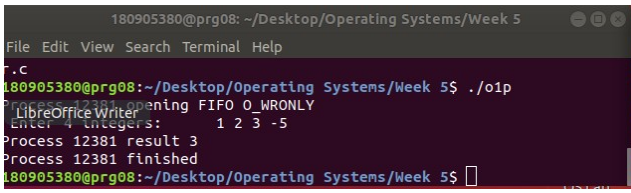
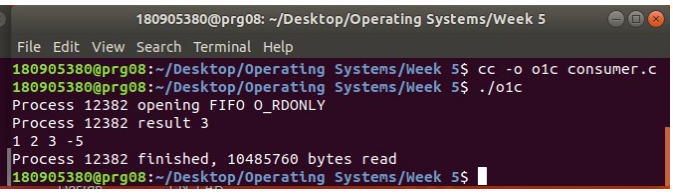
Q1. Write a producer and consumer program in C using the FIFO queue. The producer should write a set of 4 integers into the FIFO queue and the consumer should display the 4 integers.

//producer.c

```
#include <unistd.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <fcntl.h>
#include <limits.h>
#include <sys/types.h>
#include <sys/stat.h>

#define FIFO_NAME "/tmp/my_fifo"
#define BUFFER_SIZE PIPE_BUF
#define TEN_MEG (1024 * 1024 * 10)

int main()
{
	int pipe_fd;
	int res;
	int open_mode = O_WRONLY;
	int bytes_sent = 0;
	int buffer[BUFFER_SIZE + 1];
	if (access(FIFO_NAME,F_OK) == -1)
	{
		res = mkfifo(FIFO_NAME, 0777);
		if (res != 0)
		{
			fprintf(stderr, "Could not create fifo %s\n", FIFO_NAME);
			exit(EXIT_FAILURE);
		}
	}
	printf("Process %d opening FIFO O_WRONLY\n", getpid());
	printf(" Enter 4 integers:\t");
	for (int i = 0; i < 4; i++)
		scanf("%d", &buffer[i]);
	pipe_fd = open(FIFO_NAME, open_mode);
	printf("Process %d result %d\n", getpid(), pipe_fd);
	if (pipe_fd != -1)
	{
		while(bytes_sent < TEN_MEG)
		{
			res = write(pipe_fd, buffer, BUFFER_SIZE);
			if (res == -1)
			{
				fprintf(stderr, "Write error on pipe\n");
				exit(EXIT_FAILURE);
			}
			bytes_sent += res;
		}
		(void)close(pipe_fd);
	}
	else
		exit(EXIT_FAILURE);
	printf("Process %d finished\n", getpid());
	exit(EXIT_SUCCESS);
}
```

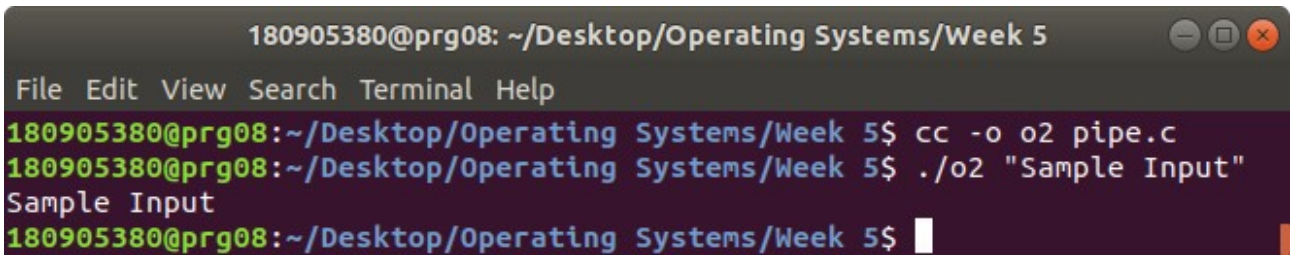
```c
//consumer.c
#include <unistd.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <fcntl.h>
#include <limits.h>
#include <sys/types.h>
#include <sys/stat.h>

#define FIFO_NAME "/tmp/my_fifo"
#define BUFFER_SIZE PIPE_BUF

int main()
{
	int pipe_fd;
	int res;
	int open_mode = O_RDONLY;
	int buffer[BUFFER_SIZE + 1];
	int bytes_read = 0;
	memset(buffer, '\0', sizeof(buffer));
	printf("Process %d opening FIFO O_RDONLY\n", getpid());
	pipe_fd = open(FIFO_NAME, open_mode);
	printf("Process %d result %d\n", getpid(), pipe_fd);
	if (pipe_fd != -1)
	{
		do
		{
			res = read(pipe_fd,buffer,BUFFER_SIZE);
			bytes_read += res;
		}while (res > 0);
		(void)close(pipe_fd);
		for (int i = 0; i < 4; i++)
			printf("%d ",buffer[i]);
		printf("\n");
	}
	else
		exit(EXIT_FAILURE);
	printf("Process %d finished, %d bytes read\n", getpid(), bytes_read);
	exit(EXIT_SUCCESS);
}
```





Q2. Demonstrate creation, writing to and reading from a pipe.

