

Part 1

```
pi@raspberrypi:~/assignments/ass6.1/src $ ./count
1
2
3
4
5
6
7
8
9
10
11
12
13
14
```

Figure 1: Function of count program

```
pi@raspberrypi:~/assignments/ass6.1/src $ ./count | ./multiply 2
2
4
6
8
10
12
^C
pi@raspberrypi:~/assignments/ass6.1/src $ ps
  PID TTY          TIME CMD
  5193 pts/5        00:00:01 bash
  8292 pts/5        00:00:00 ps
pi@raspberrypi:~/assignments/ass6.1/src $ ./count | ./multiply 3
3
6
9
12
15
18
^C
pi@raspberrypi:~/assignments/ass6.1/src $
```

Figure 2: Count output piped to the multiplier

Part 2

Information is passed between the programs by the shared accessible variable shm_p, it is stored as a file in /dev/shm/demo/shm.

The figure consists of four terminal windows arranged in a 2x2 grid, showing the execution of a program and its interaction with shared memory.

- Top Left:** Shows the initial login of a user on a Raspberry Pi. The user enters their password and is prompted for a new password. The terminal displays system information, including the kernel version (5.10.63) and the date (Tue Sep 28 11:24:51 BST 2021). It also shows the SSH status and the default password for the 'pi' user.
- Top Right:** Shows the user navigating to the directory `~/assignments/ass6.1/src` and running the command `./count | ./multiply`. The terminal output shows the execution of the `count` and `multiply` programs, which are part of the `shared-mem-demo.c` test.
- Bottom Left:** Shows the user navigating to the directory `~/dev/shm` and running the command `cat demo-shm`. The terminal output shows the contents of the shared memory, which is `demo-shm sem.demo-sem`.
- Bottom Right:** Shows the user navigating back to the directory `~/assignments/ass6.1/src` and running the command `./pt2`. The terminal output shows the execution of the `pt2` program, which is part of the `shared-mem-demo.c` test.

Figure 3: Shows content of 3 instances of the program, also the contents of the shared memory in bottom left

Part 3

I reduced the size of the shared memory to 256, since I was storing 8 bit integers as the shared variable

I reduced the size of the shared memory to 1, since I was storing 8 bit integers as the shared variable which is just 1 byte.

```

pi@raspberrypi:~/assignments/ass6.1/src $ ./sh_mult 2 & ./sh_mult 3 & ./sh_count

[1] 5587
[2] 5588
./sh_count PID=5589
Creating shared memory and setting size=256
./sh_mult PID=5587
./sh_mult PID=5588
1
2
3
2
4
6
3
4
12
8
5
15
10
6
18
12
7
21
14
8
24
16
^C
pi@raspberrypi:~/assignments/ass6.1/src $ p
-bash: p: command not found
pi@raspberrypi:~/assignments/ass6.1/src $ ps
  PID TTY          TIME CMD
  5193 pts/5        00:00:01 bash
   5587 pts/5        00:00:00 sh_mult
   5588 pts/5        00:00:00 sh_mult
   5599 pts/5        00:00:00 ps
pi@raspberrypi:~/assignments/ass6.1/src $ kill 5587
[1]-  Terminated                  ./sh_mult 2
pi@raspberrypi:~/assignments/ass6.1/src $ kill 5588
[2]+  Terminated                  ./sh_mult 3
pi@raspberrypi:~/assignments/ass6.1/src $ █

```

Figure 4: One program incrementing counter and 2 other multiplying by 2 or 3

Note in figure 3, that the order of the multipliers 2 and 3 isn't deterministic and changes randomly although I didn't think this was something that needed correcting so I left it as is.