Assignment#2

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Operating System

2022/04/14

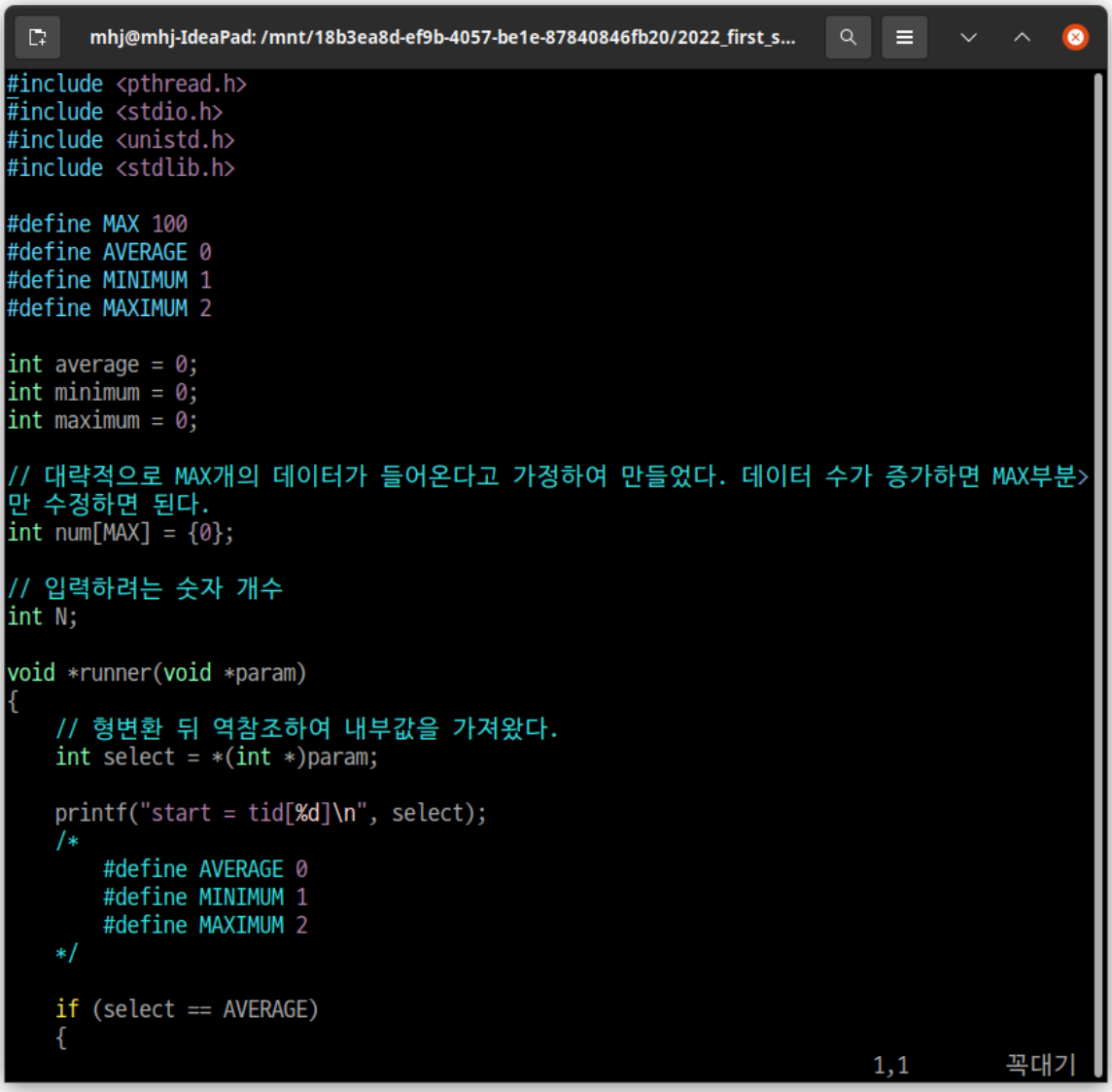
0. Source Code

```
#include <pthread.h>
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#define MAX 100
#define AVERAGE 0
#define MINIMUM 1
#define MAXIMUM 2
int average = 0;
int minimum = 0;
int maximum = 0;
// 대략적으로 MAX개의 데이터가 들어온다고 가정하여 만들었다. 데이터 수가 증가하면 MAX부분만 수정하면 된다.
int num[MAX] = {0};
// 입력하려는 숫자 개수
int N;
void *runner(void *param)
{
  // 형변환 뒤 역참조하여 내부값을 가져왔다.
  int select = *(int *)param;
  printf("start = tid[%d]¥n", select);
  /*
```

