Week2 > C q1.c

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

int main(int argc, char *argv[])
{
    int rank;
    char word[100];

    MPI_Init(&argc, &argv);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);

    if (rank == 0)
    {
        printf("Enter a word: ");
        printf("\n");
        scanf("%s", word);

        MPI_Ssend(word, strlen(word) + 1, MPI_CHAR, 1, 0, MPI_COMM_WORLD);

        MPI_Recv(word, 100, MPI_CHAR, 1, 1, MPI_COMM_WORLD, MPI_STATUS_IGNORE);
        printf("Toggled word received back: %s\n", word);
    }
    else if (rank == 1)
    {
        MPI_Recv(word, 100, MPI_CHAR, 0, 0, MPI_COMM_WORLD, MPI_STATUS_IGNORE);

        for (int i = 0; word[i] != '\0'; i++)
        {
            if (islower(word[i]))
                word[i] = toupper(word[i]);
            else if (isupper(word[i]))
                word[i] = tolower(word[i]);
        }

        MPI_Ssend(word, strlen(word) + 1, MPI_CHAR, 0, 1, MPI_COMM_WORLD);
    }
    if(rank == 0) printf("Q1,Adarsh Ranjan 230962278\n");


    MPI_Finalize();
    return 0;
}
```

```
(dse) mca@computinglab25-22:~/Desktop/PPL_230962278/Week2$ mpicc q1.c -o q1
(dse) mca@computinglab25-22:~/Desktop/PPL_230962278/Week2$ mpirun -np 2 ./q1
hwloc/linux: Ignoring PCI device with non-16bit domain.
Pass --enable-32bits-pci-domain to configure to support such devices
(warning: it would break the library ABI, don't enable unless really needed).
Enter a word:
helloMPI
Toggled word received back: HELLOmpi
Q1,Adarsh Ranjan 230962278
```

Week2 > C q2.c

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

int main(int argc, char *argv[])
{
    int rank, size, number;

    MPI_Init(&argc, &argv);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);
    MPI_Comm_size(MPI_COMM_WORLD, &size);

    if (rank == 0)
    {
        printf("Enter a number: ");
        print("\n");
        scanf("%d", &number);

        for (int i = 1; i < size; i++)
        {
            MPI_Send(&number, 1, MPI_INT, i, 0, MPI_COMM_WORLD);
        }
    }
    else
    {
        MPI_Recv(&number, 1, MPI_INT, 0, 0, MPI_COMM_WORLD, MPI_STATUS_IGNORE);
        printf("Process %d received number %d\n", rank, number);
    }
    if(rank == 0) printf("Q2,Adarsh Ranjan 230962278\n");


    MPI_Finalize();
    return 0;
}

```

```
(dse) mca@computinglab25-22:~/Desktop/PPL_230962278/Week2$ mpicc q2.c -o q2
(dse) mca@computinglab25-22:~/Desktop/PPL_230962278/Week2$ mpirun -np 4 ./q2
hwloc/linux: Ignoring PCI device with non-16bit domain.
Pass --enable-32bits-pci-domain to configure to support such devices
(warning: it would break the library ABI, don't enable unless really needed).
Enter a number:
5
Process 1 received number 5
Process 2 received number 5
Process 3 received number 5
Q2,Adarsh Ranjan 230962278
```

Week2 > C q3.c

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

int main(int argc, char *argv[])
{
    int rank, size;
    int value;

    MPI_Init(&argc, &argv);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);
    MPI_Comm_size(MPI_COMM_WORLD, &size);

    int buffer_size = size * (sizeof(int) + MPI_BSEND_OVERHEAD);
    char *buffer = (char *)malloc(buffer_size);

    MPI_Buffer_attach(buffer, buffer_size);

    if (rank == 0)
    {
        int arr[size];
        printf("Enter %d elements:\n", size);
        for (int i = 0; i < size; i++)
            scanf("%d", &arr[i]);

        for (int i = 0; i < size; i++)
            MPI_Bsend(&arr[i], 1, MPI_INT, i, 0, MPI_COMM_WORLD);
    }

    MPI_Recv(&value, 1, MPI_INT, 0, 0, MPI_COMM_WORLD, MPI_STATUS_IGNORE);

    if (rank % 2 == 0)
        printf("Process %d (Even) Square = %d\n", rank, value * value);
    else
        printf("Process %d (Odd) Cube = %d\n", rank, value * value * value);

    MPI_Buffer_detach(&buffer, &buffer_size);
    free(buffer);

    if(rank == 0) printf("Q3,Adarsh Ranjan 230962278\n");


    MPI_Finalize();
    return 0;
}
```

```
(dse) mca@computinglab25-22:~/Desktop/PPL_230962278/Week2$ mpicc q3.c -o q3
(dse) mca@computinglab25-22:~/Desktop/PPL_230962278/Week2$ mpirun -np 4 ./q3
hwloc/linux: Ignoring PCI device with non-16bit domain.
Pass --enable-32bits-pci-domain to configure to support such devices
(warning: it would break the library ABI, don't enable unless really needed).
Enter 4 elements:
3
4
5
6
Process 0 (Even) Square = 9
Q3,Adarsh Ranjan 230962278
Process 1 (Odd) Cube = 64
Process 2 (Even) Square = 25
Process 3 (Odd) Cube = 216
```

Week2 > C q4.c

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

int main(int argc, char *argv[])
{
    int rank, size, value;

    MPI_Init(&argc, &argv);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);
    MPI_Comm_size(MPI_COMM_WORLD, &size);

    if (rank == 0)
    {
        printf("Enter an integer: ");
        printf("\n");
        scanf("%d", &value);

        value++;
        MPI_Send(&value, 1, MPI_INT, 1, 0, MPI_COMM_WORLD);

        MPI_Recv(&value, 1, MPI_INT, size - 1, 0, MPI_COMM_WORLD, MPI_STATUS_IGNORE);
        printf("Final value at root: %d\n", value);
    }
    else
    {
        MPI_Recv(&value, 1, MPI_INT, rank - 1, 0, MPI_COMM_WORLD, MPI_STATUS_IGNORE);
        value++;

        if (rank == size - 1)
            MPI_Send(&value, 1, MPI_INT, 0, 0, MPI_COMM_WORLD);
        else
            MPI_Send(&value, 1, MPI_INT, rank + 1, 0, MPI_COMM_WORLD);
    }

    if(rank == 0) printf("Q4,Adarsh Ranjan 230962278\n");

    MPI_Finalize();
    return 0;
}
```

```
(dse) mca@computinglab25-22:~/Desktop/PPL_230962278/Week2$ mpicc q4.c -o q4
(dse) mca@computinglab25-22:~/Desktop/PPL_230962278/Week2$ mpirun -np 4 ./q4
hwloc/linux: Ignoring PCI device with non-16bit domain.
Pass --enable-32bits-pci-domain to configure to support such devices
(warning: it would break the library ABI, don't enable unless really needed).
Enter an integer:
5
Final value at root: 9
Q4,Adarsh Ranjan 230962278
```