





CompTIA Linux+ and LPIC Practice Tests

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## Appendix Answers to Review Questions

### Chapter 1: System Architecture (Domain 101)

1. C. SATA disks are addressed as `/dev/sdX`, just like a SCSI disk. `/dev/hdX` is a traditional ATA disk. The other options do not exist.
2. B. Current interrupt (IRQ) assignments are contained in the file `/proc/interrupts`. Therefore, viewing the contents of the file with a command such as `cat` will work. There is no `view` command, thus making answer A incorrect. Likewise, there is no `/dev/lrq` file, thereby making answers C and D incorrect.
3. C. The `/dev/fd0` interface is typically the first floppy disk in a Linux system. There is no `/dev/hd0` or `/dev/flop0`, thereby making answers A and B incorrect. While there is a `/dev/sda` interface, that will be the first SCSI or SATA disk within the system.
4. D. Configuration files for `udev` are found in `/etc/udev`, which makes answer D correct. The other options do not exist.
5. A. The `modprobe` command loads the module and its dependencies, if applicable. The `lsmod` command is used to list currently loaded modules, making answer B incorrect. The `insmod` command will load a given module but not its dependencies. Answer D, `rmmod`, is used to remove a module from memory.
6. B. The `lsusb` command is used to obtain a basic list of USB devices on a system. The other commands are not valid. In the case of answer D, the `ls` command is valid, but there is no `-usb` option.
7. D. The `/etc/hotplug/usb` directory contains scripts that run when a given device is plugged in. The other directories don't exist, so those options are not correct for this question.
8. C. The keyword `single` given on the Linux kernel command line will boot the system into single-user mode. The other options are not valid.
9. A. The Shift key, if pressed when control has first been handed to GRUB, will cause the GRUB menu to be displayed.
10. D. The `dmesg` command displays the contents of the kernel ring

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`/var/log/dmesg`. The other options shown for this question are not valid commands.

11. 11. C. Runlevel 1, sometimes displayed as runlevel s or S, is single-user mode in which many services are not started. Runlevel 5 and Runlevel 6 are used for other purposes and runlevel SU is not a valid option.
12. 12. D. Scripts are stored in `/etc/init.d` on a system using SysVinit. You may sometimes find these linked from `/etc/rc.d/init.d` as well. The other options are not valid for this question.
13. 13. A. The `init` command can be used to access different runlevels. Runlevel 6 is used for rebooting the system. Answer B will shut down the system entirely, not reboot it. Answer C will place the system into single-user mode. Answer D is not a valid option.
14. 14. C. The `telinit` command can be used to refresh the system after changes have been made to `/etc/inittab`. Notably, answer B will reboot the system, but that was not an option given the question asked. Answers A and D are not valid commands.
15. 15. D. The `runlevel` command displays the current runlevel for a system. Answer B is not a valid option for the `init` command, and adding `sudo` in front of the `init` command makes no difference. Answer A is not a valid command.
16. 16. C. Unit configuration files are stored in `/lib/systemd/system`. The other directory options for this question are not relevant or do not exist by default. Operating system files are typically stored in `/usr/lib/system` and those related to `systemd` can be found in the `/usr/lib` hierarchy.
17. 17. A. The listing shows a symbolic linked file located in the current directory, linked to `.configs/fetchmail/.fetchmailrc`. The file is owned by the root user and root group, and it was created on July 8, 2014.
18. 18. B. The `systemctl` command is used to work with services and targets. The `list-units` command is used to list targets. The other commands are not used for this purpose or do not exist with the required option.
19. 19. C. The `-nn` option displays both numbers and device names, thus making answer C correct. The `-n` option (answer B) displays only numbers. The other two options do not exist.
20. 20. D. The `lsmod` command is used to list currently loaded kernel modules, thereby making answer D correct for this question. The `insmod` command (answer A) is used to load modules. Answer C is a valid command but not a valid option for that command, while answer B does not exist.
21. 21. C. The `--show-depends` option shows the modules that depend on the specified module. The options shown in the other answers do not exist.
22. 22. B. The `wall` command is used to send a message to all users, thereby making answer B correct. The `cat` command is used as a means to concatenate or view files, while `tee` is used to send output to standard output and a file. Finally, `ssh` is the secure shell client command, and it is not used for the purpose specified.
23. 23. B. Checking to ensure that the disk is detected in the BIOS is a good first step in troubleshooting. Answer A, unplugging the disk, won't help it to be detected. Restarting the web server won't help detect the disk, and the `disk-detect` command does not exist.

24. 24. D. The `/proc/bus/usb` directory contains information about USB devices. The other directories are not valid for this purpose.
25. 25. B. The `root=/dev/sda2` option will cause the given kernel to load `/dev/sda2` for its root partition. The `rootpartition` option is not valid, and the format of the `root={hd0,3}` is not valid in this context.
26. 26. C. You begin an editing session with an E when the boot option is highlighted. You can then make changes, and when finished, press B to boot the system.
27. 27. A. The `ls` command from within the `grub >` prompt will show the available partitions in a format such as `(hd0,1)`.
28. 28. D. The file `/var/log/dmesg` will typically contain historical messages from the current booting of the system. On some distributions of Linux, this information is also in `/var/log/boot.log`.
29. 29. C. Out of the options given, the `systemctl status` command is the most appropriate. The `telinit` and `sysctl` commands are not used for this purpose. Likewise, the `-ls` option is not valid for `systemctl`.
30. 30. B. The `isolate` option is used to move the system into the target specified, thereby making option B the correct one. The other options do not exist.
31. 31. A. The `initctl reload` command causes Upstart to reread its configuration files.
32. 32. B. The `-list` option will show all services on a system along with their status for each runlevel.
33. 33. C. USB devices are generally considered to be hotplug devices. Hotplug devices describe those devices that can be inserted and removed while the system is “hot,” or powered on, whereas coldplug devices are those that must be inserted and removed when the system is powered off.
34. 34. D. The root partition is mounted after device initialization. System services, including multi-user mode, start after the root partition is mounted. The other two options, A and C, take place prior to the kernel initializing device drivers.
35. 35. A. With cable select, ATA drives will be detected in the order in which they are plugged in on the cable from the motherboard. It's likely that the drives need to be swapped physically on the cable.
36. 36. B. The `umount` command is used to unmount drives within a running system. The other commands do not exist.
37. 37. D. The ESP is typically mounted at `/boot/efi`.
38. 38. A. The `mount` command is used to mount drives in Linux. The source and destination mount points are expected as arguments. Drive partitions begin at the number 1, making the first partition number 1.
39. 39. D. Of the options presented, running `dmesg` is a common way to find out the location to which the kernel has assigned the drive. Rebooting the system is not a good option, though it would work. There is no such thing as `/var/log/usb.log`, and the location of the drive may change regardless of port, depending on how the drive may be detected in the system.

