Hands-on Activity 4.4	
Characters and Strings	
Course Code: CPE007	**Program:** Computer Engineering
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Section: CPE11S1	**Date Submitted: 9/26/2025**
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Output	

1. Try to create a program that outputs the following?

According to islower:
p is a lowercase letter
P is not a lowercase letter
5 is not a lowercase letter
! is not a lowercase letter

According to isupper:
D is an uppercase letter
d is not an uppercase letter
8 is not an uppercase letter
& is not an uppercase letter

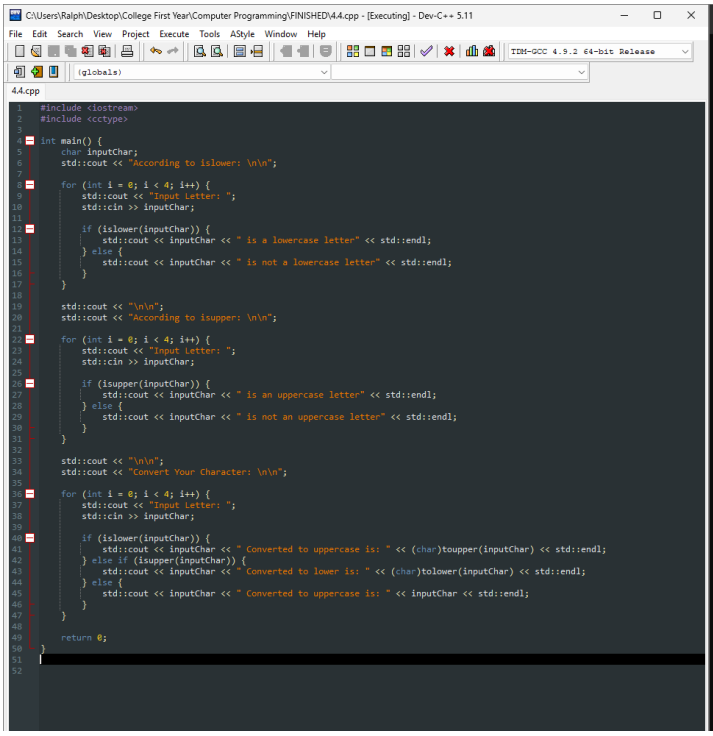
u converted to uppercase is U
7 converted to uppercase is 7
$ converted to uppercase is $
L converted to lowercase is l

CODE:

```
#include <iostream>
#include <cctype>

int main() {
    char inputChar;
    std::cout << "According to islower: \n\n";

    for (int i = 0; i < 4; i++) {
        std::cout << "Input Letter: ";
        std::cin >> inputChar;

        if (islower(inputChar)) {
            std::cout << inputChar << " is a lowercase letter" << std::endl;
        } else {
            std::cout << inputChar << " is not a lowercase letter" << std::endl;
        }
    }

    std::cout << "\n\n";
    std::cout << "According to isupper: \n\n";

    for (int i = 0; i < 4; i++) {
        std::cout << "Input Letter: ";
```

```
        std::cin >> inputChar;

        if (isupper(inputChar)) {
            std::cout << inputChar << " is an uppercase letter" << std::endl;
        } else {
            std::cout << inputChar << " is not an uppercase letter" << std::endl;
        }
    }

    std::cout << "\n\n";
    std::cout << "Convert Your Character: \n\n";

    for (int i = 0; i < 4; i++) {
        std::cout << "Input Letter: ";
        std::cin >> inputChar;

        if (islower(inputChar)) {
            std::cout << inputChar << " Converted to uppercase is: " << (char)toupper(inputChar) << std::endl;
        } else if (isupper(inputChar)) {
            std::cout << inputChar << " Converted to lower is: " << (char)tolower(inputChar) << std::endl;
        } else {
            std::cout << inputChar << " Converted to uppercase is: " << inputChar << std::endl;
        }
    }

    return 0;
}
```

RESULT:



ANALYSIS:
We first have to add our headers: #include <iostream> for inputs/outputs (cin, cout), and #include <cctype> to be able to use the functions islower, isupper for checking and tolower, toupper for converting. In the first for-loop, the program asks you to input a letter (inputChar). Whatever letter you input, it will identify whether it is a lowercase or not by using the islower function. If the letter is a lowercase ('a' to 'z'), it will print out "is a lowercase letter". If not, it will print "is not a lowercase letter". This repeats 4 times, asking the user for 4 characters before moving on. The second for-loop works the same way, except this time it uses isupper to check if the input is an uppercase letter. If the letter is uppercase, it will print "is an uppercase letter". Otherwise, it prints "is not an uppercase letter". Again, this loop runs 4 times. Finally, the third for-loop is where the program converts letters. It still asks the user for 4 inputs, but this time it checks if the input is lowercase or uppercase. If the letter is lowercase, it will be converted to uppercase using toupper. If the letter is uppercase, it will be converted to lowercase using tolower. If the input isn't a letter at all, the program just prints it back as-is without changing anything.

Supplementary Activity

2. Write a program that inputs a character from the keyboard and tests the character with each of the functions in the character handling library.

CODE:

```
#include <iostream>
#include <cctype>

void printChar(char inputChar) {
    if (inputChar == ' ') {
        std::cout << "[space]";
    } else if (inputChar == '\n') {
        std::cout << "[newline]";
    } else if (inputChar == '\t') {
        std::cout << "[tab]";
    } else {
        std::cout << inputChar;
    }
}

int main() {
    char inputChar;

    std::cout << "Enter a single character: ";
    inputChar = std::cin.get();

    std::cout << "\nYou entered: ";
    printChar(inputChar);
    std::cout << "\n\n";

    std::cout << "Testing the character with the cctype library functions:\n";
    std::cout << "-------------------------------------------------------\n\n";

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
    if (isalnum(inputChar)) {
        std::cout << "is an alphanumeric character.\n";
```

