

CSCI 140 PA 4 Submission

Due Date:3/24/2025 Late (date and time):_____

Name(s):Ean Zheng

Exercise 1 – 5.25 LAB: Middle item; can use an array or a vector

The screenshot displays the zyBooks lab environment for '5.25 LAB: Middle item'. The lab description states: 'Given a sorted list of integers, output the middle integer. A negative number indicates the end of the input (the negative number is not a part of the sorted list). Assume the number of integers is always odd. Ex: If the input is: 2 3 4 8 11 -1 the output is: Middle item: 4'. The maximum number of list values for any test case should not exceed 9. The hint suggests reading data into a vector and finding the middle item.

The code in `main.cpp` is as follows:

```
1 //Modified by: Ean Zheng
2 #include <iostream>
3 #include <vector> // Must include vector library to use vectors
4 using namespace std;
5
6 int main() {
7
8     int list[9];
9
10    int i = 0;
11    int index = 0;
12    cin >> i;
13    while(i >= 0 && index <= 9){
14        if(index == 9){
15            cout << "Too many numbers" << endl;
16            return 0;
17        }
18        list[index] = i;
19        index++;
20        cin >> i;
21    }
22    cout << "Middle item: " << list[index/2] << endl;
23    return 0;
24 }
25
```

The console output shows the input sequence: 2 3 4 8 11 -1, followed by the output: Middle item: 45. Below the code editor, the submission status is shown as 'Submitted for grading'. The coding trail indicates the submission was made on 3/23 at 2:23 PM PDT. The latest submission passed all tests with a total score of 10/10.

Exercise 2 – 5.29 LAB: Word frequencies

zBooks My library > CSCI 140: C++ Language and Object Development home > 5.29: LAB: Word frequencies

LAB ACTIVITY | 5.29.1: LAB: Word frequencies | Full screen | 10 / 10

Write a program that reads a list of words. Then, the program outputs those words and their frequencies. The input begins with an integer indicating the number of words that follow. Assume that the list will always contain fewer than 20 words.

Ex: If the input is:

```
5 hey hi Mark hi mark
```

the output is:

```
hey - 1  
hi - 2  
Mark - 1  
hi - 2  
mark - 1
```

Hint: Use two vectors, one vector for the strings and one vector for the frequencies.

Open new tab | Dock

History Tutorial

```
main.cpp  
1 //Modified by: Ean Zheng  
2 #include <iostream>  
3 #include <vector>  
4 #include <string>  
5 using namespace std;  
6  
7 int main() {  
8  
9     vector<string> names;  
10    vector<int> frequencies;  
11    int occurrences;  
12    cin >> occurrences;  
13    for(int i = 0; i < occurrences; ++i){  
14        string x;  
15        cin >> x;  
16        int freq = 1;  
17        for(int j = 0; j < names.size(); ++j){  
18            if(x == names.at(j)){  
19                frequencies.at(j)++;  
20                freq = frequencies.at(j);  
21            }  
22            names.push_back(x);  
23            frequencies.push_back(freq);  
24        }  
25    }  
26  
27    for(int i = 0; i < occurrences; ++i){  
28        cout << names.at(i) << " - " << frequencies.at(i) << endl;  
29    }  
30    return 0;  
31 }  
32 }
```

DESKTOP CONSOLE

hi - 2
mark - 1

Submit for grading

Coding trail of your work What is this?

3/23 0 0, 0, 0, 0 ----- 6, 10 min: 30

Latest submission - 6:16 PM PDT on 03/23/25 Submission passed all tests ✓ Total score: 10 / 10 Only show failing tests Open submission's code

Exercise 3 – 5.35 LAB: Warm up: People's weights (Arrays)

LAB ACTIVITY 5.35.1 LAB: Warm up: People's weights (Arrays) Full screen 6 / 6

Program Specifications Write a program that reads five people's weights from the user input and outputs the statistics of the weights.
Note: This program is designed for incremental development. Complete each step and submit for grading before starting the next step. Only a portion of tests pass after each step but confirm progress.

Step 1 (2 pts): Read and verify user input.

