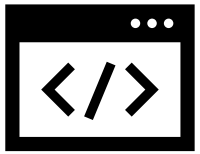
Imperial College London



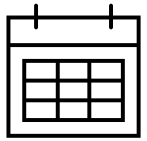
BIOE40002 – Computer Fundamentals and Programming 1

Part II – Programming 1, Lab 4

Binghuan Webster Li | *Department of Bioengineering*

binghuan.li19@imperial.ac.uk

March 24, 2022



Today's Schedule

Imperial College London

Programming *lower-level* languages

- **Recap + Introduction** - Programming in Arduino/C-like languages
  - Variables
  - Control flow
  - Functions
- **Lab work**
- **Summary of Programming 1 + Exams**
- **Wrapping up… and some final thoughts**

An (not-so-successful) Arduino project

Imperial College London

Programming *lower-level* languages

Imperial College London

- **Arduino**: open-source, rapid prototyping **microcontroller** platform
- Arduino scripts / codes: **sketches**
- Programming in Arduino:
  - a variant of C++, or just say, a C-like language
  - Same syntax to C / C++
  - A compiled language
  - Hardware-related
- **Today's topic →Programming *C-like* languages**

Variables

Imperial College London

- In all C-like languages, all variables MUST be **declared** before using

Data type *Variable name* *Semicolon: termination of a statement*

```
int myinteger = 1;

float myfloat = 1.22;

char myChar = 'a';
```

- Primary data types:
  - `int` (integer, 16 bits)
  - `float` (floating point, 32 bits)
  - `char` (character, 8 bits)
  - `double` (double precision floating point)
- Modifiers:
  - `short`
  - `long`
  - `signed`
  - `unsigned`

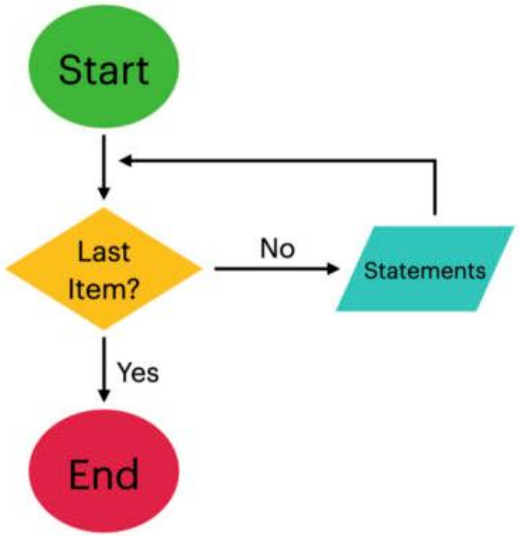
32 bits!

```
long int
```

Control flow

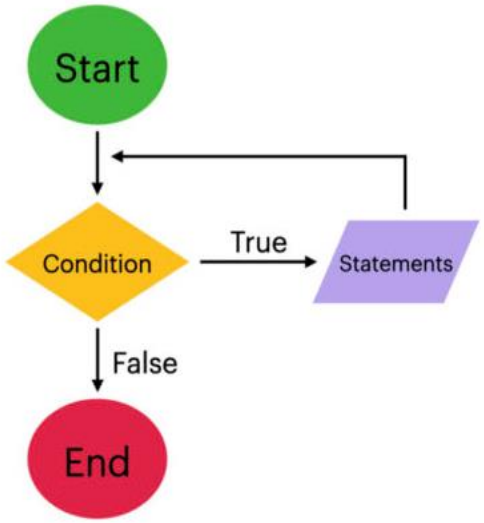
Imperial College London

`For` loop



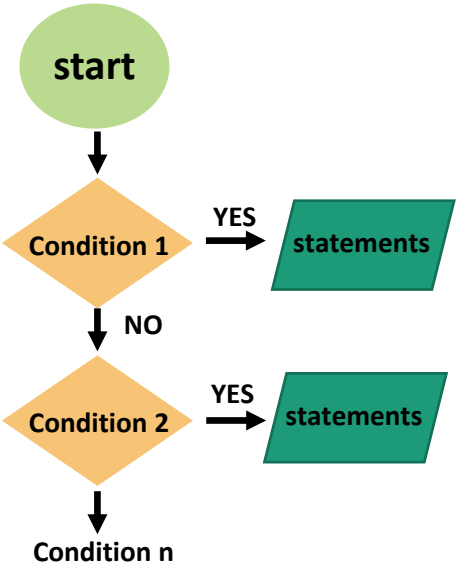

```
for (int i=0; i<5; i++)
{
    printf("%d", i);
}
```

