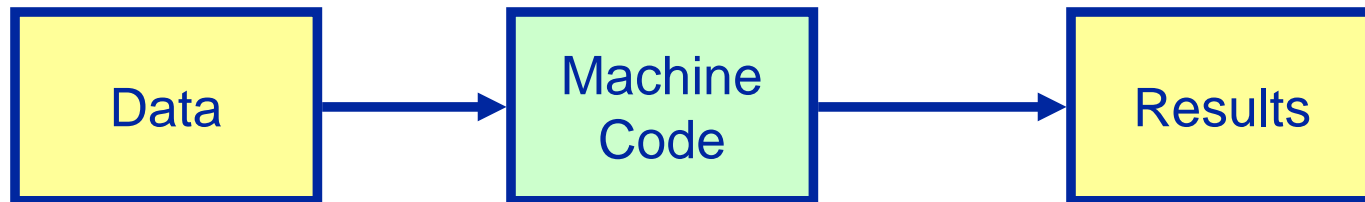
Compilation (translatation)

Input

Program

Output

| High Level Language | → | Compiler | → | Object Code |

Linking (using pre-built libraries)

Input   Program   Output

```
┌──────────────┐
│    Object    │
│     Code     │──────┐
└──────────────┘      │
                      │
┌──────────────┐      │   ┌──────────────┐      ┌──────────────┐
│   Compiled   │      └──▶│    Linker    │─────▶│   Machine    │
│  Libraries   │─────────▶│              │      │     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
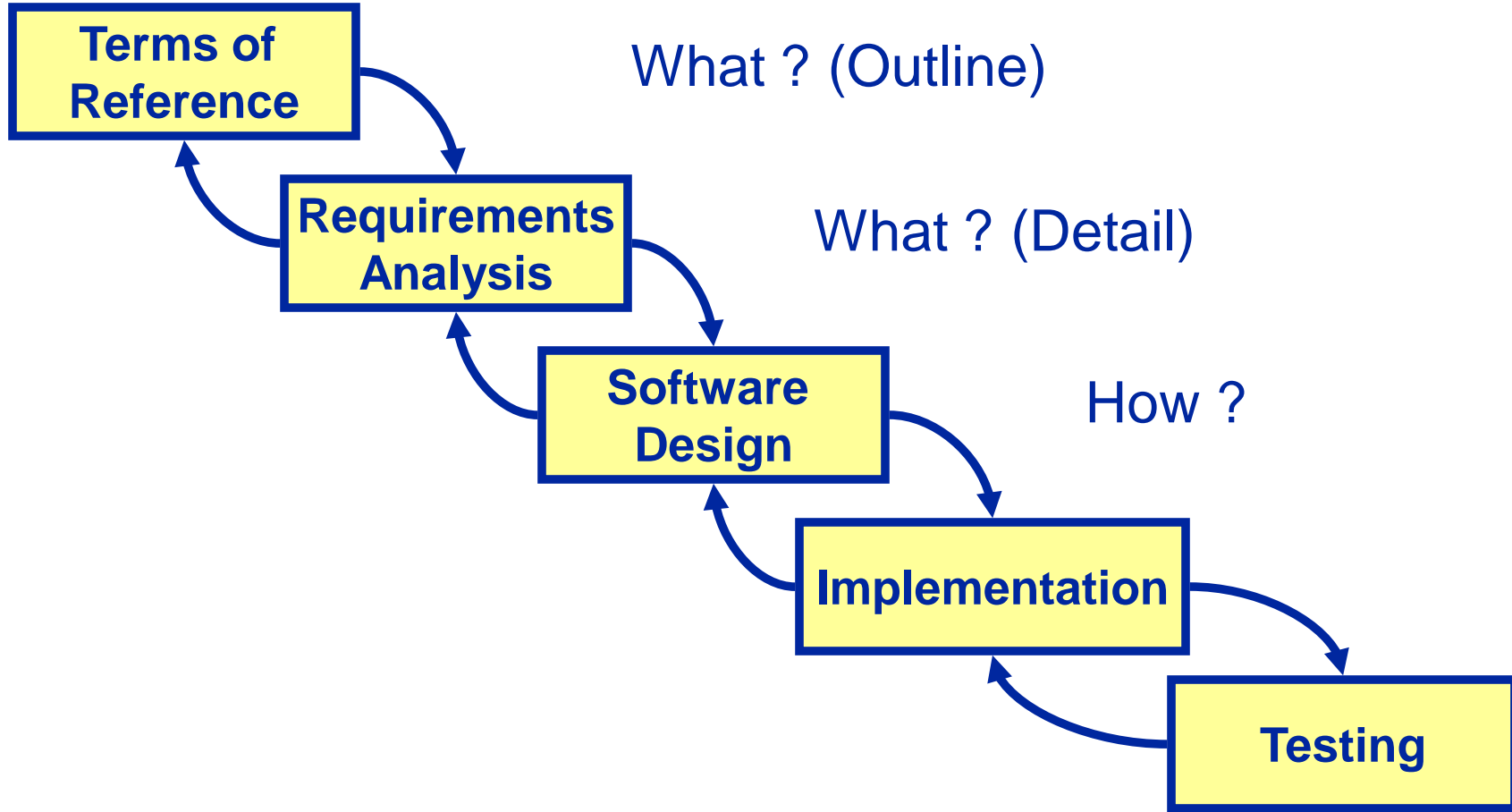
Terms of Reference

- 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
