

ASSIGNMENT 1

Exercises

- a) Run command **more /proc/cpuinfo** and explain the following terms: **processor** and **cores**.

This virtual file identifies the type of processor used by your system. The following is an example of the output typical of /proc/cpuinfo.

```
misbahnaeem@misbahnaeem-VirtualBox:~/Desktop$ more /proc/cpuinfo
processor       : 0
vendor_id     : GenuineIntel
cpu family    : 6
model         : 142
model name    : Intel(R) Core(TM) m3-7Y30 CPU @ 1.00GHz
stepping      : 9
cpu MHz       : 1608.002
cache size    : 4096 KB
physical id   : 0
siblings      : 1
core id       : 0
cpu cores     : 1
apicid        : 0
initial apicid : 0
fpu           : yes
fpu_exception : yes
cpuid level   : 22
wp            : yes
```

Processor: Provides each processor with an identifying number. On systems that have one processor, only a 0 is present. If we have more than one processor it will display all processor information separately counting the processors using zero notation.

Core: CPU-core has value 1 so it means I have one core in my system and one processor is working in that core.

- b) **How many cores does your machine have?**

My machine has 1 core.

- c) **How many processors does your machine have?**

My machine has only 1 processor as shown in above fig.

- d) **What is the frequency of each processor?**

The processor has 1608.002MHZ frequency.

- e) **How much physical memory does your system have?**

```
misbahnaeem@misbahnaeem-VirtualBox:~/Desktop$ grep MemTotal /proc/meminfo
MemTotal:      1004372 kB
```

f) How much of this memory is free?

The free memory in my system is 87916KB.

```
misbahnaeem@misbahnaeem-VirtualBox:~/Desktop$ more /proc/meminfo
MemTotal:      1004372 kB
MemFree:       87916 kB
MemAvailable:  232096 kB
```

g) What is total number of number of forks since the boot in the system?

```
misbahnaeem@misbahnaeem-VirtualBox:~/Desktop$ vmstat -f 1
3414 forks
```

h) How many context switches has the system performed since bootup?

```
misbah123@misbah123-VirtualBox:/proc$ pidstat -w
Linux 5.8.0-43-generic (misbah123-VirtualBox) 15/03/2021 _x86_64_
1 CPU)
```

	UID	PID	cschw/s	nvcschw/s	Command
16:34:05	0	1	8.41	11.26	systemd
16:34:05	0	2	0.29	0.00	kthreadd
16:34:05	0	3	0.00	0.00	rcu_gp
16:34:05	0	4	0.00	0.00	rcu_par_gp
16:34:05	0	5	19.12	0.01	kworker/0:0-events
16:34:05	0	6	0.01	0.00	kworker/0:0H-kblockd
16:34:05	0	7	4.33	0.01	kworker/0:1-events
16:34:05	0	8	2.64	0.04	kworker/u2:0-events_unbound
16:34:05	0	9	0.00	0.00	mm_percpu_wq
16:34:05	0	10	15.87	0.20	ksoftirqd/0
16:34:05	0	11	72.38	0.00	rcu_sched
16:34:05	0	12	0.26	0.00	migration/0
16:34:05	0	13	0.01	0.00	idle_inject/0
16:34:05	0	14	0.02	0.00	cpuhp/0
16:34:05	0	15	0.40	0.00	kdevtmpfs
16:34:05	0	16	0.00	0.00	netns
16:34:05	0	17	0.00	0.00	rcu_tasks_kthre
16:34:05	0	18	0.00	0.00	rcu_tasks_rude_
16:34:05	0	19	0.00	0.00	rcu_tasks_trace
16:34:05	0	20	0.05	0.00	kauditd
16:34:05	0	21	0.01	0.00	khungtaskd

