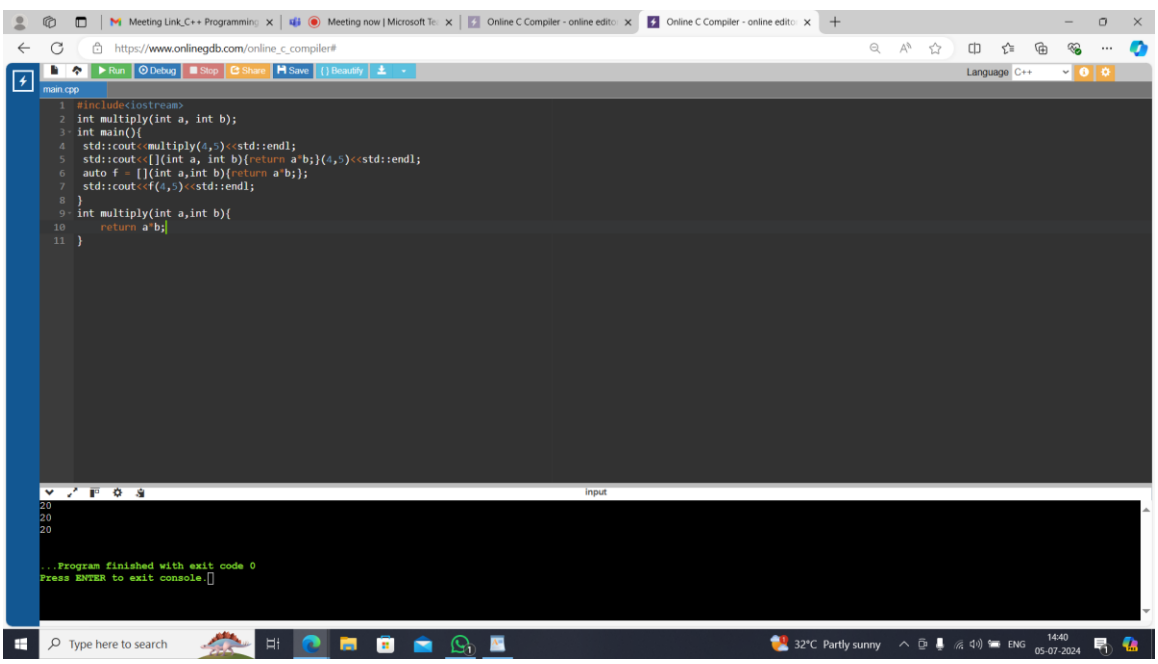
**LAMBDA EXPRESSION :-**

```
#include<iostream>

int multiply(int a, int b);

int main(){

  std::cout<<multiply(4,5)<<std::endl;

  std::cout<<[](int a, int b){return a*b;}(4,5)<<std::endl;

  auto f = [](int a,int b){return a*b;};

  std::cout<<f(4,5)<<std::endl;

}

int multiply(int a,int b){

        return a*b;

}
```