40. 40. B. From these options, only B will shut down the system immediately. Answer A will cancel a shutdown.
41. 41. C. The `ExecStart` option indicates the command to be executed on startup of a `systemd` service.
42. 42. D. The `systemctl get-default` command will show the default target. The other commands and options are not valid.
43. 43. A. The `enable` option configures the service to start on boot. The `start` option, answer D, is used to start a service immediately. The other options are not valid for this command.
44. 44. C. The `/proc` filesystem contains information about currently running processes and additional information about the kernel and current boot of the system.
45. 45. C. The `-t` option to `lsusb` will print output in a tree-like format so that you can see which devices are connected to which bus. The other arguments to `lsusb` are not valid, and the `usblist` command is not real.
46. 46. A. SCSI supports 7 to 15 devices per bus, depending on the type of SCSI.
47. 47. D. If a working device does not appear in `lsmod`, it typically means that the kernel has a driver already loaded by virtue of being compiled into the kernel itself rather than loaded through a module. The use of `systemd` (answer A) or `initramfs` (answer B) has no effect.
48. 48. C. The `-w` option causes the module to wait until it's no longer needed prior to unloading. The `-f` option forces immediate removal and should be used with caution. The other options are not valid for `rmmmod`.

## Chapter 2: Linux Installation and Package Management(Domain 102)

1. 1. D. The partition containing `/var` should be the largest for a mail server because mail spools are stored within this hierarchy. The `/etc/` hierarchy is usually small, as is `/usr/bin`. The `/mail` directory does not exist by default.
2. 2. C. The `rootnoverify` option is used to specify a non-Linux kernel, one that GRUB should not attempt to load. The `initrd` option is used for specifying the initial RAM disk, thereby making option A incorrect. The remaining options, B and D, are not valid options for GRUB.
3. 3. C. The `noexec` option will prevent programs that reside on the partition from being executed. The `noexec` option is used frequently for mounting the `/tmp` partition.
4. 4. A. The `update-grub` command sends its output to `STDOUT`. Therefore, you must redirect using `>` and send that output to the correct file. The other options are not valid for this purpose. Answers C and D are not valid commands while answer B contains invalid options and an invalid location for the destination file.
5. 5. B. MBR-based disks can be partitioned with up to four primary partitions, one of which can be further partitioned or extended into logical partitions.
6. 6. D. The `ldconfig` command updates the current shared library cache and list. `ldconfig` reads `/etc/ld.so.conf` and incorporates

any changes found within it. The other commands listed as options for this question do not exist.

7. 7. B. The `upgrade` option for `apt-get` will upgrade the system to the latest version of software for packages already installed. The `apt-update` command does not exist nor does the `-U` option to `dpkg`. The `apt-cache` command is used to work with the package cache.
8. 8. C. The `yum install` command will install a given package. The `update` option will update a package. The other options listed do not exist.
9. 9. C. Root's home directory is `/root` on a Linux system. While the `/home` directory does exist, there is no `root` or `su` user within that hierarchy by default. The `/` directory is the root of the filesystem but not root's home directory.
10. 10. A. `rpm2cpio` sends its output to `STDOUT` by default, and therefore that output needs to be redirected to a file in most cases.
11. 11. B. `0x82` is Linux swap while `0x83` is Linux. NTFS is `0x07` and FAT32 is `0x0c`.
12. 12. B. The `/usr` hierarchy contains many of the programs that run on a Linux system. Other notable directories for programs are `/bin` and `/sbin`.
13. 13. B. GRUB begins its count at 0, and in this scenario there are two operating systems. Therefore, because Linux is first in the configuration file, its number would be 0, which is then sent to the `default=` option.
14. 14. A. The `/etc/default/grub` file can be used for this purpose. You may also edit `/boot/grub/grub.cfg`, but this was not an option given for this question.
15. 15. B. The `deplist` option displays the dependencies for the given package. The `list` option displays information about a specific package, while the other two options are not valid.
16. 16. A. The `-ivh` options will install a file using `rpm`, displaying both verbose output and hash marks for progress. The other options presented do not exist or do not accomplish the specified task.
17. 17. B. The `export` command is used to set environment variables in Bash. The other commands are not valid for this purpose.
18. 18. D. The `yumdownloader` utility will download an RPM package but not install it. The `yumdownloader` utility is part of the `yum-utils` package. The other options listed for this question do not exist.
19. 19. A. The `apt-cache` command is used to work with the package cache, and the `search` option is used to search the cache for the supplied argument, in this case `zsh`. The `apt-get` command is used to work with packages themselves, while the `apt-search` command does not exist.
20. 20. C. The `GRUB_DEFAULT` option, when in the `/etc/default/grub` file, is used to configure the operating system that will boot by default. The other options do not exist in this context.
21. 21. A. The `ro` option, which is the default for GRUB, will initially mount the root partition as read-only and then remount as read-write.