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16:34:05	0	22	0.00	0.00	oom_reaper
16:34:05	0	23	0.00	0.00	writeback
16:34:05	0	24	0.00	0.00	kcompactd0
16:34:05	0	25	0.00	0.00	ksmd
16:34:05	0	26	0.00	0.00	khugepaged
16:34:05	0	72	0.00	0.00	kintegrityd
16:34:05	0	73	0.00	0.00	kblockd
16:34:05	0	74	0.00	0.00	blkcg_punt_bio
16:34:05	0	75	0.00	0.00	tpm_dev_wq
16:34:05	0	76	0.00	0.00	ata_sff
16:34:05	0	77	0.00	0.00	md
16:34:05	0	78	0.00	0.00	edac-poller
16:34:05	0	79	0.00	0.00	devfreq_wq
16:34:05	0	80	0.00	0.00	watchdogd
16:34:05	0	81	3.64	0.10	kworker/u2:1-ext4-rsv-conversi on
16:34:05	0	82	0.00	0.00	pm_wq
16:34:05	0	84	0.68	2.76	kswapd0
16:34:05	0	85	0.00	0.00	ecryptfs-kthrea
16:34:05	0	87	0.00	0.00	kthrotld
16:34:05	0	88	0.00	0.00	acpi_thermal_pm
16:34:05	0	89	0.01	0.00	scsi_eh_0
16:34:05	0	90	0.00	0.00	scsi_tmf_0
16:34:05	0	91	0.10	0.00	scsi_eh_1
16:34:05	0	92	0.00	0.00	scsi_tmf_1
16:34:05	0	94	0.00	0.00	vfiio-irqfd-clea
16:34:05	0	95	0.31	0.00	kworker/u2:3-events_unbound
16:34:05	0	96	0.00	0.00	ipv6_addrconf
16:34:05	0	105	0.00	0.00	kstrp
16:34:05	0	108	0.00	0.00	zswap-shrink
16:34:05	0	109	0.01	0.00	kworker/u3:0
16:34:05	0	114	0.00	0.00	charger_manager
16:34:05	0	115	58.09	0.04	kworker/0:1H-kblockd
16:34:05	0	150	0.04	0.00	scsi_eh_2
16:34:05	0	151	14.27	0.01	kworker/0:3-events
16:34:05	0	153	0.00	0.00	scsi_tmf_2
16:34:05	0	174	0.99	0.33	jbd2/sda5-8
16:34:05	0	175	0.00	0.00	ext4-rsv-conver
16:34:05	0	214	4.32	0.44	systemd-journal
16:34:05	0	244	0.17	0.00	loop0
16:34:05	0	248	0.89	1.38	systemd-udevd
16:34:05	0	249	0.19	0.00	loop1
16:34:05	0	250	0.18	0.01	loop2
16:34:05	0	251	0.17	0.00	loop3
16:34:05	0	252	2.80	0.00	loop4
16:34:05	0	288	0.00	0.00	cryptd
16:34:05	0	318	14.64	0.00	irq/18-vmwgfx
16:34:05	0	319	0.00	0.00	ttm_swap
16:34:05	101	478	0.48	0.17	systemd-resolve
16:34:05	102	480	0.13	0.14	systemd-timesyn
16:34:05	0	514	0.37	0.27	accounts-daemon
16:34:05	0	515	0.78	0.00	acpid
16:34:05	0	516	0.04	0.00	anacron
16:34:05	115	518	0.86	0.02	avahi-daemon
16:34:05	0	519	0.05	0.01	cron
16:34:05	0	520	0.30	0.05	cupsd
16:34:05	100	521	17.27	0.10	throttled