`while` condition




```
int i = 0;
while (int i<5)
{
    printf("%d", i);
    i++;
}
```

`if...else...` statements




```
int i = 2;
if (i<3){
    printf("i < 3");
}
else{
    printf("i >= 3");
}
```

Functions

Imperial College London

Return type *Function name* *Arguments*

```
return_type function_name(arg1, arg2, arg3, …argN)
{

    statement1;
    statement2;
    …
    statement_N;

    return variable/value;
}
```

Your statements

Return variables / value from the function

Return type:

- `int`
- `char*`
- `bool`
- `void`

return nothing

Compilation

Imperial College London

Pre-processing

Compilation

Uploading

main.ino

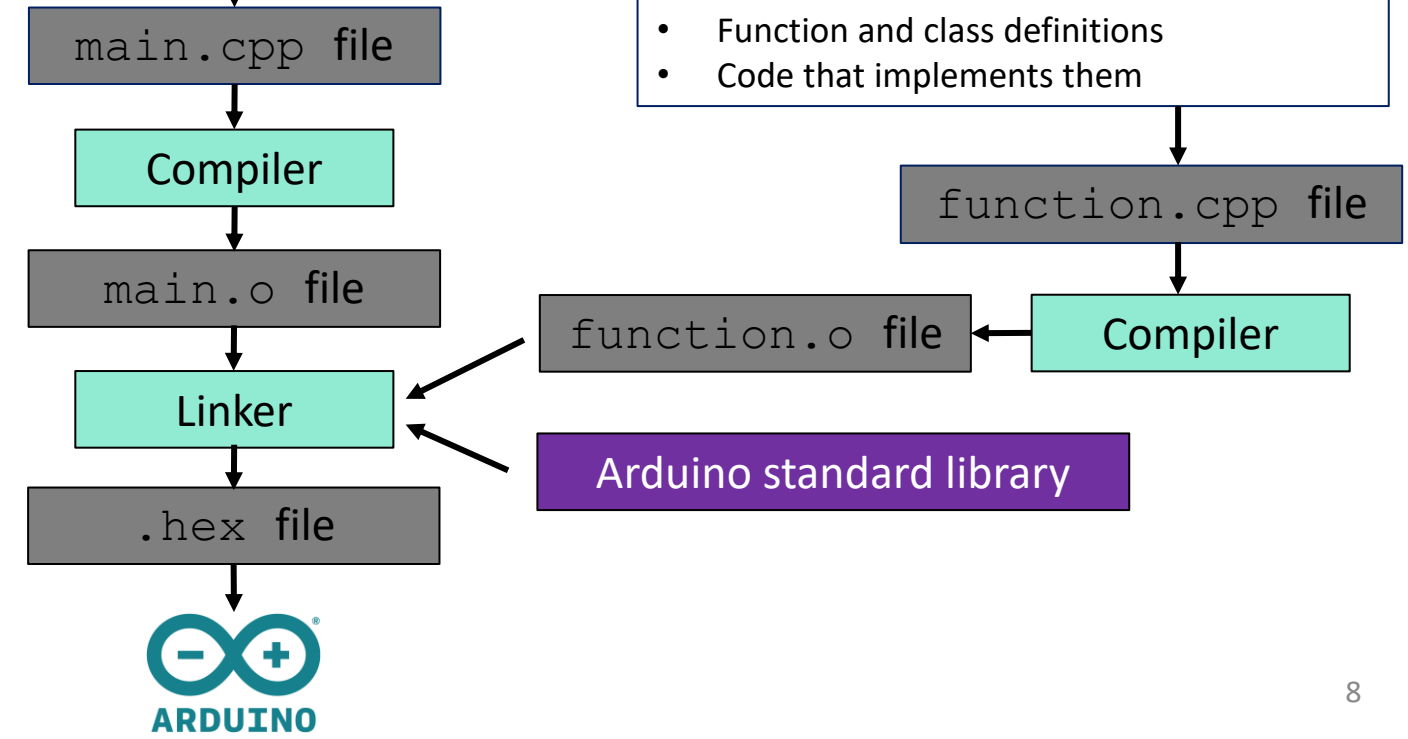
```
#include "function.h"

void setup(){
 // statements
}

void loop(){
 // statements
}
```

Header **function.h**

- Function and class declarations
- Instructions on how to use them

Function **function.ino**

- Function and class definitions
- Code that implements them



Imperial College London

Questions?