22. 22. D. Configuration files related to the repositories for YUM are located in `/etc/yum.repos.d`. Of the other options, `/etc/yum.conf` is a file and not a directory, and the other directories do not exist.
23. 23. A. The `-V` or `--verify` option will check the files in a given package against versions (or checksums) in the package database. If no files have been altered, then no output is produced. Note that output may be produced for files that are changed during installation or for other reasons. Note also the use of an uppercase `V` for this option as opposed to the lowercase `v` for verbose.
24. 24. C. The `-o` option can be used to specify a destination file to which output will be sent instead of `STDOUT`. The other options listed in this question do not exist.
25. 25. A. The `menu.lst` and `grub.conf` files are used in GRUB Legacy, that is, prior to GRUB 2. This therefore makes answer B incorrect.
26. 26. D. The `ldd` command will list the libraries on which the command's argument depends.
27. 27. B. Swap space is used when there is insufficient RAM on a system.
28. 28. B. The `/etc/lib` directory is not typically associated with library files and does not typically exist on a Linux system unless manually created. The other options either contain system libraries or can be used for that purpose.
29. 29. C. The `apt-get update` command will cause the package cache to be updated by retrieving the latest package list from the package sources. There is no `cache-update` option or `update` option to `apt-cache`. The `upgrade` option is used to update the system's packages and not the cache.
30. 30. C. The file `sources.list` located in `/etc/apt` contains the list of repositories for Debian packages. The other file locations do not exist by default.
31. 31. A. The `/boot` partition will typically be much less than 500 MB but should not be undersized. The used space within `/boot` will increase as more kernels are added such as during an upgrade process.
32. 32. B. The `pvccreate` command initializes a physical partition for future use as a logical volume with LVM.
33. 33. D. The `grub-install` command is used to install GRUB onto a disk and the second SATA disk would be `/dev/sdb`, therefore making answer D the correct option. You can use `grub-install` on different disks in order to provide an alternate or backup boot option.
34. 34. A. The `dpkg-reconfigure` program will cause an already-installed package to be reconfigured or changed. The `-r` option for `dpkg` is for removal of a package, thus making answer B incorrect. There is no `reconf` option for `dpkg` or `reinstall` option for `apt-get`.
35. 35. C. The `lvcreate` command is used to create logical volumes with LVM. The `pvccreate` command initializes physical volumes prior to creating logical volumes. The command in the other two options for this question do not exist.
36. 36. A. Physical volumes are initialized first, followed by volume group creation, and then logical volume creation.

37. 37. D. `aptitude` provides the terminal-based interface rather than the standard command-line interface of the other tools listed in this question.

38. 38. D. The `-search` option performs a search of various fields such as the package name and description.

39. 39. B. The `rpm -q kernel` command will show the kernel version. You can also use `uname -r` for the same purpose.

40. 40. C. The `GRUB_DEFAULT` option in `/etc/default/grub` will set the operating system to boot by default.

41. 41. A. The `exclude` option can be used to exclude certain packages. The argument accepts wildcards, and therefore excluding all `kernel*` updates will create the desired behavior.

42. 42. B. The partition type `0x83` should be created for a normal Linux partition. Type `82` is used for swap, while `84` is an OS/2 partition. There is no `L` type.

43. 43. B. The `grub-mkconfig` command should be run after making a change to the `/etc/default/grub` file so that a new configuration file can be created with the changed option(s).

44. 44. B. The `-s` option to `dpkg` searches for the given package and provides information about its current status on the system. The `apt-cache` command is not used for this purpose, and the `-i` option for `dpkg` installs a package. The `apt-info` command does not exist.

45. 45. C. The `lvm diskscan` command looks for physical volumes that have been initialized for use with LVM.

46. 46. B. The `--resolve` option will download the dependencies of the package being downloaded. The other options shown within this question are not valid for the `yumdownloader` command.

47. 47. A. The `-i` option to `dpkg` will install a previously downloaded package. The other commands don't exist, and the `-U` option for `dpkg` does not exist.

48. 48. D. GRUB Legacy begins counting at 0 and separates the disk letter and partition with a comma, therefore making `0,0` the first partition on the first disk. Answer A is not the first disk on the system and answers B and C contain nonexistent partitions or devices.

### Chapter 3: GNU and Unix Commands (Domain 103)

1. 1. B. The `env` command will print the current environment variables from Bash. The `printenv` command will also perform the same operation. The other commands listed in this question do not exist.

2. 2. D. The `set` command can be used for a variety of purposes to change how the shell environment works. One such option is `-C`, which prevents output redirection such as that done with `>` from overwriting a file if the file already exists.

3. 3. C. The `man` command displays documentation for the command given as the argument. The other options listed for this answer do not exist.

4. 4. D. The `uname` command is used to print system information, and the `-a` option prints all information available to `uname`.

5. 5. A. The `g` option, also known as global or greedy, will apply the matched operation to the entire line rather than just the first instance of the match. The other options apply as they would for a Perl Compatible Regular Expression.
6. 6. C. The `-l` option provides the number of lines given as input. For example, `wc -l /etc/passwd` would print the number of lines in the `/etc/passwd` file. The other options given in this question are not valid for the `wc` command.
7. 7. C. Both `head` and `tail` print 10 lines of output by default.
8. 8. B. The `-rf` options to `rm` will recursively remove contents of a directory, including other directories. The `-f` option alone will not work in this case because of the additional directories. The other options given for `rmdir` do not exist.
9. 9. D. The `-type` option causes `find` to limit its search to directories only, whereas the `-name` option limits the names of returned elements. Note the use of the wildcard due to the phrasing of the question. Also note the use of `./` to denote beginning the search in the current directory.
10. 10. A. The `cat` command will display the contents of the file `/etc/passwd` and then pipe that output to the `awk` command. The `awk` command then parses its input, splitting along the specified separator for `/etc/passwd`, which is a colon (`:`). The output is then printed and piped to the `sort` command. The `sort` command in option B will not work because the `cut` command requires an argument. Likewise, the `echo` command in option C will only echo `/etc/passwd` to stdout. The `split` command can also be used to split input but does so on a fixed width manner which is generally not feasible when working with the `passwd` file as input. Also, the `tr` command is a typical companion to the `awk` command and helps to substitute the characters from `awk` output.
11. 11. C. The `-l` option for `ls` produces long or listed output, and `-t` sorts by timestamp. The `-r` option reverses the order, and `-a` is needed to include hidden (dot) files, thus making answer C correct.
12. 12. A. The timestamp of the file will change when `touch` is run on a file that already exists.
13. 13. D. The `-i` option will cause both `cp` and `mv` to be interactive, that is, prompt before overwriting. The `-f` option will force the command to run while `-r` is recursive.
14. 14. C. The `tee` command will send output both to stdout and to the specified file, thus making answer C correct. Option A will redirect output to the correct file but not to stdout simultaneously. The other answers will not work for this question. It should be noted that there is no specific formatting included with `cat` or `tee`. If formatting is needed for text processing, the `fmt` command can be used.
15. 15. A. The `-p` option will cause `mkdir` to create additional levels of directories without error. Running `mkdir` without options will not work in this case. The `-r` and `-f` options to `mkdir` do not exist.
16. 16. B. The `-R` option will copy directories recursively. Note that if the `-i` option is not enabled, the recursive copy will overwrite files in the destination. The `-v` option adds verbosity but does not cause any recursion, and the `-Z` option does not exist.
17. 17. C. The `file` command can be used to determine which type of file is being used. This can be particularly helpful for files without extensions where you are unsure if you should view the contents of the file. Option A, `grep`, is used to look within files but would not be



helpful in this case. The `telnet` and `export` commands are not used for this purpose.

