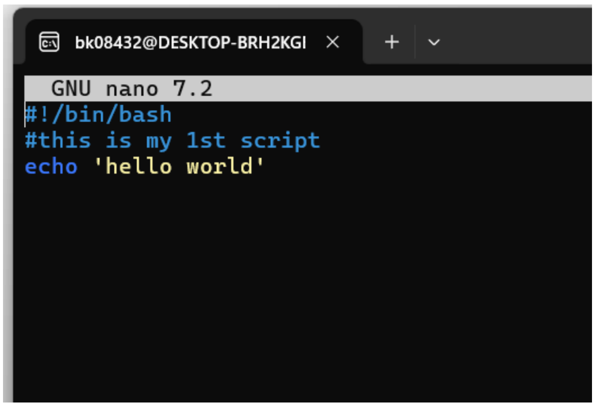
Lab 2 OS

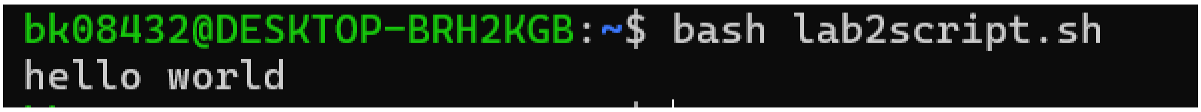
Name: basil khowaja bk08432

Nano:

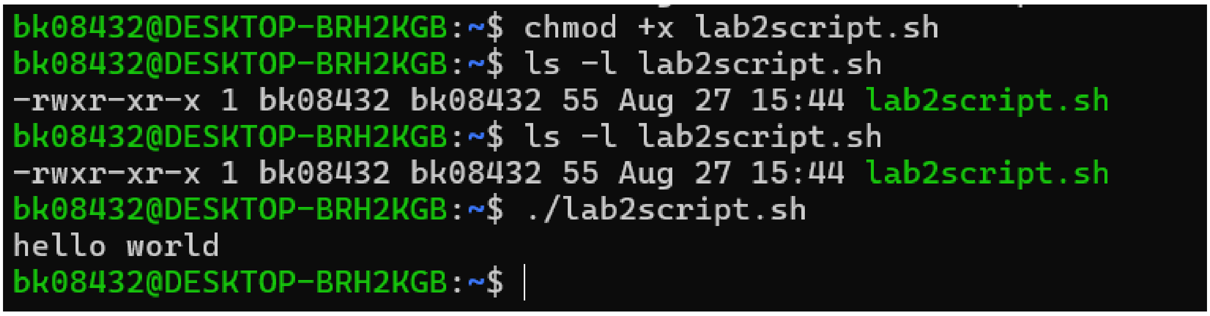


```
  GNU nano 7.2
#!/bin/bash
#this is my 1st script
echo 'hello world'
```

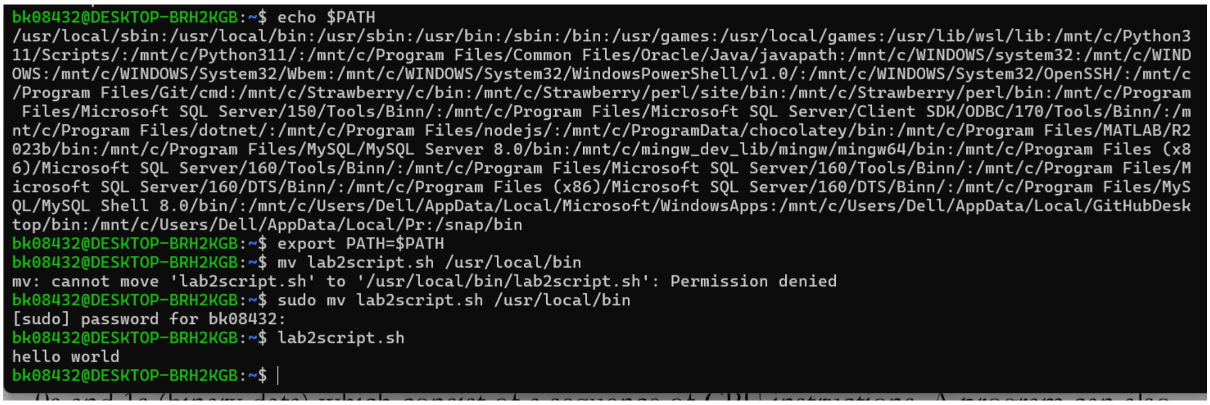
Running the script file:



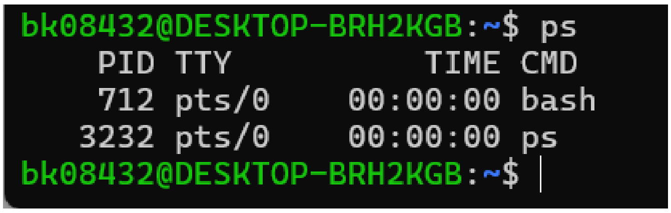
```
bk08432@DESKTOP-BRH2KGB:~$ bash lab2script.sh
hello world
```



```
bk08432@DESKTOP-BRH2KGB:~$ chmod +x lab2script.sh
bk08432@DESKTOP-BRH2KGB:~$ ls -l lab2script.sh
-rwxr-xr-x 1 bk08432 bk08432 55 Aug 27 15:44 lab2script.sh
bk08432@DESKTOP-BRH2KGB:~$ ls -l lab2script.sh
-rwxr-xr-x 1 bk08432 bk08432 55 Aug 27 15:44 lab2script.sh
bk08432@DESKTOP-BRH2KGB:~$ ./lab2script.sh
hello world
bk08432@DESKTOP-BRH2KGB:~$ |
```

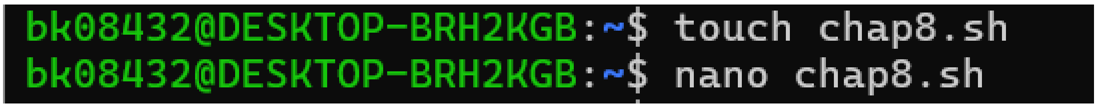


```
bk08432@DESKTOP-BRH2KGB:~$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/usr/lib/wsl/lib:/mnt/c/Python3
11/Scripts/:/mnt/c/Python311/:/mnt/c/Program Files/Common Files/Oracle/Java/javapath:/mnt/c/WINDOWS/system32:/mnt/c/WIND
OWS:/mnt/c/WINDOWS/System32/Wbem:/mnt/c/WINDOWS/System32/WindowsPowerShell/v1.0/:/mnt/c/WINDOWS/System32/OpenSSH/:/mnt/c
/Program Files/Git/cmd:/mnt/c/Strawberry/c/bin:/mnt/c/Strawberry/perl/site/bin:/mnt/c/Strawberry/perl/bin:/mnt/c/Program
 Files/Microsoft SQL Server/150/Tools/Binn/:/mnt/c/Program Files/Microsoft SQL Server/Client SDK/ODBC/170/Tools/Binn/:/m
nt/c/Program Files/dotnet/:/mnt/c/Program Files/nodejs/:/mnt/c/ProgramData/chocolatey/bin:/mnt/c/Program Files/MATLAB/R2
023b/bin:/mnt/c/Program Files/MySQL/MySQL Server 8.0/bin:/mnt/c/mingw_dev_lib/mingw/mingw64/bin:/mnt/c/Program Files (x8
6)/Microsoft SQL Server/160/Tools/Binn/:/mnt/c/Program Files/Microsoft SQL Server/160/Tools/Binn/:/mnt/c/Program Files/M
icrosoft SQL Server/160/DTS/Binn/:/mnt/c/Program Files (x86)/Microsoft SQL Server/160/DTS/Binn/:/mnt/c/Program Files/MyS
QL/MySQL Shell 8.0/bin/:/mnt/c/Users/Dell/AppData/Local/Microsoft/WindowsApps:/mnt/c/Users/Dell/AppData/Local/GitHubDesk
top/bin:/mnt/c/Users/Dell/AppData/Local/Pr:/snap/bin
bk08432@DESKTOP-BRH2KGB:~$ export PATH=$PATH
bk08432@DESKTOP-BRH2KGB:~$ mv lab2script.sh /usr/local/bin
mv: cannot move 'lab2script.sh' to '/usr/local/bin/lab2script.sh': Permission denied
bk08432@DESKTOP-BRH2KGB:~$ sudo mv lab2script.sh /usr/local/bin
[sudo] password for bk08432:
bk08432@DESKTOP-BRH2KGB:~$ lab2script.sh
hello world
bk08432@DESKTOP-BRH2KGB:~$ |
```

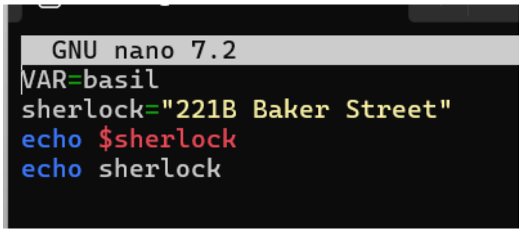


```
bk08432@DESKTOP-BRH2KGB:~$ ps
    PID TTY          TIME CMD
    712 pts/0    00:00:00 bash
   3232 pts/0    00:00:00 ps
bk08432@DESKTOP-BRH2KGB:~$ |
```

Chapter 8:

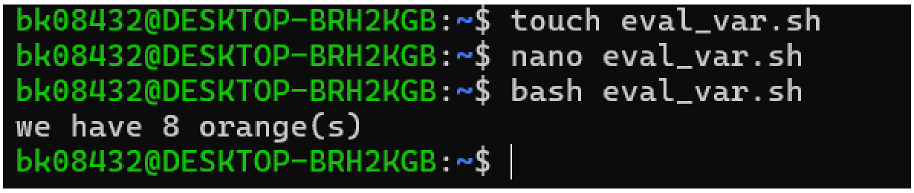


```
bk08432@DESKTOP-BRH2KGB:~$ touch chap8.sh
bk08432@DESKTOP-BRH2KGB:~$ nano chap8.sh
```

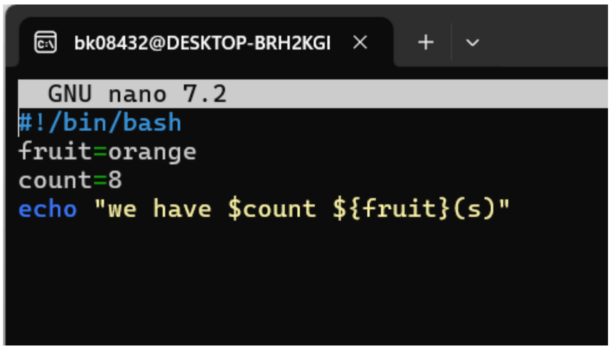


```
  GNU nano 7.2
VAR=basil
sherlock="221B Baker Street"
echo $sherlock
echo sherlock
```

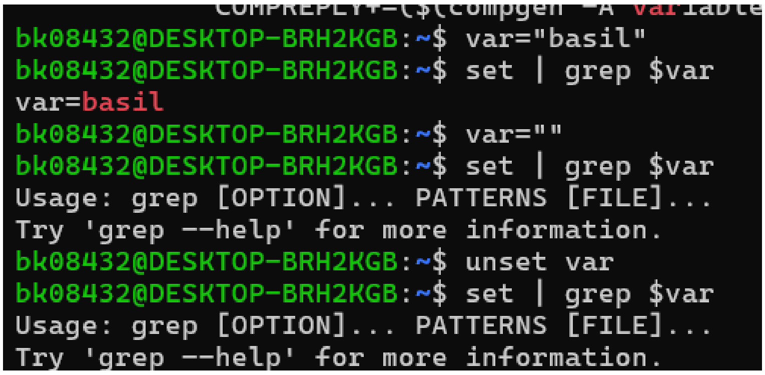
Evaluation of variables:



```
bk08432@DESKTOP-BRH2KGB:~$ touch eval_var.sh
bk08432@DESKTOP-BRH2KGB:~$ nano eval_var.sh
bk08432@DESKTOP-BRH2KGB:~$ bash eval_var.sh
we have 8 orange(s)
bk08432@DESKTOP-BRH2KGB:~$
```

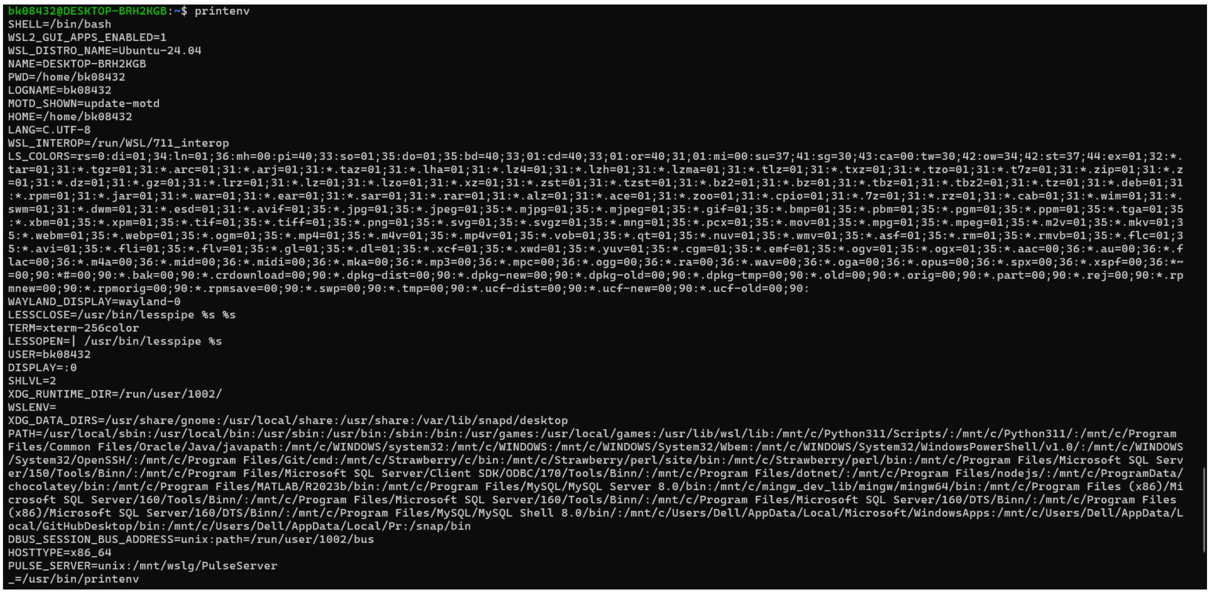


```
  GNU nano 7.2
#!/bin/bash
fruit=orange
count=8
echo "we have $count ${fruit}(s)"
```