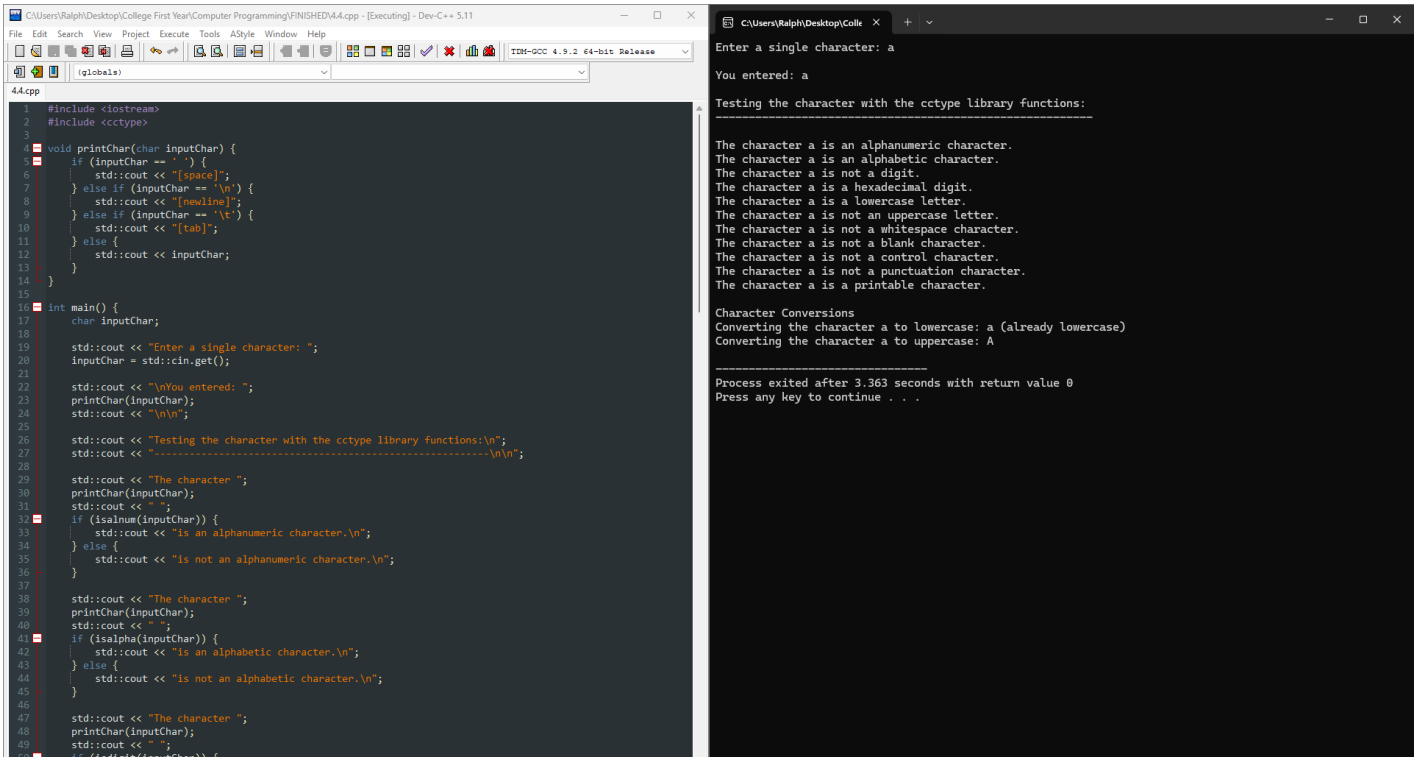
```
} else {
    std::cout << "is not an alphanumeric character.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
if (isalpha(inputChar)) {
    std::cout << "is an alphabetic character.\n";
} else {
    std::cout << "is not an alphabetic character.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
if (isdigit(inputChar)) {
    std::cout << "is a digit.\n";
} else {
    std::cout << "is not a digit.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
if (isxdigit(inputChar)) {
    std::cout << "is a hexadecimal digit.\n";
} else {
    std::cout << "is not a hexadecimal digit.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
if (islower(inputChar)) {
    std::cout << "is a lowercase letter.\n";
} else {
    std::cout << "is not a lowercase letter.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
if (isupper(inputChar)) {
    std::cout << "is an uppercase letter.\n";
} else {
    std::cout << "is not an uppercase letter.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
```

```
if (isspace(inputChar)) {
    std::cout << "is a whitespace character.\n";
} else {
    std::cout << "is not a whitespace character.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
if (isblank(inputChar)) {
    std::cout << "is a blank character.\n";
} else {
    std::cout << "is not a blank character.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
if (iscntrl(inputChar)) {
    std::cout << "is a control character.\n";
} else {
    std::cout << "is not a control character.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
if (ispunct(inputChar)) {
    std::cout << "is a punctuation character.\n";
} else {
    std::cout << "is not a punctuation character.\n";
}

std::cout << "The character ";
printChar(inputChar);
std::cout << " ";
if (isprint(inputChar)) {
    std::cout << "is a printable character.\n";
} else {
    std::cout << "is not a printable character.\n";
}

// Conversions
std::cout << "\nCharacter Conversions" << std::endl;
if (isalpha(inputChar)) {
    std::cout << "Converting the character ";
    printChar(inputChar);
    std::cout << " to lowercase: ";
    if (islower(inputChar)) {
        std::cout << inputChar << " (already lowercase)" << std::endl;
    } else {
        std::cout << (char)tolower(inputChar) << std::endl;
```

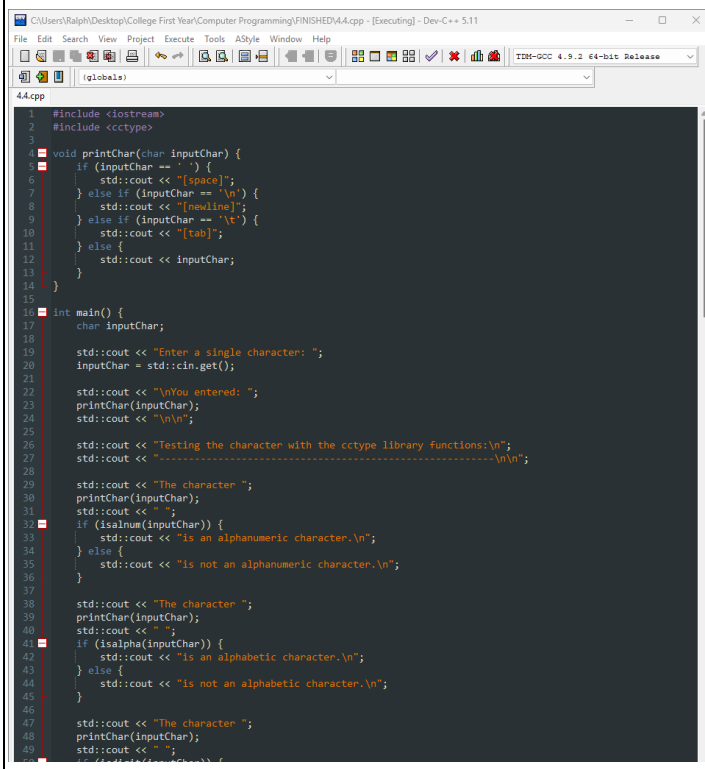
```
        }

        std::cout << "Converting the character ";
        printChar(inputChar);
        std::cout << " to uppercase: ";
        if (isupper(inputChar)) {
            std::cout << inputChar << " (already uppercase)" << std::endl;
        } else {
            std::cout << (char)toupper(inputChar) << std::endl;
        }
    } else {
        std::cout << "The character ";
        printChar(inputChar);
        std::cout << " is not a letter and cannot be converted to lowercase or uppercase.\n";
    }

    return 0;
}
```

