

CODE

```
#include <pthread.h>
#include <semaphore.h>
#include <stdio.h>

sem_t wrt;
pthread_mutex_t mutex;
int cnt = 1;
int numreader = 0;

void *writer(void *wno)
{
    sem_wait(&wrt);
    cnt = cnt*2;
    printf("Writer %d modified cnt to %d\n",*((int *)wno),cnt);
    sem_post(&wrt);
}

void *reader(void *rno)
{
    // Reader acquire the lock before modifying numreader
    pthread_mutex_lock(&mutex);
    numreader++;
    if(numreader == 1) {
        sem_wait(&wrt); // If this id the first reader, then it will block the writer
    }
    pthread_mutex_unlock(&mutex);
    // Reading Section
    printf("Reader %d: read cnt as %d\n",*((int *)rno),cnt);

    // Reader acquire the lock before modifying numreader
    pthread_mutex_lock(&mutex);
    numreader--;
    if(numreader == 0) {
        sem_post(&wrt); // If this is the last reader, it will wake up the writer.
    }
    pthread_mutex_unlock(&mutex);
}

int main()
{
    pthread_t read[10],write[5];
    pthread_mutex_init(&mutex, NULL);
    sem_init(&wrt,0,1);
```

o

```
int a[10] = {1,2,3,4,5,6,7,8,9,10}; //Just used for numbering the producer and consumer

for(int i = 0; i < 10; i++) {
    pthread_create(&read[i], NULL, (void *)reader, (void *)&a[i]);
}

for(int i = 0; i < 5; i++) {
    pthread_create(&write[i], NULL, (void *)writer, (void *)&a[i]);
}

for(int i = 0; i < 10; i++) {
    pthread_join(read[i], NULL);
}

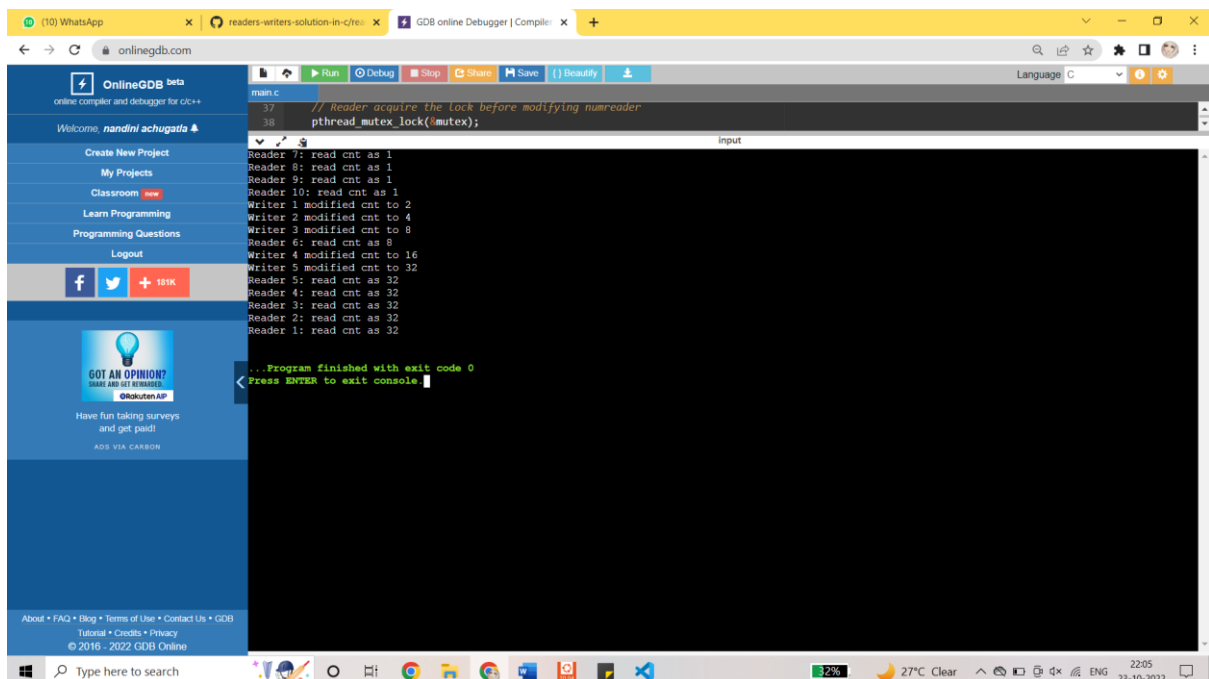
for(int i = 0; i < 5; i++) {
    pthread_join(write[i], NULL);
}

pthread_mutex_destroy(&mutex);
sem_destroy(&wrt);

return 0;

}
```

OUTPUT



The screenshot shows the OnlineGDB web interface. The left sidebar contains navigation links: 'Create New Project', 'My Projects', 'Classroom', 'Learn Programming', 'Programming Questions', and 'Logout'. The main area displays the C code and its output. The code defines an array 'a' with values 1 through 10, creates 10 reader threads and 5 writer threads, and uses a mutex and semaphore for synchronization. The output shows the following sequence of operations:

```
Reader 7: read cnt as 1
Reader 8: read cnt as 1
Reader 9: read cnt as 1
Reader 10: read cnt as 1
Writer 1 modified cnt to 2
Writer 2 modified cnt to 4
Writer 3 modified cnt to 8
Reader 6: read cnt as 8
Writer 4 modified cnt to 16
Writer 5 modified cnt to 32
Reader 5: read cnt as 32
Reader 4: read cnt as 32
Reader 3: read cnt as 32
Reader 2: read cnt as 32
Reader 1: read cnt as 32
```

The program finished with exit code 0. The status bar at the bottom indicates the system is at 27°C, clear, on 23-10-2022.