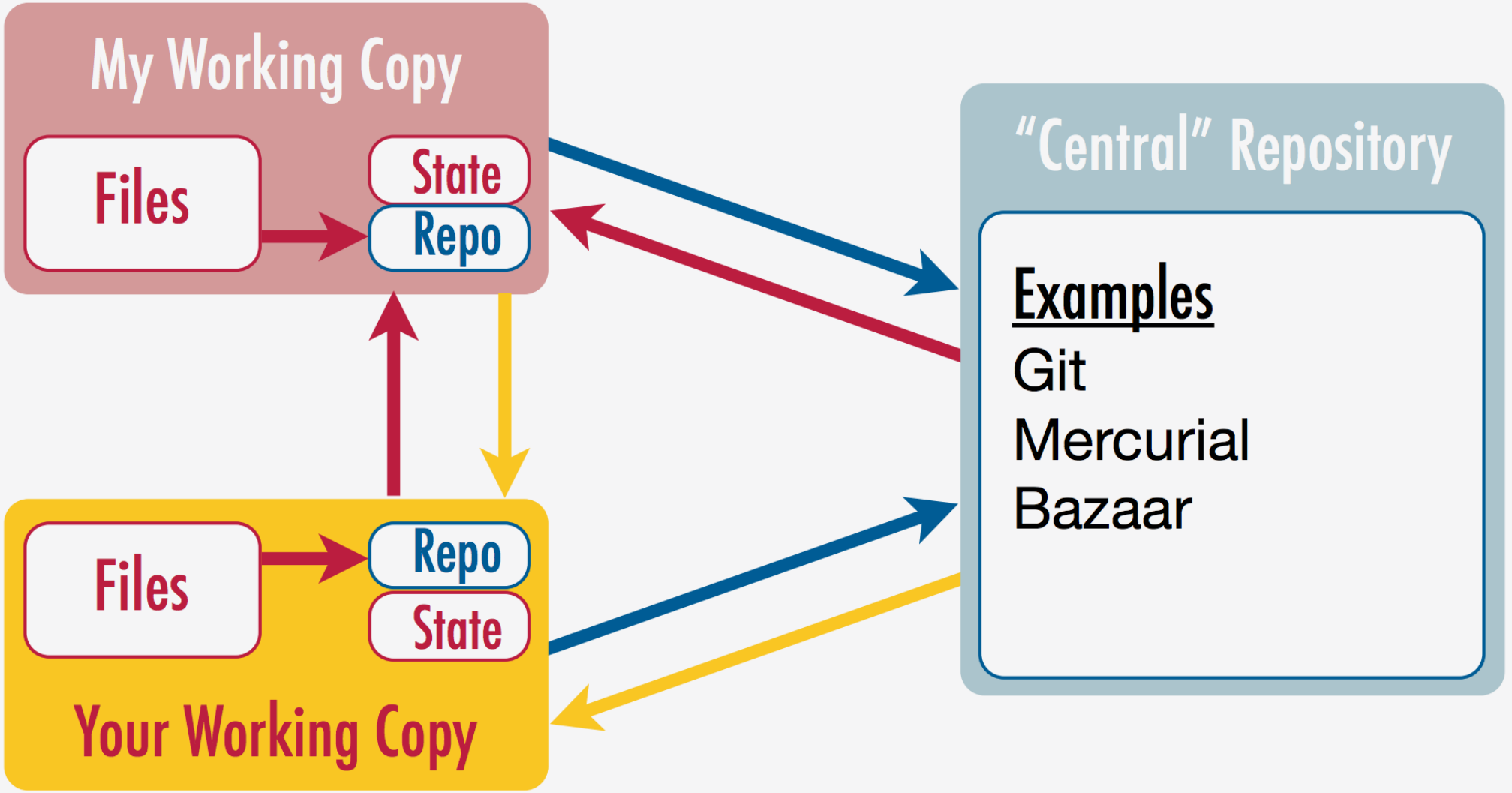
Quick Recap

Recap – Git Version Control

We covered how to use Git for Version Control:

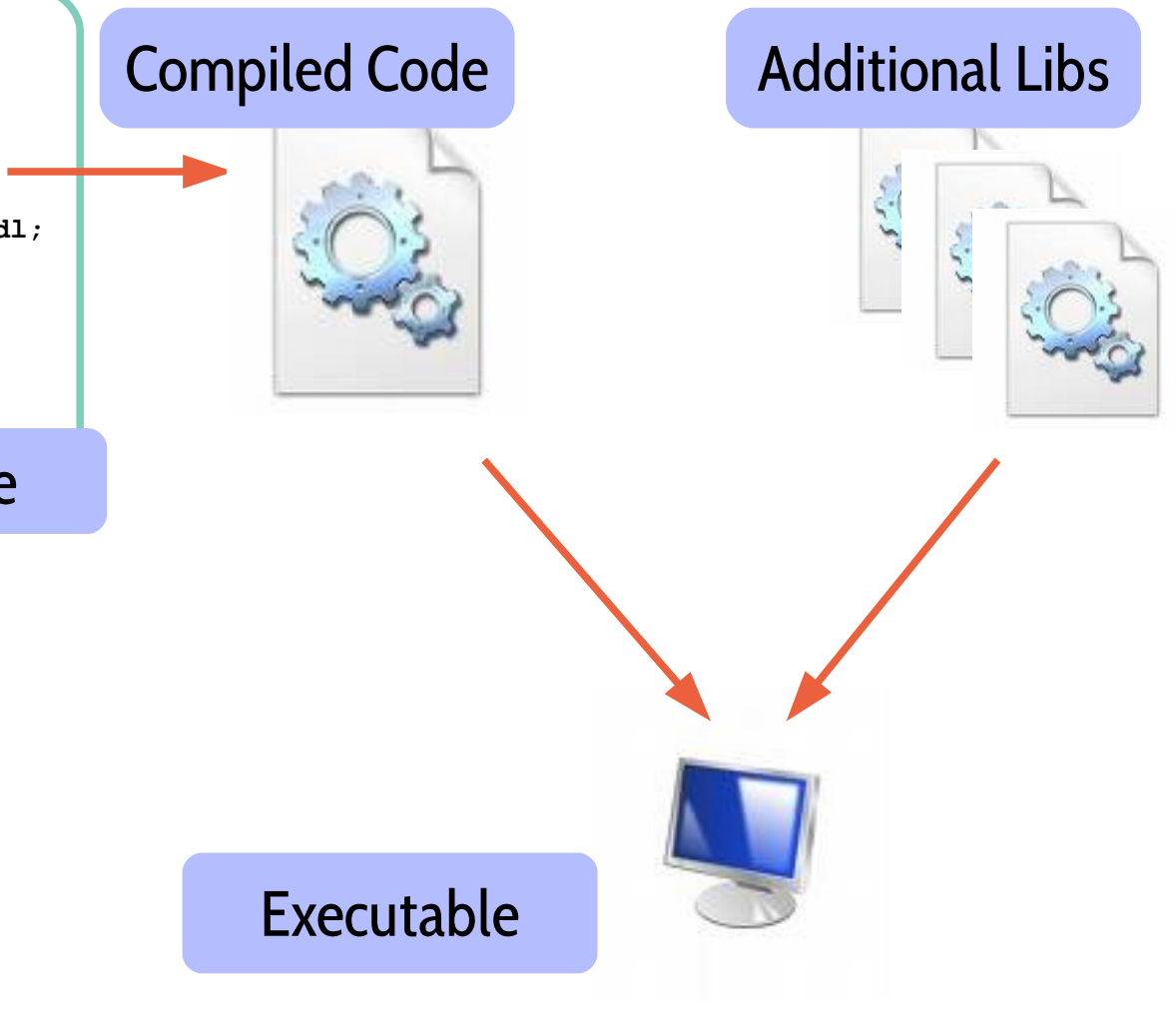


Recap - Writing and Compiling Code

C++ code can be written using any text editor, but to create the actual programs requires a compiler that creates the machine-readable code