RESULT:

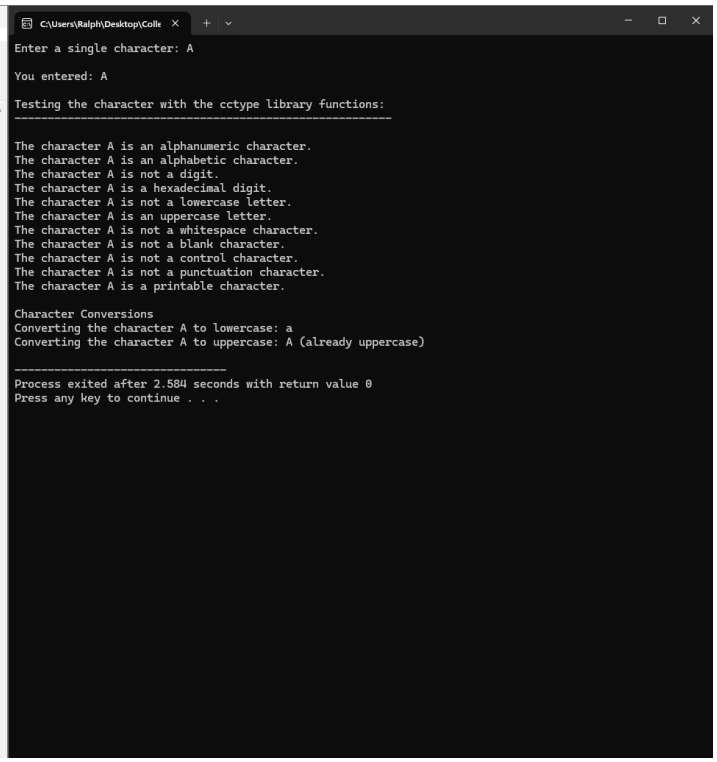
ENTERING A LOWERCASE LETTER



ENTERING UPPERCASE LETTER

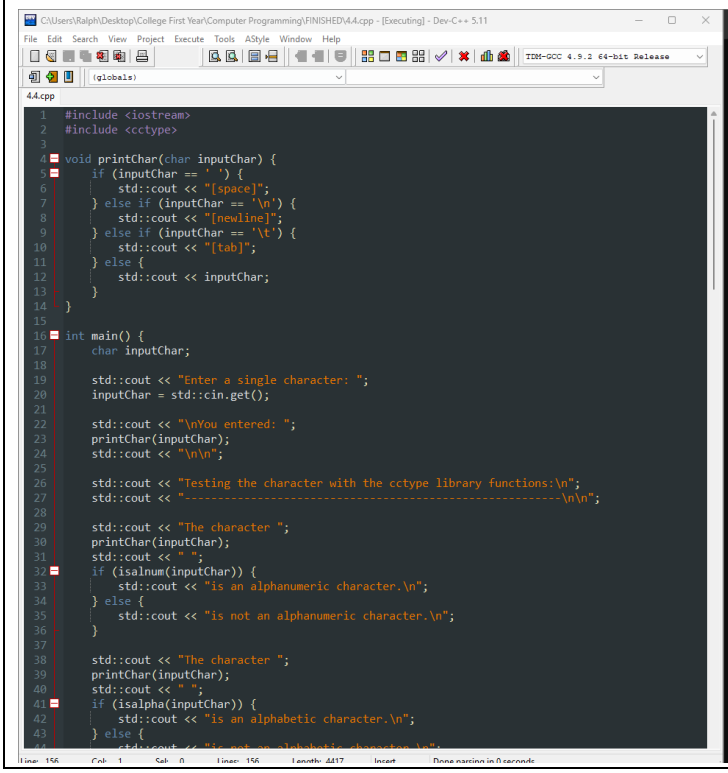


```
#include <iostream>
#include <cctype>

void printChar(char inputChar) {
    if (inputChar == ' ') {
        std::cout << "[space]";
    } else if (inputChar == '\n') {
        std::cout << "[newline]";
    } else if (inputChar == '\t') {
        std::cout << "[tab]";
    } else {
        std::cout << inputChar;
    }
}

int main() {
    char inputChar;

    std::cout << "Enter a single character: ";
    inputChar = std::cin.get();

    std::cout << "\nYou entered: ";
    printChar(inputChar);
    std::cout << "\n\n";

    std::cout << "Testing the character with the cctype library functions:\n";
    std::cout << "------------------------------------------------------------\n\n";

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
    if (isalnum(inputChar)) {
        std::cout << "is an alphanumeric character.\n";
    } else {
        std::cout << "is not an alphanumeric character.\n";
    }

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
    if (isalpha(inputChar)) {
        std::cout << "is an alphabetic character.\n";
    } else {
        std::cout << "is not an alphabetic character.\n";
    }

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
```

