Basics of C++

Introduction

This will be a brief introduction to C++

This workshop is intended for those with zero experience with C++ and minimal to no experience with other languages

We will go over the very basic building blocks of the language that you need to start programming

We will then write a game of hangman together to see what we have learned

Why C++

C++ gives you control of what your computer is doing

Because of this, C++ is:

- Fast and efficient
- Scalable
- Widely used (a majority of video game engines and desktop applications run on C++)

Arduino’s language is based on C++

Data Types

```
int a = 2;

float f = 2.3;

double d = 3.14;

char c = 'w';

string s = "Hello world";

bool b = true;
```

if, else if, else

```
int a = 2;
if (a == 2) {
    // Do something
}

if (a == 3) {
    // Do something
}
else if (a == 4) {
    // Do something else
}
else {
    // Otherwise, do this
}
```

while loops

```
int i = 0;

while (i < 5) {
    i = i + 1;
}

// This loops 5 times
```

do while loops

```
int i = 0;

do {
    i = i + 1;
} while (i < 0);

// This loops 1 time
```

for loops

```
for (int i=0; i<5; i++) {
    // Do something
}
```

1. int i=0
2. while (i<5)
3. i++ means i=i+1

Arrays

```
int foo[5] = { 16, 2, 77, 40,
12071 };
char a[3] = {'a', 'b', 'c'};
int my_variable[5];

my_variable[0] = 4;
```

Notice:

- Arrays start at 0
- The last index of foo is not foo[5] but foo[4]

Functions

```
int my_function(int a, int b) {
    int c = a + b;

    return c;
}

void other_function(int a, int b) {
    a = 3;
}

int main {
    int a = 1;
    int b = 2;

    int r = my_function(a, b);
    other_function(2, b);

    return 0;
}
```

Standard Libraries

```
#include <math.h>

int x = 1;
int y = 0;
y = log2(x);
```

Input/Output

```
cout << “Hello world”;

int a = 2;
cout << a << endl;

cin >> a;
```

Summary

- A computer needs to know how to handle information given to it, data types let it know how
  - int, float, double, char, bool, void
  - All data is is stored in memory
    - Can create fancy and fast memory structures to package data together (arrays, structs, classes)
    - Can mess with the memory addresses of data by using pointers
- Coding is about making logical decisions, control structures help us in making these
  - if, else if, else, switch
- Reusing code saves time and avoids bugs.
  - Functions provide an easy way to bundle code under a label
  - Loops (for, while, do while) let us repeat some code a bunch of times without having to manually type it each time.
  - Libraries let us use code others have written beforehand, no point in reinventing the wheel.
    - The #include directive tells the compiler to fetch another library from somewhere
    - Libraries are subdivided into namespaces to avoid conflicting variable/function names.

Basic Hello World Program

```
1 #include <iostream>
2 using namespace std;
3
4 int main() {
5     cout << "Hello world" << endl;
6     return 0;
7 }
```

(Line numbers 1, 2, 4, 5)

1. Libraries used to bundle code.
   #include directive seen on line 1.

2. Namespace for even larger code base, like standard syntax rules, etc.
   i.e. standard cout

4. Main returns 0 means everything was ok.

5. cout prints out with << operator.
   endl is “make a new line here”.

Basic Hello World Program

```
1 #include <iostream>
2 using namespace std;
3
4 int main() {
5     cout << "Hello world" << endl;
6     return 0;
7 }
```

1. Repeating code is a waste of effort and time, instead C++ (and many other languages) bundle code into libraries. To use these libraries, such as the library called iostream (used for input and output), we use the #include directive seen on line 1.
2. These libraries can be massive so some items are placed into namespaces. This avoids having two items that may conflict (like having two functions named print). The stream we will be using, cout, and the variable endl, are from the std namespace. Without line 2 we can still refer to cout and endl by instead typing std::cout and std::endl but by saying we are going to be using the namespace std we save ourselves some extra typing.

