Answers to Even-Numbered Exercises

<div style="text-align: right">**4**</div>

from page 132

1. Is each of the following an absolute pathname, a relative pathname, or a simple filename?

    a. **milk_co**

    b. **correspond/business/milk_co**

    c. **/home/alex**

    d. **/home/alex/literature/promo**

    e. **..**

    f. **letter.0610**

2. List the commands you can use to

    a. Make your home directory the working directory

    b. Identify the working directory

    cd, pwd

3. If your working directory is **/home/alex** with a subdirectory named **literature**, give three sets of commands that you can use to create a subdirectory named **classics** under **literature**. Also give several sets of commands that you can use to remove the **classics** directory and its contents.

4. The df utility displays all mounted filesystems along with information about each. Use the df utility with the **–h** (humanly readable) option to answer the following questions.

```
$ df -h
Filesystem        Size  Used Avail Use% Mounted on
/dev/hda1         1.4G  242M  1.1G  18% /
/dev/hda3          23M   11M   10M  51% /boot
/dev/hda4         1.5G  1.2G  222M  85% /home
/dev/hda7         564M   17M  518M   4% /tmp
/dev/hdc1         984M   92M  842M  10% /gc1
/dev/hdc2          16G   13G  1.9G  87% /gc2
```

   a. How many filesystems are on your GNU/Linux system?

   b. Which filesystem stores your home directory?

   c. Assuming that your answer to part 4a is two or greater, attempt to create a hard link to a file on another filesystem. What error message do you get? What happens when you attempt to create a symbolic link to the file instead?

   Following are sample answers to these questions. Your answers will be different because your filesystems are different.

   a. six **b. /dev/hda4 c.** `ln: creating hard link '/tmp/xxx' to 'xxx':` `Invalid cross-device link`. No problem creating a cross-device symbolic link.

5. Suppose that you have a file that is linked to a file owned by another user. What can you do so that changes to the file are no longer shared?

6. You should have read permission for the **/etc/passwd** file. To answer the following questions, use cat or less to display **/etc/passwd**. Look at the fields of information in **/etc/passwd** for the users on your system.

   a. What character is used to separate fields in **/etc/passwd**?

   b. How many fields are used to describe each user?

   c. How many users are on your system?

   d. How many different login shells are in use on your system? (*Hint:* Look at the last field.)

   e. The second field of **/etc/passwd** stores user passwords in encoded form. If the password field contains an x, your system uses shadow passwords and stores the encoded passwords elsewhere. Does your system use shadow passwords?

   a. colon (:), **b.** seven, **c. d.** and **e.** system dependent

7. If **/home/jenny/draft** and **/home/alex/letter** are links to the same file and the following sequence of events occurs, what will be the date in the opening of the letter?

   a. Alex gives the command **vi letter**.

   b. Jenny gives the command **vi draft**.

   c. Jenny changes the date in the opening of the letter to January 31, 2003, writes the file, and exits from vi.

   d. Alex changes the date to February 1, 2003, writes the file, and exits from vi.

8. Suppose that a user belongs to a group that has all permissions on a file named **jobs_list,** but the user, as the owner of the file, has no permissions. Describe what operations, if any, the user can perform on **jobs_list.** What command that the user can give will grant the user all permissions on the file?

   Initially, the owner/user cannot perform any operations involving the file, other than to use ls to list it. When the owner/user gives the following command, the owner/user can perform any operation involving the file:

   ```
   $ chmod 7xx jobs_list
   ```

   The **xx** can be any two digits (0-7).

9. Does the root directory have any subdirectories that you cannot search? Does the root directory have any subdirectories that you cannot read? Explain.

10. Assume that you are given the directory structure shown in Figure 4-2 and the following directory permissions:

    ```
    d--x--x---   3 jenny     pubs            512 Mar 10 15:16 business
    drwxr-xr-x   2 jenny     pubs            512 Mar 10 15:16 business/milk_co
    ```

    For each category of permissions—owner, group, and other—what happens when you run each of the following commands? Assume that the working directory is the parent of **correspond** and that the file **cheese_co** is readable by everyone.

    a. **cd correspond/business/milk_co**

    owner: OK, group: OK, other: permission denied

    b. **ls –l correspond/business**

    owner, group, and other: permission denied

    c. **cat correspond/business/cheese_co**

owner and group: `is directory`, other: `permission denied`

Advanced Exercises

11. Create a file named **–x** in an empty directory. Explain what happens when you try to rename it. How can you rename it?

12. Suppose that the working directory contains a single file named **andor**. What error message do you get when you run the following command line?

    ```
    $ mv andor and\/or
    ```

    Under what circumstances is it possible to run the command without producing an error?

    ```
    $ mv andor and\/or
    mv: cannot move 'andor' to 'and/or': No such file or directory
    $ mkdir and
    $ mv andor and\/or
    $ ls and
    or
    ```

    (The backslash is superfluous.)

13. The **ls –i** command displays a filename preceded by the inode number of the file (page 126). Write a command to output inode/filename pairs for the files in the working directory, sorted by inode number. (*Hint:* Use a pipe.)

14. Do you think that the system administrator has access to a program to decode user passwords? Why or why not (see exercise 6)?

    The system administrator cannot decode user passwords. The administrator can assign a new password to a user. Passwords are generally encrypted by a one-way hash so that the system can tell when the correct password is entered, but it cannot regenerate the cleartext password. Fundamentally, the system applies the hash algorithm to the entered password and sees if the result matches the stored, encrypted password. A match means the correct password was entered.

15. Is it possible to distinguish a file from a hard link to a file? That is, given a filename, can you tell whether it was created using an ln command? Explain.

16. Explain the error messages displayed in the following sequence of commands:

```
$ ls -l
total 1
drwxrwxr-x   2 alex     bravo         1024 Mar  2 17:57 dirtmp
$ ls dirtmp
$ rmdir dirtmp
rmdir: dirtmp: Directory not empty
$ rm dirtmp/*
rm: No match.
```

There is a file whose name begins with a period (an invisible file) in the **dirtmp** directory. Use ls with the **–a** option to list the file. Remove the file, and then you will be able to remove the directory.

17. How can you create a file named **–i**? Which techniques do not work, and why do they not work?

18. How can you remove a file named **–i**? Which techniques do not work, and why do they not work?

Most utilities assume that **–i** is an option, not the name of a file, and so do not work properly when called with an argument of a file named **–i**. Many utilities assume that everything on the command line to the right of a **– –** option is a filename. Using one of these utilities, you can work with a file whose name begins with a hyphen by marking the end of the options on the command line with the **– –** option followed by the filename.