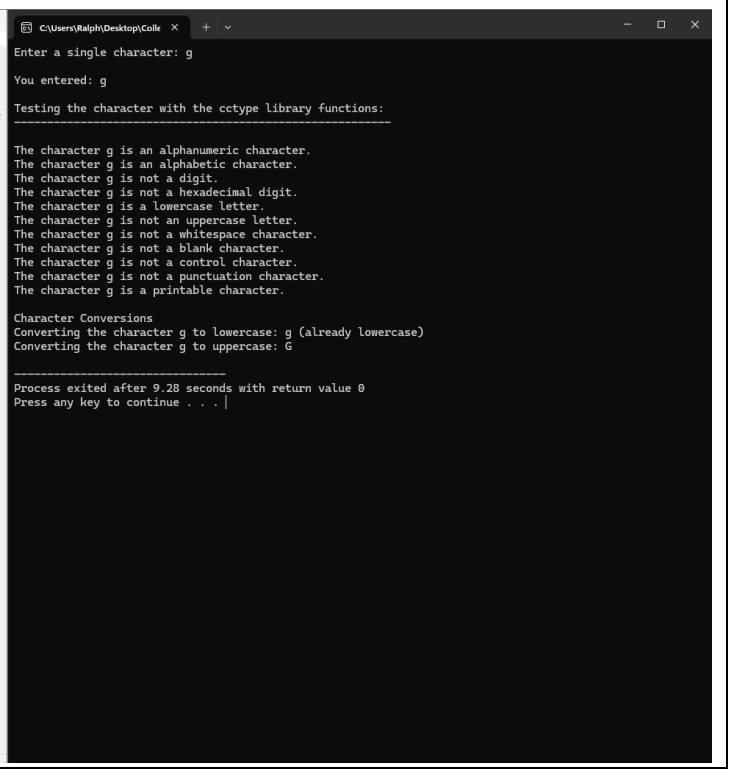


```
Enter a single character: A

You entered: A

Testing the character with the cctype library functions:
------------------------------------------------------------

The character A is an alphanumeric character.
The character A is an alphabetic character.
The character A is not a digit.
The character A is a hexadecimal digit.
The character A is not a lowercase letter.
The character A is an uppercase letter.
The character A is not a whitespace character.
The character A is not a blank character.
The character A is not a control character.
The character A is not a punctuation character.
The character A is a printable character.

Character Conversions
Converting the character A to lowercase: a
Converting the character A to uppercase: A (already uppercase)

--------------------------------
Process exited after 2.584 seconds with return value 0
Press any key to continue . . .
```

ENTER A LETTER (g-z, G-Z)

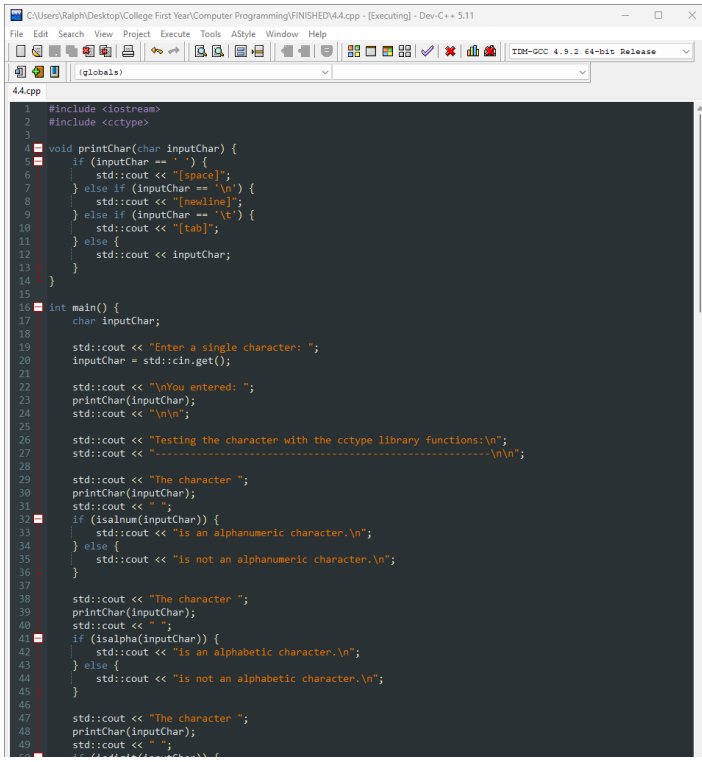


```
#include <iostream>
#include <cctype>

void printChar(char inputChar) {
    if (inputChar == ' ') {
        std::cout << "[space]";
    } else if (inputChar == '\n') {
        std::cout << "[newline]";
    } else if (inputChar == '\t') {
        std::cout << "[tab]";
    } else {
        std::cout << inputChar;
    }
}

int main() {
    char inputChar;

    std::cout << "Enter a single character: ";
    inputChar = std::cin.get();

    std::cout << "\nYou entered: ";
    printChar(inputChar);
    std::cout << "\n\n";

    std::cout << "Testing the character with the cctype library functions:\n";
    std::cout << "------------------------------------------------------------\n\n";

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
    if (isalnum(inputChar)) {
        std::cout << "is an alphanumeric character.\n";
    } else {
        std::cout << "is not an alphanumeric character.\n";
    }

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
    if (isalpha(inputChar)) {
        std::cout << "is an alphabetic character.\n";
    } else {
        std::cout << "is not an alphabetic character.\n";
```

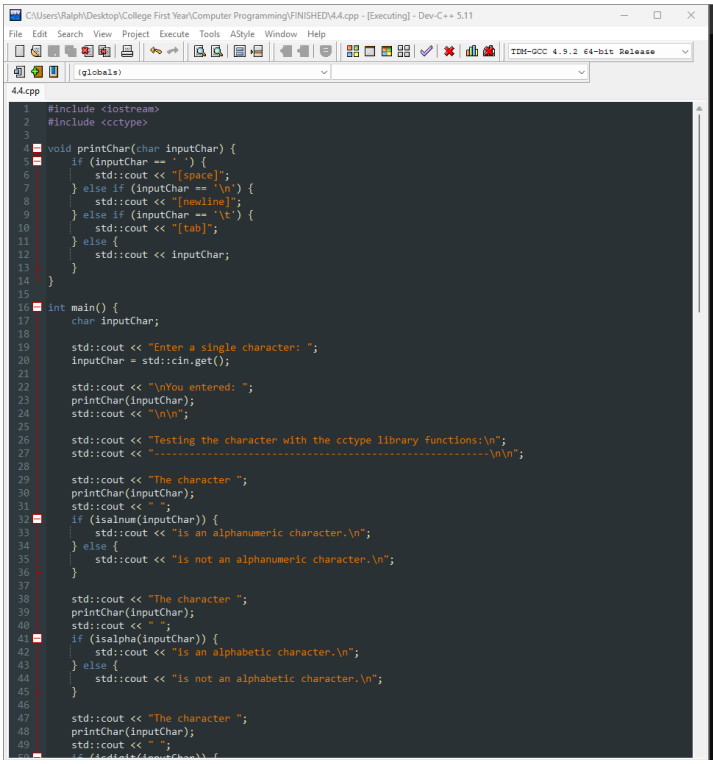


```
Enter a single character: g

You entered: g

Testing the character with the cctype library functions:
------------------------------------------------------------

The character g is an alphanumeric character.
The character g is an alphabetic character.
The character g is not a digit.
The character g is not a hexadecimal digit.
The character g is a lowercase letter.
The character g is not an uppercase letter.
The character g is not a whitespace character.
The character g is not a blank character.
The character g is not a control character.
The character g is not a punctuation character.
The character g is a printable character.

Character Conversions
Converting the character g to lowercase: g (already lowercase)
Converting the character g to uppercase: G

--------------------------------
Process exited after 9.28 seconds with return value 0
Press any key to continue . . .
```