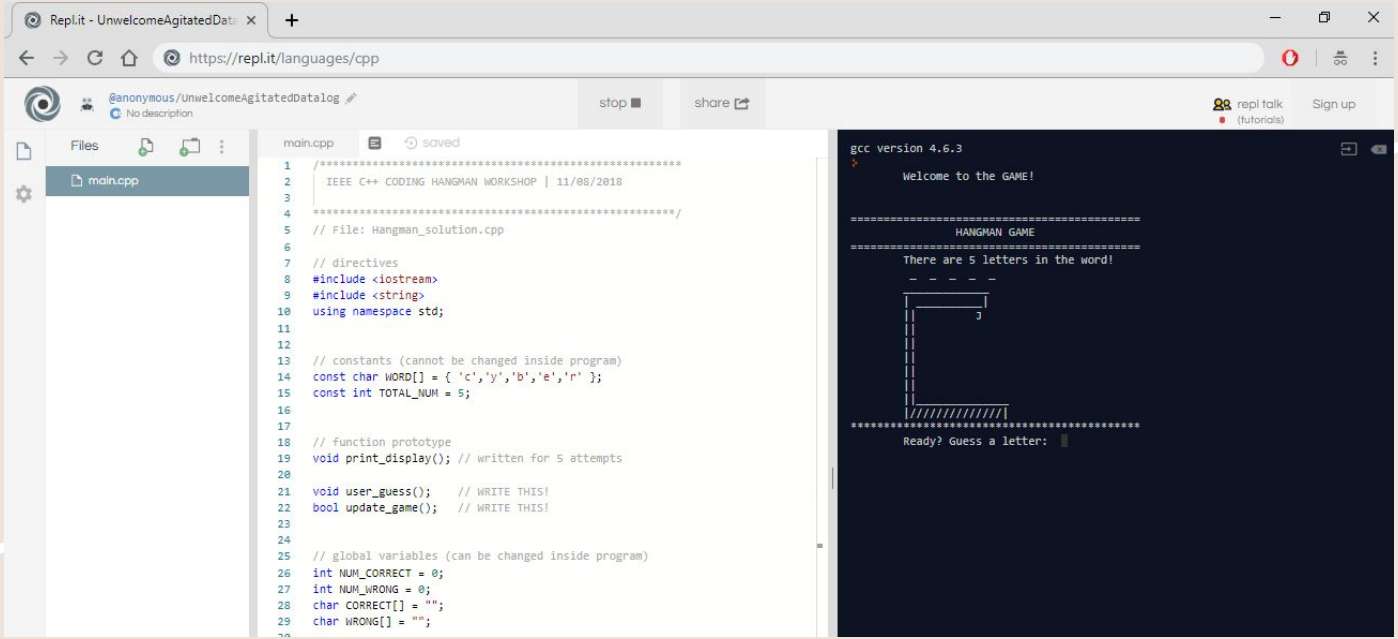
Basic Hello World Program

```
1 #include <iostream>
2 using namespace std;
3
4 int main() {
5     cout << "Hello world" << endl;
6     return 0;
7 }
```

4. When a program is ran ‘int main’ is the first function to be ran. It returns a number Indicating the reason for the program closing. Returning 0 means everything was ok.

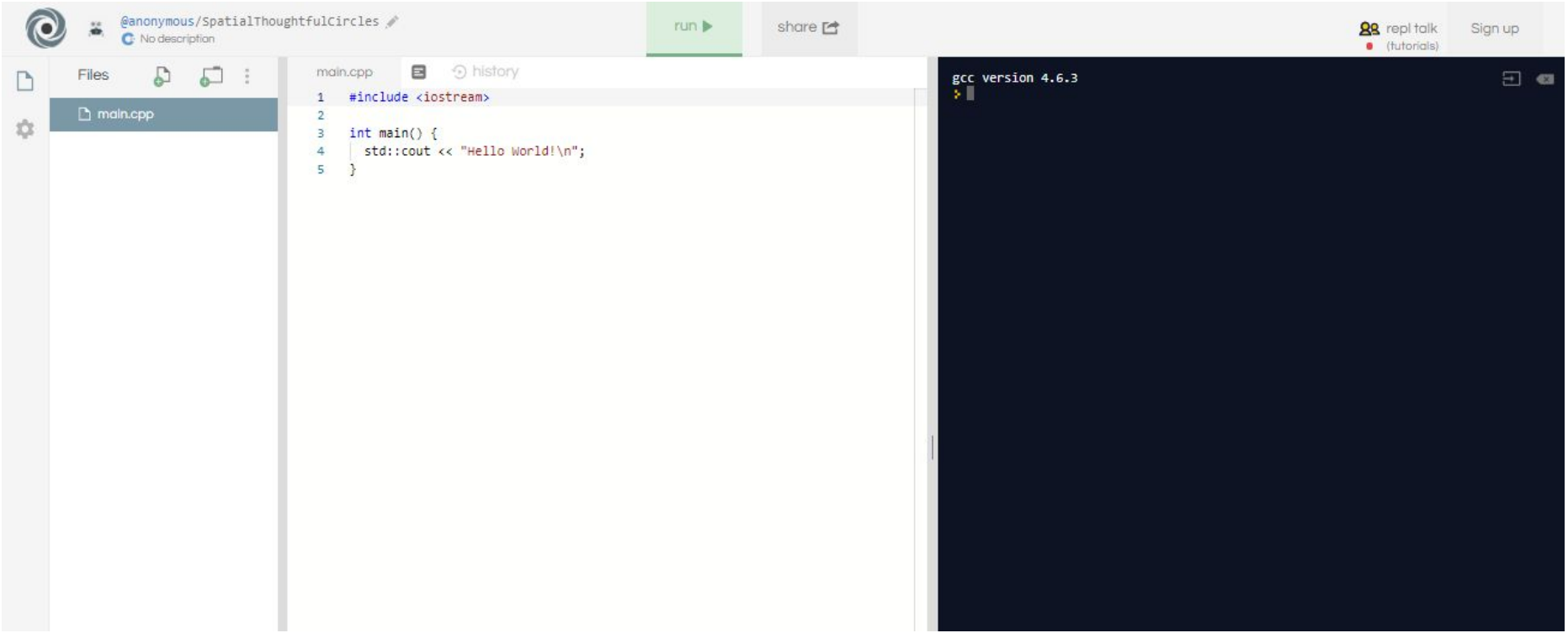
5. cout is called a stream, you can feed it in with the << operator. This input is then passed to the standard output (the terminal). endl simply means “make a new line here”.

