# What is Programming?

For us, programming is the process of outlining a set of steps for the computer to follow in order to fulfil a task and provide us with an output. Consider a simple task, say making cereal. The task can be outlined in a number of steps:

1. Get: Bowl, Spoon, Cereal, Milk
2. Pour Cereal into Bowl
3. Pour Milk into Bowl
4. Eat the Cereal

The same process of deconstructing tasks is how computers can understand, process and execute complex commands. As programmers, we will concern ourselves with how to break down the solutions to problems and with "showing" the computer what to do to do each step to solve the problem. Therefore, in-essence, computer science is machine *assisted* problem solving.

In this course, we will be concerning ourselves only with a *higher level language*, that means that we will communicate with the computer using a language that is easy for humans to understand and to remember. To do this, we will be using an Interactive Development Environment (IDLE) which through an Interpreter which turns the human-interfaced high level code into the binary elements of Object Code

All High Level Source Code → Compiler → Object Code (Executable)

Error Report
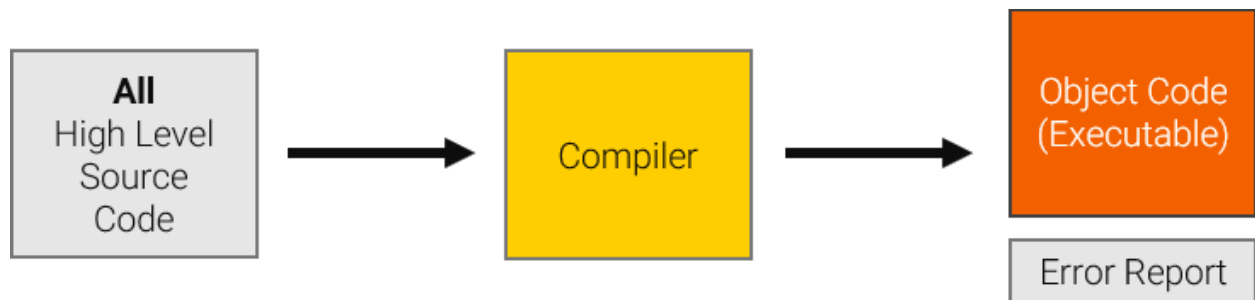
This is quite important since, we must not forget that computers can still only understand binary states: 0 and 1. This means that Programming can give us solutions to "problems" based on mathematical logic. We cannot program a computer to evaluate qualitative statements but only quantitative statements.

Throughout this course, it is recommended that you think of Python as a new language that you will be learning. The purpose of this language is to instruct the computer to undertake specific actions.The specifics of the language, its idiomatic signature let's say, will be something that you will remember due to practice and it is not recommended that you actively seek to remember lots of the functions we will cover.Thus, programming is our ability to understand a problem, break-down its solution into steps, and then instruct the computer to follow such steps.

Introducing Python

For the duration of this course, we will be using Python 3.8.x. which is a widely used programming language designed mainly for back-end applications. Python is the pinnacle of modern computer science development as it packs a wide array of very powerful features which makes many other languages somewhat obsolete. Python is a multi-paradigm language which means it is:

- **Object Oriented:** Can create structures with cross-relations and functions (E.g. Java)
- **Procedural:** Can run scripts line-by-line without need for larger structures (E.g. C)
- **Functional:** Can perform functions without data mutation just with logical evaluation (E.g. Wolfram)

Python has a range of other benefits that will assist us in learning how to program. The first is simplistic syntax. Compared to other widely used languages Python lacks the use of semicolons (;), blackets ({ }) and other application specific syntax elements. This means that typing errors will be less common and writing code will be significantly easier. Python also features a wide range of Libraries which are sets of pre-coded instructions. Libraries are extensively used in real use cases of programming and we will also be using them later in the course.

Python is the future! Machine Learning, Data Analytics, Process Automation, all are fields which Python is designed to excel at. This however, means that Python is a *backend* language and therefore is not designed to be interfaced with humans. Although there are structures that allow Python developers to create User Interfaces, UI applications are almost never designed using Python. Although the browser you are reading this on isn't programmed in Python, the program on the server that handled your request to get this file, probably was. Don't let this deter you if you are seeking to learn to program front-end software as this is introductory.

What's Next?

Once you finish this course you will be on-track to move into more complex Python courses (which we probably will run) and/or exploration of the general comp. Sci. world. This course has been designed to allow participants to leave with the widest possible knowledge of computer science theory and Python. From here you can explore specific topics in computer science such as:

- Data Analytics and Data Visualization
- Machine Learning and Artificial Intelligence
- Task Automation
- Computer Networks

But also tackle other languages and IT fields such as web development. Surprisingly programming can also increase your understanding of Microsoft Excel.