Prompt the user to enter five numbers, being five people's weights. Store the numbers in an array of doubles. Output the array's numbers in one line, each number followed by one space. Submit for grading to confirm 2 tests pass.
Note: Output each floating-point value with two digits after the decimal point, which can be achieved by executing `cout << fixed << setprecision(2);` once before all other `cout` statements.
Ex: If the input is:

```
Enter weight 1:
236.0
Enter weight 2:
89.5
Enter weight 3:
142.0
Enter weight 4:
166.4
Enter weight 5:
93.0
```

the output is:

```
You entered: 236.00 89.50 142.00 166.40 93.00
```

Step 2 (1 pt): Output the total weight, by summing the array's elements.

Submit for grading to confirm 3 tests pass.
Ex: With the same example input as in Step 1, the output is:

```
You entered: 236.0 89.5 142.0 166.4 93.0
Total weight: 726.90
```

Step 2 (1 pt): Output the total weight, by summing the array's elements.

Submit for grading to confirm 3 tests pass.
Ex: With the same example input as in Step 1, the output is:

```
You entered: 236.0 89.5 142.0 166.4 93.0
Total weight: 726.90
```

Step 3 (1 pt): Output the average of the weights.

Submit for grading to confirm 4 tests pass.
Ex: With the same example input as in Step 1, the output is:

```
You entered: 236.0 89.5 142.0 166.4 93.0
Total weight: 726.90
Average weight: 145.38
```

Step 4 (2 pt): Output the maximum weight.

Submit for grading to confirm all tests pass.
Ex: With the same example input as in Step 1, the output is:

```
You entered: 236.0 89.5 142.0 166.4 93.0
Total weight: 726.90
Average weight: 145.38
Max weight: 236.00
```

Code Editor:

```
main.cpp
1 #include <iostream>
2 #include <iomanip>
3 using namespace std;
// For setprecision
```

Buttons: Run, Open new tab, Dock, History, Tutorial

zyBooks My library > CSCI 140: C++ Language and Object Development home > 5.35: LAB: Warm up: People's weights (Arrays)

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main.cpp

```
1 #include <iostream>
2 #include <iomanip> // For setprecision
3 using namespace std;
4
5 int main() {
6     double weights[5];
7     double total = 0;
8     double average;
9     double max = 0;
10    for (int i = 0; i < 5; i++){
11        cout << "Enter weight: " << i << " " << endl;
12        cin >> weights[i];
13        if (weights[i] > max) max = weights[i];
14        total += weights[i];
15    }
16
17    average = total/5;
18    cout << "You entered: " << fixed << setprecision(2);
19    for (int i = 0; i < 5; i++){
20        cout << weights[i] << " ";
21    }
22
23    cout << endl << endl;
24    cout << "Total weight: " << total << endl;
25    cout << "Average weight: " << average << endl;
26    cout << "Max weight: " << max;
27
28    return 0;
29 }
```

DESKTOP CONSOLE

```
Enter weight 4:
166.4
Enter weight 5:
93.0
You entered: 236.0 89.5 142.0 166.4 93.0

Total weight: 726.90
Average weight: 145.38
Max weight: 236.00
```

zyBooks My library > CSCI 140: C++ Language and Object Development home > 5.35: LAB: Warm up: People's weights (Arrays)

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```
15 }
16
17 average = total/5;
18 cout << "You entered: " << fixed << setprecision(2);
19 for (int i = 0; i < 5; i++){
20     cout << weights[i] << " ";
21 }
22
23 cout << endl << endl;
24 cout << "Total weight: " << total << endl;
25 cout << "Average weight: " << average << endl;
26 cout << "Max weight: " << max;
27
28 return 0;
29 }
```

DESKTOP CONSOLE

```
Enter weight 4:
166.4
Enter weight 5:
93.0
You entered: 236.0 89.5 142.0 166.4 93.0