Let’s Get Started !



We’ll use this online C++ compiler:

repl.it/languages/cpp



They have fun titles on the top (refresh page to see new names)

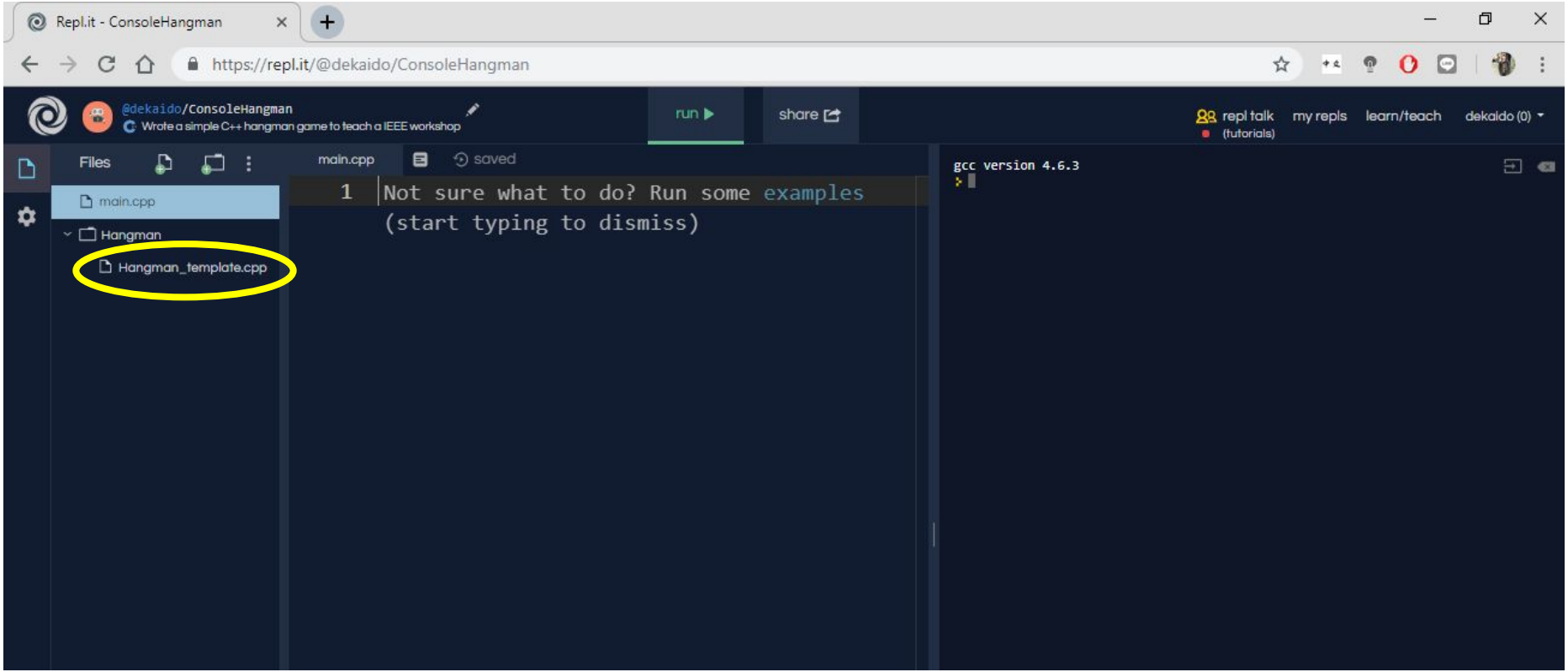
Let’s try playing a game of hangman. The completed version :)