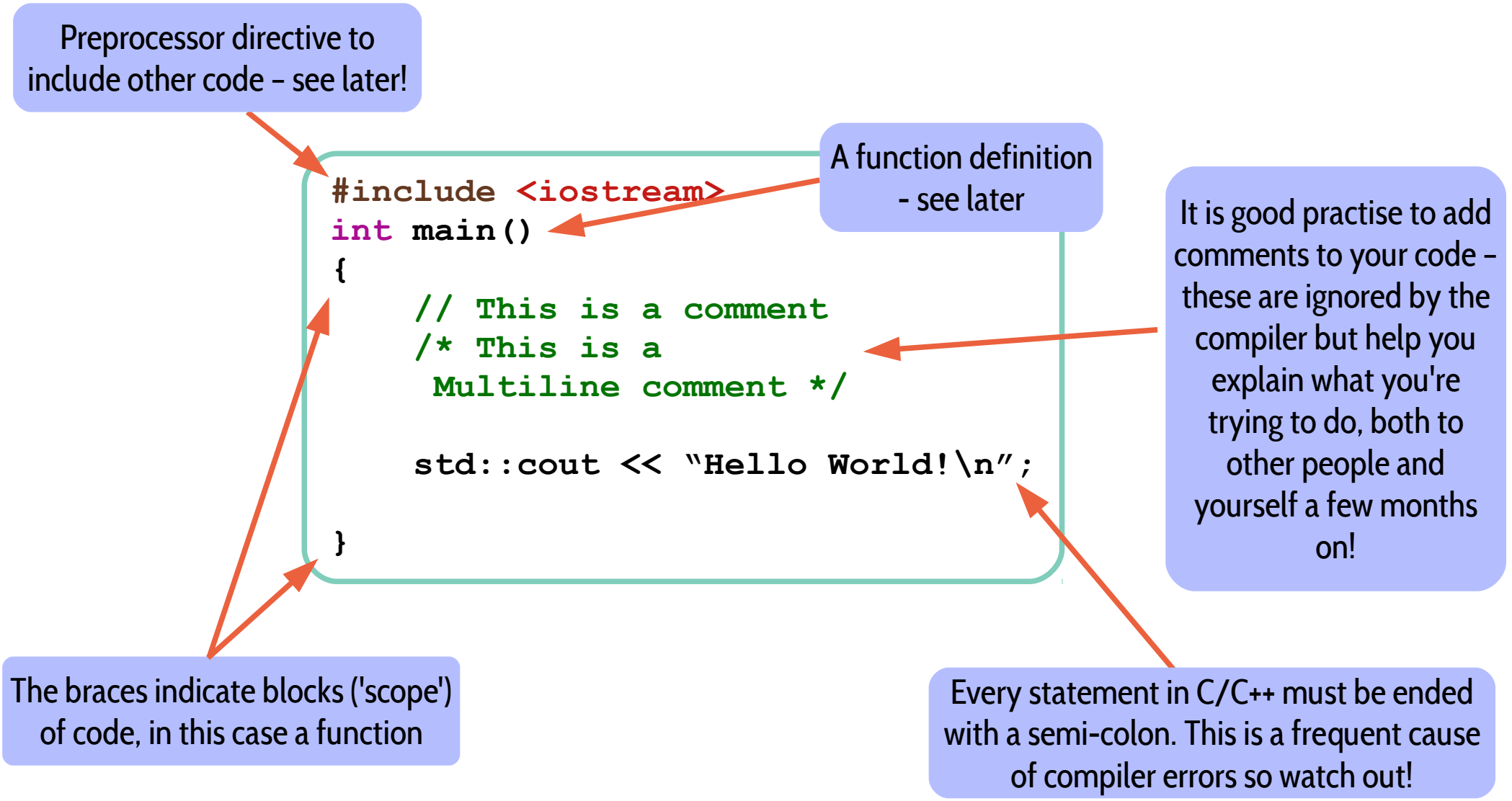
```cpp
#include <iostream>

int main()
{
    // Read and print three
    // floating point numbers
    std::cout << "Give 3 nums" << std::endl;
    float a{0}, b{0}, c{0};
    std::cin >> a >> b >> c;
    std::cout << "You gave... ";
    std::cout << a << ", " << b << ", "
          << c << std::endl;
}
```

Raw Code



Recap - Basic Syntax of a C/C++ Program

We covered the basic syntax of C++




```
#include <iostream>
int main()
{
    // This is a comment
    /* This is a
     Multiline comment */

    std::cout << "Hello World!\n";

}
```

Recap - Types, Objects, Values and Variables

We covered the basics of how data is stored in C++:

- Types – How to interpret data in a memory location ('object') and what operations can be performed by it
- Object – Defined area of memory that holds the data ('values') associated with a type
- Value – Actual data/bits in memory interpreted by the 'type'
- Variable – A flag or name of an area of memory ('object')

As well as how they are manipulated using operators:

- Assignment: a = b
- Dec/Increment: a--, a++
- Bitwise shift/stream: a << b, a >> b
- Modulus: %
- Array: []