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16:34:05	103	521	13.87	5.08	dbus-daemon
16:34:05	0	522	3.62	3.84	NetworkManager
16:34:05	0	532	0.44	0.21	networkd-dispat
16:34:05	0	533	1.35	23.67	polkitd
16:34:05	104	535	0.05	0.00	rsyslogd
16:34:05	0	536	0.74	0.57	snaped
16:34:05	0	537	0.05	0.03	switcheroo-cont
16:34:05	0	538	4.91	0.31	systemd-logind
16:34:05	0	540	0.36	0.21	udisksd
16:34:05	0	541	0.18	0.01	wpa_supplicant
16:34:05	115	567	0.01	0.00	avahi-daemon
16:34:05	0	599	0.91	0.04	cups-browsed
16:34:05	7	602	0.01	0.03	dbus
16:34:05	7	603	0.01	0.02	dbus
16:34:05	0	618	0.34	0.14	ModemManager
16:34:05	0	626	0.28	0.17	unattended-upgr
16:34:05	0	645	0.32	0.38	gdm3
16:34:05	120	673	0.26	0.06	whoopsie
16:34:05	116	679	0.05	0.00	kerneloops
16:34:05	116	681	0.03	0.00	kerneloops
16:34:05	111	752	0.06	0.07	rtkit-daemon
16:34:05	0	848	0.24	0.39	upowerd
16:34:05	121	1079	0.42	0.77	colord
16:34:05	0	1119	0.06	0.16	gdm-session-wor
16:34:05	1000	1131	1.68	1.25	systemd
16:34:05	1000	1133	0.00	0.00	(sd-pam)
16:34:05	1000	1139	0.60	0.43	pulseaudio
16:34:05	1000	1141	0.70	0.10	tracker-miner-f
16:34:05	1000	1143	9.45	2.78	dbus-daemon
16:34:05	1000	1146	1.23	0.08	gnome-keyring-d
16:34:05	1000	1151	0.28	0.54	gvfsd
16:34:05	1000	1156	0.01	0.00	gvfsd-fuse
16:34:05	1000	1175	0.13	0.28	gvfs-udisks2-vo
16:34:05	1000	1181	0.17	0.00	gvfs-mtp-volume
16:34:05	1000	1185	0.17	0.01	gvfs-gphoto2-vo
16:34:05	1000	1188	0.06	0.04	gdm-x-session
16:34:05	1000	1192	0.17	0.00	gvfs-afc-volume
16:34:05	1000	1197	0.19	0.01	gvfs-goa-volume
16:34:05	1000	1201	0.06	0.21	goa-daemon
16:34:05	1000	1203	92.90	30.31	Xorg
16:34:05	1000	1210	0.07	0.11	goa-identity-se
16:34:05	1000	1237	0.46	0.19	gnome-session-b
16:34:05	1000	1289	0.58	1.76	gvfsd-metadata
16:34:05	1000	1308	0.07	0.00	ssh-agent
16:34:05	1000	1331	0.07	0.04	at-spi-bus-laun
16:34:05	1000	1337	0.76	0.03	dbus-daemon
16:34:05	1000	1351	0.01	0.01	gnome-session-c
16:34:05	1000	1360	0.61	0.28	gnome-session-b
16:34:05	1000	1374	50.31	73.56	gnome-shell
16:34:05	1000	1396	0.20	0.05	ibus-daemon
16:34:05	1000	1400	0.07	0.02	ibus-memconf
16:34:05	1000	1401	0.25	1.25	ibus-extension-
16:34:05	1000	1403	0.17	0.47	ibus-x11
16:34:05	1000	1405	0.29	0.03	ibus-portal
16:34:05	1000	1418	0.68	0.22	at-spi2-registr
16:34:05	1000	1422	0.10	0.01	xdg-permission-

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16:34:05	1000	1424	0.31	0.23	gnome-shell-cal
16:34:05	1000	1435	0.28	0.27	evolution-sourc
16:34:05	1000	1448	0.56	0.07	evolution-calen
16:34:05	1000	1454	0.13	0.27	gjs
16:34:05	1000	1455	0.12	0.03	ibus-engine-sim
16:34:05	1000	1457	0.10	0.11	gsd-a11y-settin
16:34:05	1000	1458	0.74	0.20	gsd-color
16:34:05	1000	1459	0.11	0.09	gsd-datetime
16:34:05	1000	1460	0.14	0.13	gsd-housekeepin
16:34:05	1000	1461	0.58	0.22	gsd-keyboard
16:34:05	1000	1462	0.56	0.84	gsd-media-keys
16:34:05	1000	1463	0.52	0.76	gsd-power
16:34:05	1000	1464	0.11	0.01	gsd-print-notif
16:34:05	1000	1465	0.16	0.00	gsd-rfkill
16:34:05	1000	1466	0.14	0.01	gsd-screensaver
16:34:05	1000	1467	0.25	0.03	gsd-sharing
16:34:05	1000	1468	0.08	0.14	gsd-smartcard
16:34:05	1000	1469	0.10	0.16	gsd-sound
16:34:05	1000	1470	0.06	0.16	gsd-usb-protect
16:34:05	1000	1471	0.52	0.28	gsd-wacom
16:34:05	1000	1472	0.08	0.12	gsd-wwan
16:34:05	1000	1473	1.09	0.60	gsd-xsettings
16:34:05	1000	1543	0.03	0.02	gsd-disk-utilit
16:34:05	1000	1545	0.78	0.50	evolution-alarm
16:34:05	1000	1565	0.10	0.03	gsd-printer
16:34:05	1000	1595	0.16	0.15	gvfsd-trash
16:34:05	1000	1599	0.08	0.02	dconf-service
16:34:05	1000	1624	0.30	0.03	evolution-addre
16:34:05	1000	1678	2.94	1.83	gnome-initial-s
16:34:05	1000	1714	6.32	1.90	gnome-terminal-
16:34:05	1000	1720	17.82	9.61	baobab
16:34:05	1000	1731	0.41	0.07	bash
16:34:05	1000	1744	1.17	0.61	update-notifier
16:34:05	1000	1846	2.90	3.62	nautilus
16:34:05	0	3137	0.33	0.13	packagekitd
16:34:05	1000	3215	0.00	0.01	pidstat