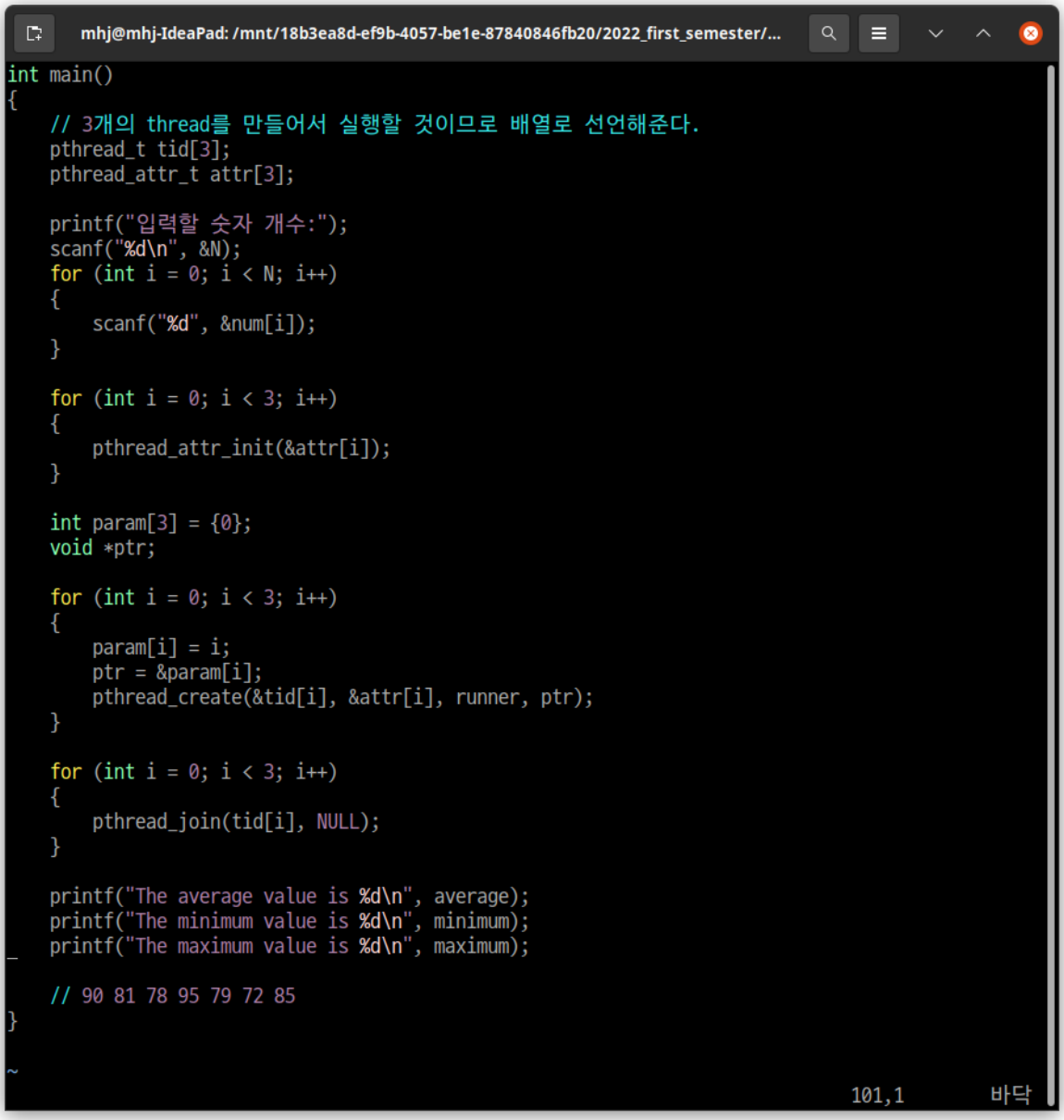
```
    #define AVERAGE 0
    #define MINIMUM 1
    #define MAXIMUM 2
  */
  if (select == AVERAGE)
  {
    for (int i = 0; i < N; i++)
    {
      average += num[i];
    }
    average /= N;
  }
  else if (select == MINIMUM)
  {
    minimum = num[0];
    for (int i = 1; i < N; i++)
    {
      if (minimum > num[i])
      {
        minimum = num[i];
      }
    }
  }
  else if (select == MAXIMUM)
  {
    maximum = num[0];
    for (int i = 1; i < N; i++)
    {
      if (maximum < num[i])
      {
        maximum = num[i];
      }
    }
  }
  pthread_exit(0);
}
int main()
{
  // 3개의 thread를 만들어서 실행할 것이므로 배열로 선언해준다.
  pthread_t tid[3];
```

```
    pthread_attr_t attr[3];
    printf("입력할 숫자 개수:");
    scanf("%d¥n", &N);
    for (int i = 0; i < N; i++)
    {
        scanf("%d", &num[i]);
    }
    for (int i = 0; i < 3; i++)
    {
        pthread_attr_init(&attr[i]);
    }
    int param[3] = {0};
    void *ptr;
    for (int i = 0; i < 3; i++)
    {
        param[i] = i;
        ptr = &param[i];
        pthread_create(&tid[i], &attr[i], runner, ptr);
    }
    for (int i = 0; i < 3; i++)
    {
        pthread_join(tid[i], NULL);
    }
    printf("The average value is %d¥n", average);
    printf("The minimum value is %d¥n", minimum);
    printf("The maximum value is %d¥n", maximum);
    // 90 81 78 95 79 72 85
}
```