ENTERING A NUMBER

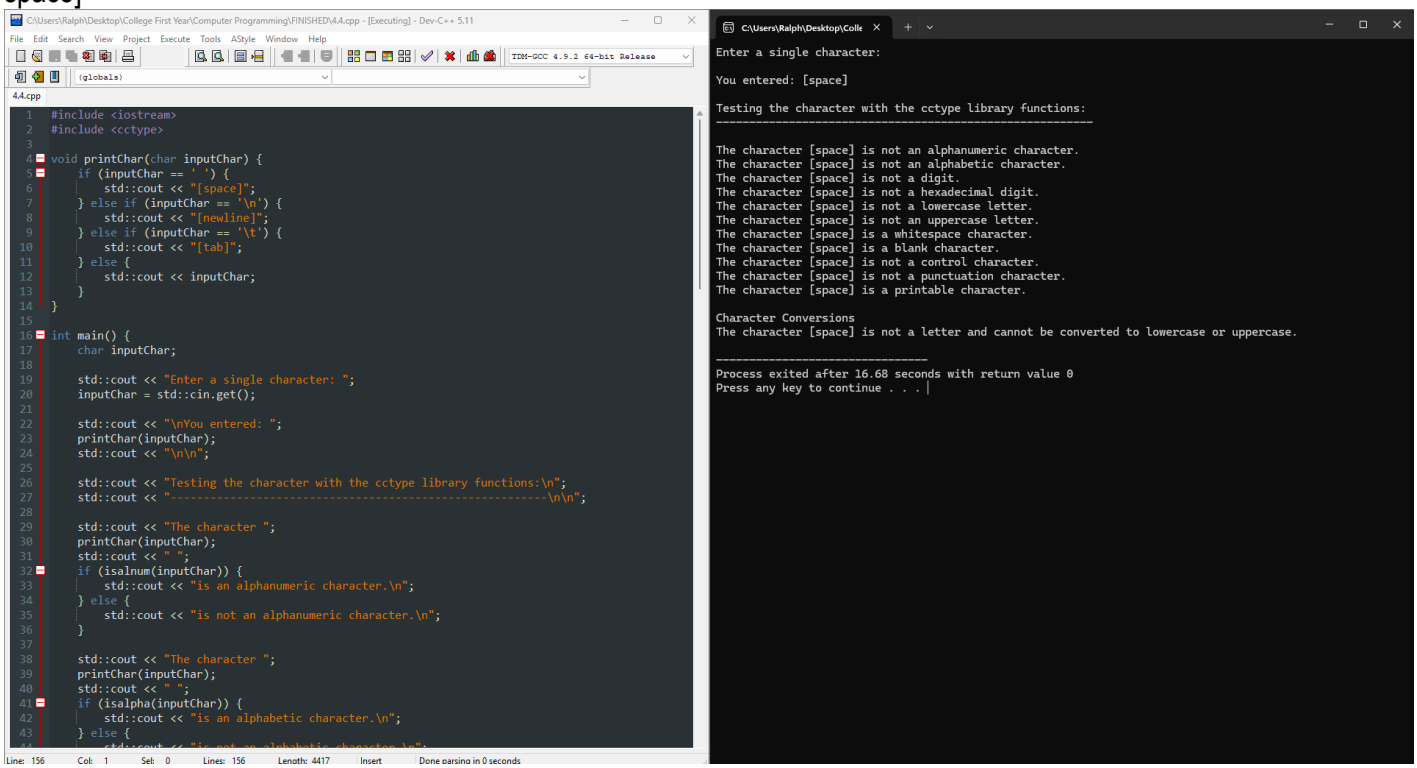


ENTERING A SPECIAL CHARACTER



ENTERING [space] , [tab] and [newline]