18. 18. C. The `dd` command is used to create disk images, among other things. In this case, the input file is `/dev/sda1` and the output file is `output.img`. It's also common to add the `blocksize` option by using the `bs` argument, such as `bs=1M`.
19. 19. B. The `cut` command uses a tab as its default delimiter. This can be changed with the `-d` option. You might use the `cut` command in order to apply text filters to one or more files so that they can be further processed later. For example, you might cut certain fields and create new files that can be connected together using the `join` or `paste` commands. You can use the `unexpand` command if you need to convert spaces to tabs and the `expand` command to convert tabs to spaces. However, you can also change the delimiter that is used by `cut`.
20. 20. A. The `-z` option will unzip the file while `-x` will extract from the tar archive, and `-f` is used to indicate the file on which to perform the aforementioned operations. It's typical to add `-v` for verbose output as well.
21. 21. D. The `fg` command will bring a command to the foreground if it has been backgrounded with either `&` or with the `bg` command. You might background a command or process so that it continues running after logout.
22. 22. B. While the `ps auxw` command combined with `grep` will provide information on the running Apache instances, it will provide much more information than is required or useful for this problem. The `pgrep` command provides only the process IDs and therefore meets the criteria presented in the question.
23. 23. D. The `top` command is used to monitor continuously things like CPU and memory usage, and the `-p` option monitors a single process. By using the run quotes with the `pidof` command, the process ID is provided as input to the `-p` option.
24. 24. D. The `free` command displays overall memory usage for both RAM and swap and can be used to determine when additional memory might be needed.
25. 25. A. You need to write the changes to the file; therefore, you'll need `:w`. The addition of `q` will also quit. Note that you could use `ZZ` to write and quit as well. The `dd` command deletes a line whereas `x` deletes a single character.
26. 26. D. The `-n` option changes the number of lines of output for both `head` and `tail` to the number specified. The other options listed in this question are not valid for `head`, and the `-f` option follows a file with `tail` as the file grows.
27. 27. A. The `uptime` command shows basic information such as that described in the question along with the number of users logged into the system and the current time. The `bash` command is a shell environment, and the `ls` command will not display the required information.
28. 28. D. The `screen` command starts a new terminal that can be disconnected and reconnected as needed. Processes running from within the screen session do not know that they are running in a screen session, and therefore this meets the criteria needed to satisfy this question. The `fg` or `bg` commands will not meet the criteria, and the `kill` command will stop a process.
29. 29. C. The `-9` option invokes `SIGKILL`, which will force the process to end. The `-15` signal is the default, and the `-f` and `-stop` options do not

exist. Certain commands may have been started with `nohup`, meaning that they are immune to hangups that might be issued with other signals. Note that you can kill a group of commands with the `pkill` command rather than individually with `kill`.

30. 30. C. Within Bash, the number 1 represents `stdout` and 2 represents `stderr`. Redirecting both means combining them in the manner shown in option C.

31. 31. B. The `nice` command, when run without arguments, will output the priority for the currently logged-in user, which is normally 0. The `renice` command can be used to change the priority of running processes. The other two commands shown as options for this question do not exist.

32. 32. D. Within a regular expression, `*` represents zero or more characters, and in this case the problem doesn't care whether a person is using `/bin/bash` or `/usr/bin/zsh`. Likewise, a `.` matches a single character, but in the case of `bash` and `zsh` we need to look at the first and optionally a second character, thus the `?` making the second `.` optional. Finally, the `$` anchors the pattern at the end of the string and is also key for this regular expression. The `egrep` command is equivalent to `grep -e` and `fgrep` is equivalent to `grep -F`, both of which are deprecated. For more information on regular expressions see `regex(7)`.

33. 33. A. The different levels of the manual are accessed by preceding the argument with the desired level. The other options, such as `-list`, do not exist in this context.

34. 34. C. The `o` command opens a new line below the current cursor location. The `a` command begins an insert mode session at the character after the cursor, not the line. The `i` command begins an insert mode session at the current cursor location.

35. 35. A. Sending `-HUP` as part of the `kill` command will restart a process. Of the other answers, `-9` will kill the process completely. The other two answers do not exist as valid means to kill a process.

36. 36. B. The `history` command will display your command history, including commands from the current session. You can specify how many lines of history to display, as shown in the answer for this question. Note that `.bash_history` will not show the current session's history.

37. 37. C. The `jobs` built-in command shows the list of jobs running in the background. Its output includes a job number and the status of the job.

38. 38. B. The `find` command beginning with the path and then the `-name` argument will locate all of the files called `.bash_history`. The output from the `find` command should be piped to `xargs`, which can then build further commands from standard input. Note that this question and solution assume that all users use the Bash shell and are keeping history.

39. 39. C. The `tail` command provides the end portion of the file given as an argument. Adding the `-f` option will cause the output to update as new lines are added to the file being tailed.

40. 40. D. The `nl` command will prepend line numbers onto the file given as its argument. The output is then sent to `stdout`. Of the other answers, `wc -l` will print the number of lines in the file but not prepend those numbers onto each line, as was asked for in this question.

41. 41. A. The `xz` command can compress and decompress files in a variety of formats, one of which is `lzma`.
42. 42. A. The `find` command is used for this purpose. Adding `-type f` will limit the search to only files, and the `-mtime` option will limit to modification time in day format.
43. 43. C. The `mv` command is used to move files, and `*.txt` will look for all files with a `.txt` extension. Note the fully qualified destination with a `/` preceding the name `tmp`.
44. 44. D. The `pwd` command prints the current working directory. The `cd` command changes directory.
45. 45. A. The file first needs to be sorted to group common zip codes together. After that, piping the output to `uniq` will display the unique zip codes, and the `-c` option provides a count.
46. 46. A. Preceding the command with `!` will search history and execute the specified command. For example, `!vi` will start your last `vi` session.
47. 47. C. The `killall` command is used to terminate processes using their name.
48. 48. C. The `?` will search backward in a file within `vi`. The `/` is used for searching forward. The `h` key will move the cursor to the left one character, and the `x` key will delete a character.