QUESTION 2:

- i. What is the PID of the process running the CPU command?

PID for the CPU process is "7963".

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
7963	misbahn+	20	0	2364	520	452	R	98.3	0.1	5:45.81	cpu

- ii. How much CPU and memory does this process consume?

CPU and memory consumption is 98.3% and 0.1% respectively.

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
7963	misbahn+	20	0	2364	520	452	R	98.3	0.1	5:45.81	cpu

- iii. What is the current state of the process? For example, is it running or in a blocked state or a zombie state?

Current state of the process is Zombie.

QUESTION 3:

Part(a):

PID of CPU-print is "8130".

```
misbahnaeem@misbahnaeem-VirtualBox:~$ ps aux | grep -i cpu-print
misbahn+ 8130 28.5 0.0 2496 644 pts/0 S+ 14:18 2:40 ./cpu-print
misbahn+ 8142 0.0 0.2 18012 2856 pts/1 S+ 14:27 0:00 grep --color
=auto -i cpu-print
```

```
misbahnaeem@misbahnaeem-VirtualBox:~$ pidof cpu-print
8130
```

PART(B):

Find the PID of the parent of the CPU-print process, i.e., the shell process. Next, find the PIDs of all the ancestors, going back at least 5 generations (or until you reach the init process).

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PID of all process:

```
misbahnaeem@misbahnaeem-VirtualBox:~$ ps -efj
UID          PID     PPID    PGID     SID   C  STIME TTY          TIME CMD
root           1         0        1         1  0  09:38 ?        00:00:04 /sbin/init
root           2         0         0         0  0  09:38 ?        00:00:00 [kthreadd]
root           3         2         0         0  0  09:38 ?        00:00:00 [rcu_gp]
root           4         2         0         0  0  09:38 ?        00:00:00 [rcu_par_gp]
root           6         2         0         0  0  09:38 ?        00:00:00 [kworker/0:
root           9         2         0         0  0  09:38 ?        00:00:00 [mm_percpu_
root          10         2         0         0  0  09:38 ?        00:00:01 [ksoftirqd/
root          11         2         0         0  0  09:38 ?        00:00:03 [rcu_sched]
root          12         2         0         0  0  09:38 ?        00:00:00 [migration/
root          13         2         0         0  0  09:38 ?        00:00:00 [idle_injec
root          14         2         0         0  0  09:38 ?        00:00:00 [cpuhp/0]
root          15         2         0         0  0  09:38 ?        00:00:00 [kdevtmpfs]
root          16         2         0         0  0  09:38 ?        00:00:00 [netns]
root          17         2         0         0  0  09:38 ?        00:00:00 [rcu_tasks_
root          18         2         0         0  0  09:38 ?        00:00:00 [rcu_tasks_
root          19         2         0         0  0  09:38 ?        00:00:00 [rcu_tasks_
root          20         2         0         0  0  09:38 ?        00:00:00 [kauditd]
root          21         2         0         0  0  09:38 ?        00:00:00 [khungtaskd
root          22         2         0         0  0  09:38 ?        00:00:00 [oom_reaper]
root          23         2         0         0  0  09:38 ?        00:00:00 [writeback]
root          24         2         0         0  0  09:38 ?        00:00:00 [kcompactd0
root          25         2         0         0  0  09:38 ?        00:00:00 [ksmd]
root          26         2         0         0  0  09:38 ?        00:00:00 [khugepaged
root          72         2         0         0  0  09:38 ?        00:00:00 [kintegrity
root          73         2         0         0  0  09:38 ?        00:00:00 [kblockd]
root          74         2         0         0  0  09:38 ?        00:00:00 [blkcg_punt
root          75         2         0         0  0  09:38 ?        00:00:00 [tpm_dev_wq

root          76         2         0         0  0  09:38 ?        00:00:00 [ata_sff]