OUTPUT :-

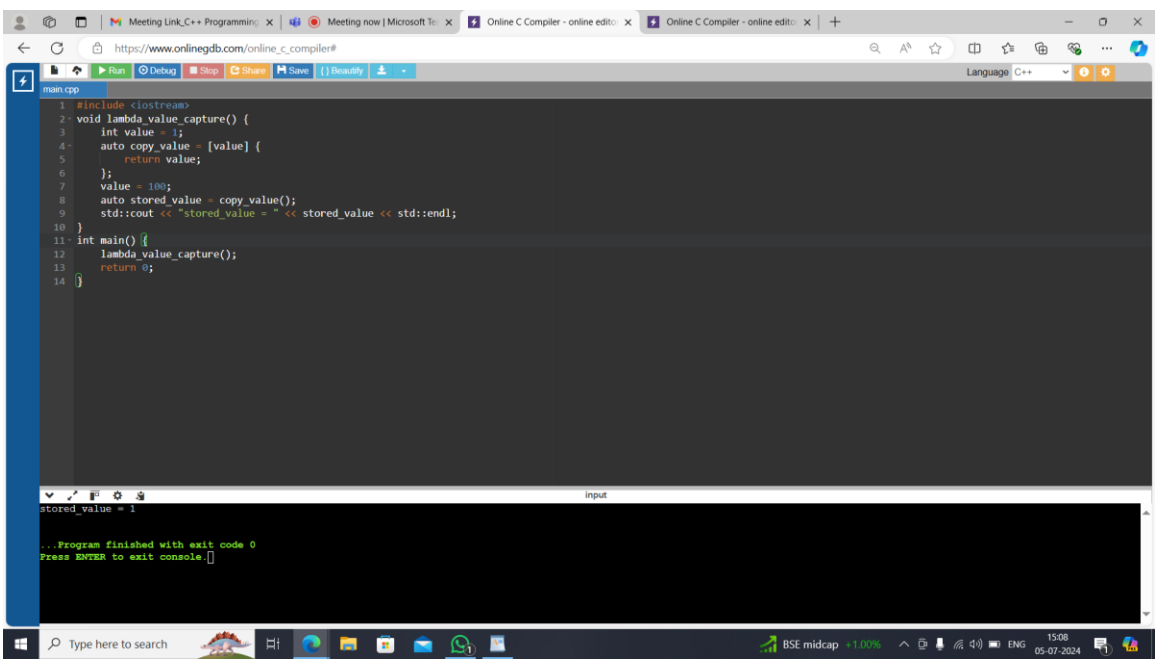



**CAPTURE BY VALUE :-**

```
#include <iostream>

void lambda_value_capture() {
```

```
    int value = 1;
    auto copy_value = [value] {
        return value;
    };
    value = 100;
    auto stored_value = copy_value();
    std::cout << "stored_value = " << stored_value << std::endl;
}
int main() {
    lambda_value_capture();
    return 0;
}
```

OUTPUT :-

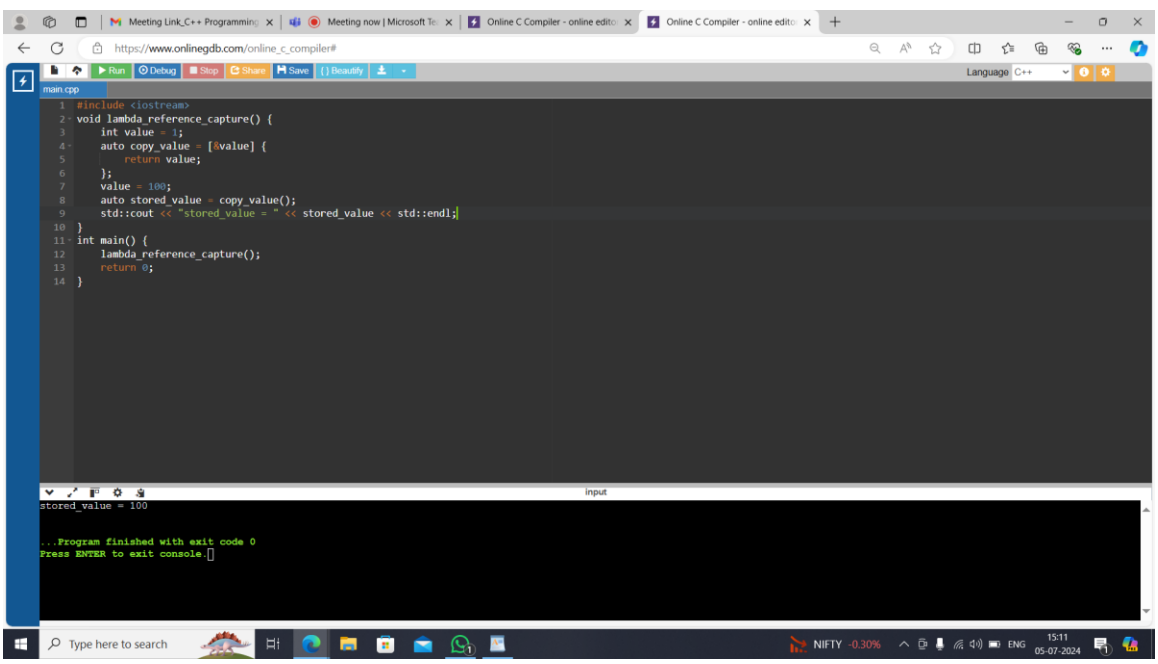



**REFERENCE CAPTURE :-**

```
#include <iostream>
void lambda_reference_capture() {
```

```
    int value = 1;
    auto copy_value = [&value] {
        return value;
    };
    value = 100;
    auto stored_value = copy_value();
    std::cout << "stored_value = " << stored_value << std::endl;
}
int main() {
    lambda_reference_capture();
    return 0;
}
```

