[Workshop Report-2]

Student Id : NP03A190051

Student Name : Rishab Sharma

Section : L5CG7

Lecturer : Jnaneshwor Bohara

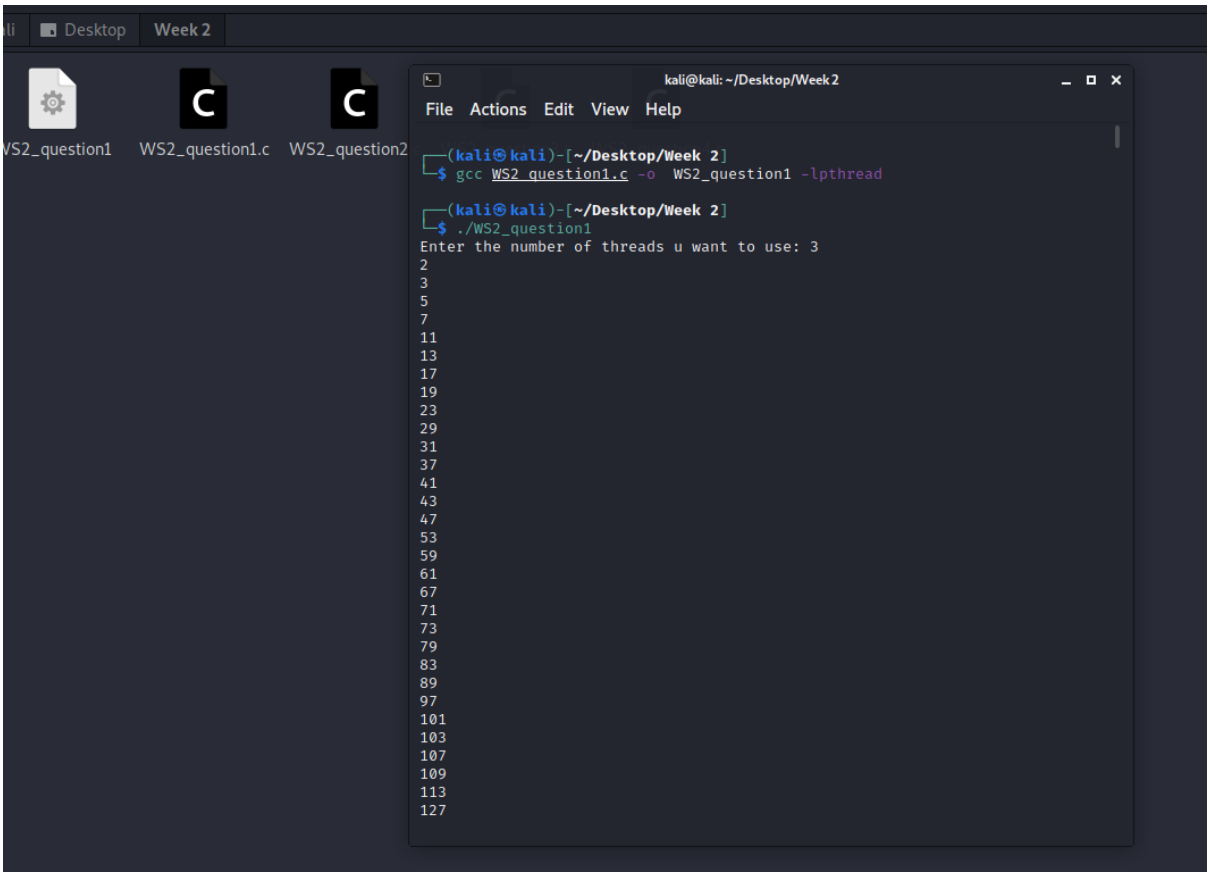
Module Leader : Hiran Patel

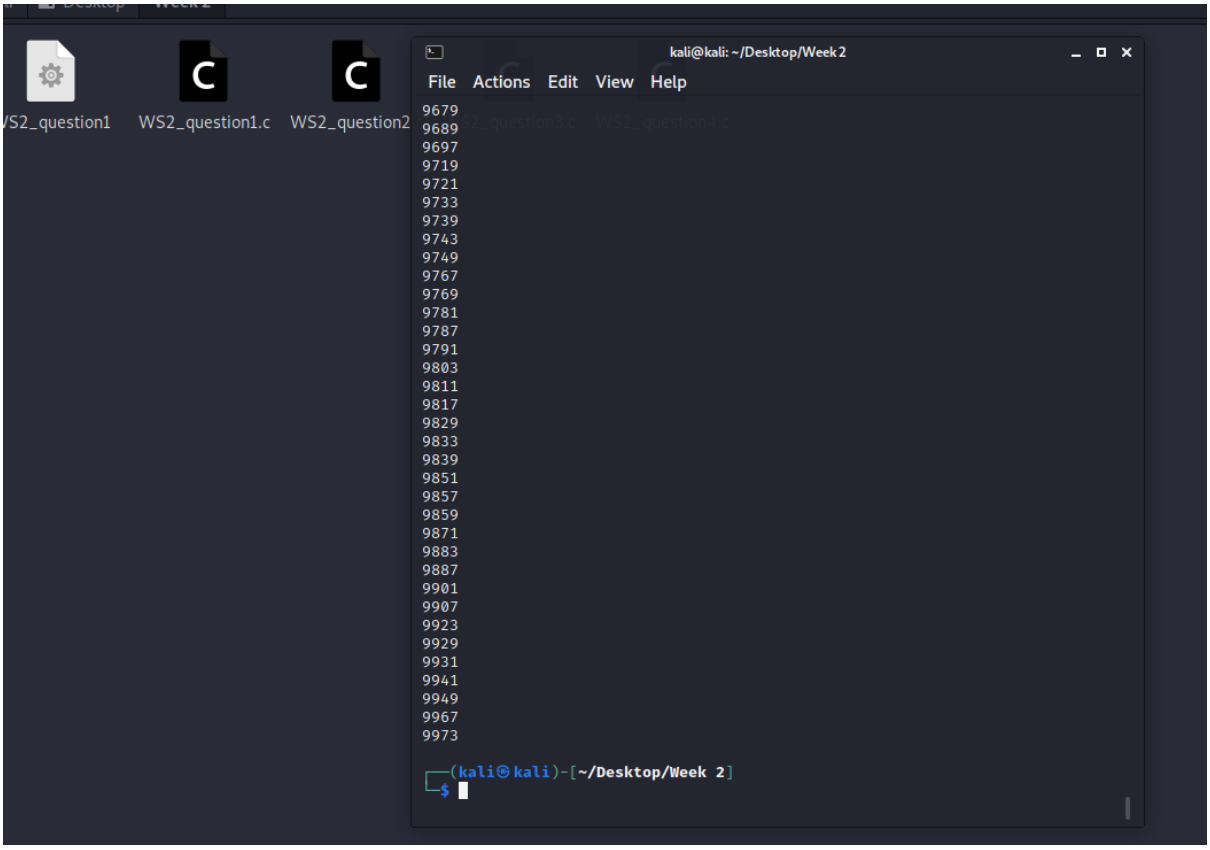
Submitted on : 22nd September, 2021

1. Write a multithreaded C program to print out all the prime numbers between 1 to 10000. Use exactly 3 threads.

=>
```
#include <stdio.h>
#include <stdlib.h>
#include <pthread.h>

void *printPrimeNumbers() {
    int flag, i, j;

    for(i=1; i<=10000; i++) {
        flag = 1;

        if(i==1 || i==0) {
            continue;
        }

        for (j = 2; j <= i/2; j++) {
            if(i % j == 0) {
                flag = 0;
                break;
            }
        }

        if(flag == 1) {
            printf("%d\n", i);
        }
    }
}

int main() {
    int n;
```

```
    pthread_t thread_id;
    printf("Enter the number of threads u want to use: ");
    scanf("%d", &n);
    int i;
    for(i = 0; i < n; i++) {
        pthread_create(&thread_id, NULL, printPrimeNumbers, &thread_id);
        pthread_join(thread_id, NULL);
    }
    exit(0);
}
```





2. Convert this program to prompt the user for a number and then to create the number of threads the user has specified to find the prime numbers.