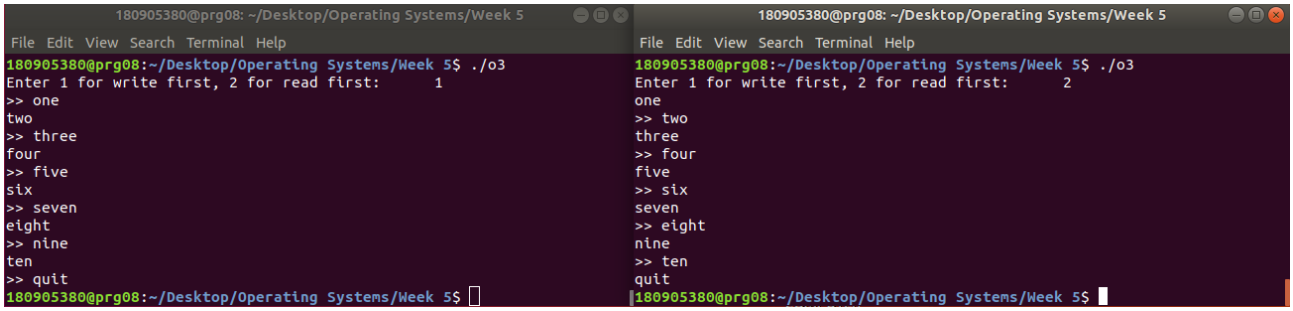
```
#include <sys/wait.h>
#include <assert.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <string.h>

int main(int argc, char *argv[])
{
	int pfd[2];
	pid_t cpid;
	char buf;
	assert(argc == 2);
	if (pipe(pfd) == -1)
	{
		perror("pipe");
		exit(EXIT_FAILURE);
	}
	cpid = fork();
	if (cpid == -1)
	{
		perror("fork");
		exit(EXIT_FAILURE);
	}
	if (cpid == 0)
	{
		close(pfd[1]);
		while (read(pfd[0],&buf,1) > 0)
			write(STDOUT_FILENO, &buf, 1);
		write(STDOUT_FILENO, "\n", 1);
		close(pfd[0]);
		exit(EXIT_SUCCESS);
	}
	else
	{
		close(pfd[0]);
		write(pfd[1], argv[1], strlen(argv[1]));
		close(pfd[1]);
		wait(NULL);
		exit(EXIT_SUCCESS);
	}
}
```



Q3. Write a C program to implement one side of FIFO.

```
#include <unistd.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <fcntl.h>
#include <limits.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <sys/wait.h>

#define FIFO_NAME "/tmp/my_fifo"
#define BUFFER_SIZE PIPE_BUF

int main()
{
	int pipe_fd;
	int res;
	int open_mode_1 = O_WRONLY;
	int open_mode_2 = O_RDONLY;
	int user_mode;
	int run = 1;
	printf("Enter 1 for write first, 2 for read first:\t");
	scanf("%d",&user_mode);
	if (user_mode == 1)
	{
		if (access(FIFO_NAME,F_OK) == -1)
		{
			res = mkfifo(FIFO_NAME, 0777);
			if (res != 0)
			{
				fprintf(stderr, "Could not create fifo %s\n", FIFO_NAME);
				exit(EXIT_FAILURE);
			}
		}
	}
	while(run)
	{
		if (user_mode == 1)
		{
			char buffer1[BUFFER_SIZE + 1];
			pipe_fd = open(FIFO_NAME, open_mode_1);
			printf(">> ");
			scanf("%s",buffer1);
			if (pipe_fd != -1)
			{
				res = write(pipe_fd, buffer1, BUFFER_SIZE);
				if (res == -1)
				{
					fprintf(stderr, "Write error on pipe\n");
					exit(EXIT_FAILURE);
				}
				close(pipe_fd);
				user_mode = 2;
				if (strcmp(buffer1,"quit") == 0)
					run = 0;
			}
			else
				exit(EXIT_FAILURE);
		}
		else if (user_mode == 2)
```

```
		{
			char buffer2[BUFFER_SIZE + 1];
			memset(buffer2, '\0', sizeof(buffer2));
			pipe_fd = open(FIFO_NAME, open_mode_2);
			if (pipe_fd != -1)
			{
				do
				{
					res = read(pipe_fd,buffer2,BUFFER_SIZE);
				}while (res > 0);
				close(pipe_fd);
				user_mode = 1;
				printf("%s\n",buffer2);
				if (strcmp(buffer2,"quit") == 0)
					run = 0;
			}
			else
				exit(EXIT_FAILURE);
		}
	}
	exit(EXIT_SUCCESS);
}
```



Q4. Write a C program reading and writing a binary files in C.

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

int main()
{
   int n = 5;
   int num[3];
   FILE *fptr;
   if ((fptr = fopen("hey.bin","wb")) == NULL)
   {
      printf("Error! opening file");
      exit(1);
   }
   num[0] = n;
   num[1] = 5*n;
   num[2] = 5*n + 1;
   fwrite(num, sizeof(num), 1, fptr);
   fclose(fptr);
   if ((fptr = fopen("hey.bin","rb")) == NULL)
   {
      printf("Error! opening file");
      exit(1);
   }
   fread(num, sizeof(num), 1, fptr);
   printf("n1: %d\tn2: %d\tn3: %d\n", num[0], num[1], num[2]);
   fclose(fptr);
   return 0;
}
```