Writing Programs

C# Programming

Being a Computer Programmer

- Nowadays it is almost socially acceptable to admit that you can write programs
  - Although you might get asked to fix a lot of computers if you do
  - ...and people will wonder why you aren't rich
- I tell people I am a "Software Engineer"
- This sounds more classy, and is closer to what I actually do

What is Programming?

- Programming:

  "Deriving and expressing a solution to a problem in a form which a computer can understand and execute"
- You have to know how to solve the problem **before** you write the program
- The computer has to understand your instructions

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From Problem to Program

- The starting point for a program is a problem
- Throughout this course we are going to work on the basis that we are solving problems for customers
- This helps us focus on the job in hand:
  - If we don't make the customer happy, we don't get paid...

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Working with Customers

- If you can learn how to work with customers you will become a great programmer
- Computer Scientists are not noted for their "people skills" (not sure why) but if you can get good at this angle your future in the business is assured

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Solving the Wrong Problem

- This is one of the most common reasons why software projects fail
- The programmers created a solution to the wrong problem
- There are lots of reasons why this can happen
- Not all of these reasons are technical

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Double Glazing Problem

- Given the width and height of a window we need to calculate:
  - The amount of wood needed for the frame
  - The area of the glass required

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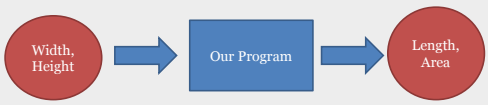
Data Processing



- We can view our program as a data processor
- We can specify what goes in and what comes out

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Adding Metadata

- Metadata is **very** important
  - there is always a question in our exam about metadata
- Metadata for us is *"data about data"*
- Meta in this context means "stepping back" from the problem in order to consider the meaning of the things in it

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The Importance of Metadata

- The metadata is how we get from data to information
- Saying a window is "3" wide does not tell us anything, we also need to know that window width is measured in metres
- To create a useful solution we need to gather all the metadata about it

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Spot the Metadata:

- Some of these statements are metadata:
  - Windows sizes are measured in metres
  - Wood is ordered in feet lengths
  - The lounge window is 2 metres wide
  - The largest piece of wood you can have is 5 metres long
  - Window frames are 2 inches thick

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Defining Inputs

- Width:
  - Measured in metres
  - Smallest value 0.5 largest 3.5
- Height
  - Measured in metres
  - Smallest value 0.5 largest 2.0

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Defining Outputs

- Length of wood
  - Measured in feet (conversion of 3.25 feet per metre
- Size of glass
  - Measured in square metres

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Proving it Works

- The final thing we need is a test to prove that it works:

"If I give the program the inputs 2 metres high and 1 metre wide the program should print out: 4 square metres of glass and 19.5 feet of wood"

- If the program does this the customer must pay me for my work

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Getting it in Writing

- It is very important if you do a job for money that you make sure that:
  - You get paid
  - You don't end up doing too much work
  - You don't get sued by your customer
- Getting your specification signed off is the key to achieving these things

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Customer Involvement

- The worst thing you can do at this point is go off and build the solution
  - The customer should continue to be involved in the development
- Often the customer will have strong opinions on how the program is to be used
- They also might change their requirements when they see what you have done

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Writing the Program

- If you don't know how to solve the problem yourself you can't write the program
  - A program is just your explanation of the how to solve the problem
- Working out how you would perform the solution is a very good starting point for writing the program

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Programming Languages

- We can't just use English to tell a computer what to do
  - Computer are too stupid to understand it.
  - English is much to vague.
- Instead we have to use special, unambiguous, languages which can be converted into computer instructions

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Different Languages

- There are hundreds of different programming languages
  - each has its own fans and detractors
- They all do the same job though
  - provide a way to tell a computer what to do
- As a programmer you will need to be able to use several languages and will have to learn new ones

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The C# Language

- C# is based on the Java language, which is based on the C++ language, which is based on the C programming language
- Once you have learnt C# you should be able to pick the others up quite easily
  - Although there are some differences that you need to know

Summary

- Programs tell a computer what to do
- Information that adds context to your data is called “metadata” (data about data)
- Programming is also about finding out what the customer wants you to do
- The program you write is expressed in a special programming language