Total weight: 726.90
Average weight: 145.38
Max weight: 236.00
```

Submit for grading

Coding trail of your work [What is this?](#)

3/23 0 -- 0,6 min:13

Latest submission - 6:42 PM PDT on 03/23/25 Submission passed all tests ✓ Total score: 6 / 6

☐ Only show failing tests [Open submission's code](#)

1: Compare output 1 / 1

Exercise 4 – Large Integers – more points for this exercise

If you need to work with very large integers such as applications in data encryption and decryption, you may not be able to use data type `int` or even the new `long long int`. A string or an array of integers can be used to store a large integer, but it is easier to perform basic arithmetic operations with an array or vector of integers. There are many ways you can store the digits in an array or vector: `{1, 2, 3, 4, 0 ... 0}`, `{4, 3, 2, 1, 0 ... 0}`, or `{0 ... 0, 1, 2, 3, 4,}`. For this exercise, the integer 1234 **MUST** be stored in an `int` array `a` or `int` vector `a` by setting `a[0]` to 4, `a[1]` to 3, `a[2]` to 2, and `a[3]` to 1 and the number of digits (4) can be stored in a separate variable (the second way). Unused digits will be initialized to 0 and you might need a variable such as `numDigits` or `lastIndex` to keep track of the number of actual digits.

Source code below:

```
/* Program: Large Integers Program for Exercise 4, PA Submission 4
   Author: Ean Zheng
   Class: CSCI 140
   Date: 3/23/2025
   Description:
   I certify that the code below is my own work.
   Exception(s): N/A
*/
#include <cstring>
#include <iostream>

using namespace std;

int main()
{
    cout << "Author: Ean Zheng" << endl;
    int array[25];
    char cstring[26];

    cout << "Enter a large integer up to 25 digits ---> ";
    cin >> cstring;

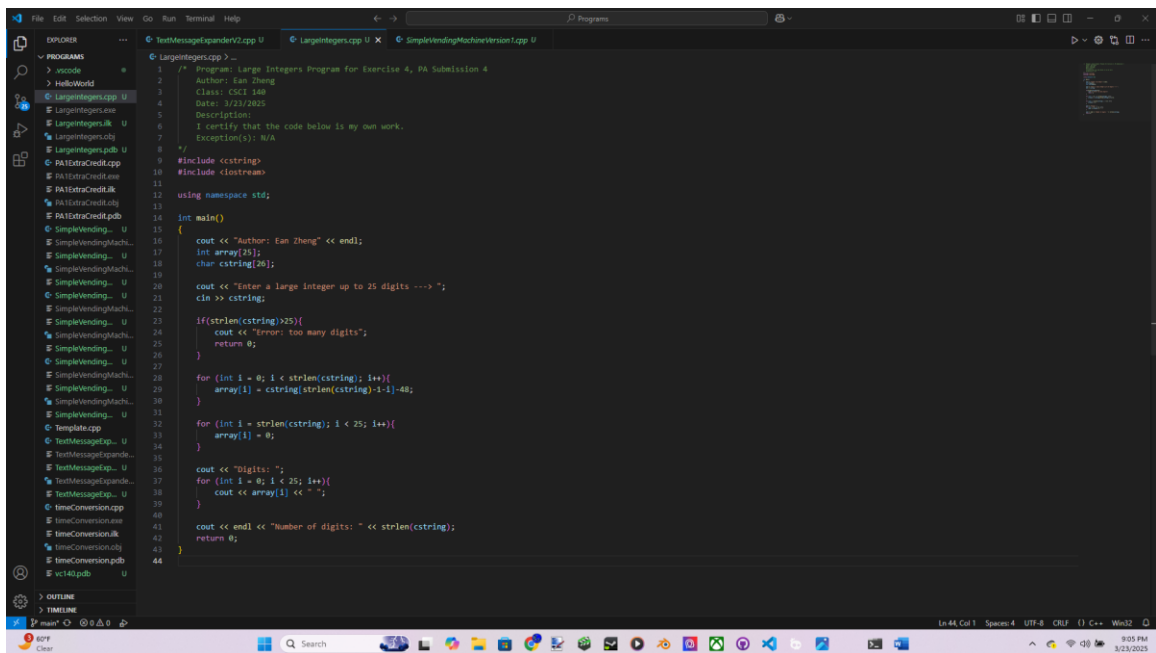
    if(strlen(cstring)>25){
        cout << "Error: too many digits";
        return 0;
    }

    for (int i = 0; i < strlen(cstring); i++){
        array[i] = cstring[strlen(cstring)-1-i]-48;
    }