=> #include <stdio.h>

#include <stdlib.h>

#include <pthread.h>

```
void *printPrimeNumbers() {
   int flag, i, j;

   for(i=1; i<=10000; i++) {
      flag = 1;

      if(i==1 || i==0) {
         continue;
      }
```

```
        for (j = 2; j <= i/2; j++) {
            if(i % j == 0) {
                flag = 0;
                break;
            }
        }

        if(flag == 1) {
            printf("%d\n", i);
        }
    }
}

int main() {
    int n;
    pthread_t thread_id;
    printf("Enter the number of threads u want to use: ");
    scanf("%d", &n);
    int i;
    for(i = 0; i < n; i++) {
        pthread_create(&thread_id, NULL, printPrimeNumbers, &thread_id);
        pthread_join(thread_id, NULL);
    }
    exit(0);
}
```

3. Convert the program in (2) so that each thread returns the number of prime numbers that it has found using pthread_exit() and for main program to print out the number of prime number that each thread has found.

=> #include<stdio.h>

#include<stdlib.h>

#include<pthread.h>

typedef struct{

int start;

int end;

}

range;

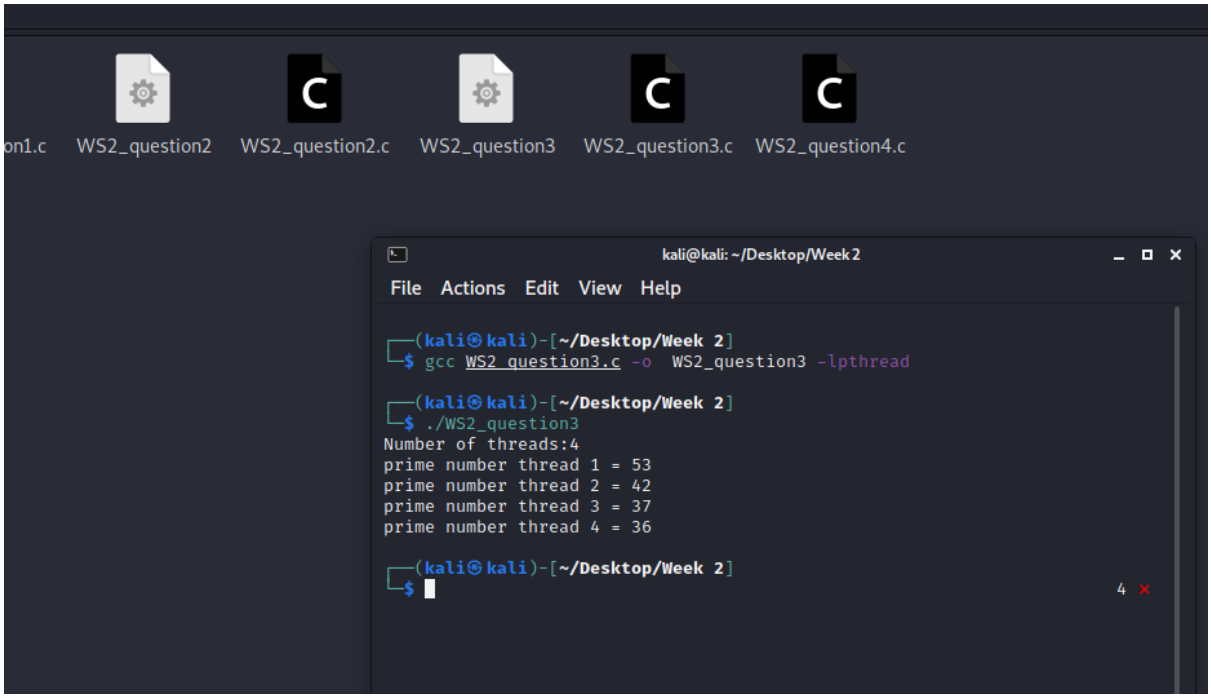
void *prime(void *ptr)

