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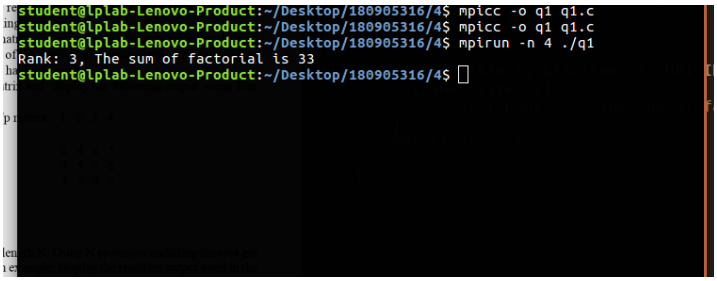
CSE-A
Roll no: 37

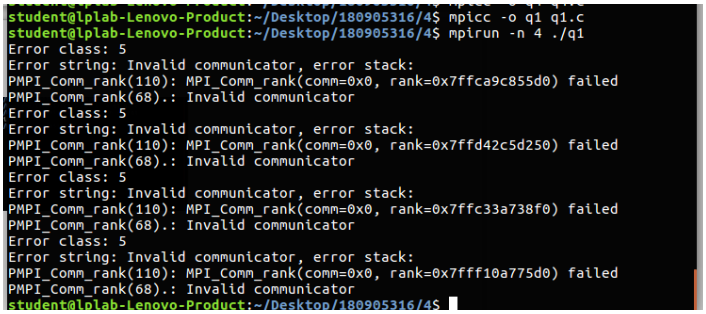
LAB-4

Q1:

```
#include <mpi.h>
#include <stdio.h>
#include <string.h>

int main(int argc, char *argv[])
{
	int rank, size;
	int fact=1, factsum;

	MPI_Init(&argc, &argv);

	MPI_Errhandler_set(MPI_COMM_WORLD, MPI_ERRORS_RETURN);
	//triggering an error
	//int errcode=MPI_Comm_rank(size, &rank);
	int errcode=MPI_Comm_rank(MPI_COMM_WORLD, &rank);
	MPI_Comm_size(MPI_COMM_WORLD, &size);

	for(int i=1; i<=rank+1; i++){
		fact=fact*i;
	}

	MPI_Scan(&fact, &factsum, 1, MPI_INT, MPI_SUM, MPI_COMM_WORLD);

	if(rank==size-1){
		printf("Rank: %d, The sum of factorial is %d\n", rank, factsum);
	}

	if(errcode!=MPI_SUCCESS){
		int errclass;
		char errstring[1024];
		int len;
		MPI_Error_class(errcode,  &errclass);
		MPI_Error_string(errcode, errstring, &len);
		printf("Error class: %d\n", errclass);
		printf("Error string: %s\n", errstring);
	}

	MPI_Finalize();
	return 0;
}
```