root          77         2         0         0  0  09:38 ?        00:00:00 [md]
root          78         2         0         0  0  09:38 ?        00:00:00 [edac-polle
root          79         2         0         0  0  09:38 ?        00:00:00 [devfreq_wq
root          80         2         0         0  0  09:38 ?        00:00:00 [watchdogd]
root          82         2         0         0  0  09:38 ?        00:00:00 [pm_wq]
root          84         2         0         0  0  09:38 ?        00:00:03 [kswapd0]
root          85         2         0         0  0  09:38 ?        00:00:00 [ecryptfs-k
root          87         2         0         0  0  09:38 ?        00:00:00 [kthrotld]
root          88         2         0         0  0  09:38 ?        00:00:00 [acpi_therm
root          89         2         0         0  0  09:38 ?        00:00:00 [scsi_eh_0]
root          90         2         0         0  0  09:38 ?        00:00:00 [scsi_tmf_0
root          91         2         0         0  0  09:38 ?        00:00:00 [scsi_eh_1]
root          92         2         0         0  0  09:38 ?        00:00:00 [scsi_tmf_1
root          94         2         0         0  0  09:38 ?        00:00:00 [vfio-irqfd
root          96         2         0         0  0  09:38 ?        00:00:00 [ipv6_addrc
root         105         2         0         0  0  09:38 ?        00:00:00 [kstrp]
root         108         2         0         0  0  09:38 ?        00:00:00 [zswap-shri
root         109         2         0         0  0  09:38 ?        00:00:00 [kworker/u3
root         114         2         0         0  0  09:38 ?        00:00:00 [charger_ma
```

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```

root      115      2      0      0 0 09:38 ?      00:00:02 [kworker/0:
root      151      2      0      0 0 09:38 ?      00:00:00 [scsi_eh_2]
root      152      2      0      0 0 09:38 ?      00:00:00 [scsi_tmf_2
root      174      2      0      0 0 09:38 ?      00:00:00 [jbd2/sda5-
root      175      2      0      0 0 09:38 ?      00:00:00 [ext4-rsv-c
root      214      1     214     214 0 09:38 ?      00:00:01 /lib/system
root      241      2      0      0 0 09:38 ?      00:00:00 [loop0]
root      242      2      0      0 0 09:38 ?      00:00:00 [loop1]
root      244      2      0      0 0 09:38 ?      00:00:00 [loop2]
root      245      2      0      0 0 09:38 ?      00:00:00 [loop3]
root      246      2      0      0 0 09:38 ?      00:00:00 [loop4]
root      248      1     248     248 0 09:38 ?      00:00:01 /lib/system
root      249      2      0      0 0 09:38 ?      00:00:00 [loop5]
root      250      2      0      0 0 09:38 ?      00:00:01 [irq/18-vmw
root      251      2      0      0 0 09:38 ?      00:00:00 [ttm_swap]
root      308      2      0      0 0 09:38 ?      00:00:00 [cryptd]
systemd+  473      1     473     473 0 09:38 ?      00:00:00 /lib/system
systemd+  474      1     474     474 0 09:38 ?      00:00:00 /lib/system
root      507      1     507     507 0 09:38 ?      00:00:01 /usr/lib/ac
root      508      1     508     508 0 09:38 ?      00:00:00 /usr/sbin/a
avahi     510      1     510     510 0 09:38 ?      00:00:00 avahi-daemo
root      511      1     511     511 0 09:38 ?      00:00:00 /usr/sbin/c
root      512      1     512     512 0 09:38 ?      00:00:00 /usr/sbin/c
message+  513      1     513     513 0 09:38 ?      00:00:04 /usr/bin/db
root      514      1     514     514 0 09:38 ?      00:00:15 /usr/sbin/N
root      532      1     532     532 0 09:38 ?      00:00:00 /usr/bin/py
root      534      1     534     534 0 09:38 ?      00:00:03 /usr/lib/po
syslog    538      1     538     538 0 09:38 ?      00:00:00 /usr/sbin/r
root      539      1     539     539 0 09:38 ?      00:00:06 /usr/lib/sn

```