Play one round

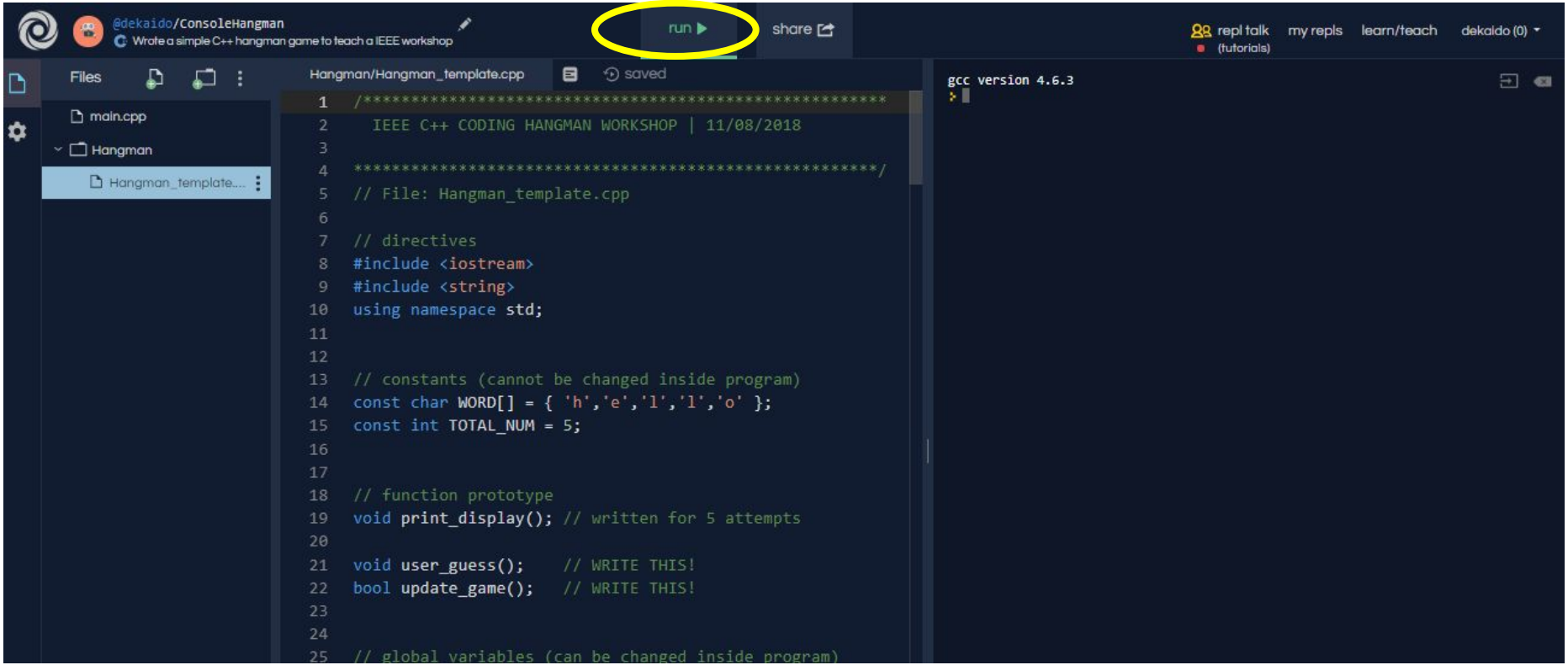
(Test my solution to see how the game should work !)

Now, your turn.
Copy or Download my template to your own!

repl.it/@dekaido/ConsoleHangman



The file in the folder “Hangman” . . . named **Hangman_template.cpp**



Try running it

Okay, now I will go over the template :)

Any questions, ask us !