    for (int i = strlen(cstring); i < 25; i++){
        array[i] = 0;
    }

    cout << "Digits: ";
    for (int i = 0; i < 25; i++){
        cout << array[i] << " ";
    }

    cout << endl << "Number of digits: " << strlen(cstring);
    return 0;
}
```



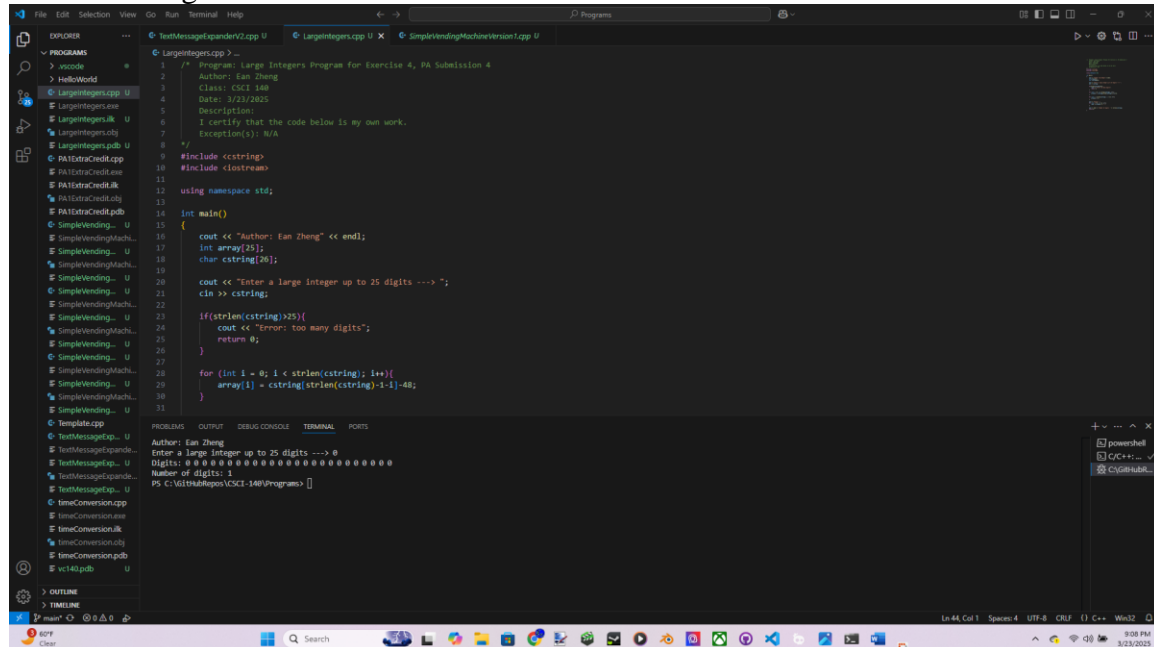
Input/output below:

Author: Ean Zheng

Enter a large integer up to 25 digits ---> 0

Digits: 0

Number of digits: 1