#### Chapter 4: Devices, Linux Filesystems, and the Filesystem Hierarchy Standard (Domain 104)

1. 1. A. The `which` command returns the full path to the given command, and it is useful for determining both whether a given command is available and the location from which the command will run.
2. 2. A. The `chgrp` command can be used to change group ownership of a file. The order is `chgrp <groupname> <target>`.
3. 3. C. The file is almost certainly a hard link to the original script. While `ls` won't show this information, the `stat` command will show that it is a link and also show the inode to which the file is linked.
4. 4. A. The `-i` option to `df` produces information on inodes across all filesystems. The `ls -i` option will produce inode listings but only for the current directory. The `-i` option is invalid for `du`, and `dm` does not exist as a command.
5. 5. C. The `-y` option will attempt to repair automatically, essentially answering `y`, or `yes`, instead of prompting. Of the other options, only `-v` is valid and will produce verbose output.
6. 6. D. The first step is to use `fdisk` to create one or more partitions, then format the partitions, and then mount the partitions for use. The `fdisk` command is used with various types of disks including MBR-based partitions.
7. 7. B. The `tune2fs` command can be used for this purpose but should be used with care because it can result in data corruption.
8. 8. B. The addition of journaling in `ext3` increased filesystem reliability and performance.

9. 9. C. The `-S` option displays output in a format such as `u=rwx,g=rwx,o=rx`. The other options listed in this problem do not exist.
10. 10. B. The `-s` option to `ln` creates a symbolic link or symlink.
11. 11. C. The `whereis` command displays pertinent information about the command given as its argument. For example, entering `whereis apache2` on a Debian system will show the binary location, configuration file location, and other relevant details.
12. 12. A. The `PRUNEPATHS` option accepts a space-separated list of paths to remove from the results. The other options listed in this question do not exist.
13. 13. D. The `/srv` hierarchy is used for data for server programs. The `/etc` hierarchy is configuration information, while `/var` is also used for data files but variable ones such as mail files. The `/tmp` directory is for temporary files.
14. 14. C. The `chmod` command is used for this purpose, and the `u+s` option sets the sticky bit for the user on the specified target.
15. 15. C. The `-a` option mounts all filesystems in `/etc/fstab` that are currently available. Of the other options listed, only the `-f` option is available and it is a shortcut to the “fake” option that does nothing except perform a dry run of the mount.
16. 16. B. The `mkswap` command formats a swap partition. The `fdisk` command is used to create the partition itself but not format it. The other two options do not exist.
17. 17. A. The `tune2fs` command displays a lot of information about filesystems including the number of times that the filesystem has been mounted.
18. 18. A. The `-g` option displays progress of the dump. The other options listed do not exist.
19. 19. D. The `quotacheck` command is used to update the quota file for the given filesystem. The `quota -u` command will display the current quota for a given user. The other commands do not exist.
20. 20. A. The `du` command will report on disk usage in a recursive manner, unlike the other commands shown here.
21. 21. C. The `/etc/fstab` file is used to store information about the filesystems to mount within the system.
22. 22. D. The `/media` mount point is used for removable media. See <https://wiki.linuxfoundation.org/en/FHS> for more information on the FHS.
23. 23. A. The `/etc/mtab` file contains currently mounted filesystems. Note that `/etc/fstab` contains filesystem information but not about which filesystems are currently mounted.
24. 24. B. The `-r` option causes `umount` to attempt to remount in read-only mode. The `-v` option is verbose mode, and the `-f` option forces the operation. The `-o` option does not exist.
25. 25. C. The `022 umask` value will translate into 644 permissions on a new non-executable file.

26. 26. B. The 1 within the listing indicates a symlink. There is no way to tell if a file or directory is temporary. A directory will display a d instead of an l. Symbolic links are not copies of files but rather are akin to shortcuts. Changes to the contents of the symlink change the source file as well.
27. 27. B. The `repquota` command is used for this purpose, and the `-a` option will display information for all filesystems.
28. 28. C. The `updatedb` command will update the database used by the `locate` command.
29. 29. A. The `type` built-in command returns the location that the shell will use in order to run the given command. The `find` command cannot be used for this purpose, and the other commands do not exist.
30. 30. B. The `-R` option will perform the change ownership in a recursive manner.
31. 31. D. The proper order is the device (UUID or partition), followed by the directory to mount that device, followed by its type and options, and then the dump and fsck settings.
32. 32. A. The `blkid` command will show partition UUIDs. You can also get this information with the `lsblk -no UUID <partition>` command. The other commands shown in this question do not accomplish the required task.
33. 33. D. The `xfs_info` command is equivalent to `xfs_growfs -n`.
34. 34. B. The `mkfs.btrfs` command is used to create btrfs filesystems and does not require the drive to be partitioned.
35. 35. C. The `usrquota` option will enable user-level quotas on the given mount point. This is typically set within `/etc/fstab`.
36. 36. A. The best option among these choices is to change the group to `www-data` and change the permissions such that the group can write into the directory. Option B should never be used because it enables world writing to the directory. The other options will not allow the web server group to write into the directory.
37. 37. A. The `tune2fs` command is used for this purpose, and the `-c` option sets the mount count for the specified partition.
38. 38. B. The `parted` command can be used to resize partitions in such a way. The `mkfs` command is not used for this purpose, and the other two options do not exist.
39. 39. C. The VFAT filesystem is known as `vfat` to the `mount` command, and the other elements of the `mount` command are standard.
40. 40. D. The `c` option in `gdisk` is used to change the partition name. The `n` option creates a new partition, the `v` option verifies the disk, and the `b` option creates a backup of GPT data to a file.
41. 41. C. The `-b` option prints known bad blocks. The `-f` option is used to force the display of information, and the other options don't exist.
42. 42. B. The `-A` option checks all filesystems in `/etc/fstab`, while the `-M` option excludes the root filesystem. The `fsck` that will run will be dependent on the type of filesystem. For example, `e2fsck` will be executed for `ext2` partitions.