Recap – Program Flow

We looked at conditionals and loops:

```
if (a == b)
{
    // Do something...
}
else
{
    // Do something else instead
}
```

```
switch (flag)
{
    case 0:
        // Do something for this value
        break;

    case 1:
        // Do something else for this value
        break;

    default:
        // Do something for all other values
        break;
}
```

```
int i{0};
while (i < 10)
{
    // Do something 10 times
    ++i;
}
```

```
for (int i{0}; i < 10; ++i)
{
    // Do something 10 times
}
```

Recap – Vectors

We also looked at the first basic container – a vector:

```
#include <vector>
#include <string>
#include <iostream>

int main()
{
    // Construct a vector
    std::vector<double> vec = {1.2, 3.4, 5.6};

    // print out the vector size (3)
    std::cout << vec.size() << std::endl;

    // add a few elements
    vec.push_back(7.8);
    vec.push_back(9.1);

    // vector size (5)
    std::cout << vec.size() << std::endl;

    // remove an element
    vec.pop_back();

     // vector size (4)
    std::cout << vec.size() << std::endl;

    // loop over the vector using an index counter
    for (size_t i{0}; j < vec.size(); i++)
    {
        std::cout << "Index: " << i << " " << vec[i] << std::endl;
    }
}
```

Recap – Command Line Arguments

Finally, we covered getting information into your program from the user using command line arguments:

Reading arguments in C++

- Due to backward compatibility with C, the way that these appear in **main()** are as two function arguments:
  - **argc** is an integer - the number of arguments
  - **argv** is a C-style array of C-style strings - the arguments themselves
- These are rather fiddly to work with, so best to immediately convert them into a more usable form, a std::vector of std::string objects:

```
int main(int argc, char* argv[])
{
    std::vector<std::string> cmdLineArgs { argv, argv+argc };
```

- We can then loop over and/or access the individual arguments as with any std::vector

New Github Classroom for Day 2

- As mentioned last week, there will be a new ‘base’ repo for each day
- This will contain the ‘ideal solution’ to the previous day’s exercises
- Clone the created repository from the link on the course pages just as with last week and you’re good to go!

Writing C++ Functions

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Program Flow – Writing Functions (1)

- We saw last time that functions can be very useful ways of re-using code. As well as calling external functions written by someone else, it is also very useful to write your own. Just like a variable, a function must be declared before it can be used:

  ‹return_type› ‹function_name› (‹arguments›) { ‹code_block› }

- After declaration, the function is called by just giving the function name and the required arguments in brackets just as we saw previously
- An important point to remember is that variables are passed ' by value' – i.e. the object value passed is copied to the new variable, the object itself is not sent to the function
- This is important to remember when dealing with 'large' objects like strings or vectors – a copy will be made which can be slow!

Program Flow – Writing Functions (2)

Declare and define a function that multiplies two numbers together and returns the result

Note that you have already encountered a function: the 'main' function. This is a special function that is where the program starts, but it behaves in the same way

```
#include <iostream>

double multiply( const double first, const double second )
{
    return first * second;
}

void print( const double value )
{
    std::cout << "Result: " << value << std::endl;
}

int main()
{
    double a{43.0},
    double b{21.0},

    double c{ multiply(a, b) };
    print(c);

    print( multiply(a, c) );
}
```

This function prints the given number with an additional message

Note that, the variables here WILL NOT BE CHANGED as the values are COPIED to the function where new objects are created

Documenting Function Behaviour

- Though we have already highlighted the importance of documenting your code in comments, with functions there are more things to consider
- We will be covering one popular style of comment documentation in detail later, but for the moment, make sure you are detail:
  - A brief, one line description of the function
  - If necessary, more info about how to use the function and what it does
  - The arguments to the function
  - What it returns

```
double multiply( double a, double b)
{
    /* multiply two values together and return the result

     double a: First number to multiply
     double a: Second number to multiply

     return: The value of the product of a and b
     */

    return a * b;
}
```

Exercise - Start Using Functions

- Now you have learnt how to write your own functions, we can now start using them in your cipher code to 'tidy things up' a bit
- For the next exercise, move your transliteration code from within the 'while' loop into a function called 'transformChar' that takes a char and returns a string after applying the transliteration:

```
std::string transformChar( const char in_char )
```

- After removing code from the 'while' loop, in its place you will need to add a call to the 'transformChar' function and add the return value to the 'inputText' string
- Your new function will have to be put before your main function where it's referenced