```
1  /* Program: Large Integers Program for Exercise 4, PA Submission 4
2  Author: Ean Zheng
3  Class: CSCE 140
4  Date: 3/23/2025
5  Description:
6  I certify that the code below is my own work.
7  Exception(s): N/A
8  */
9  #include <string>
10 #include <iostream>
11
12 using namespace std;
13
14 int main()
15 {
16     cout << "Author: Ean Zheng" << endl;
17     int array[25];
18     char cstring[26];
19
20     cout << "Enter a large Integer up to 25 digits ---> ";
21     cin >> cstring;
22
23     if(strlen(cstring)>25){
24         cout << "Error: too many digits";
25         return 0;
26     }
27
28     for (int i = 0; i < strlen(cstring); i++){
29         array[i] = cstring[strlen(cstring)-i-1]-48;
30     }
31 }
```

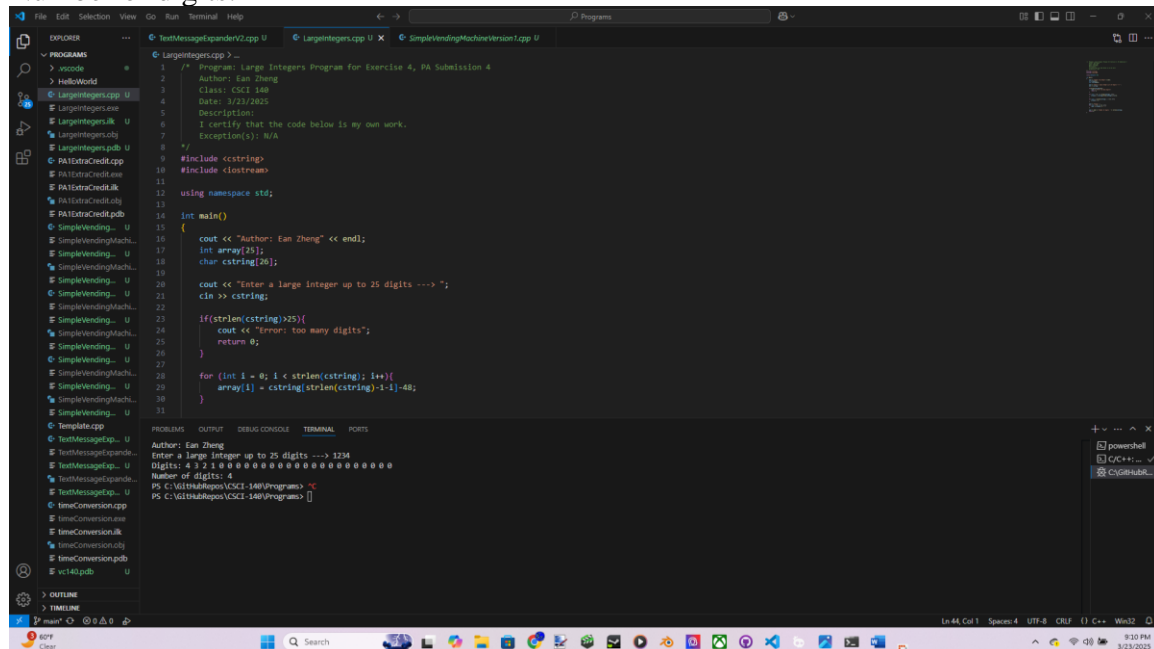
Author: Ean Zheng
Enter a large Integer up to 25 digits ---> 0
Digits: 0
Number of digits: 1
PS C:\Git\HRepo\VCSC1-140\Programs>

Author: Ean Zheng

Enter a large integer up to 25 digits ---> 1234

Digits: 4 3 2 1 0

Number of digits: 4



