Computer science: Is the study of algorithms.

- The **Aim** of computer scienctist is to:
    - **Study algorithms formal and mathematical properties**- studying the behaviour of algorithms to work out whether it is correct and efficient
    - **Hardware realization**: Designing and building computer system that can execute algorithms
    - **Linguistic realization**: designing programming languages and translating to languages executable by hardware
    - **Their Application**: Identifying important problems and designing correct and efficient software packages to solve these problems

Algorithms (Informal): ordered sequences of instructions that is guaranteed to solve a specific problem. And a computer must be able to solve the equivalent form of problems for you

Algorithm: An algorithm is *a well ordered collection* of *unambiguous* and *effectively computable operation* that, when executed**, must produces a result** and *halts in a finite amount of times*.

- The **Properties**: of algorithms include:
    - **Well ordered:** the order of operations in algorithm must be correct. The algorithm must be efficient so one particular algorithm is more efficient but gives same result. First operation is clearly indicated to know where it starts
    - **Unambiguous:** Instructions must be clear in what it is and what it does eg: Do part 1 or part 2
    - **Effectively computable operations:** Algorithm must be within *capabilities* of *computer* it will be executed on. Eg:Addition only works if pc has addition. Also algorithm must be within external limits on the sort of computation performed ie: dividing by 0 doesn't work
    - **Halts in a finite amount of time:** Algorithm must be able to find a result in a finite amount of time (doesn't go in forever). So infinite loops are not ie: if it needs human to stop its not algorithm

- An issue here is that we sometimes write ambiguous code which we think that the computer can understand but in actual fact a computer can't make decisions we must write.

Groups Pseudocode Syntax:

- **Computers receive information (Input):**
  - *Get:* Receives input from the user/keyboard ie: Input 5 numbers (types 5 numbers)
  - *Read:* Receives input from file (Not user inputted defined variable in the file ie Int Cars = 4)
  - *Input:* Use this
- **Computers output:**
  - Print: Output to printer EG: Print “”
  - Display written to screen
  - Output: EG: Output “The output is: “, Dumb
- **Assign a value to a variable or memory location:**
  - Set: to assign stuff EG: Set Num1 to 0

Define Variable by: Integer num1, num2, num3,

So summary of pseudocode:

```
Start
{
    Integer Num1,Num2, Num3

    Output “Enter a number: “
    Input numTotal

    Output “Number is: “, NumTotal

    IF Num1 > Num2 Then
        Output “Num1 Is larger than Num 2”
    Else
        IF Num1 = Num 2 THEN
            Output “Num 1 is = Num 2”
        Else
            If  Num 1 < Num 2 THEN
                Output “Num 1 is less then num2”
            Else



}
End
```

IMPORTANT INDENT EVERY IF AND ELSE

*For this course just use print “Yolo”, (Name of Variable)

- **Structures** of algorithms/Structure Theorm: these three make up algorithm. Not one structure.
    - **Sequence:** relates to steps executed on step after another no variations. Problem- doesn’t go according to plan rest of steps fail Two types
        - **Computation:** so steps involving some maths or computational operations and then doing something with answer of computation (maths)
        - **Input/output steps:** involve either getting new data for program from external source (user typing) or the outputting data from program (printing it to the screen)

    - **Selection:** Computer will distinguish two possibilities provided for on a condition. The conditions always relate to truth or falsity of some expression.
      So if the condition is true algorithm will do a set of sequential statements if false so different set of sequential steps.
      Importance: algorithms to behave in different ways

    - **Iterations:** repetition of certain steps again according to truth or false of a some condition. This is good since computers can perform boring task over again very quickly

- Size of Int: 32 Long: 64 Char: 6 Float 32 Double 64

  Computer stores 0 and 1s these are called binary digits or bits. A bit is too small (one piece of informations such as on or off)

  Therefore 8 bits = byte