OUTPUT :-

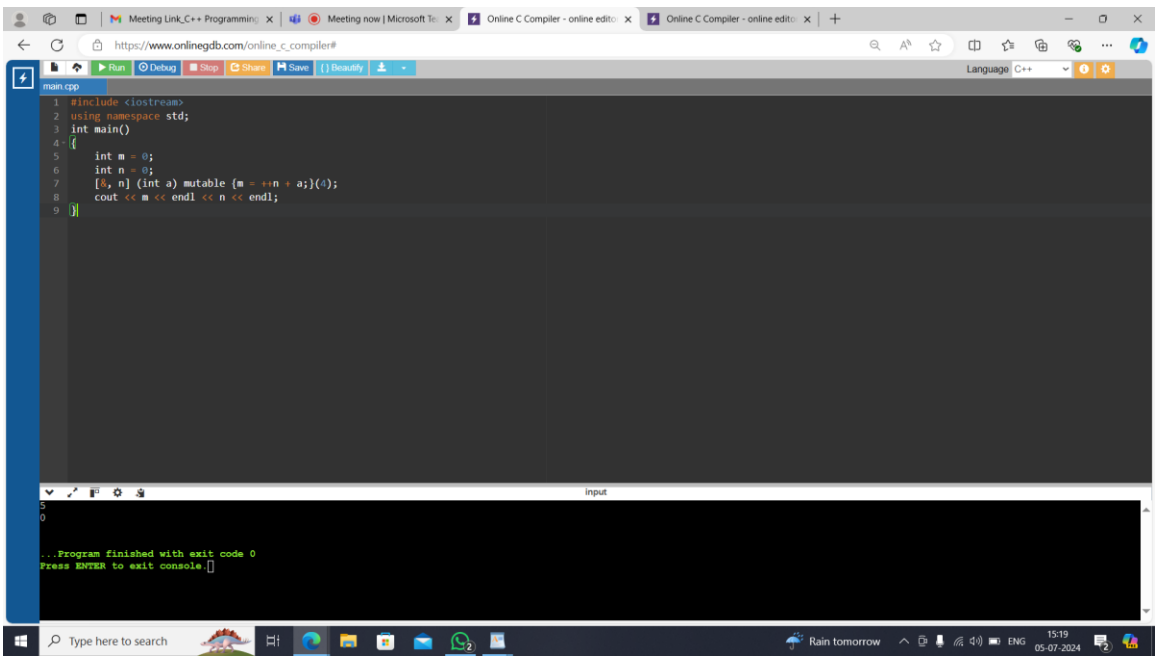



**CAPTURE BY BOTH (VALUE & REFERENCE) :-**

```
#include <iostream>
using namespace std;
```

```
int main()
{
    int m = 0;
    int n = 0;
    [&, n] (int a) mutable {m = ++n + a;}(4);
    cout << m << endl << n << endl;
}
```

