Programming languages

- A program is a sequence of instructions that a computer can follow
  - These instructions are written in *machine code*
    - Looks like 0010 1001 0101 1101
  - Programming in machine code is really, really hard
  - So, we use *high-level programming* languages like C++

- C++ is written as plain text in files we call *source code*
  - A C++ *compiler* takes those files and *compiles* them into machine code

Programs and functions

- Programs use *sequential* execution
  - They can only do one thing at a time (oversimplification)
  - Statements are executed in the order they are given
- Programs are divided up into *functions*
  - Having one big sequence of statements gets hard to manage
- A function is just a named set of statements
  - Tells the computer to do a particular task
  - By combining a bunch of tasks, you can make more interesting and powerful programs
  - Functions for many tasks have already been written and can be reused

The `main` Function

- So how does the program know where to start?
  - Every C++ program must have a function named `main`
  - When the program runs, it starts by calling the `main` function

- Important to note! C++ programs do not start execution at the top of the page!

Programs and functions

- Any function can *call* another function at any time
  - Functions are named
    - Valid names can use letters, numbers and _
    - Valid names cannot start with a number
  - To call a function named my_function, use the statement:

    ```
    my_function();
    ```

  - (note the parenthesis after the name)

- When function A calls function B:
  - Function A pauses
  - Function B executes (starting from its top)
  - When function B is done, function A resumes

Programs and functions

- To recap:
  - Programs are organized into functions
  - Functions are sequences of statements
  - Functions are executed sequentially (top-to-bottom)
  - Execution starts with the main function
  - Functions can call each other, passing control

Writing Functions

- To write a function, you specify a *header* and a *body*
  - The header is made up of three parts
    - A return type
    - A function name
    - A list of parameters between parentheses ()
  - The body is a sequence of statements
    - These statements define what the function does
    - They are placed between two curly braces {}

`main` Function

- For the main function :
  - The return type is `int`
  - The function name is `main`
  - The parameter list is empty `()`
  - The body is whatever instructions you want the computer to carry out
    - The final line in the body is a *return* statement, which ends the function (and thus the whole program)

```
int main ()
{
  // statements to execute

  return 0;
}
```