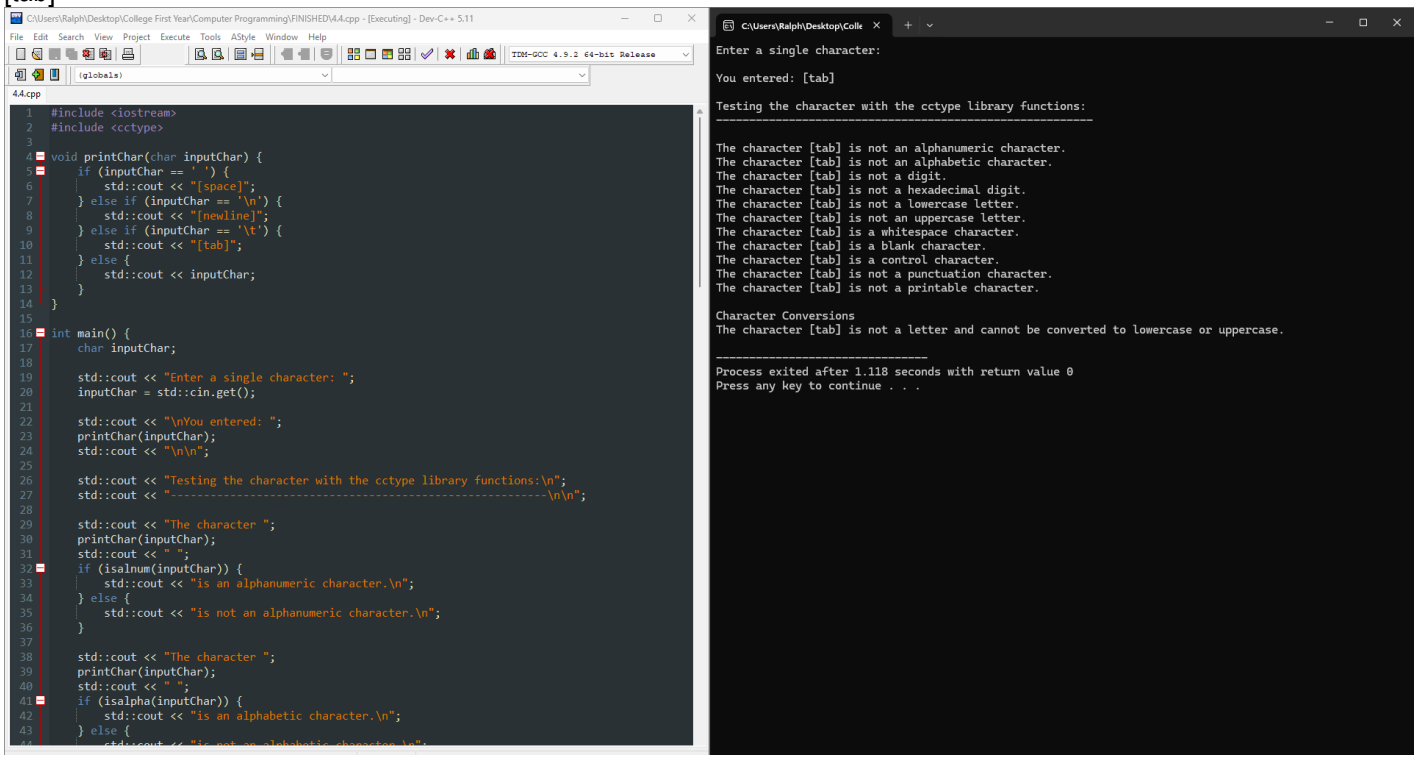
space]



```
#include <iostream>
#include <cctype>

void printChar(char inputChar) {
    if (inputChar == ' ') {
        std::cout << "[space]";
    } else if (inputChar == '\n') {
        std::cout << "[newline]";
    } else if (inputChar == '\t') {
        std::cout << "[tab]";
    } else {
        std::cout << inputChar;
    }
}

int main() {
    char inputChar;

    std::cout << "Enter a single character: ";
    inputChar = std::cin.get();

    std::cout << "\nYou entered: ";
    printChar(inputChar);
    std::cout << "\n\n";

    std::cout << "Testing the character with the cctype library functions:\n";
    std::cout << "------------------------------------------------------------\n\n";

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
    if (isalnum(inputChar)) {
        std::cout << "is an alphanumeric character.\n";
    } else {
        std::cout << "is not an alphanumeric character.\n";
    }

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
    if (isalpha(inputChar)) {
        std::cout << "is an alphabetic character.\n";
    } else {
```

```
Enter a single character:

You entered: [space]

Testing the character with the cctype library functions:
------------------------------------------------------------

The character [space] is not an alphanumeric character.
The character [space] is not an alphabetic character.
The character [space] is not a digit.
The character [space] is not a hexadecimal digit.
The character [space] is not a lowercase letter.
The character [space] is not an uppercase letter.
The character [space] is a whitespace character.
The character [space] is a blank character.
The character [space] is not a control character.
The character [space] is not a punctuation character.
The character [space] is a printable character.

Character Conversions
The character [space] is not a letter and cannot be converted to lowercase or uppercase.

--------------------------------
Process exited after 16.68 seconds with return value 0
Press any key to continue . . .
```

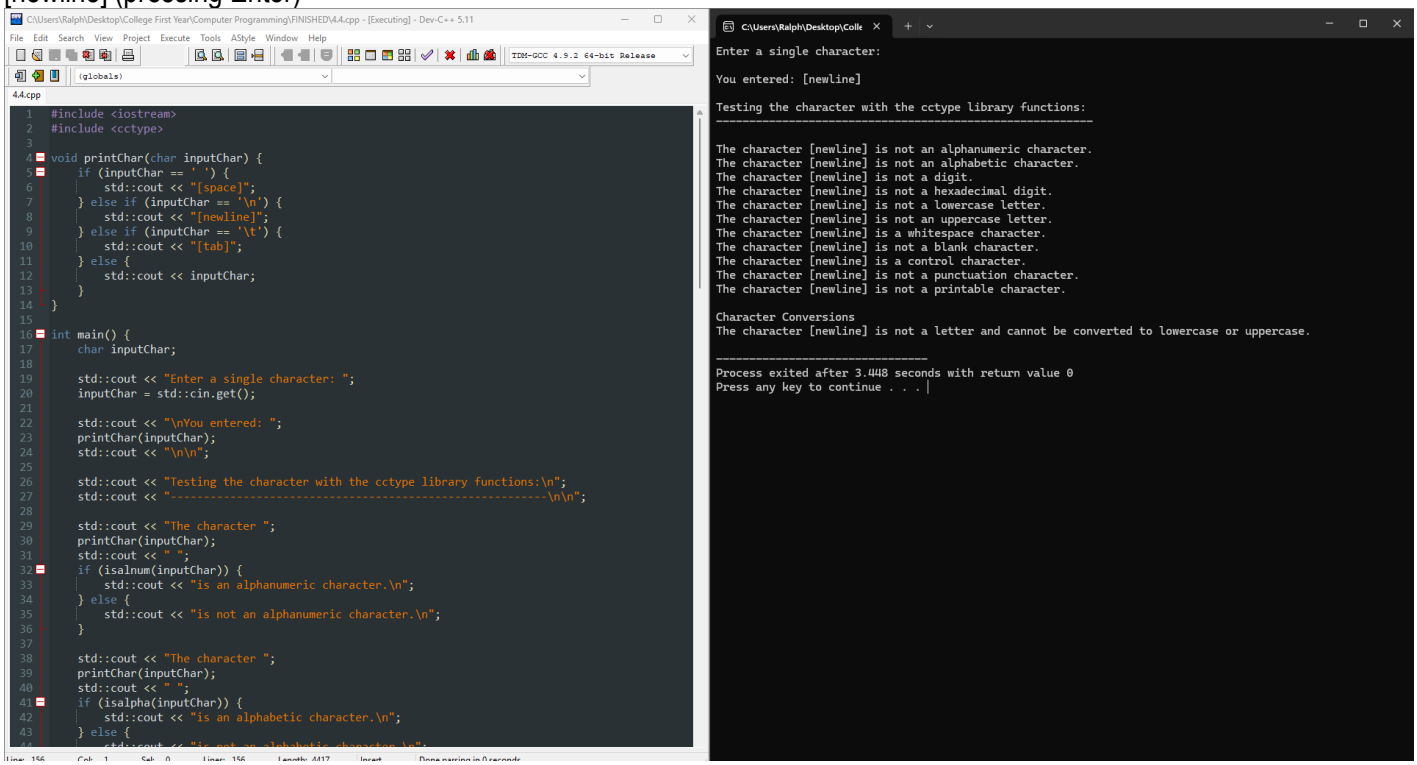
[tab]



```
#include <iostream>
#include <cctype>

void printChar(char inputChar) {
    if (inputChar == ' ') {
        std::cout << "[space]";
    } else if (inputChar == '\n') {
        std::cout << "[newline]";
    } else if (inputChar == '\t') {
        std::cout << "[tab]";
    } else {
        std::cout << inputChar;
    }
}

int main() {
    char inputChar;

    std::cout << "Enter a single character: ";
    inputChar = std::cin.get();

    std::cout << "\nYou entered: ";
    printChar(inputChar);
    std::cout << "\n\n";

    std::cout << "Testing the character with the cctype library functions:\n";
    std::cout << "------------------------------------------------------------\n\n";

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
    if (isalnum(inputChar)) {
        std::cout << "is an alphanumeric character.\n";
    } else {
        std::cout << "is not an alphanumeric character.\n";
    }

    std::cout << "The character ";
    printChar(inputChar);
    std::cout << " ";
    if (isalpha(inputChar)) {
        std::cout << "is an alphabetic character.\n";
    } else {
```

```
Enter a single character:

You entered: [tab]

Testing the character with the cctype library functions:
------------------------------------------------------------

The character [tab] is not an alphanumeric character.
The character [tab] is not an alphabetic character.
The character [tab] is not a digit.
The character [tab] is not a hexadecimal digit.
The character [tab] is not a lowercase letter.
The character [tab] is not an uppercase letter.
The character [tab] is a whitespace character.
The character [tab] is a blank character.
The character [tab] is a control character.
The character [tab] is not a punctuation character.
The character [tab] is not a printable character.

Character Conversions
The character [tab] is not a letter and cannot be converted to lowercase or uppercase.

--------------------------------
Process exited after 1.118 seconds with return value 0
Press any key to continue . . .
```