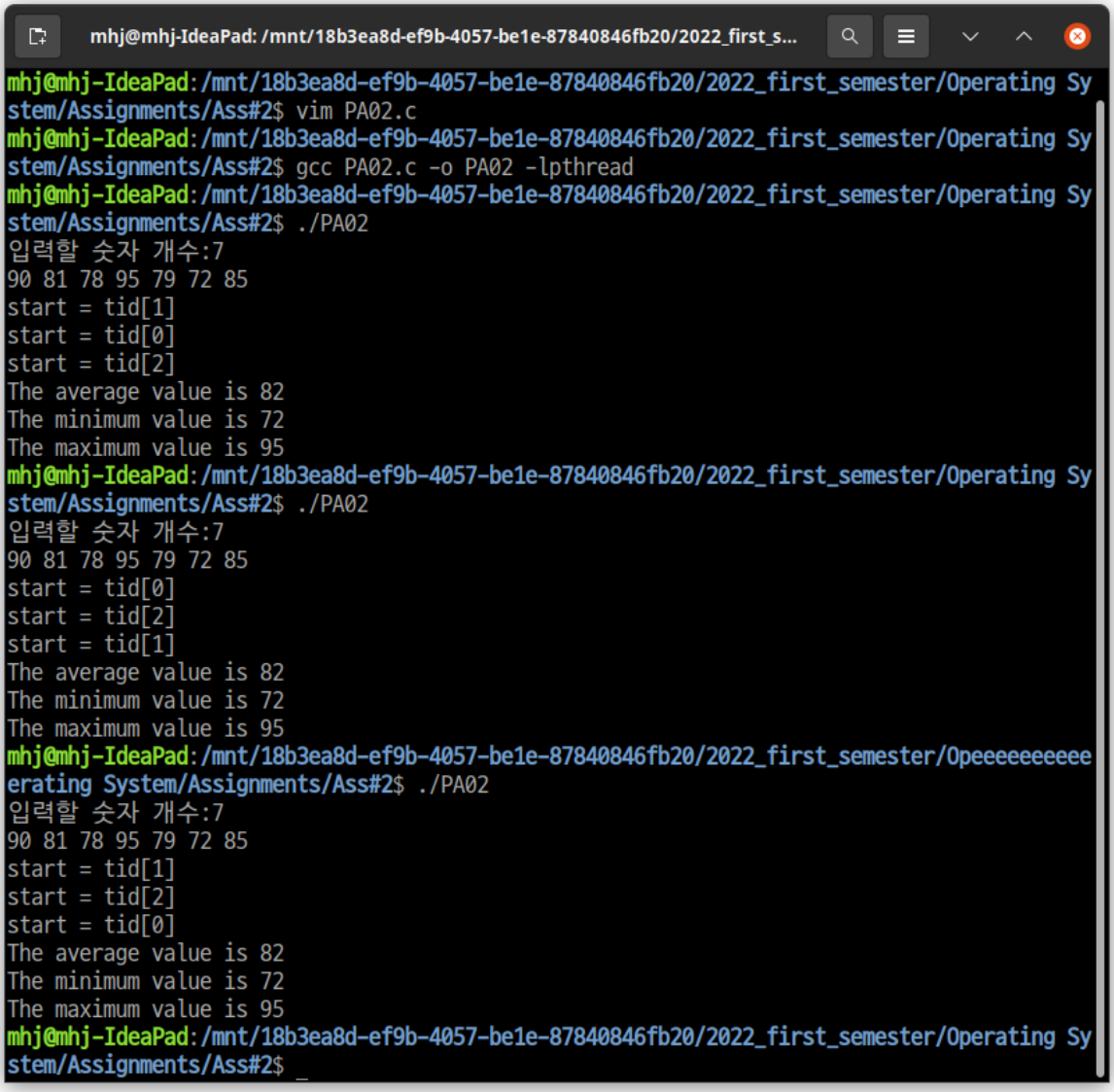
1. Screen capture of your final codes using VI editor.

