

```
csimons637@cislmons-csce311: ~$ sudo apt update
[sudo] password for csimons637:
Hit:1 http://us.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 https://packages.microsoft.com/repos/ms-teams stable InRelease
Get:3 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:6 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Hit:5 https://packagecloud.io/AtomEditor/atom/any InRelease
Get:7 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1,468 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu focal-updates/main i386 Packages [585 kB]
Get:9 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [279 kB]
Get:10 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [14.7 kB]
Get:11 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [1,135 kB]
Get:12 http://us.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [892 kB]
Get:13 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [38.2 kB]
Get:14 http://us.archive.ubuntu.com/ubuntu focal-updates/universe i386 Packages [663 kB]
Get:15 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata [9,108 B]
Get:16 http://us.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [363 kB]
Get:17 http://us.archive.ubuntu.com/ubuntu focal-updates/universe amd64 c-n-f Metadata [20.0 kB]
Get:18 http://us.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [944 B]
Get:19 http://us.archive.ubuntu.com/ubuntu focal-backports/main amd64 DEP-11 Metadata [7,992 B]
Get:20 http://us.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 Metadata [11.3 kB]
Get:21 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 Packages [643 kB]
Get:22 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [66.1 kB]
Get:23 http://security.ubuntu.com/ubuntu focal-security/universe amd64 c-n-f Metadata [13.0 kB]
Get:24 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [2,464 B]
Fetched 6,548 kB in 5s (1,454 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
All packages are up to date.
csimons637@cislmons-csce311: ~$
```

Screenshot of “sudo apt update”

```
csimons637@cislmons-csce311:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
  linux-headers-5.11.0-44-generic linux-hwe-5.11-headers-5.11.0-44 linux-lnag-5.11.0-44-generic linux-modules-5.11.0-44-generic linux-modules-extra-5.11.0-44-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
csimons637@cislmons-csce311:~$
```

Screenshot of “sudo apt upgrade”

```
csimons637@cislmons-csce311: ~$ sudo apt install build-essential
Reading package lists... Done
Building dependency tree
Reading state information... Done
build-essential is already the newest version (12.8ubuntu1.1).
build-essential set to manually installed.
The following packages were automatically installed and are no longer required:
  linux-headers-5.11.0-44-generic linux-hwe-5.11-headers-5.11.0-44 linux-image-5.11.0-44-generic linux-modules-5.11.0-44-generic linux-modules-extra-5.11.0-44-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
csimons637@cislmons-csce311: ~$
```

Screenshot of “sudo apt install build-essential”

The screenshot shows the Visual Studio Code interface with a C++ project named 'HelloWorld.c'. The Explorer sidebar on the left shows the project structure with files 'a.out', 'HelloWorld.c', and 'project1.pdf'. The main editor window displays the source code for 'HelloWorld.c', which includes a copyright notice and a simple 'Hello, World!' program using `std::cout`. The code is as follows:

```
1  /*  
2  * Copyright 2022 Charles I. Simons  
3  */  
4  #include <iostream>  
5  
6  using std::cout;  
7  
8  int main (int argc, char **argv) {  
9      cout << "Hello, World!\n";  
10  
11 }
```

The status bar at the bottom indicates the current file is 'main*', the cursor is at line 9, column 29, and the encoding is UTF-8. The interface is running on a Linux system.

Screenshot of code in editor

The screenshot displays the Visual Studio Code interface with a C++ project named 'HelloWorld.c'. The Explorer sidebar on the left shows the project structure, including 'PROJECT 1', 'a.out', 'HelloWorld.c', and 'project1.pdf'. The main editor area shows the source code of 'HelloWorld.c', which includes a copyright notice for Charles I. Simons and a simple C++ program that prints 'Hello, World!'. The Terminal panel at the bottom shows the execution of the program, with the command 'g++ HelloWorld.c' and the resulting output 'a.out' and 'project1.pdf'. The status bar at the bottom indicates the current file is 'main*' and the editor is in 'Ln 9, Col 29'.

```
File Edit Selection View Go Run Terminal Help
C HelloWorld.c x project1.pdf
PROJECT 1
a.out
C HelloWorld.c 3
project1.pdf
1 /*
2  * Copyright 2022 Charles I. Simons
3  */
4 #include <iostream>
5
6 using std::cout;
7
8 int main (int argc, char **argv) {
9     cout << "Hello, World!\n";
10 }
11
```

PROBLEMS 3 OUTPUT TERMINAL DEBUG CONSOLE

```
csimons637@csimons-csce311:~/csce311/Project 1$ g++ HelloWorld.c
csimons637@csimons-csce311:~/csce311/Project 1$ ls
a.out HelloWorld.c project1.pdf
csimons637@csimons-csce311:~/csce311/Project 1$
```

main* Ln 9, Col 29 Spaces: 4 UTF-8 LF C Linux

Screenshot of compilation/build output

The screenshot displays the Visual Studio Code interface for a project named 'HelloWorld.c - Project 1'. The Explorer sidebar on the left shows the project structure with files 'a.out', 'HelloWorld.c', and 'project1.pdf'. The main editor window displays the source code for 'HelloWorld.c', which includes a copyright notice for Charles I. Simons (2022) and a C++ program that prints 'Hello, World!'. The program uses the `iostream` library and the `cout` stream. The bottom panel is divided into 'PROBLEMS', 'OUTPUT', 'TERMINAL', and 'DEBUG CONSOLE' tabs. The 'TERMINAL' tab is active, showing the command `./a.out` being executed in a bash shell, resulting in the output 'Hello, World!'. The status bar at the bottom indicates the current position is at line 9, column 29, with 4 spaces, in UTF-8 encoding, on a Linux system.

```
File Edit Selection View Go Run Terminal Help
C HelloWorld.c x project1.pdf
PROJECT 1
  a.out
  HelloWorld.c
  project1.pdf
1  /*
2   * Copyright 2022 Charles I. Simons
3   */
4  #include <iostream>
5
6  using std::cout;
7
8  int main (int argc, char **argv) {
9      cout << "Hello, World!\n";
10 }
11

PROBLEMS 0 OUTPUT TERMINAL DEBUG CONSOLE
csimons637@csimons-csce311:~/csce311/Project 1$ ./a.out
Hello, World!
csimons637@csimons-csce311:~/csce311/Project 1$
+ bash
- bash

main* 123, 0: 2 1
Ln 9, Col 29 Spaces: 4 UTF-8 LF C Linux
```

Screenshot of executed object file and appropriate output