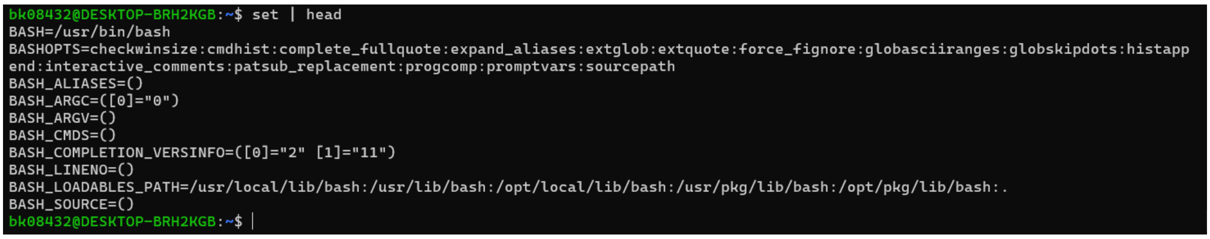


```
    COMPREPLY+=($(compgen -A variable
bk08432@DESKTOP-BRH2KGB:~$ var="basil"
bk08432@DESKTOP-BRH2KGB:~$ set | grep $var
var=basil
bk08432@DESKTOP-BRH2KGB:~$ var=""
bk08432@DESKTOP-BRH2KGB:~$ set | grep $var
Usage: grep [OPTION]... PATTERNS [FILE]...
Try 'grep --help' for more information.
bk08432@DESKTOP-BRH2KGB:~$ unset var
bk08432@DESKTOP-BRH2KGB:~$ set | grep $var
Usage: grep [OPTION]... PATTERNS [FILE]...
Try 'grep --help' for more information.
```

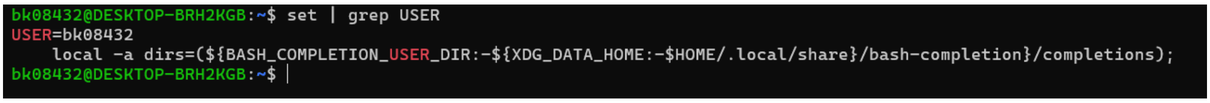
8.2 Environment:



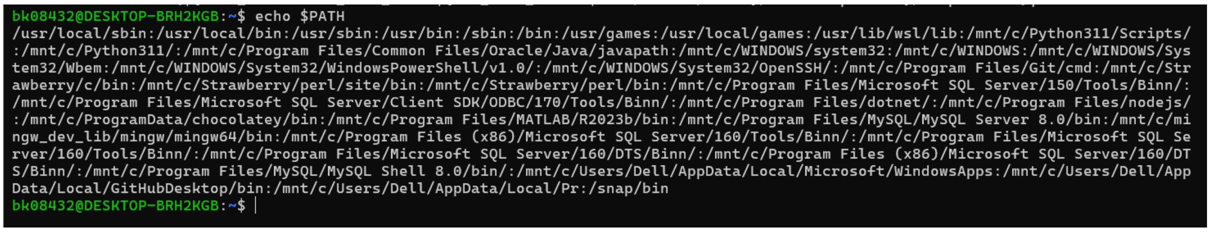
```
bk08432@DESKTOP-BRH2KGB:~$ printenv
SHELL=/bin/bash
WSL2_GUI_APPS_ENABLED=1
WSL_DISTRO_NAME=Ubuntu-24.04
NAME=DESKTOP-BRH2KGB
PWD=/home/bk08432
LOGNAME=bk08432
MOTD_SHOWN=update-motd
HOME=/home/bk08432
LANG=C.UTF-8
WSL_INTEROP=/run/WSL/711_interop
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=00:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.
tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=01;31:*.lha=01;31:*.lz4=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01;31:*.tzo=01;31:*.t7z=01;31:*.zip=01;31:*.z
=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;31:*.tzst=01;31:*.bz2=01;31:*.bz=01;31:*.tbz=01;31:*.tbz2=01;31:*.tz=01;31:*.deb=01;31
:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.rar=01;31:*.alz=01;31:*.ace=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;31:*.rz=01;31:*.cab=01;31:*.wim=01;31:*.
swm=01;31:*.dwm=01;31:*.esd=01;31:*.avif=01;35:*.jpg=01;35:*.jpeg=01;35:*.mjpg=01;35:*.mjpeg=01;35:*.gif=01;35:*.bmp=01;35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35
:*.xbm=01;35:*.xpm=01;35:*.tif=01;35:*.tiff=01;35:*.png=01;35:*.svg=01;35:*.svgz=01;35:*.mng=01;35:*.pcx=01;35:*.mov=01;35:*.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;3
5:*.webm=01;35:*.webp=01;35:*.ogm=01;35:*.mp4=01;35:*.m4v=01;35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;3
5:*.avi=01;35:*.fli=01;35:*.flv=01;35:*.gl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;35:*.yuv=01;35:*.cgm=01;35:*.emf=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.f
lac=00;36:*.m4a=00;36:*.mid=00;36:*.midi=00;36:*.mka=00;36:*.mp3=00;36:*.mpc=00;36:*.ogg=00;36:*.ra=00;36:*.wav=00;36:*.oga=00;36:*.opus=00;36:*.spx=00;36:*.xspf=00;36:*~
=00;90:*#=00;90:*.bak=00;90:*.crdownload=00;90:*.dpkg-dist=00;90:*.dpkg-new=00;90:*.dpkg-old=00;90:*.dpkg-tmp=00;90:*.old=00;90:*.orig=00;90:*.part=00;90:*.rej=00;90:*.rp
mnew=00;90:*.rpmorig=00;90:*.rpmsave=00;90:*.swp=00;90:*.tmp=00;90:*.ucf-dist=00;90:*.ucf-new=00;90:*.ucf-old=00;90:
WAYLAND_DISPLAY=wayland-0
LESSCLOSE=/usr/bin/lesspipe %s %s
TERM=xterm-256color
LESSOPEN=| /usr/bin/lesspipe %s
USER=bk08432
DISPLAY=:0
SHLVL=2
XDG_RUNTIME_DIR=/run/user/1002/
WSLENV=
XDG_DATA_DIRS=/usr/share/gnome:/usr/local/share:/usr/share:/var/lib/snapd/desktop
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/usr/lib/wsl/lib:/mnt/c/Python311/Scripts/:/mnt/c/Python311/:/mnt/c/Program
Files/Common Files/Oracle/Java/javapath:/mnt/c/WINDOWS/system32:/mnt/c/WINDOWS:/mnt/c/WINDOWS/System32/Wbem:/mnt/c/WINDOWS/System32/WindowsPowerShell/v1.0/:/mnt/c/WINDOWS
/System32/OpenSSH/:/mnt/c/Program Files/Git/cmd:/mnt/c/Strawberry/c/bin:/mnt/c/Strawberry/perl/site/bin:/mnt/c/Strawberry/perl/bin:/mnt/c/Program Files/Microsoft SQL Serv
er/150/Tools/Binn/:/mnt/c/Program Files/Microsoft SQL Server/Client SDK/ODBC/170/Tools/Binn/:/mnt/c/Program Files/dotnet/:/mnt/c/Program Files/nodejs/:/mnt/c/ProgramData/
chocolatey/bin:/mnt/c/Program Files/MATLAB/R2023b/bin:/mnt/c/Program Files/MySQL/MySQL Server 8.0/bin:/mnt/c/mingw_dev_lib/mingw/mingw64/bin:/mnt/c/Program Files (x86)/Mi
crosoft SQL Server/160/Tools/Binn/:/mnt/c/Program Files/Microsoft SQL Server/160/Tools/Binn/:/mnt/c/Program Files/Microsoft SQL Server/160/DTS/Binn/:/mnt/c/Program Files
(x86)/Microsoft SQL Server/160/DTS/Binn/:/mnt/c/Program Files/MySQL/MySQL Shell 8.0/bin/:/mnt/c/Users/Dell/AppData/Local/Microsoft/WindowsApps:/mnt/c/Users/Dell/AppData/L
ocal/GitHubDesktop/bin:/mnt/c/Users/Dell/AppData/Local/Pr:/snap/bin
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1002/bus
HOSTTYPE=x86_64
PULSE_SERVER=unix:/mnt/wslg/PulseServer
_=/usr/bin/printenv
```



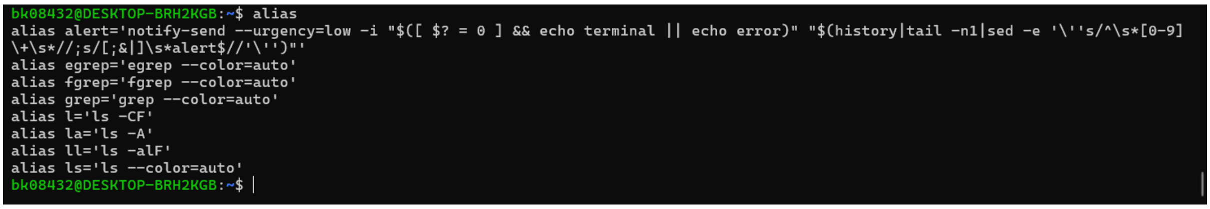
```
bk08432@DESKTOP-BRH2KGB:~$ set | head
BASH=/usr/bin/bash
BASHOPTS=checkwinsize:cmdhist:complete_fullquote:expand_aliases:extglob:extquote:force_fignore:globasciiranges:globskipdots:histapp
end:interactive_comments:patsub_replacement:progcomp:promptvars:sourcepath
BASH_ALIASES=()
BASH_ARGC=([0]="0")
BASH_ARGV=()
BASH_CMDS=()
BASH_COMPLETION_VERSINFO=([0]="2" [1]="11")
BASH_LINENO=()
BASH_LOADABLES_PATH=/usr/local/lib/bash:/usr/lib/bash:/opt/local/lib/bash:/usr/pkg/lib/bash:/opt/pkg/lib/bash:.
BASH_SOURCE=()
bk08432@DESKTOP-BRH2KGB:~$
```



```
bk08432@DESKTOP-BRH2KGB:~$ set | grep USER
USER=bk08432
    local -a dirs=(${BASH_COMPLETION_USER_DIR:-${XDG_DATA_HOME:-$HOME/.local/share}/bash-completion}/completions);
bk08432@DESKTOP-BRH2KGB:~$
```

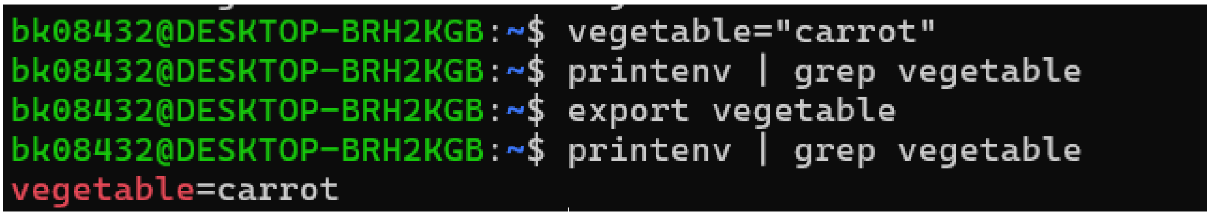


```
bk08432@DESKTOP-BRH2KGB:~$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/usr/lib/wsl/lib:/mnt/c/Python311/Scripts/
:/mnt/c/Python311/:/mnt/c/Program Files/Common Files/Oracle/Java/javapath:/mnt/c/WINDOWS/system32:/mnt/c/WINDOWS:/mnt/c/WINDOWS/Sys
tem32/Wbem:/mnt/c/WINDOWS/System32/WindowsPowerShell/v1.0/:/mnt/c/WINDOWS/System32/OpenSSH/:/mnt/c/Program Files/Git/cmd:/mnt/c/Str
awberry/c/bin:/mnt/c/Strawberry/perl/site/bin:/mnt/c/Strawberry/perl/bin:/mnt/c/Program Files/Microsoft SQL Server/150/Tools/Binn/:
/mnt/c/Program Files/Microsoft SQL Server/Client SDK/ODBC/170/Tools/Binn/:/mnt/c/Program Files/dotnet/:/mnt/c/Program Files/nodejs/
:/mnt/c/ProgramData/chocolatey/bin:/mnt/c/Program Files/MATLAB/R2023b/bin:/mnt/c/Program Files/MySQL/MySQL Server 8.0/bin:/mnt/c/mi
ngw_dev_lib/mingw/mingw64/bin:/mnt/c/Program Files (x86)/Microsoft SQL Server/160/Tools/Binn/:/mnt/c/Program Files/Microsoft SQL Se
rver/160/Tools/Binn/:/mnt/c/Program Files/Microsoft SQL Server/160/DTS/Binn/:/mnt/c/Program Files (x86)/Microsoft SQL Server/160/DT
S/Binn/:/mnt/c/Program Files/MySQL/MySQL Shell 8.0/bin/:/mnt/c/Users/Dell/AppData/Local/Microsoft/WindowsApps:/mnt/c/Users/Dell/App
Data/Local/GitHubDesktop/bin:/mnt/c/Users/Dell/AppData/Local/Pr:/snap/bin
bk08432@DESKTOP-BRH2KGB:~$
```

