02/10/25

Computers use switches called transistors (which turn on and off)  
Voltage levels map naturally to 0 and 1

Simplicity makes binary reliable and efficient

Universal across all hardware and software

Every form of data reduces to binary

Bits are the smallest unit (0 or 1)

Nibble is 4 bits (0-15, 16 possible values)

Byte is 8 bits (0-255, 256 possible values)

Word size depends on CPU (For example 32bit or 64bit)

**Word size** refers to the number of bits processed by a computer's CPU in one operation

Boolean is a data type with two values – True or False (1 or 0)

Conceptually a Boolean map directly to a single bit

Booleans use a whole byte in real languages for memory alignment

Binary has a bas of 2, so it uses digits 0 and 1

Decimal has a base of 10 (0-9)

Hex has a base 16 (0-9 and A-F)

The base also sets the place value

The maximum number of digits that can be stored in a binary number is equal to 2n, where n is the number of bits.

“A model is an external and explicit representation of a part of reality as seen by the people who wish to use that model to understand, to change, to manage, and to control part of that reality” – Pidd

Models are simplifications of reality but this is not to say they are not useful. It is the fact they are simplifications that make them useful.

* + Structures can be more easily understood
  + Creativity
  + Experimentation
  + Safety
  + Ethics and legality
  + Cost
  + Time
  + Repeatability

Categories of models

* + Explanatory
    - Used for describing or explaining reality. As a result stakeholders should be able to act and better control reality
  + Predictive
  + Experimental
    - Allow stakeholders to experiment with an alternative course of action, the model providing predictions about the likely outcome.
  + Optimising
    - Aim to determine the best courses of action for improving reality. Some guarantee the optimum, others simply look for the best possible course of action in the time available

06/10/25

* Variables: Hold your data
* Declaration: Says the variable exists
* Initialisation: Gives it an initial value
* Assignment: Updates or changes its value
* Operators: Help you do calculations and manipulate values
* Integers are whole numbers (int)
* Floating point numbers have whole and fractional values (float, loses precision with large values)
  + In python, floats use double-precision, so behave more like doubles.
* Complex numbers have real and imaginary sections (Imaginary numbers are the sqrt of negative numbers)
* Python variables are dynamically typed- the type is dependant on the value, not the variable. Other languages attach the type to the variable
* A string is text. Python does not have characters: Using single quotation marks for characters can help differentiate them from strings.
* For naming variables:
  + Local Variables: Start with an underscore; Camel case (\_localVariable)
  + Public Variables: Camel case (publicVariable)
  + Global Variables: Capitalised (GlobalVariable)