```
1  /* Program: Large Integers Program for Exercise 4, PA Submission 4
2  Author: Ean Zheng
3  Class: CSCE 140
4  Date: 3/23/2025
5  Description:
6  I certify that the code below is my own work.
7  Exception(s): N/A
8  */
9  #include <string>
10 #include <iostream>
11
12 using namespace std;
13
14 int main()
15 {
16     cout << "Author: Ean Zheng" << endl;
17     int array[25];
18     char cstring[26];
19
20     cout << "Enter a large Integer up to 25 digits ---> ";
21     cin >> cstring;
22
23     if(strlen(cstring)>25){
24         cout << "Error: too many digits";
25         return 0;
26     }
27
28     for (int i = 0; i < strlen(cstring); i++){
29         array[i] = cstring[strlen(cstring)-i-1]-48;
30     }
31 }
```

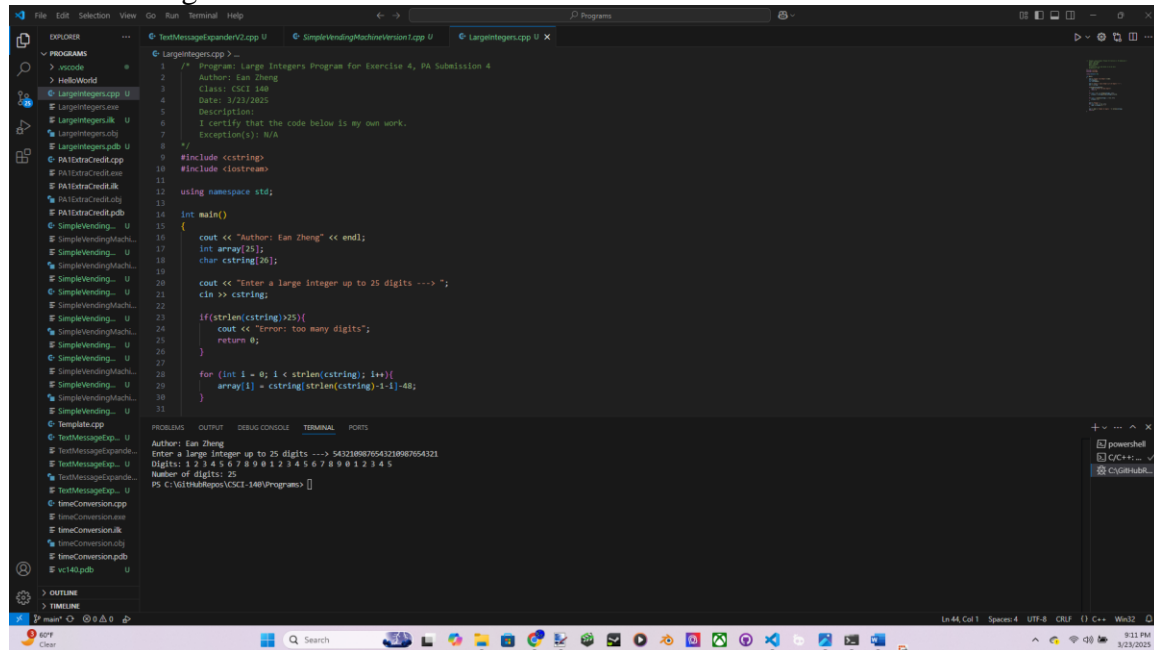
Author: Ean Zheng
Enter a large Integer up to 25 digits ---> 1234
Digits: 4 3 2 1 0
Number of digits: 4
PS C:\Git\HRepo\VCSC1-140\Programs>

Author: Ean Zheng

Enter a large integer up to 25 digits ---> 5432109876543210987654321

Digits: 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5

Number of digits: 25



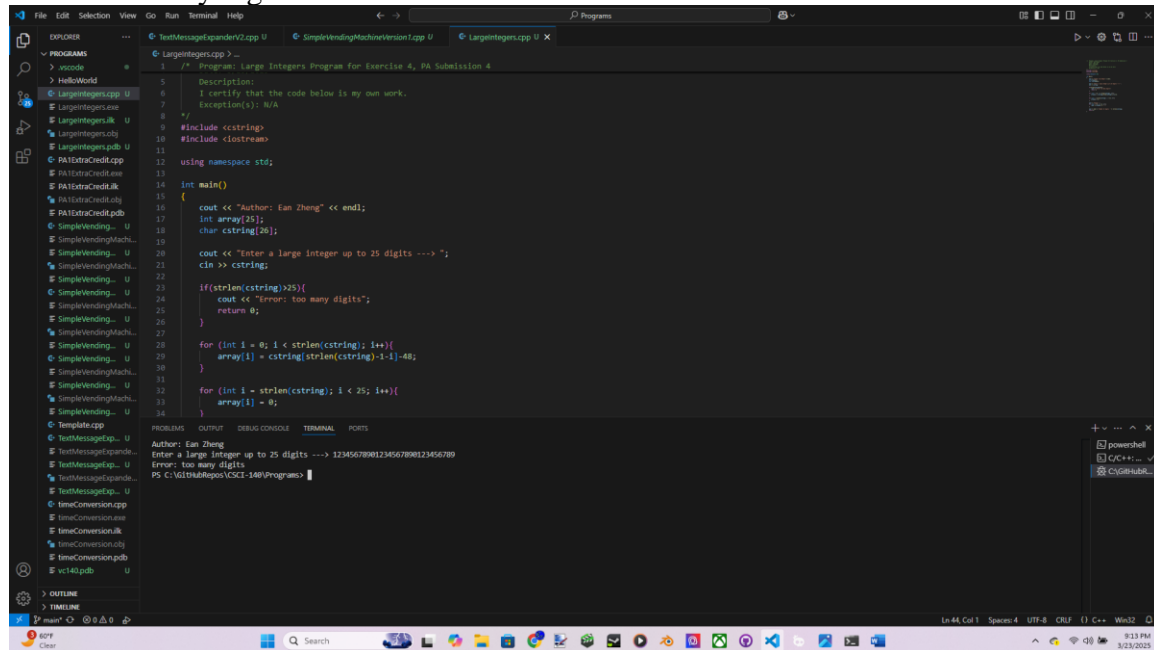
```
1 // Program: Large Integers Program for Exercise 4, PA Submission 4
2
3 Class: CSCI 140
4 Date: 3/23/2025
5 Description:
6 I certify that the code below is my own work.
7 Exception(s): N/A
8
9 #include <string>
10 #include <iostream>
11
12 using namespace std;
13
14 int main()
15 {
16     cout << "Author: Ean Zheng" << endl;
17     int array[25];
18     char cstring[26];
19
20     cout << "Enter a large integer up to 25 digits ---> ";
21     cin >> cstring;
22
23     if(strlen(cstring)>25){
24         cout << "Error: too many digits";
25         return 0;
26     }
27
28     for (int i = 0; i < strlen(cstring); i++){
29         array[i] = cstring[strlen(cstring)-i-1]-48;
30     }
31 }
```

Author: Ean Zheng
Enter a large integer up to 25 digits ---> 5432109876543210987654321
Digits: 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
Number of digits: 25
PS C:\Git\Repos\CSCI-140\Programs>

Author: Ean Zheng

Enter a large integer up to 25 digits ---> 12345678901234567890123456789

Error: too many digits