OUTPUT :-

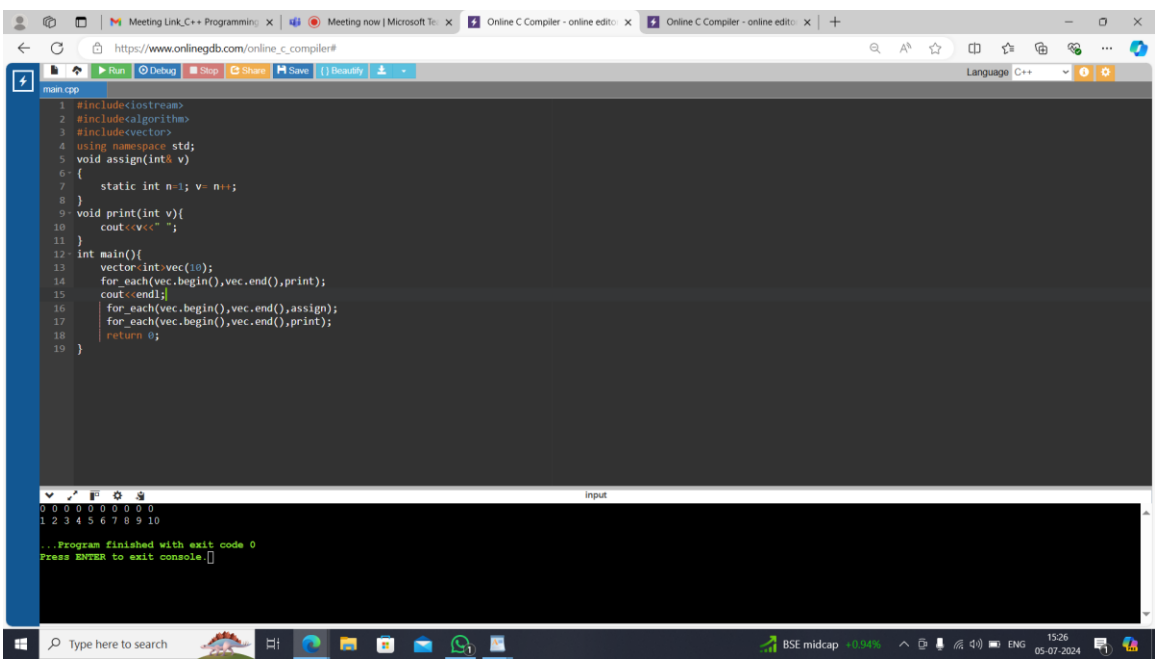



**USE CASE :-**

```
#include<iostream>
#include<algorithm>
#include<vector>
using namespace std;
void assign(int& v)
{
    static int n=1; v= n++;
```

```
}
void print(int v){
        cout<<v<<" ";
}
int main(){
        vector<int>vec(10);
        for_each(vec.begin(),vec.end(),print);
        cout<<endl;
          for_each(vec.begin(),vec.end(),assign);
          for_each(vec.begin(),vec.end(),print);
          return 0;
}
```

OUTPUT :-




**Practice Problem Statement:**

**Scenario: You're working on a data analysis project where you need to filter a list of integers based on whether they are even or odd. You want to use a lambda expression to achieve this filtering.**

**Task:**

**Define a function named filter_even_odds that takes two arguments:**

**const std::vector<int>& numbers: The vector containing the integer values.**

**bool is_even: A flag indicating whether to filter even (true) or odd (false) numbers.**

**Inside the function, use a lambda expression to iterate through the numbers vector.**

**Within the lambda, check if the current number is even using the modulo operator (%).**

**If the even/odd condition matches the is_even flag, add the number to a new filtered vector.**

**Return the filtered vector from the filter_even_odds function.**

```
#include <iostream>

#include <vector>

#include <algorithm>

std::vector<int> filter_even_odds(const std::vector<int>& numbers, bool is_even) {

	std::vector<int> filtered;

	auto filter_lambda = [&](int number) {				// Lambda function to filter even or odd
numbers based on is_even flag

		if ((number % 2 == 0 && is_even) || (number % 2 != 0 && !is_even)) {

			return true;

		}

		return false;

	};

	std::copy_if(numbers.begin(), numbers.end(), std::back_inserter(filtered), filter_lambda);
// Using std::copy_if with lambda function to copy filtered elements to new vector

	return filtered;

}

int main() {

	std::vector<int> numbers = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};


	std::vector<int> even_numbers = filter_even_odds(numbers, true);				// Filter even
numbers
```

```
    std::cout << "Even numbers: ";
    for (int num : even_numbers) {
        std::cout << num << " ";
    }
    std::cout << std::endl;

    std::vector<int> odd_numbers = filter_even_odds(numbers, false);                    // Filter odd
numbers
    std::cout << "Odd numbers: ";
    for (int num : odd_numbers) {
        std::cout << num << " ";
    }
    std::cout << std::endl;
    return 0;
}
```

OUTPUT :-

**2. Finding Maximum Value:**

**Scenario: You have a list of objects and want to find the object with the highest value based on a specific criterion.**

**Task:**

**Define a function named find_max that takes two arguments:**

**const std::vector<T>& objects: The vector containing the objects (can be any type T).**

**std::function<bool(const T& a, const T& b)> compare: A function object (e.g., a lambda) that defines the comparison logic for finding the maximum.**

**Inside the function, use a std::accumulate with a lambda expression to iterate through the objects vector.**

**Within the inner lambda, compare the current element with the current maximum using the provided compare function.**

**If the current element is greater (based on the comparison logic), return it as the new maximum.**

```
#include <iostream>
#include <vector>
#include <functional>
#include <algorithm>

template<typename T>
const T& find_max(const std::vector<T>& objects, std::function<bool(const T&, const T&)> compare) {
    // Check if vector is empty, though ideally, it should not be in your case
    if (objects.empty()) {
        throw std::invalid_argument("Empty vector passed to find_max");
    }

    // Use std::accumulate with a lambda to find the maximum element
    return std::accumulate(objects.begin() + 1, objects.end(), objects[0],
        [&](const T& current_max, const T& obj) {
            if (compare(obj, current_max)) {
                return obj;
            } else {
                return current_max;
            }
        });
}

int main() {
    std::vector<int> numbers = { 3, 9, 1, 4, 7, 5 };

    // Lambda to compare integers (find maximum)
```

```
    auto max_int = find_max(numbers, [](const int& a, const int& b) {
        return a > b; // Return true if a is greater than b
    });

    std::cout << "Max integer: " << max_int << std::endl;

    // Lambda to compare strings (find maximum based on length)
    std::vector<std::string> words = { "apple", "banana", "orange", "pear" };
    auto max_string = find_max(words, [](const std::string& a, const std::string& b) {
        return a.length() > b.length(); // Return true if length of a is greater than length of b
    });
    std::cout << "Longest word: " << max_string << std::endl;
    return 0;
}
```