43. 43. B. The `quotaon` command signifies that quotas should be enabled for the given filesystem. This would imply that a quota file has already been created. Quotas can be edited with the `edquota` command.
44. 44. C. The `fsck` option, which is represented as a number in the `/etc/fstab` file, sets the order in which the device is checked at boot time.
45. 45. D. The `-c` option creates the files for the first time. The `-f` option is used to force checking, `-u` is used for user quotas, and `-m` is used to not attempt remounting as read-only.
46. 46. C. The `debugfs` command can be used for this purpose. When opening with `-c`, the filesystem will be opened in catastrophic mode, meaning that it will be opened read-only and will not read inodes when opening.
47. 47. D. The `-inum` option searches for files by their inode number. This can be useful when searching for the files involved in hard links.
48. 48. C. The `-R` option sets the recursive option, which means that `chgrp` will traverse the given directory and perform the group ownership change operation throughout the specified hierarchy.

### Chapter 5: Working with Shells, Scripting, and Data Management (Domain 105)

1. 1. C. The `source` command is used to execute commands from a file. A typical use case is to create functions or variables that are then available for use within the current session. The other commands listed do not exist.
2. 2. B. While it's true that every user has a `.bash_logout`, the file exists in their home directory and therefore can be edited by the user. Thus, to ensure that the required command is executed at logout, the file `/etc/bash.bash_logout` must be used.
3. 3. B. The `env -u` command will unset an environment variable for the current session. The `unset` command can also be used for this purpose.
4. 4. A. The `env` command, when used as `#!/usr/bin/env bash`, will determine the location of the Bash interpreter automatically. This makes the resulting script more portable for systems where Bash may not be located in `/bin/`. You can use this command as a way to customize shell scripts for cross-platform use. Small scripts can be created for most of the commands in the book and those scripts can help automate many system administration tasks.
5. 5. D. The `SELECT` command is used for this purpose, and the `*` selection retrieves all data. `SELECT` statements include the query part followed by the `FROM` keyword and then the data source, which in this case is a table called `users`.
6. 6. B. The `PS1` variable usually has its default set in `/etc/profile` and is used as the shell prompt. Users can customize the prompt to include hostname, working directory, and other elements.
7. 7. A. The `alias` command is used for this purpose, and its format is `name=value`, thus making option A correct. The `ln` command cannot be used for this purpose because it will not accept command-line arguments for the target in such a format as shown in the options.
8. 8. B. User-based configuration files are located in the order `.bash_profile`, `.bash_login`, and `.profile`. Only the first file found is executed and the others are ignored.

9. 9. C. The `$1` variable is automatically available within Bash scripts and represents the first command-line argument. The `$0` variable is the script itself. The other variables listed in this question do not exist by default.
10. 10. D. The `fi` construct is used to indicate the end of an `if` conditional within a Bash script. In many languages, `if` conditionals are scoped by braces such as `{ }`, but in shell scripting, `fi` is used to denote the end of the condition.
11. 11. B. The `DELETE FROM` statement deletes all of the data from the given table. Note that MySQL is typically case sensitive, thus creating the need to follow the same case for the `virtualusers` table object.
12. 12. A. The `DESC` or `DESCRIBE` command is used to provide a description of the columns and column types for a table. Of the other commands shown as options, only `SELECT` is a valid SQL command, and it is used to retrieve data and not a description of the table itself.
13. 13. B. The `seq` command is used to print a sequence of numbers in a variety of formats. The answer for this question provides a starting point (0), an increment (1), and the final number (5), thus resulting in six numbers being displayed as output.
14. 14. B. The `echo` command is used to display its argument, regardless of whether the command is used inside a shell script or from the command line itself. The `env` command is used to display environment variables and therefore does not meet the need specified in the question. The `var_dump` command is used within PHP, and `ls` is used to display contents of directories.
15. 15. A. The SUID bit enables the program to run as the user who owns the file regardless of who executes the program. Using SUID is typically not recommended for security reasons.
16. 16. D. The `exec` command executes the script given as its argument and will then exit the shell. The `source` command does not exit the shell.
17. 17. C. The double-ampersand sequence executes commands only if the previous command within the command line exited cleanly.
18. 18. C. The `read` command awaits user input and places that input into the specified variable. The `exec` command is used to execute commands, and the other options are not valid for the purpose described.
19. 19. A. Parentheses are used to denote a function, such as `myFunction()`. The parentheses are optional but are then followed by curly braces containing the commands to be executed when the function is called.
20. 20. A. The `ORDER BY` clause is used for this purpose, and the `ASC` keyword needs to be added in order to make the display in ascending order.
21. 21. C. The `||` sequence indicates an alternate command to run if the initial preceding command does not exit cleanly. The `&&` sequence executes only when the preceding command exits cleanly, so it's the opposite of what the question was asking.
22. 22. C. The `elif` keyword is used to create an alternative execution path within a shell script. The other constructs such as `else if` and `elseif` are used in other languages.

23. 23. C. The `unalias` command is used to remove a previously defined alias. The `rm` command will remove regular files but not aliases. The other commands do not exist.
24. 24. D. You minimally need to be able to read the file being sourced; therefore, `chmod 400` will correctly set the permissions. Any `chmod` that gives additional permissions is not necessary.
25. 25. C. The `for` loop construct in this case will require the variable name `LIST` to be preceded with a dollar sign (`$`), thus making option C correct. The other options will not work for the purpose described.
26. 26. A. An inner join is the default type of join performed by SQL when columns are joined in the manner specified. An outer join, whether left, right, or both, is used to return rows that are not in a particular table as well.
27. 27. C. The `-lt` operator is used to test for "less than" conditions within a script. The other operators are not valid for use in a shell script.
28. 28. B. The `-e` option checks to ensure that a file exists, and it is typically used in the context of a conditional within a shell script. The other options may work within shell scripts but are not tests for file existence.
29. 29. C. The `/etc/skel` directory contains files to be copied to the user's home directory. The other directories listed for this question do not exist by default.
30. 30. A. The `UPDATE` statement uses the `SET` keyword to indicate the column or columns to change. The `WHERE` clause is optional.
31. 31. D. The syntax begins with `INSERT INTO<table>`. This syntax is then followed optionally by the names of the columns to which values will be inserted, followed then by the `VALUES` keyword and finally the values to be inserted.
32. 32. C. The `--nrc` option causes Bash to execute without reading the `/etc/bash.bashrc` file or the local `~/.bashrc` file. The other options listed do not exist as options for Bash.
33. 33. A. Array creation in a shell script involves parentheses when used in this manner. You can also use square brackets to define individual elements, as in `ARRAY[0] = "val1"`.
34. 34. C. The `-p` option displays declare statements in a way that the commands are fully qualified and could then be used as input for another command, either through piping or redirection to a script.
35. 35. A. The `.bash_profile` file, if it exists in your home directory, will be executed on login. Note that placing the function in `/etc/profile` would technically work, but then the function would be available to all users, which is not what the question is asking.
36. 36. B. The `readonly` command displays the list of read-only variables that have been declared in the current session. The other commands listed for this question do not exist.
37. 37. A. The only SQL statement that can utilize a `GROUP BY` clause is the `SELECT` statement. The other commands listed are valid but not for use with `GROUP BY`.
38. 38. C. Square brackets are used to denote the beginning and end of the test portion of a `while` loop in a shell script. Other languages generally