```

root      540      1     540     540 0 09:38 ?      00:00:00 /usr/libexe
root      542      1     542     542 0 09:38 ?      00:00:00 /lib/system
root      544      1     544     544 0 09:38 ?      00:00:00 /usr/lib/ud
root      545      1     545     545 0 09:38 ?      00:00:00 /sbin/wpa_s
avahi     546      1     510     510 0 09:38 ?      00:00:00 avahi-daemo
root      596      1     596     596 0 09:38 ?      00:00:00 /usr/sbin/c
root      609      1     609     609 0 09:38 ?      00:00:00 /usr/sbin/M
root      615      1     615     615 0 09:38 ?      00:00:00 /usr/bin/py
root      631      1     631     631 0 09:38 ?      00:00:00 /usr/sbin/g
whoopsie  680      1     680     680 0 09:38 ?      00:00:00 /usr/bin/wh
kernoops  694      1     694     694 0 09:38 ?      00:00:00 /usr/sbin/k
kernoops  699      1     699     699 0 09:38 ?      00:00:00 /usr/sbin/k
rtkit     763      1     763     763 0 09:38 ?      00:00:00 /usr/libexe
root      877      1     877     877 0 09:38 ?      00:00:01 /usr/lib/up
colord    1071     1     1071    1071 0 09:39 ?      00:00:00 /usr/libexe
root      1130     631     631     631 0 09:39 ?      00:00:00 gdm-session
misbahn+  1138      1     1138    1138 0 09:39 ?      00:00:11 /lib/system
misbahn+  1139    1138    1138    1138 0 09:39 ?      00:00:00 (sd-pam)
misbahn+  1144    1138    1144    1144 0 09:39 ?      00:00:03 /usr/bin/pu
misbahn+  1146    1138    1146    1146 0 09:39 ?      00:00:01 /usr/libexe
misbahn+  1149    1138    1149    1149 0 09:39 ?      00:00:03 /usr/bin/db
misbahn+  1154      1     1153    1153 0 09:39 ?      00:00:00 /usr/bin/gn
misbahn+  1157    1138    1157    1157 0 09:39 ?      00:00:00 /usr/libexe
misbahn+  1162    1138    1157    1157 0 09:39 ?      00:00:00 /usr/libexe
misbahn+  1177    1138    1177    1177 0 09:39 ?      00:00:00 /usr/libexe
misbahn+  1186    1130    1186    1186 0 09:39 tty2    00:00:00 /usr/lib/gd
misbahn+  1189    1186    1186    1186 0 09:39 tty2    00:01:12 /usr/lib/xo
misbahn+  1192    1138    1192    1192 0 09:39 ?      00:00:02 /usr/libexe
misbahn+  1197    1138    1197    1197 0 09:39 ?      00:00:00 /usr/libexe

```


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```

misbahn+ 1177 1138 1177 1177 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1186 1130 1186 1186 0 09:39 tty2 00:00:00 /usr/lib/gd
misbahn+ 1189 1186 1186 1186 0 09:39 tty2 00:01:12 /usr/lib/xo
misbahn+ 1192 1138 1192 1192 0 09:39 ? 00:00:02 /usr/libexe
misbahn+ 1197 1138 1197 1197 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1201 1138 1201 1201 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1205 1138 1205 1205 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1209 1138 1149 1149 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1216 1138 1149 1149 0 09:39 ? 00:00:01 /usr/libexe
misbahn+ 1241 1186 1186 1186 0 09:39 tty2 00:00:00 /usr/libexe
misbahn+ 1300 1138 1300 1300 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1314 1241 1314 1314 0 09:39 ? 00:00:00 /usr/bin/ss
misbahn+ 1337 1138 1337 1337 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1342 1337 1337 1337 0 09:39 ? 00:00:00 /usr/bin/db
misbahn+ 1361 1138 1361 1361 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1372 1138 1372 1372 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1386 1138 1386 1386 1 09:39 ? 00:05:06 /usr/bin/gn
misbahn+ 1408 1386 1408 1386 0 09:39 ? 00:00:02 ibus-daemon
misbahn+ 1412 1408 1408 1386 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1413 1408 1408 1386 0 09:39 ? 00:00:04 /usr/libexe
misbahn+ 1415 1138 1408 1386 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1417 1138 1149 1149 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1427 1138 1337 1337 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1434 1138 1434 1434 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1436 1138 1149 1149 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1447 1138 1447 1447 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1455 1138 1455 1455 0 09:39 ? 00:00:00 /usr/libexe