{

```
    int i,c;
    int *counter;
    counter = malloc(sizeof(int));
    int counts = 0;

    range *p = ptr;
    int nstart=p->start, nend=p->end;

    for(i=nstart; i<=nend; i++){
        for(c=2; c<=i-1; c++) {
            if ( i%c==0 ) {
            break;
        }

        }
        if ( c==i ) {
            counts = counts + 1;
    }

    }
    *counter = counts;
    pthread_exit(counter);
}


void main(){
    void *pointer;
    int count = 1000;
    int thread;
    printf("Number of threads:");
```

```
scanf("%d", &thread);
int sliceList[thread];  //3 slice boxes

int rem = count % thread;



for (int i =0; i<thread; i++){
    sliceList[i] = count / thread;
}

// equally distribute the remainders in each thread

for(int j = 0; j<rem; j++){
    sliceList[j] = sliceList[j] + 1;
}

int startList[thread];
int endList[thread];
// start = 0
// end = 3333

for(int l = 0 ;l < thread; l++){
    // if it is the start
    if(l == 0){
        startList[l] = 0;
    }
    // endList[1 -1] = 0 which is starting index gets the endlist value + 1
    else{
        startList[l] = endList[l-1] + 1;
    }
```

```
        endList[l] = startList[l] + sliceList[l] -1; //3334+3333-1 -> 6666
    }

    range nums[thread];

    for(int k = 0; k< thread; k++){
        nums[k].start = startList[k];
        nums[k].end = endList[k];
    }

// create thread according to nummber of thread by user
    pthread_t threadIDs[thread];

    for(int n = 0; n<thread; n++){
        pthread_create(&threadIDs[n], NULL, prime, &nums[n]);

    }

     for(int n = 0; n<thread; n++){
        pthread_join(threadIDs[n],&pointer);
        printf("prime number thread %d = %d\n",n+1,*(int*)pointer);
    }
}
```