use parentheses for this purpose.

39. **39.** B. The test built-in will return true and can be used to test for the value existence of a variable not being null. Note that the behavior of the test built-in differs depending on the number of arguments.
40. **40.** C. The HOME environment variable, set automatically to the user's home directory, is consulted when the command `cd ~` is entered. The other paths beginning with HOME do not exist by default, and the MAILPATH environment variable shown contains a list of locations where mail is checked when using the shell interactively.
41. **41.** B. The TMOUT variable can be set in a given user's shell, and they will be logged out after the value given (in seconds) of inactivity. The other environment variables listed here do not exist.
42. **42.** B. Just as with an if statement where the statement is ended with `fi`, so too is a case statement ended with the word *case* spelled backward. The curly brace shown as option D is used to close case statements in many languages but not for shell scripts.
43. **43.** A. The provided answer performs command substitution and places the value from the resulting command into a variable. Note the use of `+%s` formatting on the date, which then formats the output as seconds since the epoch, as specified in the question. Option C will provide the date within the DATE variable but will not format it as specified.
44. **44.** B. Wrapping a variable in curly braces, `${FILEPATH}`, will ensure that the variable is interpolated or expanded correctly, even when used in a place where it might not normally be expanded, such as within a quoted string.
45. **45.** B. In shell scripts, the commands to execute begin at the `do` keyword and end at the `done` keyword. Other languages generally use either curly braces or tabs.
46. **46.** D. The `-r` test determines whether a given file exists and can be read by the current user. The `-e` test only checks to see if the file exists, while `-s` determines if the file exists and has a size greater than zero. There is no `-a` file test.
47. **47.** A. The `-r` option to declare will create or mark the variable as read-only. The `-p` option prints output in a format that can be reused. The `-x` option declares the variable for export.
48. **48.** D. The `*` sequence is used to denote a default set of statements that will be executed if no other case matches within the set.

## Chapter 6: Understanding User Interfaces and Desktops (Domain 106)

1. **1.** A. The greeter is configured through `/etc/lightdm/lightdm.conf` using the `greeter-session` option. The other answers provided here are not valid.
2. **2.** B. The Screen section of `xorg.conf` is used to logically bind a given graphics card and monitor, each of which would be defined in its own respective section in the configuration file. The other options shown for this question do not exist.
3. **3.** A. Frequency options are one of Hz, k, kHz, M, or MHz, thereby making uHz an unavailable option.

4. 4. C. The `systemctl set-default` command is used for this purpose, and the target of `multi-user` is used to boot to the command line. You also need to remove the word `splash` from `/etc/default/grub` and run `update-grub` as well.
5. 5. A. The `DISPLAY` variable can be used to send the windows of an X session remotely to another computer when using protocols like `ssh`. There is no `XTERMINAL` or `XDISP` environment variable, and `XTERM` is typically a terminal window and not an environment variable.
6. 6. D. The `Welcome` option sets the message to be displayed to users within the display manager when they login. For users who are remote, the `RemoteWelcome` message can be used for the same purpose.
7. 7. C. The Shift key can be used to enable and disable sticky keys within GNOME and other operating systems for accessibility purposes.
8. 8. A. The `Disable` keyword is used to ensure that a given module is not loaded. Note that a `Load` statement for the same module takes precedence over the `Disable` statement, but `Disable` can be used to unload modules that are loaded by default.
9. 9. A. The Orca project provides assistive screen-reading capabilities within GNOME. Of the other options given, the `screen` command is valid but it is not used for this purpose.
10. 10. C. The `xrandr` command can be used to change resolution, and changing the resolution to something like 800×600 would make icons and other items appear larger.
11. 11. D. The `allow-guest` option changes the behavior of guest login for LightDM, and disallowing guest login would generally make the computer somewhat more secure, though if someone has physical access to the device they might be able to get access in other ways.
12. 12. C. The `XFree86 -configure` command tells the XFree86 server to query for hardware and create a configuration for the recognized hardware. Note that you may still need to edit the resulting configuration file because of unrecognized hardware or to account for specific configuration items.
13. 13. B. The `XkbModel` configuration option is used to set the type of keyboard being used, such as `pc105` for a 105-key keyboard. The `XkbLayout` option defines the layout of the keyboard, such as `US` for United States-style keyboards.
14. 14. B. The `VertRefresh` option is used for this purpose, and it accepts a range of values in the manner shown. The other options given for this question are not valid for the purpose described.
15. 15. D. The `xdpinfo` command displays various elements about the current display(s) along with information about X itself.
16. 16. C. The linear acceleration profile is enabled by setting the `AccelerationProfile` to 6 within `xorg.conf`. The 0 setting is known as classic, while -1 provides constant acceleration (no profile), and 7 is known as limited, which performs the same as linear but with a maximum amount of speed and acceleration.
17. 17. A. The `/usr/share/fonts` hierarchy is used for storage of fonts. Another path that might contain font information is `/usr/share/X11/fonts`, but that was not among the choices given for this question.