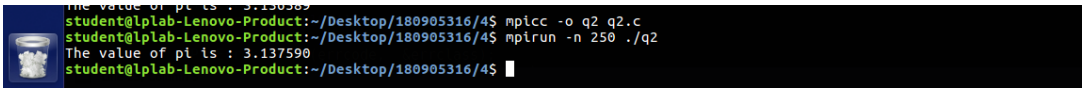
After triggering error



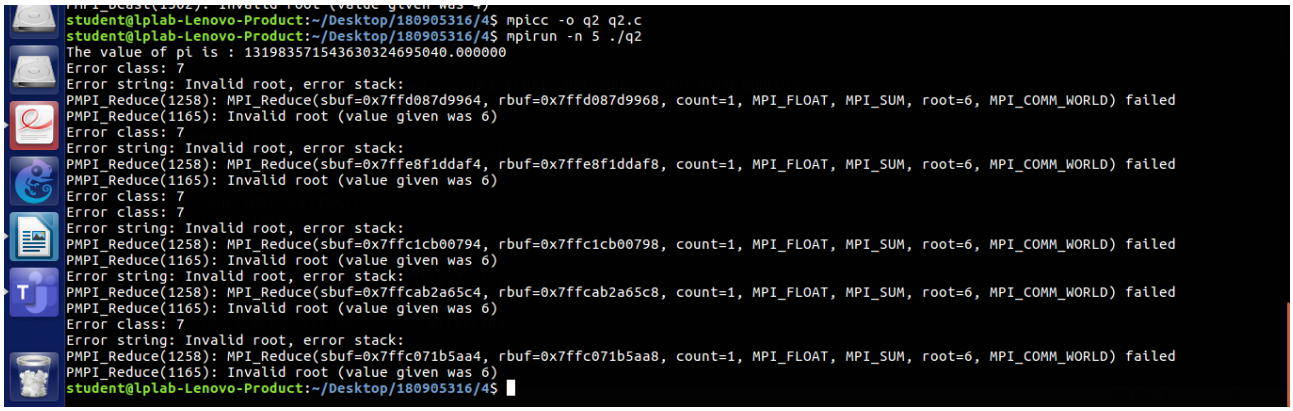
Q2:

```
#include <mpi.h>
#include <stdio.h>
#include <stdlib.h>

int main(int argc, char *argv[])
{

	int rank,size;
	MPI_Init(&argc,&argv);
	MPI_Errhandler_set(MPI_COMM_WORLD, MPI_ERRORS_RETURN);

	MPI_Comm_rank(MPI_COMM_WORLD,&rank);
	MPI_Comm_size(MPI_COMM_WORLD,&size);

	float x, y, area, pi;

	x = (float)(rank+1)/size;
	y = 4.f/(1+x*x);
	area = (1/(float)size)*y;
	//triggering an error
	//int errcode=MPI_Reduce(&area, &pi, 1, MPI_FLOAT, MPI_SUM, 6,
MPI_COMM_WORLD);
	int errcode=MPI_Reduce(&area, &pi, 1, MPI_FLOAT, MPI_SUM, 0,
MPI_COMM_WORLD);

	if (rank==0){
		printf("The value of pi is : %f\n", pi);
	}
```

```
        if(errcode!=MPI_SUCCESS){
                int errclass;
                char errstring[1024];
                int len;
                MPI_Error_class(errcode,  &errclass);
                MPI_Error_string(errcode, errstring, &len);
                printf("Error class: %d\n", errclass);
                printf("Error string: %s\n", errstring);
        }

        MPI_Finalize();
        return 0;
}
```