That's it for now.

You can now proceed to the Lab 4 exercises.

Look back

Imperial College London

- **Variables** and **arithmetic expressions**
- **Control flow:**
  - `for` loops
  - `if…elif…else` conditions
  - `while` conditions
- **Functions**
  - Function definition: arguments, statements and return
  - Scope and namespace
  - Function recursions
- **Useful modules**
  - Math, NumPy, SciPy, Matplotlib etc…
  - `import` statements
  - `pip install` utility

Python is more than a pure calculator!

Exam…

Imperial College London

- 4 compulsory questions, 90 minutes
- Live programming test

```
myList = ["Spam", 1.0, ["Foo", "Bar", True], False, "Eggs", 23]
```

Make a copy of `myList`, but with the elements in reverse order. You do not need to reverse the order of any nested lists.

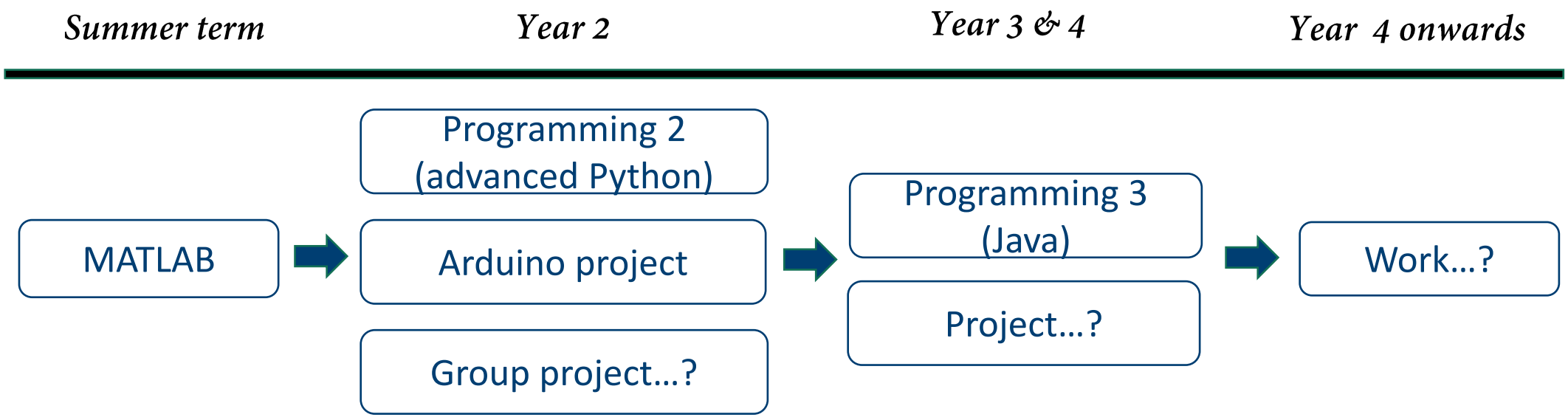
Write a function called `almostMax` which can accept an arbitrary number of non-negative floating point values and return the second largest value. You may not use the `import` command, `sorted()` or the method `sort()`. *Your function will be called in a manner similar to the following,*

```
print(almostMax(3.14, 2.72, 1.41, 9.8))
```

Beyond the exam, road ahead?

Imperial College London

- Indictive timeline:



- ***Thoughts? Expectations? Confidence?***

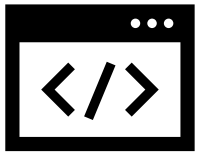
> *"There are only two kinds of languages: the ones people complain about and the ones nobody uses."*
>
> *- Bjarne Stroustrup*

Some final thoughts…

Imperial College London

- Thank you, thank you and thank you… !
- Any questions, feedbacks, complaints… Teams/email me ☺
- Departmental **UTA/GTA of the Year** nomination – coming soon
- Smooth revision and best luck in the exam !

Imperial College London



BIOE40002 – Computer Fundamentals and Programming 1

Digital Logics / Programming 1

Binghuan Webster Li | *Department of Bioengineering*

binghuan.li19@imperial.ac.uk

Spring Term, 2022