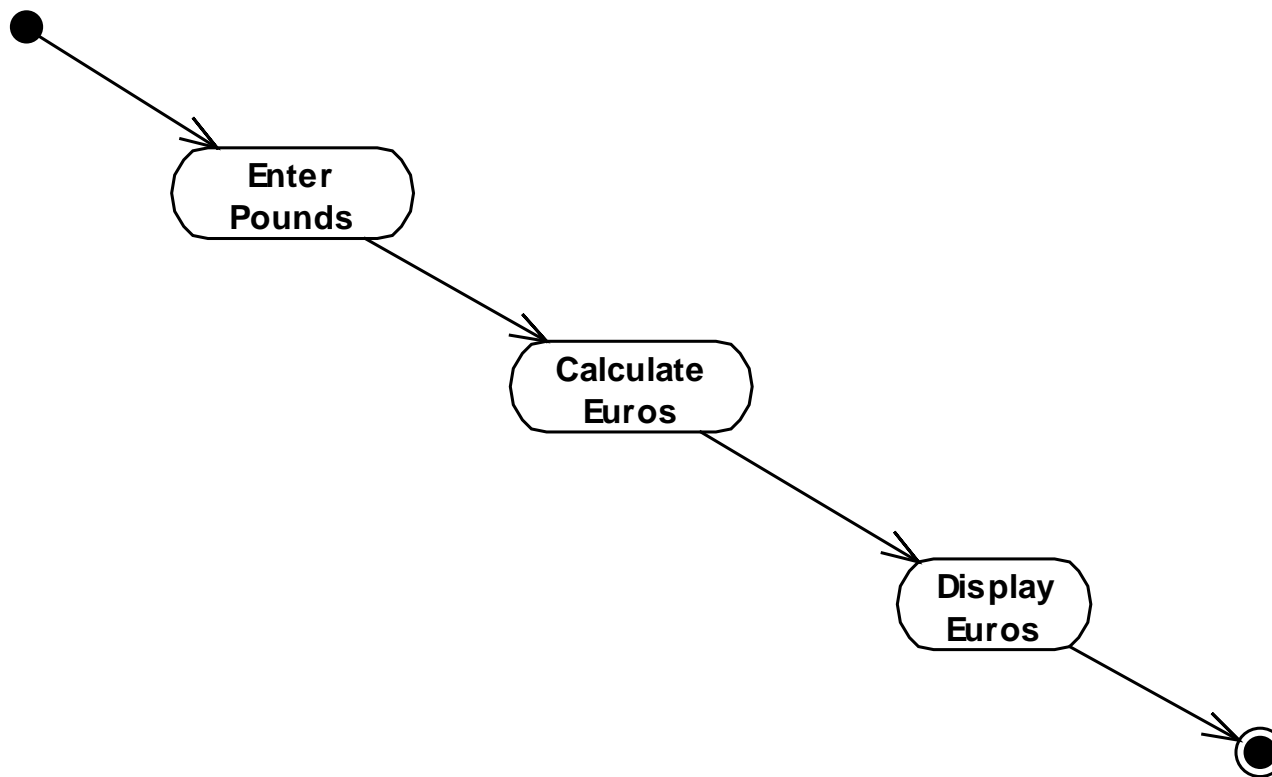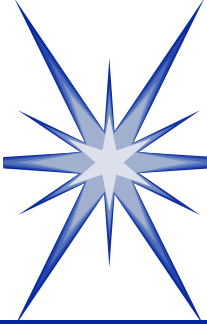
Delphi Implementation

```
procedure ConvertToEuros();
var
  pounds          : currency;
  euros           : currency;
  ExchangeRate    : Double;

begin

  pounds := GbpTextBox.Text;
  ExchangeRate  := ExchangeRateTextBox.text;

  euros  := pounds * ExchangeRate;

  EurosTextBox.Text := "Euros = " & euros;

end;
```

Testing

Function Tested	Data Used	Expected Result	Actual Result
Calculate	GBP = 400 Rate = 1.5	Euros = 600	Euros = 600
Calculate	GPB = Rate =	Error Message	Error Message
Calculate	GPB = -400 Rate = 1.5	Error Message	Euros = -600