[newline] (pressing Enter)



```
Enter a single character:

You entered: [newline]

Testing the character with the cctype library functions:
------------------------------------------------------------

The character [newline] is not an alphanumeric character.
The character [newline] is not an alphabetic character.
The character [newline] is not a digit.
The character [newline] is not a hexadecimal digit.
The character [newline] is not a lowercase letter.
The character [newline] is not an uppercase letter.
The character [newline] is a whitespace character.
The character [newline] is a blank character.
The character [newline] is a control character.
The character [newline] is not a punctuation character.
The character [newline] is not a printable character.

Character Conversions
The character [newline] is not a letter and cannot be converted to lowercase or uppercase.

--------------------------------
Process exited after 3.448 seconds with return value 0
Press any key to continue . . .
```

ANALYSIS:

We must first add our heads <iostream> for basic input/output (cin,cout) and <cctype> to be able to use the 13 functions for the code.

```
void printChar(char inputChar) {
    if (inputChar == ' ') {
        std::cout << "[space]";
    } else if (inputChar == '\n') {
        std::cout << "[newline]";
    } else if (inputChar == '\t') {
        std::cout << "[tab]";
    } else {
        std::cout << inputChar;
    }
}
```

This is the helper function this will be able to print out the non-printable characters. Instead of ‘ ‘ it will print out [space] to indicate that we input a space as our character and same goes for the [newline] and [tab]. If we don’t implement this it will print out literally nothing but a blank space and we won’t be able to identify whether that is a space, tab or newline.

The next line of code is where we will declare inputChar as a char type and after that it will ask the user for a single character input. Instead of std::cin>> inputChar we’ll be using inputChar = std::cin.get() this will allow the user to input anything as our character and that includes space, tab and newline (this is used so we can showcase the functions isspace, isblank, iscntrl and isprint). After the user inputs their desired character it will display what character, they have chosen. printChar(inputChar) is used to handle the special cases for space, tab, and newline. Instead of rewriting the same block of code every time we want to print a character, we put that logic inside the printChar function.

```
std::cout << "\nYou entered: ";
printChar(inputChar);
std::cout << "\n\n";
```

Now, this is where we’ll be testing all the functions, isalnum will check if it’s a either a letter or a number, if it’s a letter/number it will print out “is an alphanermic character” and “is not an alphanumeric character” if the inputted character is not a letter or a number. Isalpha will check if the character is a letter (a to z), isdigit will check if it’s a number (0-9 only because we are asking for a single character only) and isxdigit will check if it’s a hexadecimal digit (0-9, a-f, A- F). The

islower will check if the if the character is a lowercase letter and isuppercase will check if it's an uppercase. The isspace will check if it is whitespace or in other terms in any kind of space that is including [newline] while isblank is specifically space or tab only. iscntrl will check if the character is a control character these are non-printable characters that don't represent characters like \n and \t this won't output anything but blank spaces/whitespace. The ispunct function will check if it's a punctuation (, . ! and ?) and isprint will check if the character will be visible in the out of the code like for example the letter "N" this will show in a output if you use cout but if you follow that with "\n" it won't be printed because it's just space to go the next line of code not something that can be printed. In every function it will print out the string "The character" first followed by inputChar and the conditions from the printChar (inputChar) then string whether the character is true or false for that function (is or is not).

