

DEFINITIONS

Algorithm

A set of steps to accomplish a task.

Compile

Program

A set of instructions given to a computer, corresponding to an algorithm to solve a problem.

Interpreter

Integrated Development Environment (IDE)

Function

A common task/named sequence of instructions that perform a collective purpose, that we can reuse.

e.g., print.

Argument/Parameters

Items or values that are sent into a function.

e.g., "Hello World"

...

But, the nicer way to do this...

- "if" Ladder

```
if operation == 'a':
    answer = first + second
elif operation == 's':
    answer = first - second
elif operation == 'm':
    answer = first * second
```

Boolean

A binary value that has only two possible states: `True/False`

One of the fundamental types in Python.

So, now we have `Int`, `Float`, `String`, and `Bools`.

- Boolean Expression

An expression that combines Boolean operands using Boolean operators (`and`, `or`, `not`), which evaluates to a Boolean.

- Boolean Operators

<code>and</code>	True if both operands are true.
<code>or</code>	True if at least one operand is true.
<code>not</code>	True if operand is false; False if operand is true.

- Logic Error

- o Program passes checking/compiling and runs, but produces incorrect results or no results, due to a flaw in the algorithm or implementation of algorithm.

product = x + y

Testing vs. Debugging

Testing: running with sample data to uncover errors.

Debugging: finding the cause of a known error.

Testing Methods

Programs must be thoroughly tested for all possible input/output values to make sure the program behave correctly.

- Exhaustive Testing

Ideal Testing Strategy: (the best approach to find test values)

- o Run program using all possible inputs.
- o Compare actual inputs to expected outputs.

(How do we test for all values of integers?)

- Random Testing

A subset of values in the input domain is used for testing.

- Important: ensure values are distributed input domain.
- Can use random number generation.

FILES

Concept: Files

...a sequence of bytes stored on a secondary storage device.

- Usually stored in folders/directories.
- Has a valid, filename – determined & managed by OS.

Concept: File Types

In Python, a file is categorised as either text or binary.

[All Text Files are Binary Files, but not all Binary Files are Text.]

Text Files

- Structured as a sequence of lines.
- Each line includes a sequence of characters.
- What we know as code or syntax.
- Made up of strings, which is each terminated with new line.
- Processed one line at a time.
 - ❖ Each line is terminated with a special character.
 - ❖ End of Line (EOL) character.
 - ❖ , or `\n`
 - ❖ End the current line; tells interpreter a new one began.

Binary Files

- Any type of file that is not a text file. (Everything else)
- Compiled Programs are stored as this type.
- Only processed by an app that knows the file's structure.
- Meaning, must be apps that can read & interpret binary.
- Store information in application specific formats.
 - *Such as:* PDF, JPEG.

NUMBER SYSTEMS

Need to use binary representations for all kinds of data.

- Computer operate on binary values (as a result of being built from transistors)
- Transistors switch between two binary states: 0 and 1.
- 1 computer chip can have millions of transistors continually switching, completing complex calculations.
- ❖ Building a computer using base 10 → very difficult.
- ❖ Binary is easiest.

Bit: “Binary Digit”

- Bundled together into 8-bit collections: bytes.
- With these bytes, there are 3 types of data to represent:
 - Integers (positive and negative)
 - Floating Point Values
 - Characters

Number Representations

Numeric information is fundamental to computers, in order to encode data and instructions.

Notation: N_r for number N using radix r :

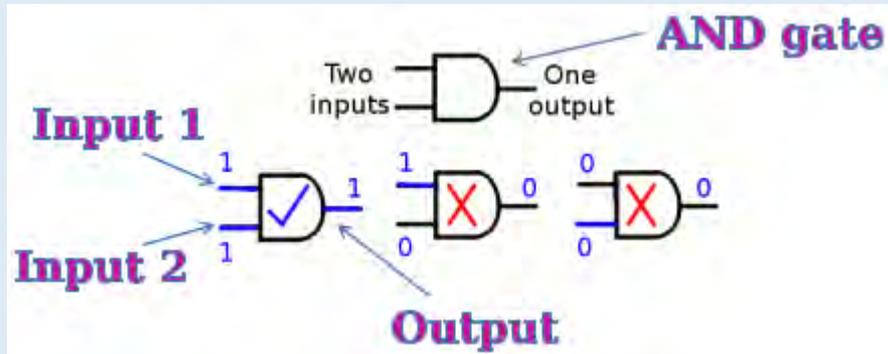
- radix refers to the base – the number of possible symbols for each digit.

General radix r number representation:

$$d_p d_{p-1} d_{p-2} \dots d_2 d_1 d_0 . d_{-1} d_{-2} \dots d_{-q}$$

- AND

- o Needs two inputs.
- o Only turns on when both inputs are ON.
- o If only one input is ON/OFF, spits out OFF.



Truth Table

- Convenient way to visualise the outputs for logic gates.
- Depicts the gate's response to each possible input set.

		Input 1	
		0	1
Input 2	0	0	0
	1	0	1

Output