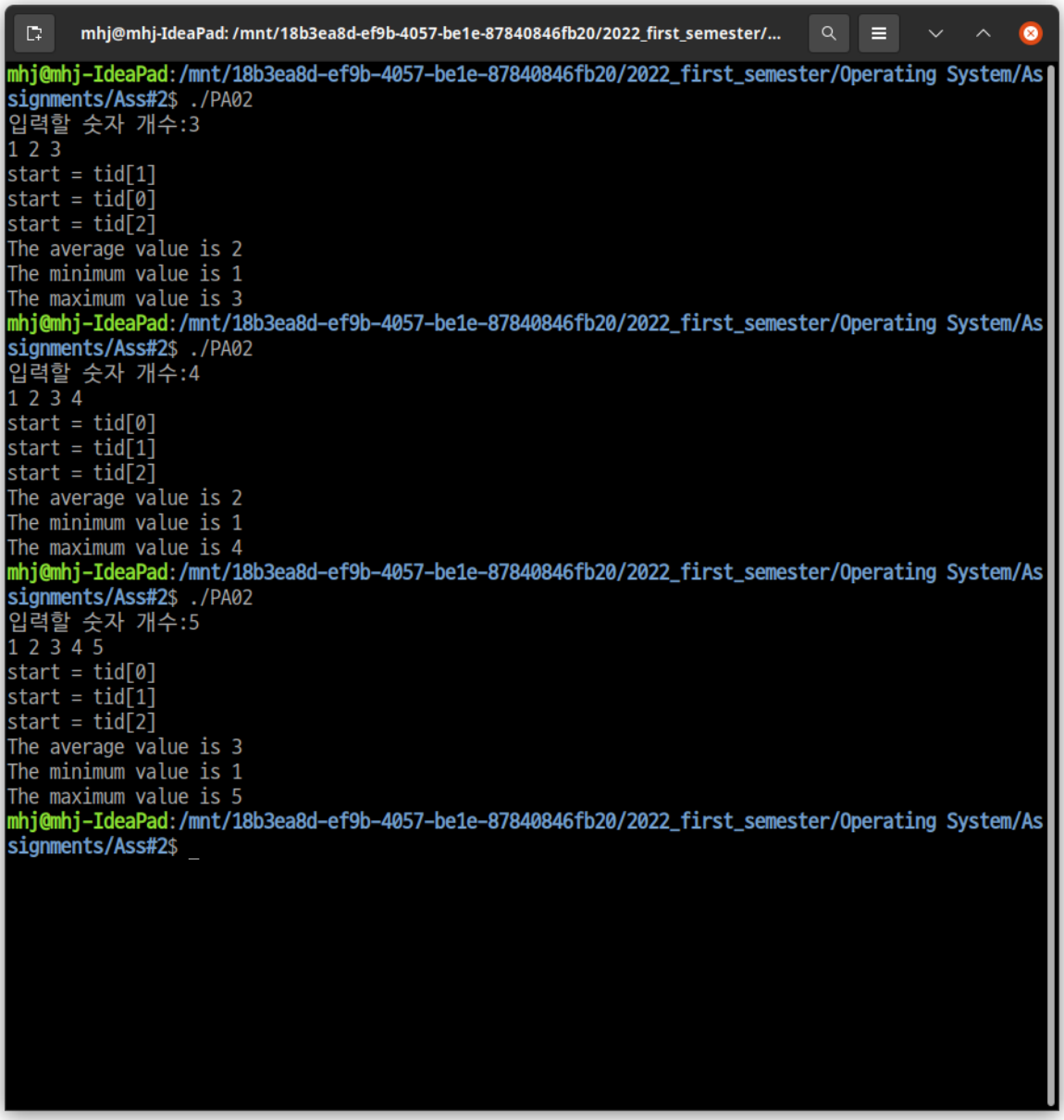

mhj@mhj-IdeaPad: /mnt/18b3ea8d-ef9b-4057-be1e-87840846fb20/2022_first_s...
#include <pthread.h>
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#define MAX 100
#define AVERAGE 0
#define MINIMUM 1
#define MAXIMUM 2
int average = 0;
int minimum = 0;
int maximum = 0;
// 대략적으로 MAX개의 데이터가 들어온다고 가정하여 만들었다. 데이터 수가 증가하면 MAX부분>
만 수정하면 된다.
int num[MAX] = {0};
// 입력하려는 숫자 개수
int N;
void *runner(void *param)
{
// 형변환 뒤 역참조하여 내부값을 가져왔다.
int select = *(int *)param;
printf("start = tid[%d]\n", select);
/*
#define AVERAGE 0
#define MINIMUM 1
#define MAXIMUM 2
*/
if (select == AVERAGE)
{
1,1
꼭대기


mhj@mhj-IdeaPad: /mnt/18b3ea8d-ef9b-4057-be1e-87840846fb20/2022_first_s...
if (select == AVERAGE)
{
for (int i = 0; i < N; i++)
{
average += num[i];
}
average /= N;
}
else if (select == MINIMUM)
{
minimum = num[0];
for (int i = 1; i < N; i++)
{
if (minimum > num[i])
{
minimum = num[i];
}
}
}
else if (select == MAXIMUM)
{
maximum = num[0];
for (int i = 1; i < N; i++)
{
if (maximum < num[i])
{
maximum = num[i];
}
}
}
pthread_exit(0);
}
int main()
61,1
44%


mhj@mhj-IdeaPad: /mnt/18b3ea8d-ef9b-4057-be1e-87840846fb20/2022_first_semester/...
int main()
{
// 3개의 thread를 만들어서 실행할 것이므로 배열로 선언해준다.
pthread_t tid[3];
pthread_attr_t attr[3];
printf("입력할 숫자 개수:");
scanf("%d\n", &N);
for (int i = 0; i < N; i++)
{
scanf("%d", &num[i]);
}
for (int i = 0; i < 3; i++)
{
pthread_attr_init(&attr[i]);