```

```

misbahn+ 1507 1138 1507 1507 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1508 1138 1508 1508 0 09:39 ? 00:00:01 /usr/libexe
misbahn+ 1509 1138 1509 1509 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1510 1138 1510 1510 0 09:39 ? 00:00:01 /usr/libexe
misbahn+ 1536 1372 1372 1372 0 09:39 ? 00:00:01 /usr/libexe
misbahn+ 1550 1372 1372 1372 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1573 1138 1494 1494 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1621 1157 1157 1157 0 09:39 ? 00:00:00 /usr/libexe
misbahn+ 1683 1138 1683 1683 0 09:40 ? 00:00:02 /usr/libexe
misbahn+ 1723 1138 1723 1723 3 09:40 ? 00:10:24 /usr/libexe
misbahn+ 1731 1723 1731 1731 0 09:40 pts/0 00:00:00 bash
misbahn+ 1737 1372 1372 1372 0 09:40 ? 00:00:02 update-noti
misbahn+ 2708 1138 1149 1149 0 10:26 ? 00:00:14 /usr/bin/na
misbahn+ 2734 1731 2734 1731 0 10:28 pts/0 00:00:00 cat
misbahn+ 2777 1157 1157 1157 0 10:29 ? 00:00:00 /usr/libexe
misbahn+ 2790 1157 1157 1157 0 10:29 ? 00:00:00 /usr/libexe
root 3322 1130 631 631 0 13:04 ? 00:00:00 gdm-session
misbahn+ 7938 1138 1149 1149 0 13:50 ? 00:00:01 /usr/bin/ge
misbahn+ 8009 1723 8009 8009 0 13:55 pts/1 00:00:00 bash
root 8044 2 0 0 4 14:09 ? 00:01:27 [kworker/u2
root 8073 2 0 0 0 14:15 ? 00:00:00 [kworker/0:
root 8074 2 0 0 0 14:15 ? 00:00:01 [kworker/0:
misbahn+ 8130 1731 8130 1731 28 14:18 pts/0 00:06:17 ./cpu-print
root 8132 2 0 0 8 14:19 ? 00:01:38 [kworker/u2
root 8144 2 0 0 2 14:27 ? 00:00:21 [kworker/u2
root 8151 2 0 0 2 14:32 ? 00:00:11 [kworker/u2
root 8243 2 0 0 0 14:36 ? 00:00:00 [kworker/0:
misbahn+ 8259 8009 8259 8009 0 14:39 pts/1 00:00:00 ps -efj

```

PART(C)

“0” is used for input redirection. “1” is used for output redirection and “2” is used for error redirection.

```
total 0
lrwx----- 1 misbah123 misbah123 64 0 23:22 15  مارج -> /dev/pts/0
l-wx----- 1 misbah123 misbah123 64 1 23:22 15  مارج -> /tmp/tmp.txt
lrwx----- 1 misbah123 misbah123 64 2 23:22 15  مارج -> /dev/pts/0
```

PART(D)

Output of the part(d)

```
misbah123@misbah123-VirtualBox:~/Downloads/intro-code$ cd /proc/19840/fd
misbah123@misbah123-VirtualBox:/proc/19840/fd$ ls -l | more
total 0
lr-x----- 1 misbah123 misbah123 64 0 23:26 15  مارج -> pipe:[115690]
lrwx----- 1 misbah123 misbah123 64 1 23:26 15  مارج -> /dev/pts/0
lrwx----- 1 misbah123 misbah123 64 2 23:26 15  مارج -> /dev/pts/0
```

