

4B OS LAB-10 ASSIGNMENT | MUHAMMAD DANISH | CS182019

CODE SCREENSHOTS

```
1  #include<iostream>
2  #include <thread>
3  #include <vector>
4  #include <mutex>
5
6  using namespace std;
7  //global variable
8  int counter=0;
9
10 class Increment{
11     private:
12         mutex m;
13
14     public:
15         void incrementFunc(int value){
16             m.lock();
17             for(int i=0; i<value; i++){
18                 counter++;
19             }
20             pthread_t ptid = pthread_self();
21             cout<<"Thread ID --> " << ptid << " added 10000000 now Counter Is : " <<counter<<endl;
22             m.unlock();
23         }
24         int getFinalValue(){
25             return counter;
26         }
27     };
28
29 int main()
30 {
31     int numOfThreads=4;
32     int incrementValue=10000000;
33     Increment incObj;
34     vector<thread> threads;
35     cout<<"Counter was Initially : "<<counter<<endl;
36
37     //here 4 threads will use same shared data
38     for(int i=0;i<numOfThreads;++i)
39         threads.push_back(thread(Increment::incrementFunc,&incObj,incrementValue));
40
41     // joining all the threads into main
42     for(int i=numOfThreads-1; i>=0; i--){
43         threads[i].join();
44     }
45
46     // final results
47     cout<< "\nTotal --> " <<numOfThreads<<" Threads Added --> " <<incrementValue<<endl;
48     cout <<"The Final Incremented Values is --> " <<incObj.getFinalValue()<<endl;
49 }
50
```

CODE OUTPUTS

Race condition (without Mutex)

```
Counter was Initially : 0
Thread ID --> 3 added 10000000 now Counter Is : 9741201
Thread ID --> 4 added 10000000 now Counter Is : 10420421
Thread ID --> 2 added 10000000 now Counter Is : 10646724
Thread ID --> 5 added 10000000 now Counter Is : 11071546

Total --> 4 Threads Added --> 10000000
The Final Incremented Values is --> 11071546

-----
Process exited after 0.3507 seconds with return value 0
Press any key to continue . . . █
```

Race condition solved with Mutex

```
Counter was Initially : 0
Thread ID --> 2 added 10000000 now Counter Is : 10000000
Thread ID --> 3 added 10000000 now Counter Is : 20000000
Thread ID --> 4 added 10000000 now Counter Is : 30000000
Thread ID --> 5 added 10000000 now Counter Is : 40000000

Total --> 4 Threads Added --> 10000000
The Final Incremented Values is --> 40000000

-----
Process exited after 0.2818 seconds with return value 0
Press any key to continue . . . █
```