}
int param[3] = {0};
void *ptr;
for (int i = 0; i < 3; i++)
{
param[i] = i;
ptr = &param[i];
pthread_create(&tid[i], &attr[i], runner, ptr);
}
for (int i = 0; i < 3; i++)
{
pthread_join(tid[i], NULL);
}
printf("The average value is %d\n", average);
printf("The minimum value is %d\n", minimum);
printf("The maximum value is %d\n", maximum);
// 90 81 78 95 79 72 85
}
~
101,1
바닥

2. Screen capture of compilation, execution and command line results.




mhj@mhj-IdeaPad: /mnt/18b3ea8d-ef9b-4057-be1e-87840846fb20/2022_first_semester/...
mhj@mhj-IdeaPad:/mnt/18b3ea8d-ef9b-4057-be1e-87840846fb20/2022_first_semester/Operating System/Assignments/Ass#2$ ./PA02
입력할 숫자 개수:3
1 2 3
start = tid[1]
start = tid[0]
start = tid[2]
The average value is 2
The minimum value is 1
The maximum value is 3
mhj@mhj-IdeaPad:/mnt/18b3ea8d-ef9b-4057-be1e-87840846fb20/2022_first_semester/Operating System/Assignments/Ass#2$ ./PA02
입력할 숫자 개수:4
1 2 3 4
start = tid[0]
start = tid[1]
start = tid[2]
The average value is 2
The minimum value is 1
The maximum value is 4
mhj@mhj-IdeaPad:/mnt/18b3ea8d-ef9b-4057-be1e-87840846fb20/2022_first_semester/Operating System/Assignments/Ass#2$ ./PA02
입력할 숫자 개수:5
1 2 3 4 5
start = tid[0]
start = tid[1]
start = tid[2]
The average value is 3
The minimum value is 1
The maximum value is 5
mhj@mhj-IdeaPad:/mnt/18b3ea8d-ef9b-4057-be1e-87840846fb20/2022_first_semester/Operating System/Assignments/Ass#2$ _