PART(E)

For cd command:

```
misbah123@misbah123-VirtualBox:~$ type -a cd
cd is a shell builtin
```

For ps:

```
misbah123@misbah123-VirtualBox:~$ type -a ps
ps is /usr/bin/ps
ps is /bin/ps
```

For history:

```
misbah123@misbah123-VirtualBox:~$ type -a history
history is a shell builtin
```

For ls:

```
misbah123@misbah123-VirtualBox:~$ type -a ls
ls is aliased to `ls --color=auto'
ls is /usr/bin/ls
ls is /bin/ls
```


QUESTION 4:

Output of while running **memory1.c**:

```
misbahnaeem@misbahnaeem-VirtualBox:~/Desktop$ gcc memory1.c -o memory1
misbahnaeem@misbahnaeem-VirtualBox:~/Desktop$ ./memory1

Program : 'memory_1'
-----

PID : 2125
Size of int : 4
```

Physical memory occupied by the process is “4952”.

```
misbahna+ 2125 1979 0 1570 4952 0 18:12 pts/0 00:00:00 ./memory1
```

Virtual memory occupied by the process is “1570”.

```
misbahna+ 2125 1979 0 1570 4952 0 18:12 pts/0 00:00:00 ./memory1
```

Output of while running **memory2.c**

```
misbahnaeem@misbahnaeem-VirtualBox:~/Desktop$ gcc memory2.c -o memory2
misbahnaeem@misbahnaeem-VirtualBox:~/Desktop$ ./memory2

Program : 'memory_2'
-----

PID : 2295
Size of int : 4
```

Physical memory used by process is “4908”.

```
misbahna+ 2295 1979 0 1571 4908 0 19:27 pts/0 00:00:00 ./memory2
```

Virtual memory used by the process is “1571”.

```
misbahna+ 2295 1979 0 1571 4908 0 19:27 pts/0 00:00:00 ./memory2
```


The physical memory used by memory1 is more than second one, but virtual memory used by memory2 is more as compared by memory1.

QUESTION 5:

Using the following commands to compile files:

```
gcc disk.c -o diskfirst
```

```
gcc disk1.c -o disksecond
```

Using iostat to observe disk usage:

```
iostat -m -p sda
```

Cache is cleared in between processes using this command:

```
sync; echo 3 >sudo /proc/sys/vm/drop_caches
```

Disk usage before running disk.c file:

avg-cpu:	%user	%nice	%system	%iowait	%steal	%idle
	20.08	0.00	3.38	0.00	0.00	76.54
Device	tps	MB_read/s	MB_wrtn/s	MB_read	MB_wrtn	
sda	1.80	0.00	0.03	0	0	
sda1	1.80	0.00	0.03	0	0	

Disk usage while disk.c file is running:

avg-cpu:	%user	%nice	%system	%iowait	%steal	%idle
	31.56	0.00	34.67	0.00	0.00	33.77
Device	tps	MB_read/s	MB_wrtn/s	MB_read	MB_wrtn	
sda	2.40	0.00	0.03	0	0	
sda1	2.40	0.00	0.03	0	0	

Disk usage before running disk1.c file:

avg-cpu:	%user	%nice	%system	%iowait	%steal	%idle
	18.64	0.00	2.37	0.00	0.00	78.99
Device	tps	MB_read/s	MB_wrtn/s	MB_read	MB_wrtn	
sda	1.80	0.00	0.03	0	0	
sda1	1.80	0.00	0.03	0	0	

Disk usage while disk1.c file is running:

avg-cpu:	%user	%nice	%system	%iowait	%steal	%idle
	34.07	0.00	32.96	0.00	0.00	32.96
Device	tps	MB_read/s	MB_wrtn/s	MB_read	MB_wrtn	
sda	1.80	0.00	0.04	0	0	
sda1	1.80	0.00	0.04	0	0	

Explanation:

Both files, disk.c and disk1.c are basically reading all the files that we have created in the disk-files directory. All 5000 of the files are stored in the disk and are fetched and stored in the cache when we run the first file. Hence, we need to remove the files from the cache so that the second file also has to access the disk rather than using them from the cache. We can see from the above outputs that when the programs are run, they both have almost the same amount of disk usage.