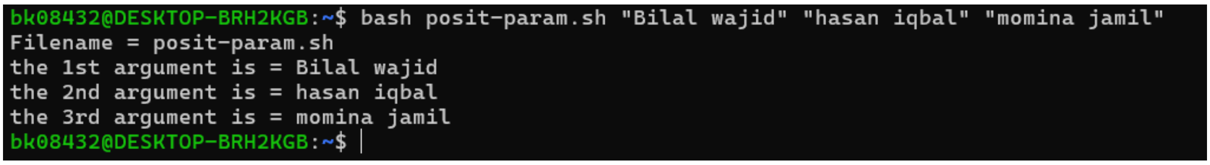


```
bk08432@DESKTOP-BRH2KGB:~$ alias
alias alert='notify-send --urgency=low -i "$([ $? = 0 ] && echo terminal || echo error)" "$(history|tail -n1|sed -e '\''s/^\s*[0-9]
\+\s*//;s/[;&|]\s*alert$//'\'')"'
alias egrep='egrep --color=auto'
alias fgrep='fgrep --color=auto'
alias grep='grep --color=auto'
alias l='ls -CF'
alias la='ls -A'
alias ll='ls -alF'
alias ls='ls --color=auto'
bk08432@DESKTOP-BRH2KGB:~$
```

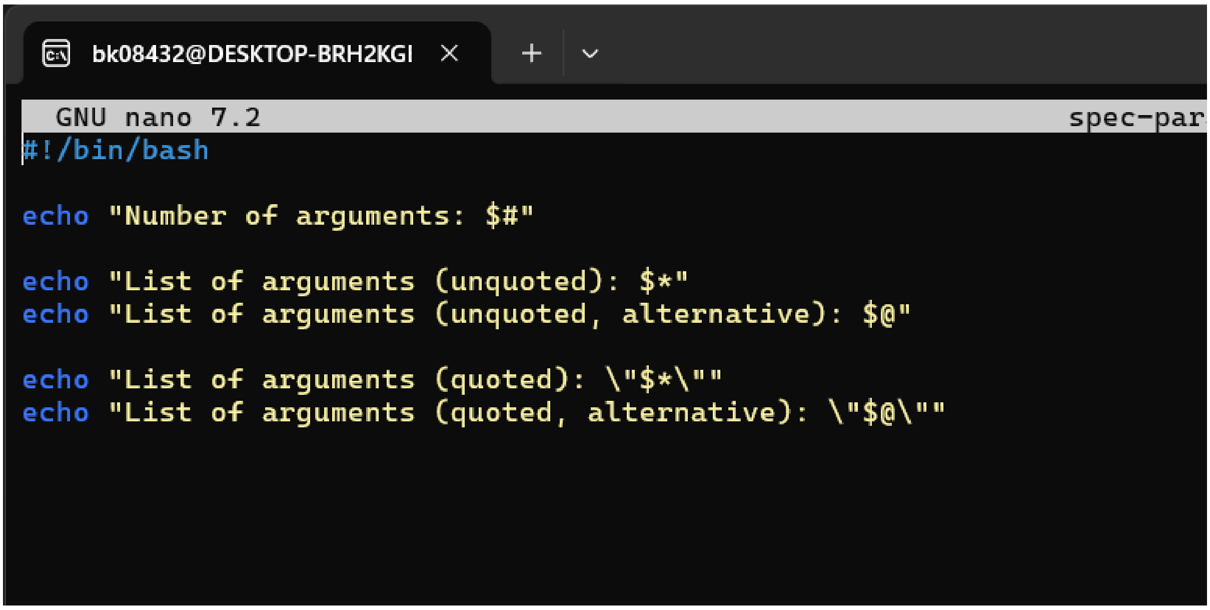
Exporting variables



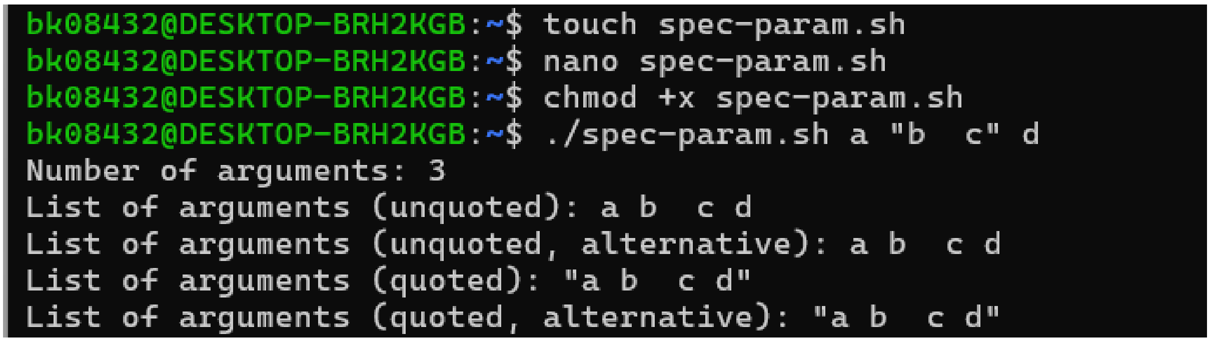
```
bk08432@DESKTOP-BRH2KGB:~$ vegetable="carrot"
bk08432@DESKTOP-BRH2KGB:~$ printenv | grep vegetable
bk08432@DESKTOP-BRH2KGB:~$ export vegetable
bk08432@DESKTOP-BRH2KGB:~$ printenv | grep vegetable
vegetable=carrot
```



```
bk08432@DESKTOP-BRH2KGB:~$ bash posit-param.sh "Bilal wajid" "hasan iqbal" "momina jamil"
Filename = posit-param.sh
the 1st argument is = Bilal wajid
the 2nd argument is = hasan iqbal
the 3rd argument is = momina jamil
bk08432@DESKTOP-BRH2KGB:~$ |
```

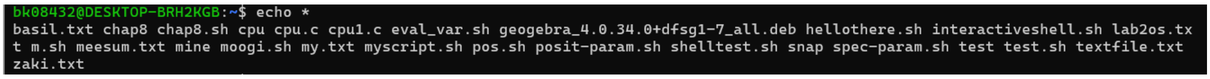


```
#!/bin/bash

echo "Number of arguments: $#"

echo "List of arguments (unquoted): $*"
echo "List of arguments (unquoted, alternative): $@"

echo "List of arguments (quoted): \"$*\""
echo "List of arguments (quoted, alternative): \"$@\""
```

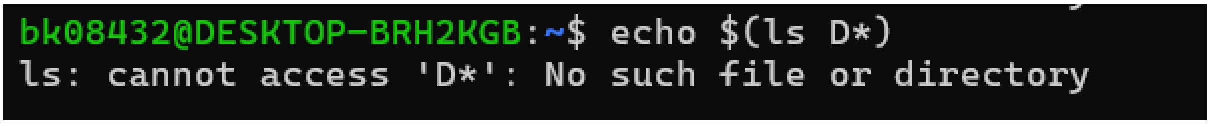


```
bk08432@DESKTOP-BRH2KGB:~$ touch spec-param.sh
bk08432@DESKTOP-BRH2KGB:~$ nano spec-param.sh
bk08432@DESKTOP-BRH2KGB:~$ chmod +x spec-param.sh
bk08432@DESKTOP-BRH2KGB:~$ ./spec-param.sh a "b  c" d
Number of arguments: 3
List of arguments (unquoted): a b  c d
List of arguments (unquoted, alternative): a b  c d
List of arguments (quoted): "a b  c d"
List of arguments (quoted, alternative): "a b  c d"
```

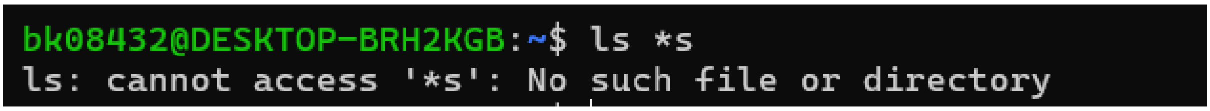
8.5:



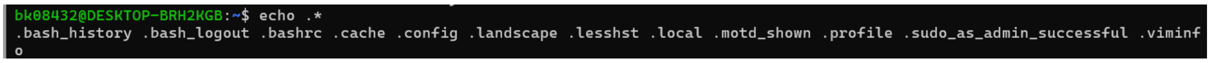
```
bk08432@DESKTOP-BRH2KGB:~$ echo *
basil.txt chap8 chap8.sh cpu cpu.c cpu1.c eval_var.sh geogebra_4.0.34.0+dfsg1-7_all.deb hellothere.sh interactiveshell.sh lab2os.tx
t m.sh meesum.txt mine moogi.sh my.txt myscript.sh pos.sh posit-param.sh shelltest.sh snap spec-param.sh test test.sh textfile.txt
zaki.txt
```



```
bk08432@DESKTOP-BRH2KGB:~$ echo $(ls D*)
ls: cannot access 'D*': No such file or directory
```

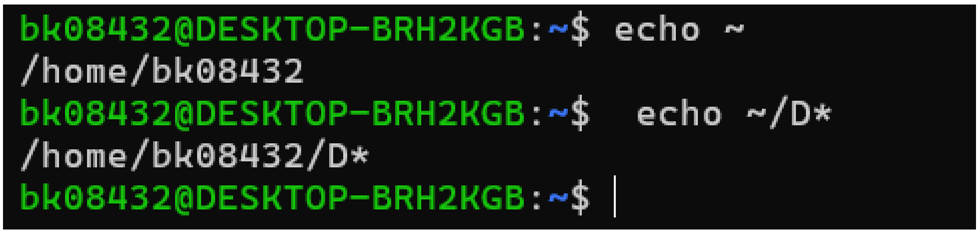


```
bk08432@DESKTOP-BRH2KGB:~$ ls *s
ls: cannot access '*s': No such file or directory
```



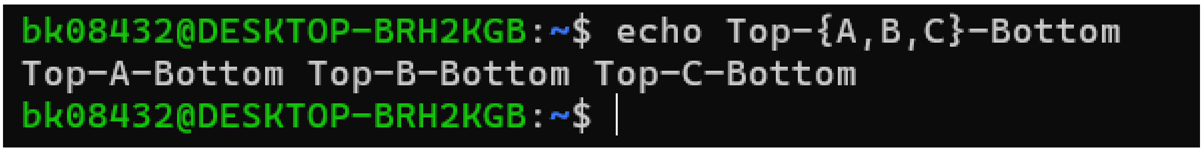
```
bk08432@DESKTOP-BRH2KGB:~$ echo .*
.bash_history .bash_logout .bashrc .cache .config .landscape .lesshst .local .motd_shown .profile .sudo_as_admin_successful .viminf
o
```

Tilde expansion:

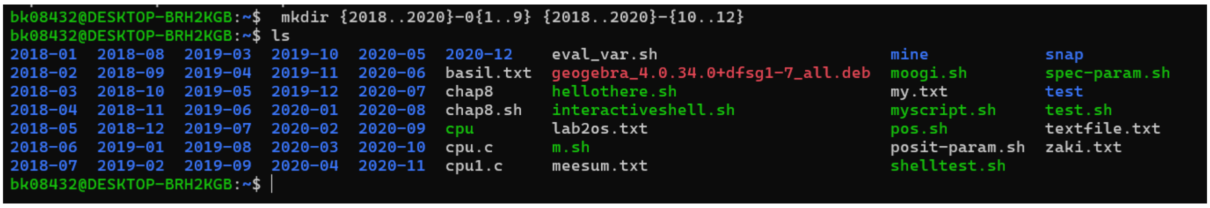


```
bk08432@DESKTOP-BRH2KGB:~$ echo ~
/home/bk08432
bk08432@DESKTOP-BRH2KGB:~$  echo ~/D*
/home/bk08432/D*
bk08432@DESKTOP-BRH2KGB:~$ |
```

Brace expression:

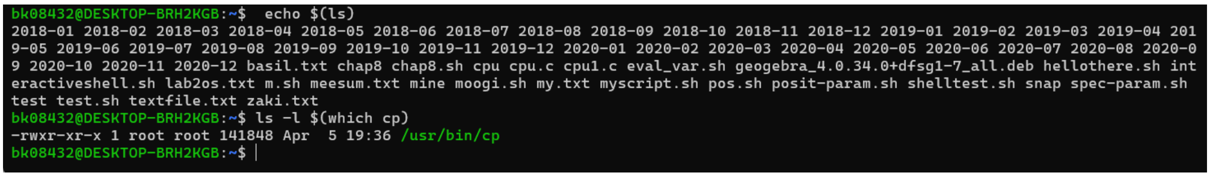


```
bk08432@DESKTOP-BRH2KGB:~$ echo Top-{A,B,C}-Bottom
Top-A-Bottom Top-B-Bottom Top-C-Bottom
bk08432@DESKTOP-BRH2KGB:~$ |
```

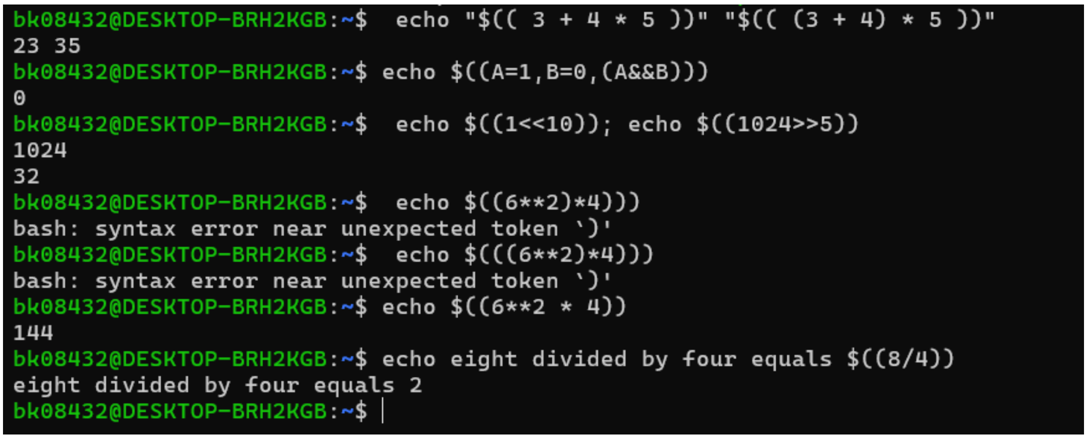


```
bk08432@DESKTOP-BRH2KGB:~$  mkdir {2018..2020}-0{1..9} {2018..2020}-{10..12}
bk08432@DESKTOP-BRH2KGB:~$ ls
2018-01  2018-08  2019-03  2019-10  2020-05  2020-12     eval_var.sh                             mine             snap
2018-02  2018-09  2019-04  2019-11  2020-06  basil.txt   geogebra_4.0.34.0+dfsg1-7_all.deb       moogi.sh         spec-param.sh
2018-03  2018-10  2019-05  2019-12  2020-07  chap8       hellothere.sh                           my.txt           test
2018-04  2018-11  2019-06  2020-01  2020-08  chap8.sh    interactiveshell.sh                     myscript.sh      test.sh
2018-05  2018-12  2019-07  2020-02  2020-09  cpu         lab2os.txt                              pos.sh           textfile.txt
2018-06  2019-01  2019-08  2020-03  2020-10  cpu.c       m.sh                                    posit-param.sh   zaki.txt
2018-07  2019-02  2019-09  2020-04  2020-11  cpu1.c      meesum.txt                              shelltest.sh
bk08432@DESKTOP-BRH2KGB:~$ |
```