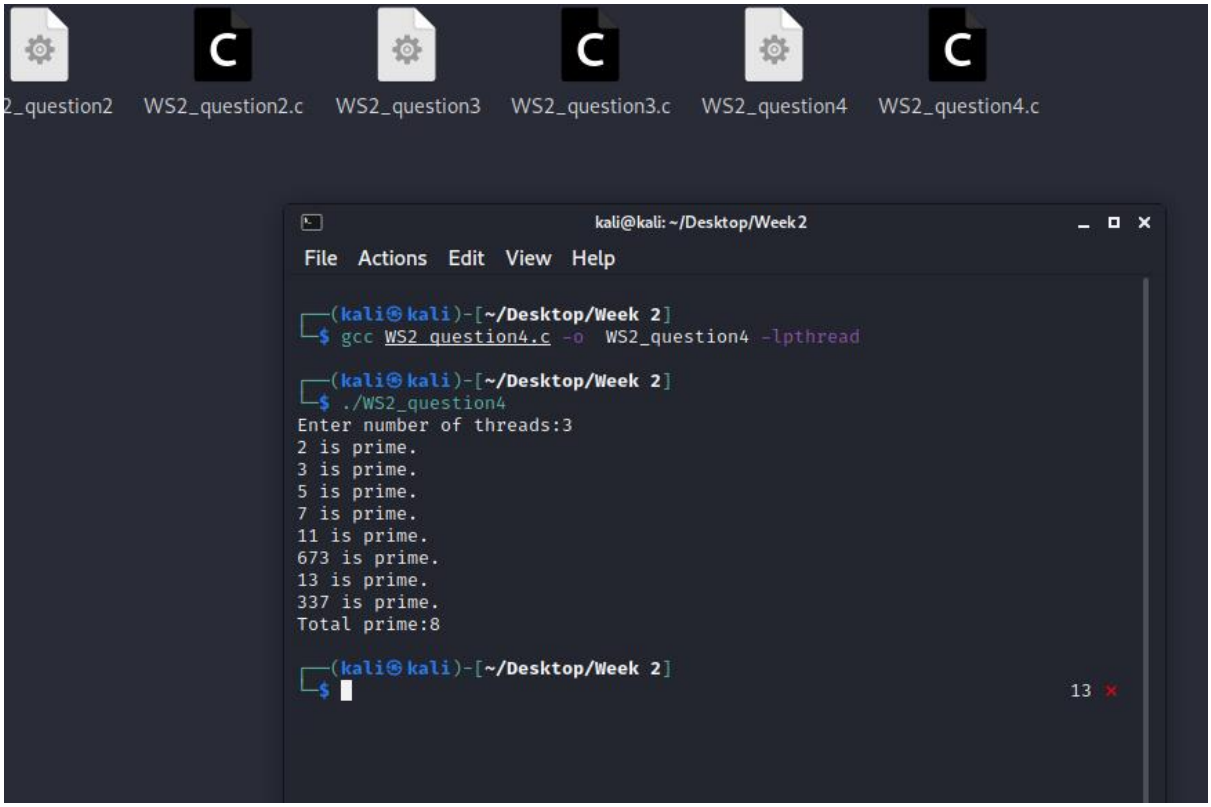


4. Convert the program in (3) to use pthread_cancel() to cancel all threads as soon as the 5th prime number has been found.

```
=> #include<stdio.h>
    #include<pthread.h>
    #include<stdlib.h>

int counter=0;



typedef struct{
    int start;
    int end;
}count;

void *countPrime(void *p){
    count *parameter;
    parameter = (count *)p;
    int start = parameter->start;
```

```
    int end = parameter->end;
    int i,c;
    for(i=start;i<end;i++){
        for(c=2;c<=i-1;c++){
            if(i%c==0){
                break;
            }
        }
         if (counter >= 5)
            {
                pthread_cancel(pthread_self());
            }
        if(c == i){
            counter+=1;
            printf("%d is prime.\n",i);
        }
    }
}

void main()
{
    int n,i;
    printf("Enter number of threads:");
    scanf("%d",&n);
    pthread_t thread[n];
    count range[n];
    int split = 1000/n;

    for(i=0;i<n;i++){
        if(i==0){
```

```
            range[i].start = 1;
            range[i].end = split;
        }
        else{
            range[i].start = range[i-1].end + 1;
            range[i].end = range[i-1].end + split;
        }
    }

    for ( i = 0; i < n; i++)
    {
        pthread_create(&thread[i],NULL,countPrime,(void *)&range[i]);
    }



    for ( i = 0; i < n; i++)
    {
        pthread_join(thread[i],NULL);
    }
    printf("Total prime:%d",counter);
}
```


2_question2
WS2_question2.c
WS2_question3
WS2_question3.c
WS2_question4
WS2_question4.c
kali@kali: ~/Desktop/Week 2
File Actions Edit View Help
(kali㉿kali)-[~/Desktop/Week 2]
$ gcc WS2_question4.c -o WS2_question4 -lpthread
(kali㉿kali)-[~/Desktop/Week 2]
$ ./WS2_question4
Enter number of threads:3
2 is prime.
3 is prime.
5 is prime.
7 is prime.
11 is prime.
673 is prime.
13 is prime.
337 is prime.
Total prime:8
(kali㉿kali)-[~/Desktop/Week 2]
$
13