Shell Basics

Instructions: Work from your home directory (root or otherwise). Follow the directions closely, and note that questions build on previous results. When executing the ownership change commands, it's ok to run the change commands even though they won't change anything – you will get an error message if something is incorrect.

1)   Create a directory 'test'

2)   Without changing directories, (ie, from your home dir), create a file in the 'test' directory, 'file1' (empty file).

3)   Change into 'test'. Create a file, 'file2', with the contents 'Hello worllld'.

4)   Using input redirection, spell check 'file2' and output the mistakes to 'file2.typos'.

5)   Copy 'file2' to 'file2.copy'. Change the contents of 'file2.copy' to 'Hello world'.

6)   Spell check 'file2.copy'

7)   If there are no mistakes, rename (mv) 'file2.copy' to 'file3'. Spell check 'file3' and put the results in 'file3.typos'.

8)   Change permissions of typo files to read for owner, nothing for anyone else (-|r--|---|---)

9)   Change the owner of 'file1', 'file2', 'file3' to yourself (your username)

10)   Change the group of the typo files to yourself (your username)

11)   Add a few more lines to 'file3' with info about yourself, such as Name, DOB, hobbies, job, etc

12)   (Give yourself write permissions on file3.typos) Spell check 'file3' again, outputting to 'file3.typos'. Use tee, so you can see if you made any mistakes. If you did, go back to the previous step!

13)   Without leaving the 'test' directory, copy file3 to your home directory and name it 'file100'. Do this with a *relative* pathname.

14)   Repeat the previous step, using an *absolute* pathname, and name it 'file101'. Change back to your home directory

15)   Run 'diff file100 file101' and see if there is any output (there shouldn't be!!!! Read the man page for diff

16)   Create an environment variable "MYPATH" with the absolute pathname to your test directory. Verify using echo.

17)   Change directory to /tmp. Using only the ls command and your MYPATH environment variable, create a long listing of the contents in your test folder.

18)   Start a new shell and see if MYPATH exists. Exit the subshell.

19)   Export MYPATH.

20) Start a new shell and see if MYPATH exists (it should!). Exit the subshell.

21) Create a symbolic link in your home directory, named "link-to-test" which points to the test folder.

22) Change directory back into your test folder. Create a hard link, named "hard-link-to-file1", linked to file1.

23) Confirm the hard link using ls and the -i option. Explain how to confirm hard links.

24) Name 10 metacharacters.

25) Perform an apropos search for "passwd" and count how many man pages reference the term. Do not use your finger to count – use a unix tool to do it for you. :)

26) Use the ls command and wildcards to figure out how many files in the /bin folder start with a 'c'. How many contain the letter 'r'? How many are exactly 4 characters long?

27) Devise a way to create a sorted listing of your environment variables and their values.

28) Remove the MYPATH environment variable.

29) Read through the manpage for the "find" command.

30) *You will need to execute this command as root.* Using find, locate every file on the computer that contains the phrase "ch" and sort the results.

31) In your own words, explain the three permission bits (r, w, x) and how they control access to files versus directories.

32) Explain how the three permission access levels (u, g, o) work.

33) What is special about inode number 2?

34) Start up vi and use it to write down your answers to the previous questions requiring explanations.

System Administration

Instructions: Work as the root user. Follow the directions closely, and note that questions build on previous results.

1) Create a new group 'dev'

2) Create a new user 'alice'. Make sure she is a member of the 'dev' group. Also, set her description to "Alice from Dev", and her default shell to '/bin/csh'

3) Check the log files and look for the log entries generated by adding alice to the system

4) Create a new group 'mktg'

5)	Create a new user 'bob' as a member of group 'mktg' and secondary member
	of the 'dev' group. Lock his account after you create it.