```
5 Description:
6 I certify that the code below is my own work.
7 Exception(s): N/A
8
9 #include <string>
10 #include <iostream>
11
12 using namespace std;
13
14 int main()
15 {
16     cout << "Author: Ean Zheng" << endl;
17     int array[25];
18     char cstring[26];
19
20     cout << "Enter a large integer up to 25 digits ---> ";
21     cin >> cstring;
22
23     if(strlen(cstring)>25){
24         cout << "Error: too many digits";
25         return 0;
26     }
27
28     for (int i = 0; i < strlen(cstring); i++){
29         array[i] = cstring[strlen(cstring)-i-1]-48;
30     }
31
32     for (int i = strlen(cstring); i < 25; i++){
33         array[i] = 0;
34     }
35 }
```

Author: Ean Zheng
Enter a large integer up to 25 digits ---> 12345678901234567890123456789
Error: too many digits
PS C:\Git\Repos\CSCI-140\Programs>

Question 1: Although C++ vectors can be more productive (getting things done quicker), list some good reasons for learning and using arrays instead of C++ vectors.

Arrays are more compact and use less space, and their set size are desirable for some cases. They also don't require additional stl headers, reducing compile time. Fixed size arrays can also be directly embedded, improving memory locality and reducing the amount of heap allocations that are needed.

Question 2: Given two int arrays with the same size, arrX and arrY, you simply cannot copy array arrY to array arrX with "arrX = arrY;". Explain why not. How would you go about copying arrY to arrX?

You can't copy one same-size array to another with a simple assignment because they have multiple values/instances. Simple assignment only works on two simple and exact instances, and don't work for multiple at once. I would copy arrY to arrX with a for loop that indexes and accesses the values of the two arrays, and assigns them each one by one until the number of iterations reaches the arrays' sizes.

Extra Credit (2 points): Start with 5.30 (LAB: Contains the character) in zyBook first and then modify it so that it does not display the trailing comma. You can copy the source code from zyBook to your development environment and then modify it. Make sure to provide the source code and sample input/output.

Ex: If the input is:

4

hello zoo sleep drizzle

z

then the output is:

zoo,drizzle

Source Code:

```
//Modified by: Ean Zheng
```

```
#include <iostream>
```

```
#include <vector>
```

```
using namespace std;
```

```
int main() {
```

```
    vector<string> list;
```

```
    int size;
```

```
    cin >> size;
```

```
    for (int i = 0; i < size; ++i) {
```

```
        string s;
```

```
        cin >> s;
```

```
        list.push_back(s);
```

```
    }
```

```
    char specialChar;
```

```
    bool first = true;
```

```
    cin >> specialChar;
```

```
    for (int i = 0; i < size; ++i) {
```

```
        if(list.at(i).find(specialChar) != string::npos){
```

```
            if(!first)
```

```
                cout << ",";
```

```
            else
```

```
                first = false;
```

```
            cout << list.at(i);
```

```
        }
```

```
    }
```

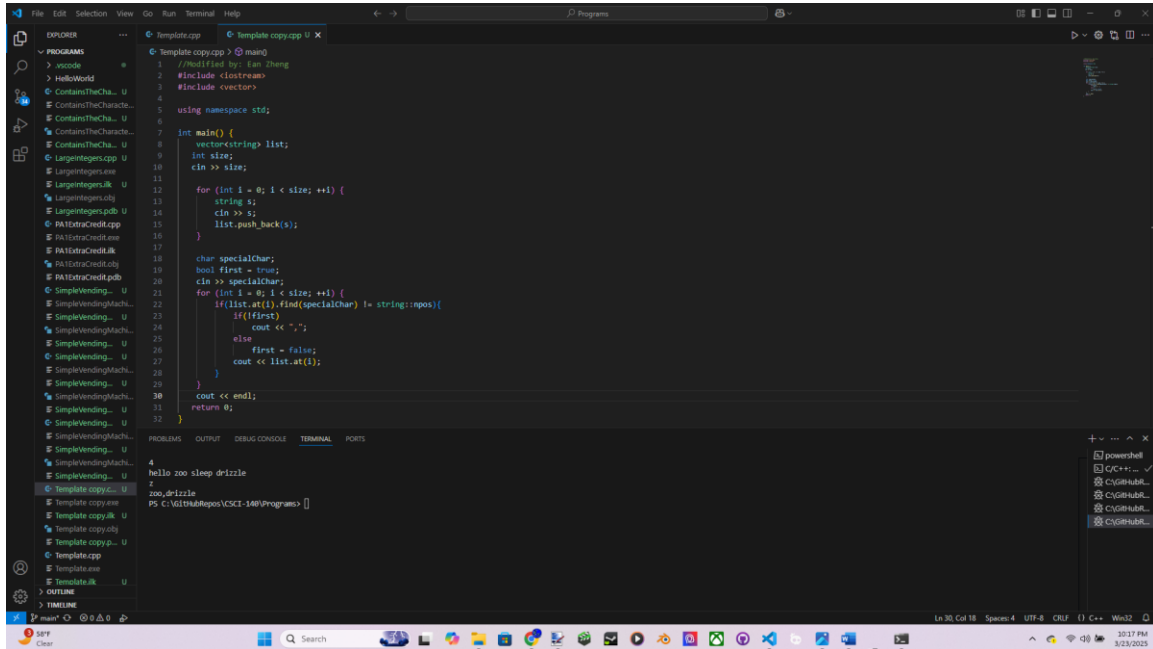
```
    cout << endl;
```

```
    return 0;
```

```
}
```

Input/Output:

4
hello zoo sleep drizzle
Z
zoo,drizzle



The screenshot shows a Visual Studio Code editor window with a C++ file named `Template.cpp`. The code is as follows:

```
1 //Postfired by: Ian Zhang
2 #include <iostream>
3 #include <vector>
4
5 using namespace std;
6
7 int main() {
8     vector<string> list;
9     int size;
10    cin >> size;
11
12    for (int i = 0; i < size; ++i) {
13        string s;
14        cin >> s;
15        list.push_back(s);
16    }
17
18    char specialChar;
19    bool first = true;
20    cin >> specialChar;
21    for (int i = 0; i < size; ++i) {
22        if (list.at(i).find(specialChar) != string::npos) {
23            if (first)
24                cout << ",";
25            else
26                first = false;
27            cout << list.at(i);
28        }
29    }
30    cout << endl;
31    return 0;
32 }
```

The output of the program is shown in the terminal window at the bottom:

```
4
hello zoo sleep drizzle
Z
zoo,drizzle
```

The terminal window title is `PS C:\GitHub\repos\VCSCI-140\Programs>`. The status bar at the bottom indicates the file is `Template.cpp`, line 30, column 18, with a UTF-8 encoding and CRLF line endings.