Command substitution:

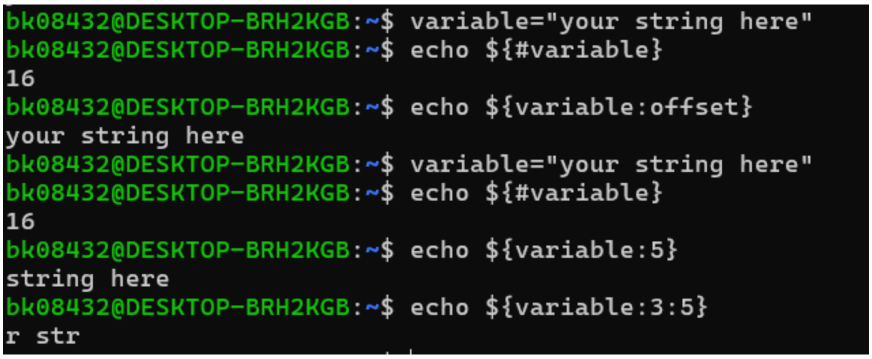


```
bk08432@DESKTOP-BRH2KGB:~$  echo $(ls)
2018-01 2018-02 2018-03 2018-04 2018-05 2018-06 2018-07 2018-08 2018-09 2018-10 2018-11 2018-12 2019-01 2019-02 2019-03 2019-04 201
9-05 2019-06 2019-07 2019-08 2019-09 2019-10 2019-11 2019-12 2020-01 2020-02 2020-03 2020-04 2020-05 2020-06 2020-07 2020-08 2020-0
9 2020-10 2020-11 2020-12 basil.txt chap8 chap8.sh cpu cpu.c cpu1.c eval_var.sh geogebra_4.0.34.0+dfsg1-7_all.deb hellothere.sh int
eractiveshell.sh lab2os.txt m.sh meesum.txt mine moogi.sh my.txt myscript.sh pos.sh posit-param.sh shelltest.sh snap spec-param.sh
test test.sh textfile.txt zaki.txt
bk08432@DESKTOP-BRH2KGB:~$ ls -l $(which cp)
-rwxr-xr-x 1 root root 141848 Apr  5 19:36 /usr/bin/cp
bk08432@DESKTOP-BRH2KGB:~$ |
```

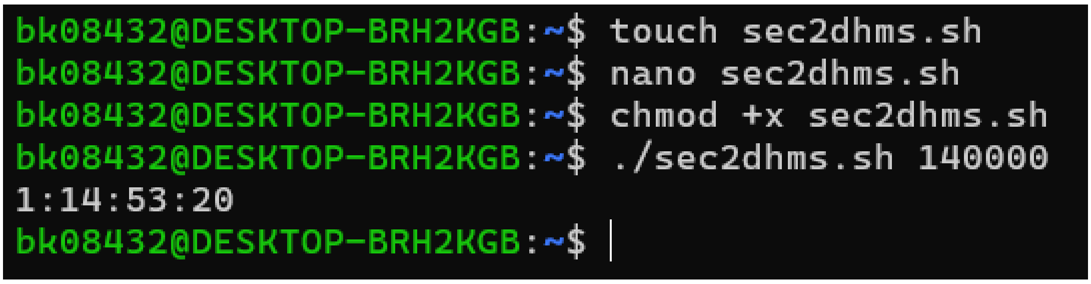


```
bk08432@DESKTOP-BRH2KGB:~$  echo "$(( 3 + 4 * 5 ))" "$(( (3 + 4) * 5 ))"
23 35
bk08432@DESKTOP-BRH2KGB:~$ echo $((A=1,B=0,(A&&B)))
0
bk08432@DESKTOP-BRH2KGB:~$  echo $((1<<10)); echo $((1024>>5))
1024
32
bk08432@DESKTOP-BRH2KGB:~$  echo $((6**2)*4)))
bash: syntax error near unexpected token `)'
bk08432@DESKTOP-BRH2KGB:~$  echo $(((6**2)*4)))
bash: syntax error near unexpected token `)'
bk08432@DESKTOP-BRH2KGB:~$ echo $((6**2 * 4))
144
bk08432@DESKTOP-BRH2KGB:~$ echo eight divided by four equals $((8/4))
eight divided by four equals 2
bk08432@DESKTOP-BRH2KGB:~$ |
```

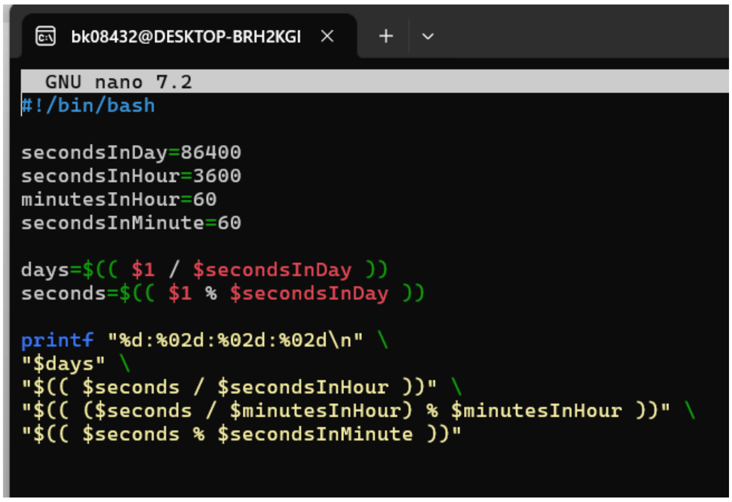
String operations:



```
bk08432@DESKTOP-BRH2KGB:~$ variable="your string here"
bk08432@DESKTOP-BRH2KGB:~$ echo ${#variable}
16
bk08432@DESKTOP-BRH2KGB:~$ echo ${variable:offset}
your string here
bk08432@DESKTOP-BRH2KGB:~$ variable="your string here"
bk08432@DESKTOP-BRH2KGB:~$ echo ${#variable}
16
bk08432@DESKTOP-BRH2KGB:~$ echo ${variable:5}
string here
bk08432@DESKTOP-BRH2KGB:~$ echo ${variable:3:5}
r str
```

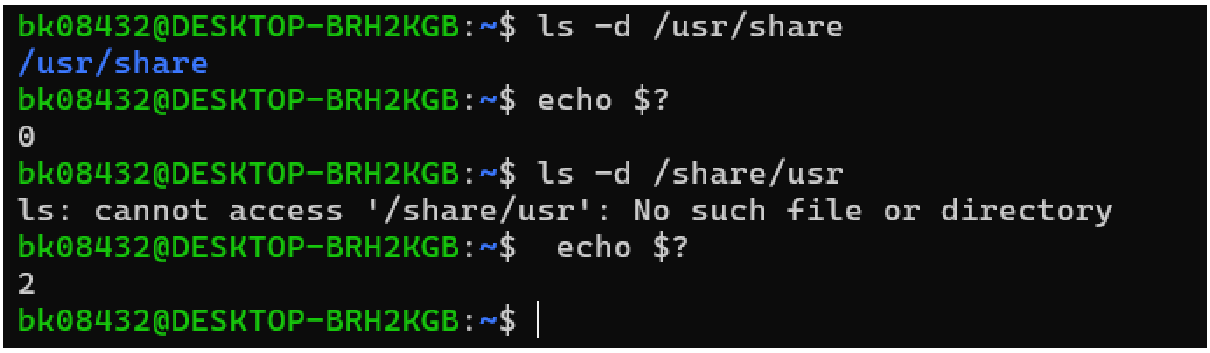


```
bk08432@DESKTOP-BRH2KGB:~$ touch sec2dhms.sh
bk08432@DESKTOP-BRH2KGB:~$ nano sec2dhms.sh
bk08432@DESKTOP-BRH2KGB:~$ chmod +x sec2dhms.sh
bk08432@DESKTOP-BRH2KGB:~$ ./sec2dhms.sh 140000
1:14:53:20
bk08432@DESKTOP-BRH2KGB:~$
```

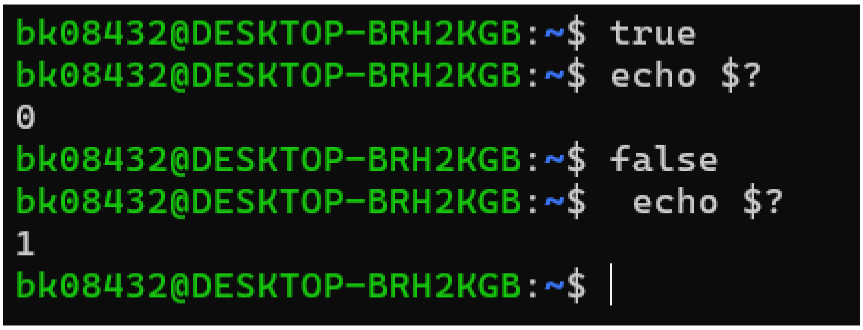


```
  GNU nano 7.2
#!/bin/bash

secondsInDay=86400
secondsInHour=3600
minutesInHour=60
secondsInMinute=60

days=$(( $1 / $secondsInDay ))
seconds=$(( $1 % $secondsInDay ))

printf "%d:%02d:%02d:%02d\n" \
"$days" \
"$(( $seconds / $secondsInHour ))" \
"$(( ($seconds / $minutesInHour) % $minutesInHour ))" \
"$(( $seconds % $secondsInMinute ))"
```

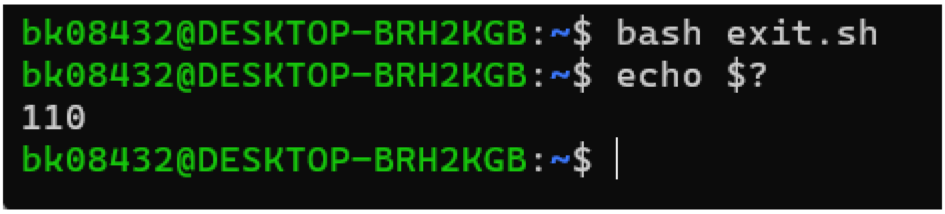
9.1:



```
bk08432@DESKTOP-BRH2KGB:~$ ls -d /usr/share
/usr/share
bk08432@DESKTOP-BRH2KGB:~$ echo $?
0
bk08432@DESKTOP-BRH2KGB:~$ ls -d /share/usr
ls: cannot access '/share/usr': No such file or directory
bk08432@DESKTOP-BRH2KGB:~$  echo $?
2
bk08432@DESKTOP-BRH2KGB:~$
```

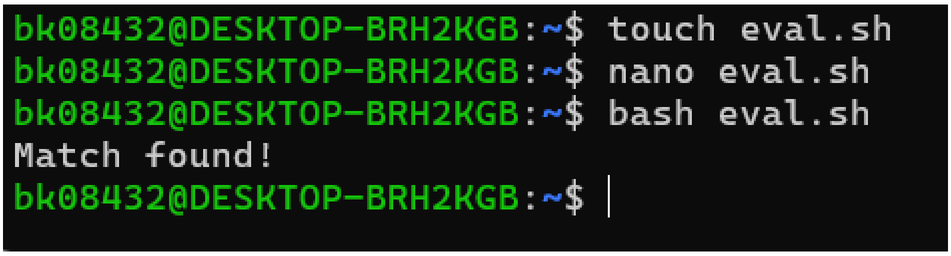


```
bk08432@DESKTOP-BRH2KGB:~$ true
bk08432@DESKTOP-BRH2KGB:~$ echo $?
0
bk08432@DESKTOP-BRH2KGB:~$ false
bk08432@DESKTOP-BRH2KGB:~$  echo $?
1
bk08432@DESKTOP-BRH2KGB:~$
```

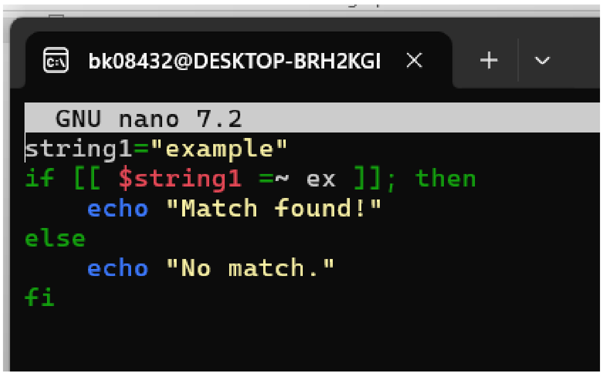


```
bk08432@DESKTOP-BRH2KGB:~$ bash exit.sh
bk08432@DESKTOP-BRH2KGB:~$ echo $?
110
bk08432@DESKTOP-BRH2KGB:~$
```

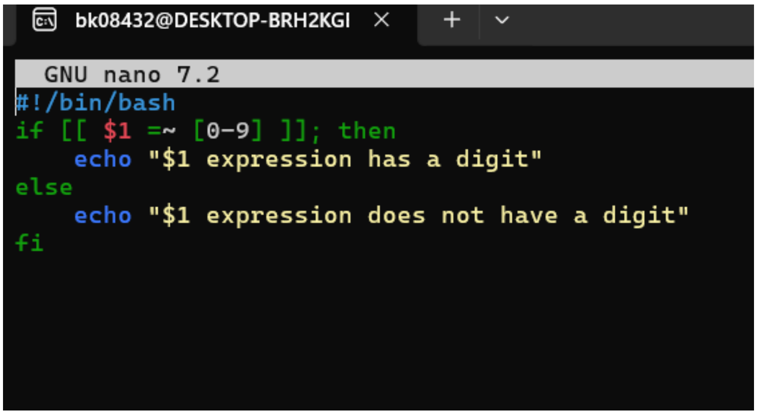
9.2:



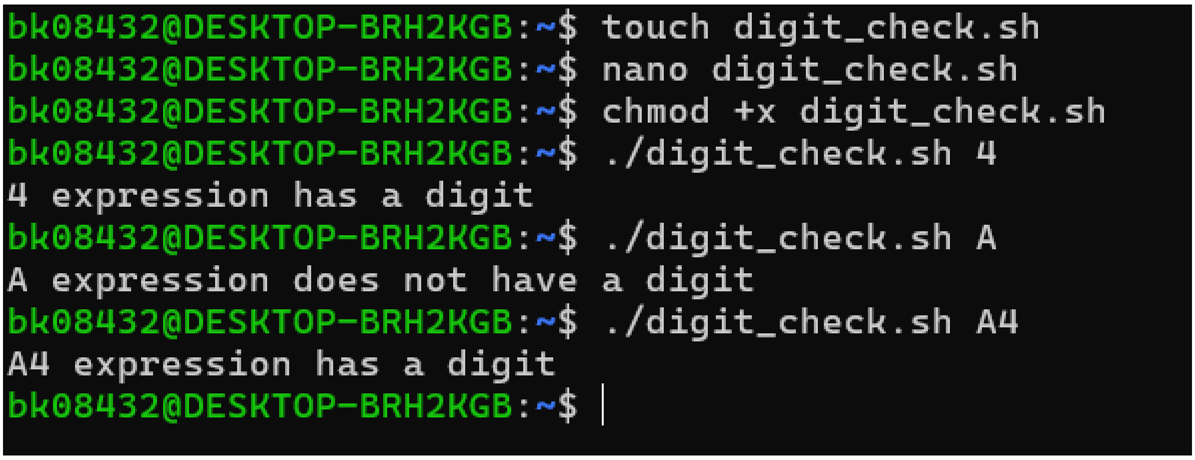
```
bk08432@DESKTOP-BRH2KGB:~$ touch eval.sh
bk08432@DESKTOP-BRH2KGB:~$ nano eval.sh
bk08432@DESKTOP-BRH2KGB:~$ bash eval.sh
Match found!
bk08432@DESKTOP-BRH2KGB:~$
```



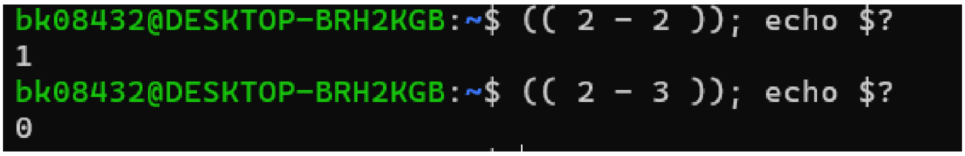
```
  GNU nano 7.2
string1="example"
if [[ $string1 =~ ex ]]; then
    echo "Match found!"
else
    echo "No match."
fi
```



```
  GNU nano 7.2
#!/bin/bash
if [[ $1 =~ [0-9] ]]; then
    echo "$1 expression has a digit"
else
    echo "$1 expression does not have a digit"
fi
```

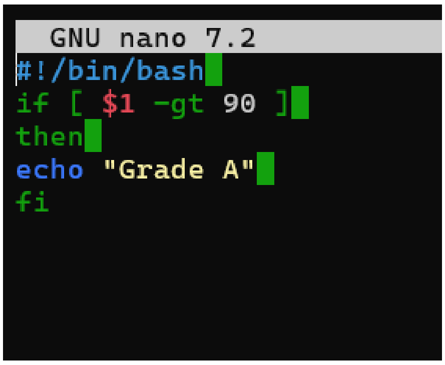


```
bk08432@DESKTOP-BRH2KGB:~$ touch digit_check.sh
bk08432@DESKTOP-BRH2KGB:~$ nano digit_check.sh
bk08432@DESKTOP-BRH2KGB:~$ chmod +x digit_check.sh
bk08432@DESKTOP-BRH2KGB:~$ ./digit_check.sh 4
4 expression has a digit
bk08432@DESKTOP-BRH2KGB:~$ ./digit_check.sh A
A expression does not have a digit
bk08432@DESKTOP-BRH2KGB:~$ ./digit_check.sh A4
A4 expression has a digit
bk08432@DESKTOP-BRH2KGB:~$
```

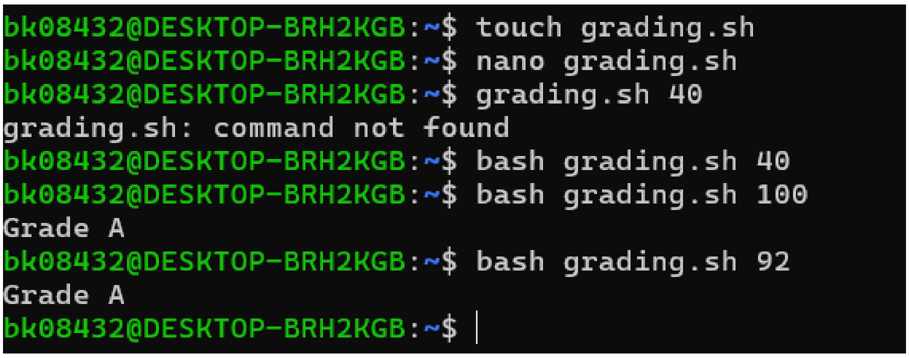


```
bk08432@DESKTOP-BRH2KGB:~$ (( 2 - 2 )); echo $?
1
bk08432@DESKTOP-BRH2KGB:~$ (( 2 - 3 )); echo $?
0
```

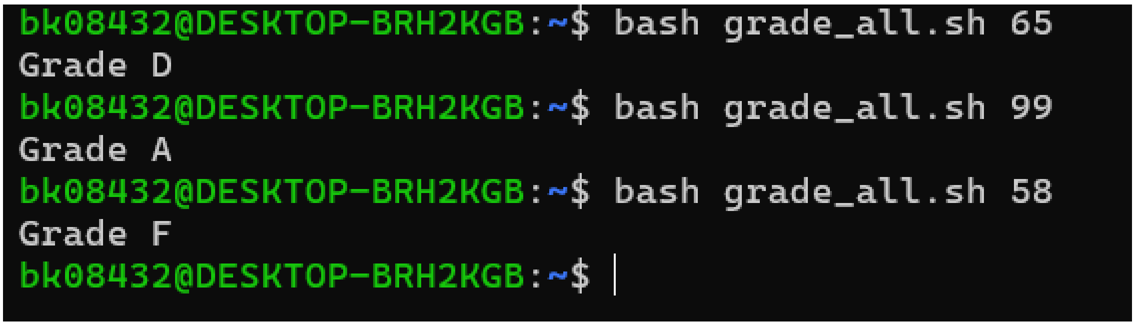
9.3:



```
#!/bin/bash
if [ $1 -gt 90 ]
then
echo "Grade A"
fi
```

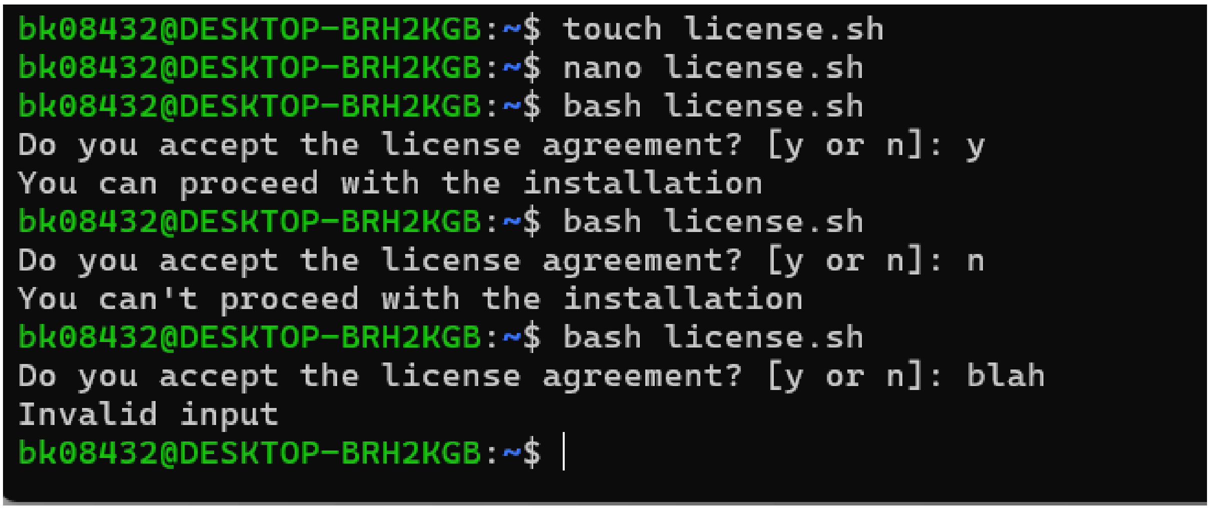


```
bk08432@DESKTOP-BRH2KGB:~$ touch grading.sh
bk08432@DESKTOP-BRH2KGB:~$ nano grading.sh
bk08432@DESKTOP-BRH2KGB:~$ grading.sh 40
grading.sh: command not found
bk08432@DESKTOP-BRH2KGB:~$ bash grading.sh 40
bk08432@DESKTOP-BRH2KGB:~$ bash grading.sh 100
Grade A
bk08432@DESKTOP-BRH2KGB:~$ bash grading.sh 92
Grade A
bk08432@DESKTOP-BRH2KGB:~$
```

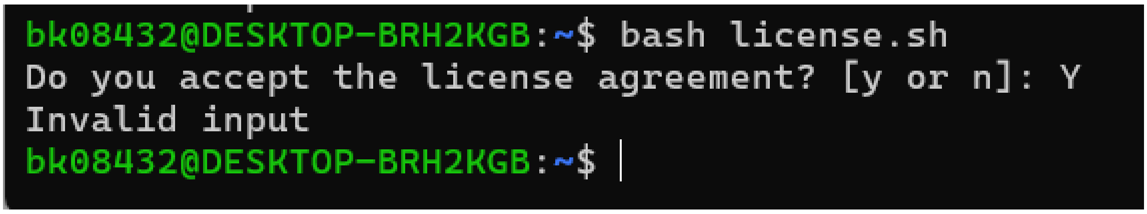


```
bk08432@DESKTOP-BRH2KGB:~$ bash grade_all.sh 65
Grade D
bk08432@DESKTOP-BRH2KGB:~$ bash grade_all.sh 99
Grade A
bk08432@DESKTOP-BRH2KGB:~$ bash grade_all.sh 58
Grade F
bk08432@DESKTOP-BRH2KGB:~$
```

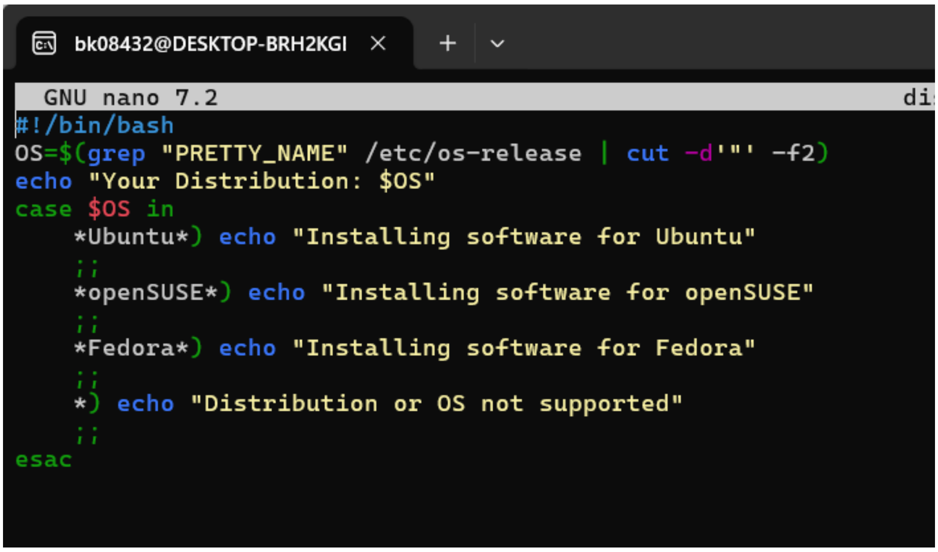
9.4:



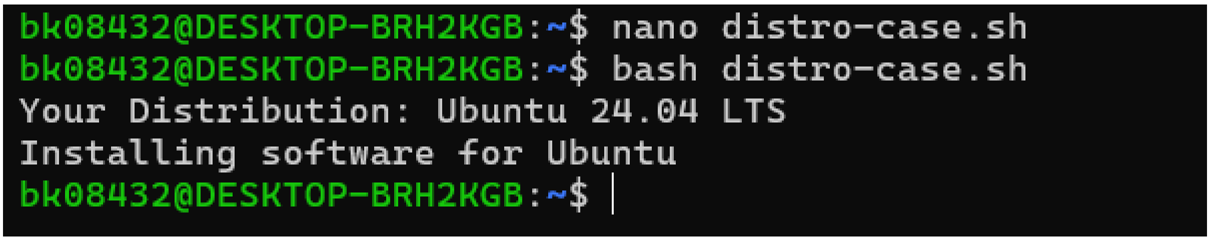
```
bk08432@DESKTOP-BRH2KGB:~$ touch license.sh
bk08432@DESKTOP-BRH2KGB:~$ nano license.sh
bk08432@DESKTOP-BRH2KGB:~$ bash license.sh
Do you accept the license agreement? [y or n]: y
You can proceed with the installation
bk08432@DESKTOP-BRH2KGB:~$ bash license.sh
Do you accept the license agreement? [y or n]: n
You can't proceed with the installation
bk08432@DESKTOP-BRH2KGB:~$ bash license.sh
Do you accept the license agreement? [y or n]: blah
Invalid input
bk08432@DESKTOP-BRH2KGB:~$ 
```



```
bk08432@DESKTOP-BRH2KGB:~$ bash license.sh
Do you accept the license agreement? [y or n]: Y
Invalid input
bk08432@DESKTOP-BRH2KGB:~$ 
```