6)	Modify user 'bob' and make his primary group 'dev' and his secondary
	group 'mktg'. Unlock user 'bob'

7)	Set the minimum password lifetime on 'bob' and 'alice' to 21 days, and
	the maximum lifetime to 45 days

8)	From the '/' directory, create a tar file backup of the home directory

9)	Create a new directory, '/backups'. Set the permissions on the
	'/backups' directory to read/write/execute for owner, and no perms for
	everyone else

10)	Using the highest compression level, compress your backup with gzip and
	move it to the '/backups' directory

11)	Going back to your home directory backup. Change directory into the
	'/tmp' folder. Extract your home backup. Check that the extract worked
	by comparing the '/tmp/home' folder with the '/home' folder.

12)	Figure out a way to count the total number of RPM packages installed on
	your machine.

13)	Generate an alphabetized list of installed RPM packages on your machine.

14)	To what package does the '/usr/bin/time' command belong?

15)	Create a cron job which appends the current date and time to
	/tmp/mycronjob every 2 minutes. Verify it is working.

16)	Rebuild the /lab filesystem using ext3, a blocksize of 1k, and a reserve
	space of 2%. Remember to umount/mount as appropriate, and confirm with
	tune2fs.

17)	*Tricky* Write a short shell script to back up the home directories
	to /backups. You should use tar and gzip to create the backup, and you
	need to devise a way to provide a unique name for the backup file.
	Consider something like backup.`date`.tar.gz. Experiment with the naming
	to get something useful. Put the shell script in cron to run every 5
	minutes, and verify it's functioning by extracting one of the backups.
	Once it's working, change the cron job to run once a day at 2am.

18)	Create the file /test1. Create a hard link to /test1 – name the link
	/usr/local/hlink-to-test1 – verify links by comparing inodes.

19)	Move alice's home directory to /lab, and update her account to reflect
	the change.

20)	Determine the inode for /test1 and use find to locate all files
	referencing that inode.

21)	Unmount and force a filesystem integrity check of the /lab filesystem.

22)	Explain what a data block is and how it is used in the Linux filesystem.

23)	Browse through the [very] long man page on bash – you'll be surprised
	the nuggets of information found from even a five minute perusal.

24)   Remount the /lab filesystem read-only and test lack of writing.

25)   Define each column of information shown in the output of the vmstat command. Explain how this knowledge can be applied to troubleshooting.

26)   From root's home directory, run:

         ls | xargs ls -l

         Analyze the output and review the manpage on xargs. Theorize as to the operation of the command shown above.

Network Administration

Instructions: Work as the root user. Follow the directions closely, and note that questions build on previous results.

1)   Check your IP address, netmask, default router and DNS servers. Write this information down (or type it into a file if you don't have pen/paper)

2)   Shut down networking (recall service command)

3)   Manually configure networking by setting up your IP address and netmask, your default route, and your DNS servers from the information you gathered earlier.

4)   Test that networking is functional by pinging yahoo.com. If networking isn't working, troubleshoot the problem and fix it.

5)   Run some random traceroutes and familiarize yourself with the output

6)   Use any of the following commands in a single commandline (with multiple pipes) to obtain a short, alphabetized list of every user running a piece of software on your system: grep, uniq, sort, ps, awk, head. You might figure out clever ways using other commands, but the goal is to get the whole thing accomplished with one press of the enter key. ;) This one is pretty tricky, so try to work it out methodically, and refer to your manpages. And remember, "UID" is not a username, that's the heading of the user id column in the output of your ps command, so you need to remove it somehow, and using a grep -v is not the answer (b/c it could remove a user named UID, slim chance of a user like that, but not impossible)

7)   Using google, a manpage, or a book, learn at least 5 new vi commands.

8)   Identify each of the following servers/daemons and explain their purpose: apache, mysql, bind, samba, squid, syslog, cups, X, inetd, gpm, init.

9)   Using FTP, log in to ftp.gnu.org as user anonymous and download "ls-lrRt.txt.gz". Extract the file and take a look at the contents.

10)   Download the source code for the latest version of Apache from: http://httpd.apache.org/download.cgi. Follow the instructions to extract, build and install a default configuration of Apache. You don't need to try and start it up, just build and install it.