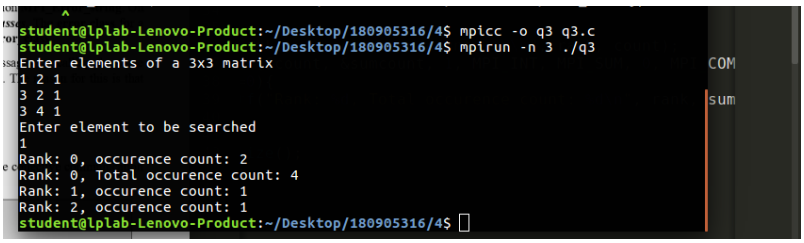
After triggering error



Q3:

```
#include <mpi.h>
#include <stdio.h>
#include <stdlib.h>
int main(int argc, char *argv[])
{
        int rank, size;
        MPI_Init(&argc, &argv);
        MPI_Errhandler_set(MPI_COMM_WORLD, MPI_ERRORS_RETURN);

        MPI_Comm_rank(MPI_COMM_WORLD, &rank);
        MPI_Comm_size(MPI_COMM_WORLD, &size);

        int mat[3][3];
        int row[3];
        int ele;
        int count=0;
```

```
        int sumcount;

        if(rank==0){
                printf("Enter elements of a 3x3 matrix\n");
                for(int i=0; i<3; i++){
                        for(int j=0; j<3; j++)
                                scanf("%d", &mat[i][j]);
                }
                printf("Enter element to be searched\n");
                scanf("%d", &ele);

        }

        //triggering an error
        //int errcode=MPI_Bcast(&ele, 1, MPI_INT, 4, MPI_COMM_WORLD);
        MPI_Bcast(&ele, 1, MPI_INT, 0, MPI_COMM_WORLD);
        MPI_Scatter(&mat, 3, MPI_INT, &row, 3, MPI_INT, 0, MPI_COMM_WORLD);

        for(int i=0; i<3; i++){
                if(row[i]==ele){
                        count++;
                }
        }

        printf("Rank: %d, occurence count: %d\n", rank, count);
        MPI_Reduce(&count, &sumcount, 1, MPI_INT, MPI_SUM, 0, MPI_COMM_WORLD);
        if(rank==0){
                printf("Rank: %d, Total occurence count: %d\n", rank, sumcount);
        }
        if(errcode!=MPI_SUCCESS){
                int errclass;
                char errstring[1024];
                int len;
                MPI_Error_class(errcode,  &errclass);
                MPI_Error_string(errcode, errstring, &len);
                printf("Error class: %d\n", errclass);
                printf("Error string: %s\n", errstring);
        }
        MPI_Finalize();
        return 0;
}
```



After triggering error:

```
PMPI_Bcast(1562): Invalid root (value given was 4)
student@lplab-Lenovo-Product:~/Desktop/180905316/4$ mpicc -o q3 q3.c
student@lplab-Lenovo-Product:~/Desktop/180905316/4$ mpirun -n 3 ./q3
Enter elements of a 3x3 matrix
1 2 3
4 5 6
1 2 3
Enter element to be searched
1
Rank: 0, occurence count: 1
Rank: 0, Total occurence count: 2
Error class: 7
Error string: Invalid root, error stack:
PMPI_Bcast(1600): MPI_Bcast(buf=0x7fffc180e19c, count=1, MPI_INT, root=4, MPI_COMM_WORLD) failed
PMPI_Bcast(1562): Invalid root (value given was 4)
Rank: 1, occurence count: 0
Error class: 7
Error string: Invalid root, error stack:
PMPI_Bcast(1600): MPI_Bcast(buf=0x7ffe46f0a2bc, count=1, MPI_INT, root=4, MPI_COMM_WORLD) failed
PMPI_Bcast(1562): Invalid root (value given was 4)
Rank: 2, occurence count: 1
Error class: 7
Error string: Invalid root, error stack:
PMPI_Bcast(1600): MPI_Bcast(buf=0x7ffe9c26882c, count=1, MPI_INT, root=4, MPI_COMM_WORLD) failed
PMPI_Bcast(1562): Invalid root (value given was 4)
student@lplab-Lenovo-Product:~/Desktop/180905316/4$
```

Q4:

```
#include <mpi.h>
#include <stdio.h>
#include <stdlib.h>

int main(int argc, char *argv[])
{
	int rank, size;
	MPI_Init(&argc, &argv);
	MPI_Comm_rank(MPI_COMM_WORLD, &rank);
	MPI_Comm_size(MPI_COMM_WORLD, &size);

	int mat[4][4];
	int res[4][4];

	int row[4];
	int buf[4];

	if(rank==0){
		printf("Enter elements of a 4x4 matrix\n");
		for(int i=0; i<4; i++){
			for(int j=0; j<4; j++)
				scanf("%d", &mat[i][j]);
		}
```

```
        }

        MPI_Scatter(&mat, 4, MPI_INT, &row, 4, MPI_INT, 0, MPI_COMM_WORLD);
        MPI_Scan(&row, &buf, 4, MPI_INT, MPI_SUM, MPI_COMM_WORLD);
        MPI_Gather(&buf, 4, MPI_INT, &res, 4, MPI_INT, 0, MPI_COMM_WORLD);

        if(rank==0){
                printf("Rank: %d, modified matrix\n", rank);

                for(int i=0; i<4; i++){
                        for(int j=0; j<4; j++){
                                printf("%d ", res[i][j]);
                        }
                        printf("\n");
                }
        }
        MPI_Finalize();
        return 0;
}
```