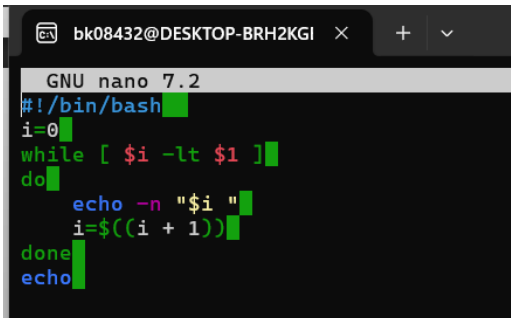


```
  GNU nano 7.2                                                   di
#!/bin/bash
OS=$(grep "PRETTY_NAME" /etc/os-release | cut -d'"' -f2)
echo "Your Distribution: $OS"
case $OS in
    *Ubuntu*) echo "Installing software for Ubuntu"
    ;;
    *openSUSE*) echo "Installing software for openSUSE"
    ;;
    *Fedora*) echo "Installing software for Fedora"
    ;;
    *) echo "Distribution or OS not supported"
    ;;
esac
```

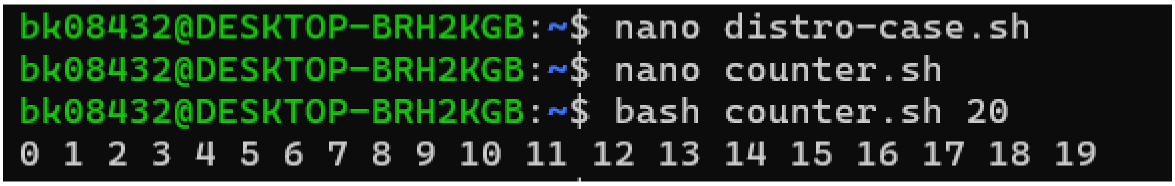


```
bk08432@DESKTOP-BRH2KGB:~$ nano distro-case.sh
bk08432@DESKTOP-BRH2KGB:~$ bash distro-case.sh
Your Distribution: Ubuntu 24.04 LTS
Installing software for Ubuntu
bk08432@DESKTOP-BRH2KGB:~$ 
```

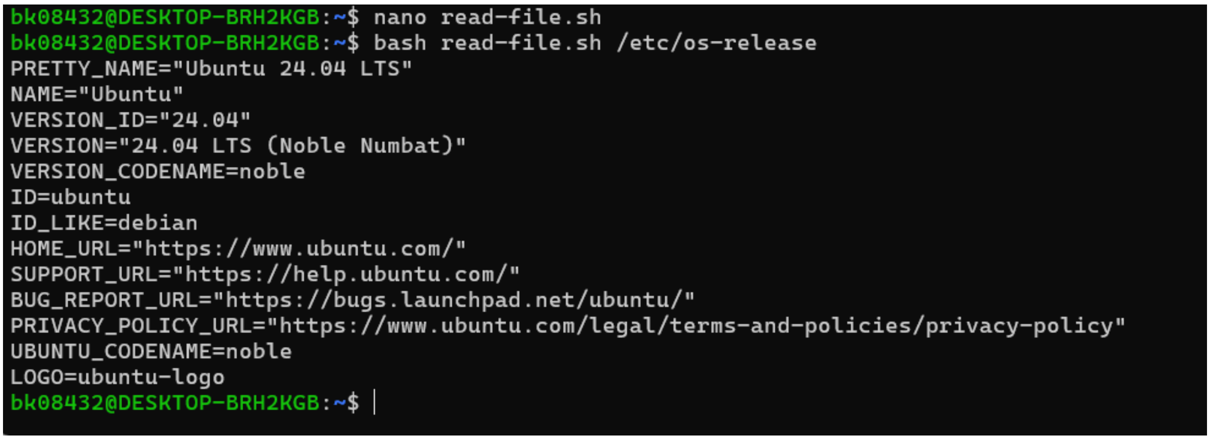
9.5:



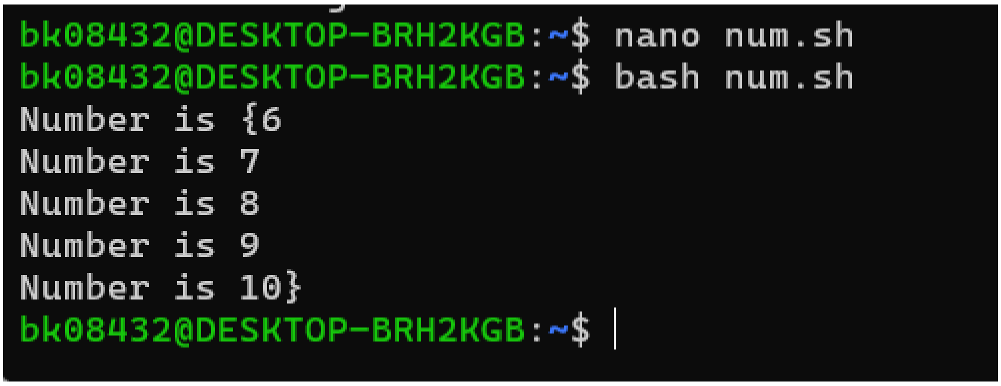
```
  GNU nano 7.2
#!/bin/bash
i=0
while [ $i -lt $1 ]
do
    echo -n "$i "
    i=$((i + 1))
done
echo
```



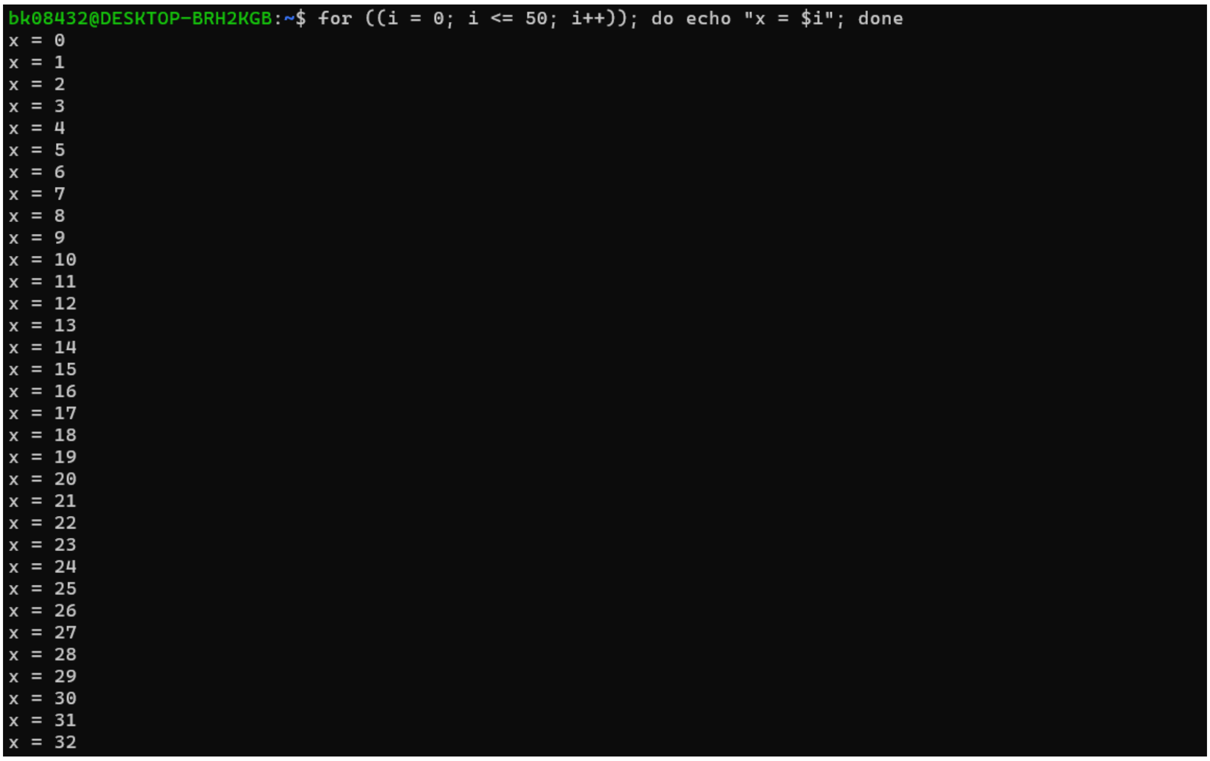
```
bk08432@DESKTOP-BRH2KGB:~$ nano distro-case.sh
bk08432@DESKTOP-BRH2KGB:~$ nano counter.sh
bk08432@DESKTOP-BRH2KGB:~$ bash counter.sh 20
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
```



```
bk08432@DESKTOP-BRH2KGB:~$ nano read-file.sh
bk08432@DESKTOP-BRH2KGB:~$ bash read-file.sh /etc/os-release
PRETTY_NAME="Ubuntu 24.04 LTS"
NAME="Ubuntu"
VERSION_ID="24.04"
VERSION="24.04 LTS (Noble Numbat)"
VERSION_CODENAME=noble
ID=ubuntu
ID_LIKE=debian
HOME_URL="https://www.ubuntu.com/"
SUPPORT_URL="https://help.ubuntu.com/"
BUG_REPORT_URL="https://bugs.launchpad.net/ubuntu/"
PRIVACY_POLICY_URL="https://www.ubuntu.com/legal/terms-and-policies/privacy-policy"
UBUNTU_CODENAME=noble
LOGO=ubuntu-logo
bk08432@DESKTOP-BRH2KGB:~$
```

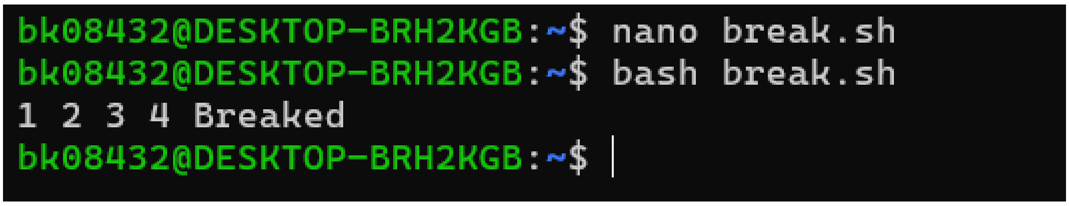


```
bk08432@DESKTOP-BRH2KGB:~$ nano num.sh
bk08432@DESKTOP-BRH2KGB:~$ bash num.sh
Number is {6
Number is 7
Number is 8
Number is 9
Number is 10}
bk08432@DESKTOP-BRH2KGB:~$
```



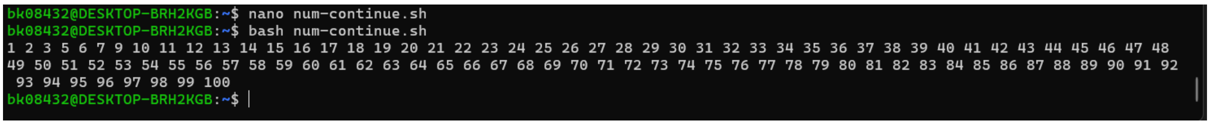
```
bk08432@DESKTOP-BRH2KGB:~$ for ((i = 0; i <= 50; i++)); do echo "x = $i"; done
x = 0
x = 1
x = 2
x = 3
x = 4
x = 5
x = 6
x = 7
x = 8
x = 9
x = 10
x = 11
x = 12
x = 13
x = 14
x = 15
x = 16
x = 17
x = 18
x = 19
x = 20
x = 21
x = 22
x = 23
x = 24
x = 25
x = 26
x = 27
x = 28
x = 29
x = 30
x = 31
x = 32
```

9.7:



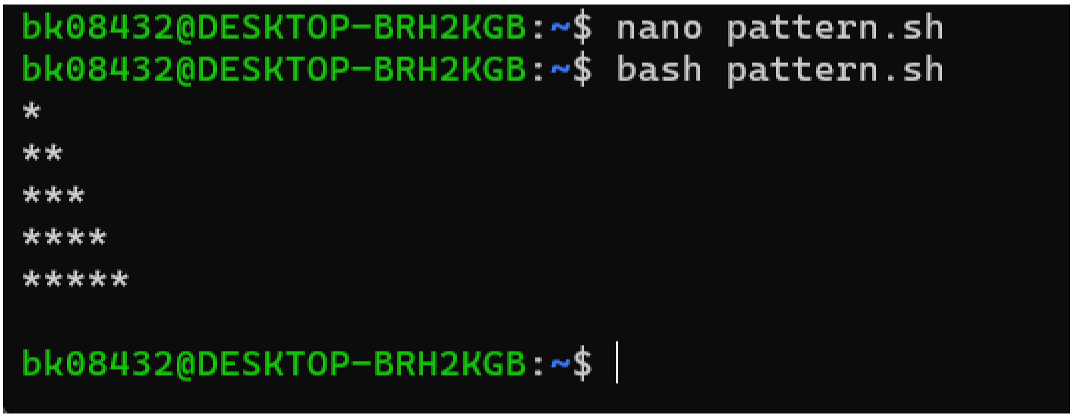
```
bk08432@DESKTOP-BRH2KGB:~$ nano break.sh
bk08432@DESKTOP-BRH2KGB:~$ bash break.sh
1 2 3 4 Breaked
bk08432@DESKTOP-BRH2KGB:~$
```

9.8:

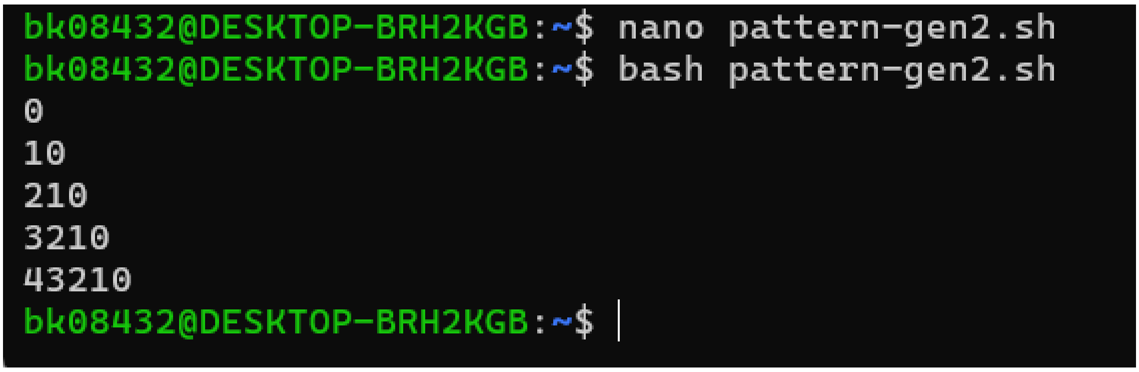


```
bk08432@DESKTOP-BRH2KGB:~$ nano num-continue.sh
bk08432@DESKTOP-BRH2KGB:~$ bash num-continue.sh
1 2 3 5 6 7 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92
 93 94 95 96 97 98 99 100
bk08432@DESKTOP-BRH2KGB:~$
```

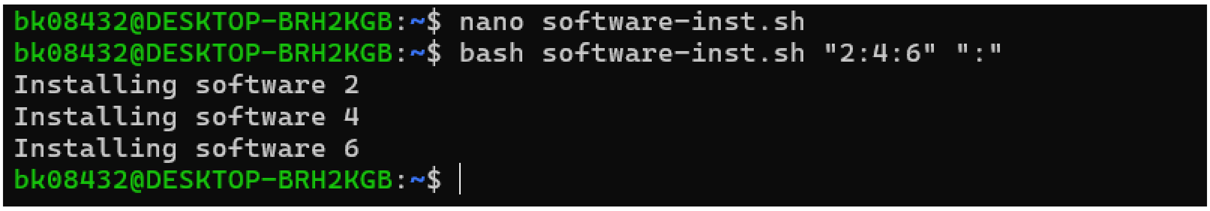
9.9:



```
bk08432@DESKTOP-BRH2KGB:~$ nano pattern.sh
bk08432@DESKTOP-BRH2KGB:~$ bash pattern.sh
*
**
***
****
*****

bk08432@DESKTOP-BRH2KGB:~$
```

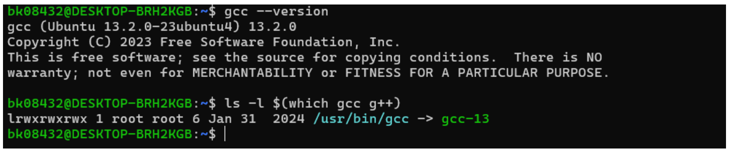


```
bk08432@DESKTOP-BRH2KGB:~$ nano pattern-gen2.sh
bk08432@DESKTOP-BRH2KGB:~$ bash pattern-gen2.sh
0
10
210
3210
43210
bk08432@DESKTOP-BRH2KGB:~$
```

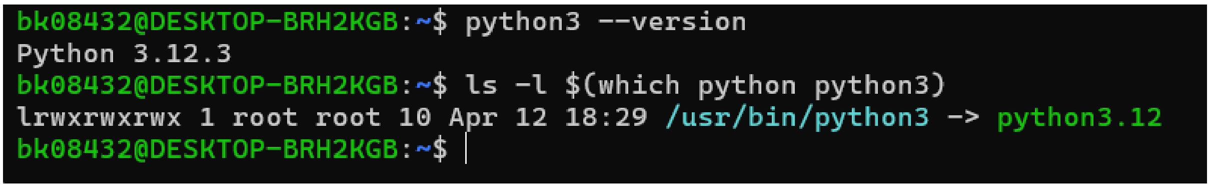


```
bk08432@DESKTOP-BRH2KGB:~$ nano software-inst.sh
bk08432@DESKTOP-BRH2KGB:~$ bash software-inst.sh "2:4:6" ":"
Installing software 2
Installing software 4
Installing software 6
bk08432@DESKTOP-BRH2KGB:~$
```

Chapter 10:



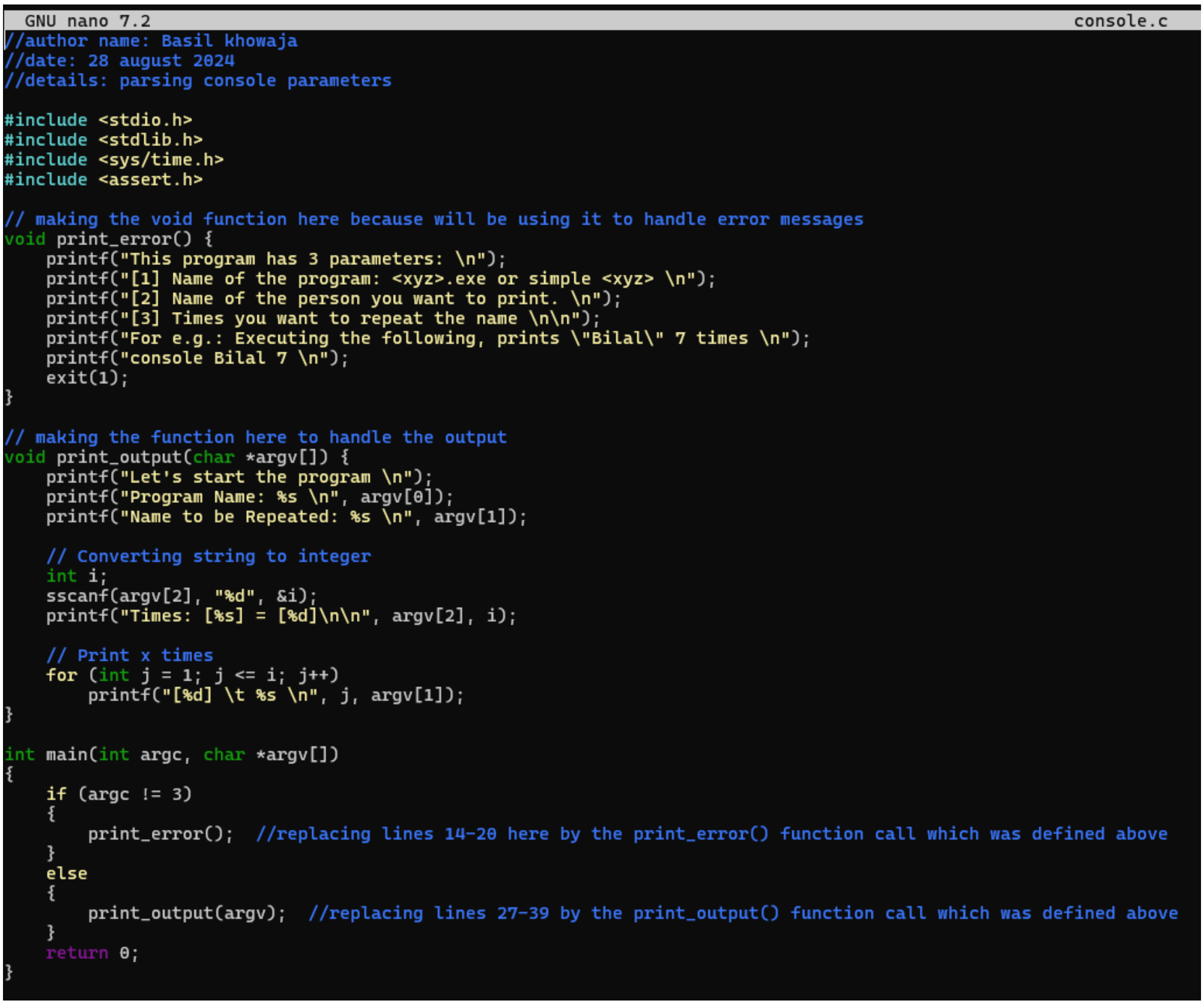
```
bk08432@DESKTOP-BRH2KGB:~$ gcc --version
gcc (Ubuntu 13.2.0-23ubuntu4) 13.2.0
Copyright (C) 2023 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

bk08432@DESKTOP-BRH2KGB:~$ ls -l $(which gcc g++)
lrwxrwxrwx 1 root root 6 Jan 31  2024 /usr/bin/gcc -> gcc-13
bk08432@DESKTOP-BRH2KGB:~$
```



```
bk08432@DESKTOP-BRH2KGB:~$ python3 --version
Python 3.12.3
bk08432@DESKTOP-BRH2KGB:~$ ls -l $(which python python3)
lrwxrwxrwx 1 root root 10 Apr 12 18:29 /usr/bin/python3 -> python3.12
bk08432@DESKTOP-BRH2KGB:~$
```

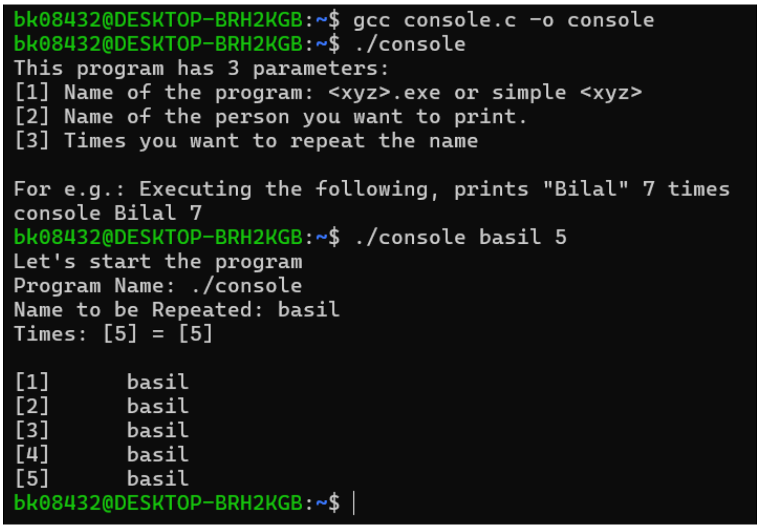
Task 3:

Code 1:



```c
//author name: Basil khowaja
//date: 28 august 2024
//details: parsing console parameters

#include <stdio.h>
#include <stdlib.h>
#include <sys/time.h>
#include <assert.h>

// making the void function here because will be using it to handle error messages
void print_error() {
    printf("This program has 3 parameters: \n");
    printf("[1] Name of the program: <xyz>.exe or simple <xyz> \n");
    printf("[2] Name of the person you want to print. \n");
    printf("[3] Times you want to repeat the name \n\n");
    printf("For e.g.: Executing the following, prints \"Bilal\" 7 times \n");
    printf("console Bilal 7 \n");
    exit(1);
}

// making the function here to handle the output
void print_output(char *argv[]) {
    printf("Let's start the program \n");
    printf("Program Name: %s \n", argv[0]);
    printf("Name to be Repeated: %s \n", argv[1]);

    // Converting string to integer
    int i;
    sscanf(argv[2], "%d", &i);
    printf("Times: [%s] = [%d]\n\n", argv[2], i);

    // Print x times
    for (int j = 1; j <= i; j++)
        printf("[%d] \t %s \n", j, argv[1]);
}

int main(int argc, char *argv[])
{
    if (argc != 3)
    {
        print_error();  //replacing lines 14-20 here by the print_error() function call which was defined above
    }
    else
    {
        print_output(argv);  //replacing lines 27-39 by the print_output() function call which was defined above
    }
    return 0;
}
```

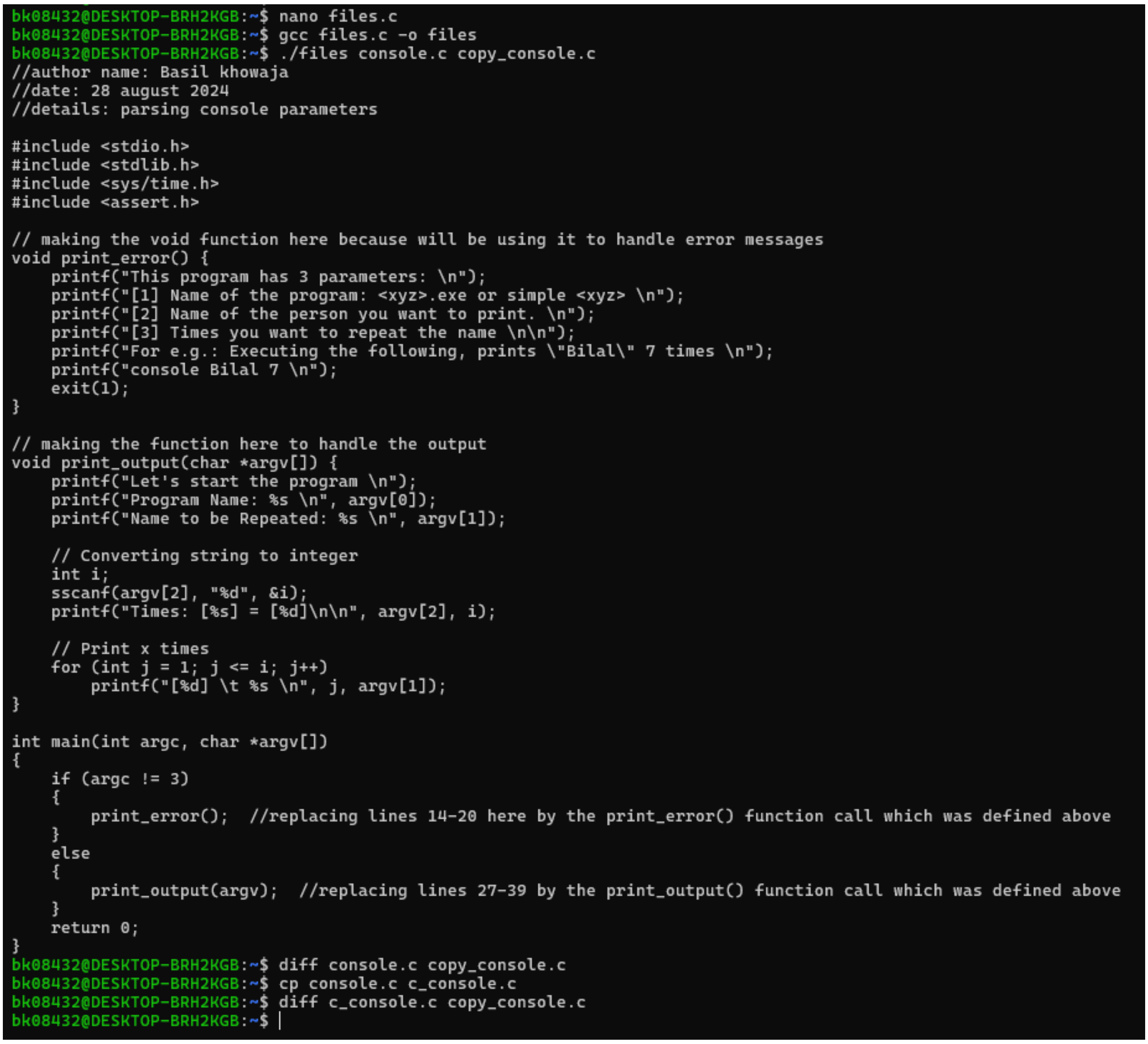
Output:



```
bk08432@DESKTOP-BRH2KGB:~$ gcc console.c -o console
bk08432@DESKTOP-BRH2KGB:~$ ./console
This program has 3 parameters:
[1] Name of the program: <xyz>.exe or simple <xyz>
[2] Name of the person you want to print.
[3] Times you want to repeat the name

For e.g.: Executing the following, prints "Bilal" 7 times
console Bilal 7
bk08432@DESKTOP-BRH2KGB:~$ ./console basil 5
Let's start the program
Program Name: ./console
Name to be Repeated: basil
Times: [5] = [5]

[1]      basil
[2]      basil
[3]      basil
[4]      basil
[5]      basil
bk08432@DESKTOP-BRH2KGB:~$ |
```