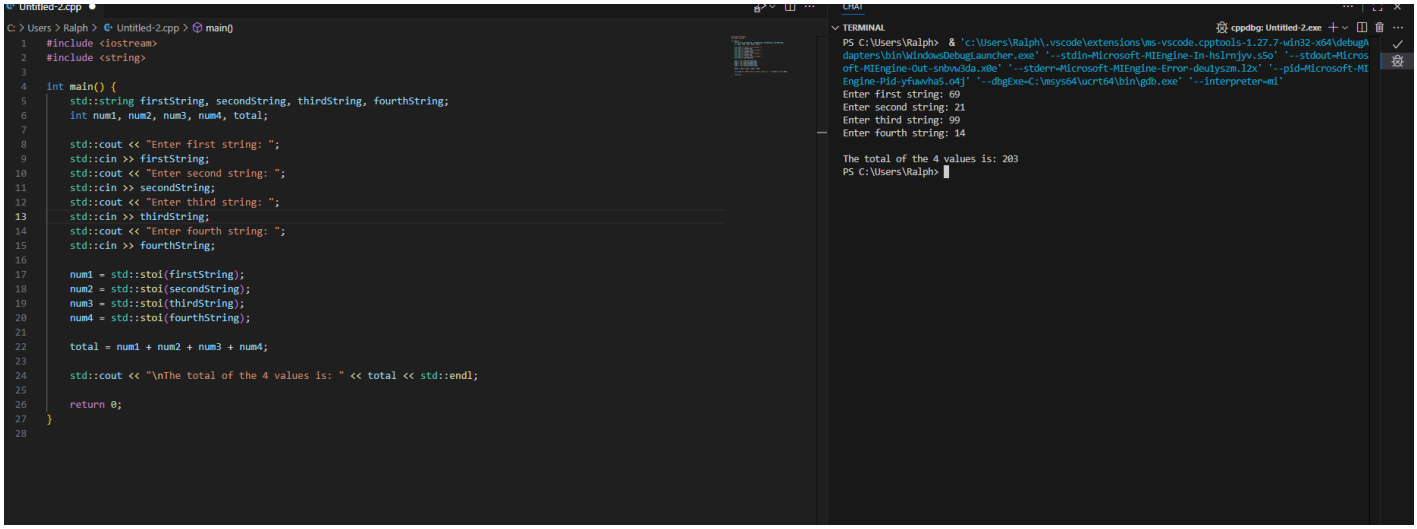
Now for the character conversions, it will print out the text that explains what is show below which is "\nCharacter Conversions" then by using isalpha it will identify whether the character is a letter or not because only letters can be converted (this was my preference). It will print "Converting the character" followed by character that was inputted (with the conditions of printChar) then print "to lowercase". If the character is already lowercase it will print the inputChar with the follow text saying "(already lowercase)" else will proceed to the conversion (the same concept applies to the uppercase characters). However, if the character that was inputted is not a letter it will print the inputChar which is the character that was inputted by the user with the string " is not a letter and cannot be converted to lowercase or uppercase.\n".

3. Write a program that inputs 4 strings that represent integers, converts the strings to integers, sums the values and prints the total of the 4 values.

CODE:

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

int main() {
    std::string firstString, secondString, thridString, fourthString;
    int num1, num2, num3, num4, total;

    std::cout << "Enter first string: ";
    std::cin >> firstString;
    std::cout << "Enter second string: ";
    std::cin >> secondString;
    std::cout << "Enter third string: ";
    std::cin >> thridString;
    std::cout << "Enter fourth string: ";
    std::cin >> fourthString;

    num1 = std::stoi(firstString);
    num2 = std::stoi(secondString);
    num3 = std::stoi(thirdString);
    num4 = std::stoi(fourthString);

    total = num1 + num2 + num3 + num4;

    std::cout << "\nThe total of the 4 values is: " << total << std::endl;

    return 0;
}
```

RESULT:



ANALYSIS:

We have our usual header which is the <iostream> to have our inputs and outputs (cin and cout) but here we have <string> this will allow us to use stoi (string to integer) for us to create the code for this task. We have our int main followed by our variables, we declare the following variables as a string (firstString, secondString, thridString, fourthString)l and for us to be able to convert these strings into integers we need our integer variables which is num1, num2, num3, num4, and total variable to calculate for the sum of all the strings when we convert it to an integer. The user is then asked to input the 4 strings and after the 4 strings have been inputted into the program it will then convert these strings into integers.using stoi.

```
num1 = std::stoi(firstString);
num2 = std::stoi(secondString);
num3 = std::stoi(thridString);
num4 = std::stoi(fourthString);
```

After converting the string into an integer, it will then move on to the next task of finding the total, and this is where our total variable comes into play where it will add everything. After it adds everything by doing total = num1 + num2 + num3 + num4 it will then display “"\nThe total of the 4 values is: " the \n is for spacing then prints the total value of the string.

Conclusion

This hands-on activity was very difficult for me to perform because it took me so long to fix my if-else statements because I wanted to do something a little extra (this resulted in me passing this late). Due to that reason the code was very long, so it took me so much more time to scroll up and down to check for errors and so many headaches. That is until I used the void function after like 30 minutes of trying to figure out how to make my code shorter or more readable. I realized I could use this function to add the parameters/conditions I need to print the space, tab, and newline on each function from the <cctype> library. The problem was it took me about an hour to understand it, and till now I’m still quite confused about how to use it effectively, but I get the gist of it at least. Another thing that took me so long was the conversions; I was tinkering so much with it by adding possible outcomes like if the character is already a lowercase character, it will output “(already lowercase),” and then I did the same thing for the uppercase. After that I added the possibility that the character might not be a letter, so I added "is not a letter and cannot be converted to lowercase or uppercase.\n" if the character input was not a letter. Of course, with this activity I was able to familiarize myself with all 13 <cctype> functions (I mean, not all of course because there are more, but the common ones at least). Using the function stoi was kind of easy for this activity, but what took me an hour (yes, an hour) was me trying to understand what the point was of using stoi when I could’ve just used the int variables to store the values and then the total variable to essentially get the same output. I’ve realized later on the reason why it is like this is because computers see numbers as text first, so instead of 45 it will be “45,” so after realizing that it gave me a deeper understanding of why we need to use this function (I would provide the article for it, but I had like 30+ tabs open because of this activity). I’ve also learned to download VS code (I don’t why it was complicated) because Dev C++ doesn’t support the function stoi apparently and the rain certainly didn’t help with the

download speeds. Did I do well in this activity? I'd say I managed to get through it. I will say that it wasn't the smoothest experience, but it wasn't the worst because I know in the future I'll be going through worse. I guess the thing I need to improve after performing this activity is just time management because trying to understand code takes a long time with determination, and I pray as I go further on my coding journey, I can practice discipline to learn code at a deeper level.