Code 2:

Task a,b done in this below snapshot:



```
bk08432@DESKTOP-BRH2KGB:~$ nano files.c
bk08432@DESKTOP-BRH2KGB:~$ gcc files.c -o files
bk08432@DESKTOP-BRH2KGB:~$ ./files console.c copy_console.c
//author name: Basil khowaja
//date: 28 august 2024
//details: parsing console parameters

#include <stdio.h>
#include <stdlib.h>
#include <sys/time.h>
#include <assert.h>

// making the void function here because will be using it to handle error messages
void print_error() {
    printf("This program has 3 parameters: \n");
    printf("[1] Name of the program: <xyz>.exe or simple <xyz> \n");
    printf("[2] Name of the person you want to print. \n");
    printf("[3] Times you want to repeat the name \n\n");
    printf("For e.g.: Executing the following, prints \"Bilal\" 7 times \n");
    printf("console Bilal 7 \n");
    exit(1);
}

// making the function here to handle the output
void print_output(char *argv[]) {
    printf("Let's start the program \n");
    printf("Program Name: %s \n", argv[0]);
    printf("Name to be Repeated: %s \n", argv[1]);

    // Converting string to integer
    int i;
    sscanf(argv[2], "%d", &i);
    printf("Times: [%s] = [%d]\n\n", argv[2], i);

    // Print x times
    for (int j = 1; j <= i; j++)
        printf("[%d] \t %s \n", j, argv[1]);
}

int main(int argc, char *argv[])
{
    if (argc != 3)
    {
        print_error();  //replacing lines 14-20 here by the print_error() function call which was defined above
    }
    else
    {
        print_output(argv);  //replacing lines 27-39 by the print_output() function call which was defined above
    }
    return 0;
}
bk08432@DESKTOP-BRH2KGB:~$ diff console.c copy_console.c
bk08432@DESKTOP-BRH2KGB:~$ cp console.c c_console.c
bk08432@DESKTOP-BRH2KGB:~$ diff c_console.c copy_console.c
bk08432@DESKTOP-BRH2KGB:~$ |
```

I Used the diff command here to compare first the console.c with copy_console.c and since it did not return anything it shows us that both files are identical. Then I used the cp command as said to use, and then again used the diff command to compare c_console.c and copy_console.c and again the output was nothing so it means these both files are also identical and contain same code.

a) What does this function do?

This function is actually copying the contents of one file into another. It takes an input file (in our case, console.c), and then it reads its contents, and writes them into a new file (copy_console.c). This function creates an exact copy of the input file which we give.

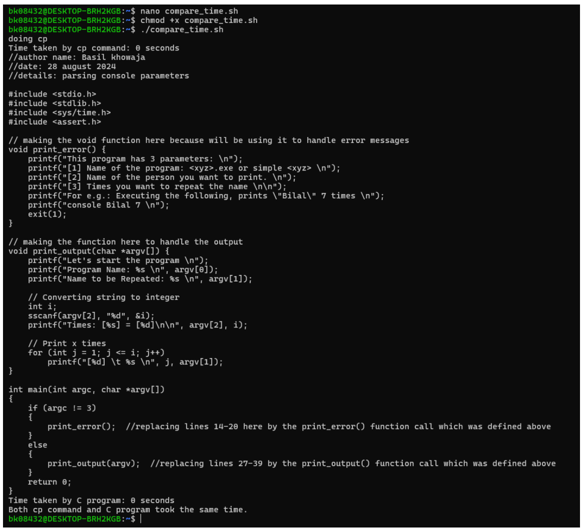
c)

Measuring in seconds;

so first I wrote the code which was actually measuring run time in seconds and it came out that both cp and c program took 0 seconds to execute, then I decided to do it in milliseconds using the $(date +%s%3N) method

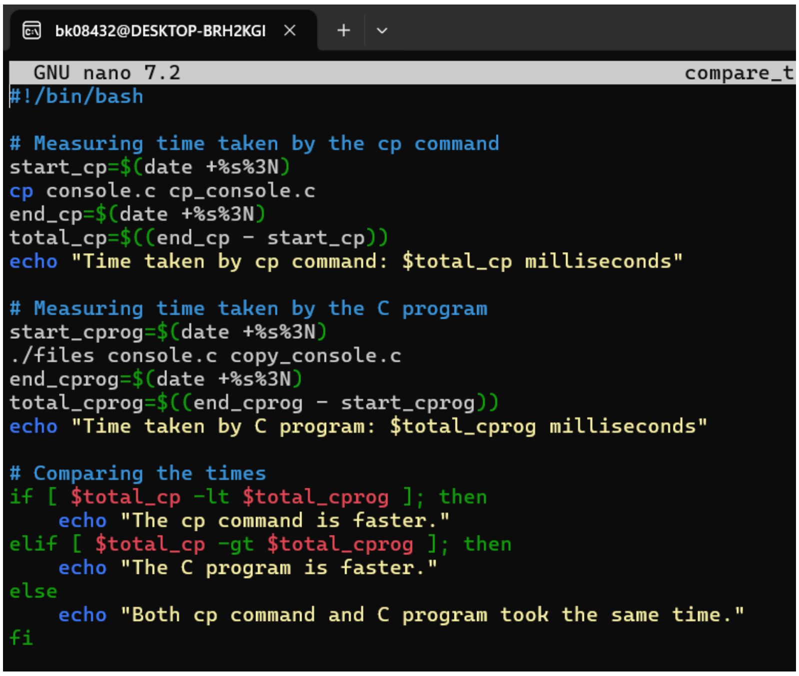
so in this $(date +%s%3N) command actually the date being used is since the epoch January 1, 1970, 00:00:00 UTC, by using %s we find the number of seconds since the epoch, then the %3N returns us the first 3 digits of nanoseconds which are essentially the milliseconds which we need.

Reference for the date command: [How do I get the current Unix time in milliseconds in Bash? - Server Fault]()



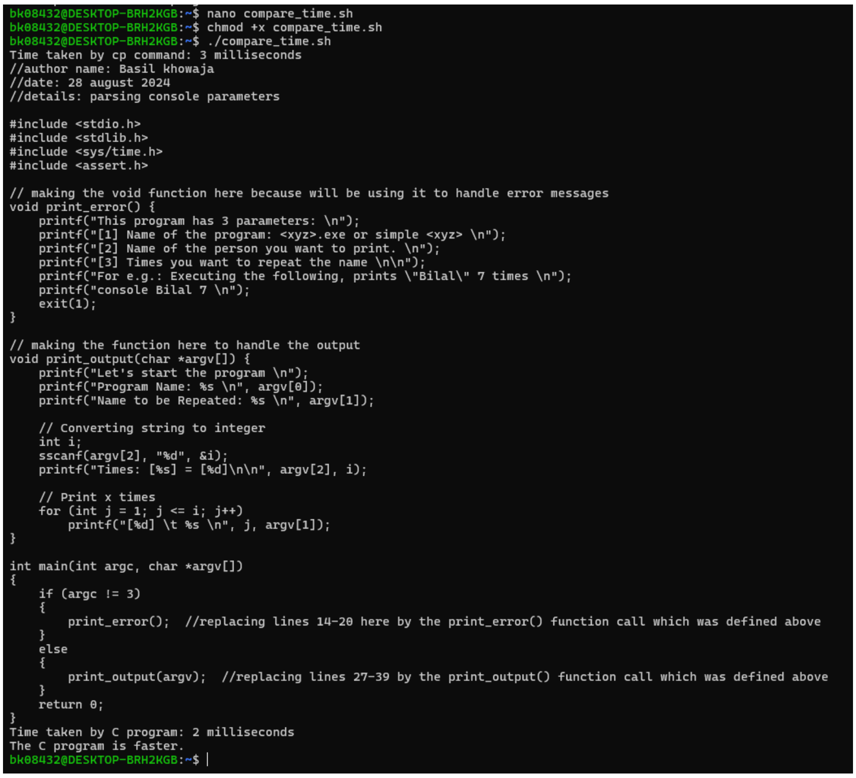
```
bk08432@DESKTOP-BRH2KGB:~$ nano compare_time.sh
bk08432@DESKTOP-BRH2KGB:~$ chmod +x compare_time.sh
bk08432@DESKTOP-BRH2KGB:~$ ./compare_time.sh
doing cp
Time taken by cp command: 0 seconds
//author name: Basil khowaja
//date: 28 august 2024
//details: parsing console parameters

#include <stdio.h>
#include <stdlib.h>
#include <sys/time.h>
#include <assert.h>

// making the void function here because will be using it to handle error messages
void print_error() {
    printf("This program has 3 parameters: \n");
    printf("[1] Name of the program: <xyz>.exe or simple <xyz> \n");
    printf("[2] Name of the person you want to print. \n");
    printf("[3] Times you want to repeat the name \n\n");
    printf("For e.g.: Executing the following, prints \"Bilal\" 7 times \n");
    printf("console Bilal 7 \n");
    exit(1);
}

// making the function here to handle the output
void print_output(char *argv[]) {
    printf("Let's start the program \n");
    printf("Program Name: %s \n", argv[0]);
    printf("Name to be Repeated: %s \n", argv[1]);

    // Converting string to integer
    int i;
    sscanf(argv[2], "%d", &i);
    printf("Times: [%s] = [%d]\n\n", argv[2], i);

    // Print x times
    for (int j = 1; j <= i; j++)
        printf("[%d] \t %s \n", j, argv[1]);
}

int main(int argc, char *argv[])
{
    if (argc != 3)
    {
        print_error();  //replacing lines 14-20 here by the print_error() function call which was defined above
    }
    else
    {
        print_output(argv);  //replacing lines 27-39 by the print_output() function call which was defined above
    }
    return 0;
}
Time taken by C program: 0 seconds
Both cp command and C program took the same time.
bk08432@DESKTOP-BRH2KGB:~$ |
```

Script:



```bash
#!/bin/bash

# Measuring time taken by the cp command
start_cp=$(date +%s%3N)
cp console.c cp_console.c
end_cp=$(date +%s%3N)
total_cp=$((end_cp - start_cp))
echo "Time taken by cp command: $total_cp milliseconds"

# Measuring time taken by the C program
start_cprog=$(date +%s%3N)
./files console.c copy_console.c
end_cprog=$(date +%s%3N)
total_cprog=$((end_cprog - start_cprog))
echo "Time taken by C program: $total_cprog milliseconds"

# Comparing the times
if [ $total_cp -lt $total_cprog ]; then
    echo "The cp command is faster."
elif [ $total_cp -gt $total_cprog ]; then
    echo "The C program is faster."
else
    echo "Both cp command and C program took the same time."
fi
```

Measuring in milliseconds to compare accurately; which showed that the C program is faster.



```
bk08432@DESKTOP-BRH2KGB:~$ nano compare_time.sh
bk08432@DESKTOP-BRH2KGB:~$ chmod +x compare_time.sh
bk08432@DESKTOP-BRH2KGB:~$ ./compare_time.sh
Time taken by cp command: 3 milliseconds
//author name: Basil khowaja
//date: 28 august 2024
//details: parsing console parameters

#include <stdio.h>
#include <stdlib.h>
#include <sys/time.h>
#include <assert.h>

// making the void function here because will be using it to handle error messages
void print_error() {
    printf("This program has 3 parameters: \n");
    printf("[1] Name of the program: <xyz>.exe or simple <xyz> \n");
    printf("[2] Name of the person you want to print. \n");
    printf("[3] Times you want to repeat the name \n\n");
    printf("For e.g.: Executing the following, prints \"Bilal\" 7 times \n");
    printf("console Bilal 7 \n");
    exit(1);
}

// making the function here to handle the output
void print_output(char *argv[]) {
    printf("Let's start the program \n");
    printf("Program Name: %s \n", argv[0]);
    printf("Name to be Repeated: %s \n", argv[1]);

    // Converting string to integer
    int i;
    sscanf(argv[2], "%d", &i);
    printf("Times: [%s] = [%d]\n\n", argv[2], i);

    // Print x times
    for (int j = 1; j <= i; j++)
        printf("[%d] \t %s \n", j, argv[1]);
}

int main(int argc, char *argv[])
{
    if (argc != 3)
    {
        print_error();  //replacing lines 14-20 here by the print_error() function call which was defined above
    }
    else
    {
        print_output(argv);  //replacing lines 27-39 by the print_output() function call which was defined above
    }
    return 0;
}
Time taken by C program: 2 milliseconds
The C program is faster.
bk08432@DESKTOP-BRH2KGB:~$ |
```