18. 18. C. Kernel versions beginning with 2.6.26 include native support for Braille displays in Linux.
19. 19. A. The `DontZoom` option prevents the specified key combinations from changing the video mode. Of the other options, the `DontZap` option changes the behavior of the `Ctrl+Alt+Backspace` key combination. The other options don't have any effect and are not valid in `xorg.conf`.
20. 20. A. The `gok` command, short for GNOME On-screen Keyboard, is the program to start the on-screen keyboard. The Caribou program will be the successor to `gok`.
21. 21. C. The `gdmsetup` program is used to configure various options for the login window and environment, including those for local and remote users. The other options shown for this question are not used for this purpose or do not exist.
22. 22. D. The `kmag` program magnifies items on a desktop and is used as an assistive technology. In general, `kmag` can be used with other window managers as well.
23. 23. C. The `greeter-show-manual-login` option, when set to `true`, will require the user to enter a username for login rather than selecting the username from a list.
24. 24. B. The Appearance section of the GNOME Control Center is used to set many aspects of how the desktop appears and behaves, including the choice of a high-contrast theme.
25. 25. B. Mouse gestures are commonly associated with assistive technologies and help to facilitate uses of programs by moving the mouse in a certain way. Mouse gestures could be used for login and to capture screenshots, but those are not adequately or generally descriptive of their use.
26. 26. D. The `Alt+Super+S` keyboard shortcut activates the screen reader in GNOME 3.9 or later. The `Super+S` shortcut enters Overview. The other shortcuts provided do not have a special meaning by default.
27. 27. D. The `startx` command kicks off the display manager after login to a local terminal. The other commands shown do not exist or will not work for the purpose described.
28. 28. B. The `BlankTime` option, which is set to 10 minutes by default, causes the monitor to go blank but not actually go into standby or other power-saving modes.
29. 29. C. The `xwininfo` command displays information about a given window within an X session. The other commands listed for this answer are not valid.
30. 30. A. The Mouse button displays keys to move the mouse. The Compose button shows a compose keyboard, and the other options are not valid.
31. 31. C. The `xhost` command is used to control access to the X server. A host is added with the `+` sign and removed by preceding the command with the `-` sign.
32. 32. B. The `ForwardX11` option must be enabled in order for X connections or windows generated from the X server to be sent over an ssh connection.

33. 33. D. The `FontPath` directive provides another location in which the server can find fonts. The other options do not exist within the context of an `xorg.conf` configuration file.
34. 34. D. With an on-screen keyboard, users can utilize a pointer such as a mouse to select keys on the keyboard.
35. 35. C. Bounce keys cause the interface not to react when keys are accidentally pressed in succession or held down.
36. 36. B. The `Alt+Ctrl+F1` key combination is used to get to a terminal prompt, and it is helpful in situations where the X server won't start properly.
37. 37. B. The `autoLogin-user` option is used to define a user who will be automatically logged in to the system. The other options given in this question do not exist.
38. 38. C. The `AccessX` utility is used on legacy or older systems to set many of the accessibility options. The functionality provided by `AccessX` can typically be found in one of the utilities provided by the native X window manager, dependent on the window manager in use.
39. 39. A. The `export` shell command sets an environment variable. In this case, the `DISPLAY` environment variable needs to be set. The `env` command shown will not set the variable.
40. 40. A. The `Menus` option displays the menu options for a given application so that those options can be manipulated with the keyboard. The `Activate` option helps to work with the desktop and other applications. The other options shown for this question are not valid.
41. 41. B. The `/etc/lightdm/lightdm.conf.d` directory contains individual `*.conf` configuration files for various settings, and it is typically parsed along with the `/etc/lightdm/lightdm.conf` file.
42. 42. C. In runlevel 3, accessed through the `telinit` command, the X server is not typically executed. Runlevel 6 will shut down the system. Runlevel 1 switches to single-user mode, while runlevel 5 is a multi-user mode in which X is usually running.
43. 43. C. The `VideoRam` option, which can be expressed in bytes, configures the amount of RAM available to the video card.
44. 44. A. The `ColorDepth` option sets the color depth for a given monitor display. A typical value might be 24 for this option.
45. 45. B. The `Identifier` option provides a unique description of each of the server layouts in an X configuration. The other options shown for this question do not exist.
46. 46. A. The `mkfontscale` command will create a `fonts.scale` file that describes outline fonts on the system, and it is used for configuration of fonts that are manually added to the system.
47. 47. A. Display Power Management Signaling (DPMS) enables additional power-saving modes, such as a full sleep mode, which enables further energy efficiency for the display.
48. 48. B. The `Emacspeak` program provides another visual assistive technology as an alternative to `Orca`. The other technologies listed here are not related to visualization or assistive technologies.

**Chapter 7: Administrative Tasks (Domain 107)**

1. 1. C. The `/etc/passwd` file contains various pieces of information about users on a system, such as username and real name, along with user id (UID) and login shell. The file is world-readable.
2. 2. B. The format for cron is [minute hour day-of-month month-of-year day-of-week] thereby making option B correct for this question.
3. 3. C. The file `/etc/localtime`, which can be an actual file or a symbolic link, is used to indicate the local time zone. The other files listed as options do not exist.
4. 4. B. The `/etc/cron.allow` file is a list of users who have permission to create and remove their own cron jobs. The `/etc/crontab` file is used to store cron jobs, and the other files do not exist.
5. 5. B. The `chage` command is used for this purpose, specifically with the `-E` option. When provided with a date, `chage` will expire the account on that date. When provided with `-1`, the expiration will be removed.
6. 6. D. Within the `/usr/share/zoneinfo` hierarchy you will find information on the various regions and time zones available. The files within this hierarchy can be symlinked to `/etc/localtime`.
7. 7. B. The `at` command is used to run a series of commands that you enter. Unlike with cron, you can schedule commands from the command line to be executed in the same order as entered, rather than having to create a specific script for the commands. The syntax shown in option B sets the time to be one hour from now.
8. 8. B. The `userdel` command is used for this purpose and the `-r` option (lowercase) deletes both the home directory and mail spool files. The `-R` (uppercase) option informs the `userdel` command to use a `chroot` directory.
9. 9. A. The `/etc/skel` directory contains files that are automatically copied to a user's home directory when that user is created. The other directories listed for this question do not exist by default.
10. 10. C. Use `anacron` when you need to schedule a job on a computer that might be off when the job is scheduled. `anacron` will take care of running the job at its next available time.
11. 11. B. The `+%s` option will format the date as seconds since January 1, 1970. This option is used frequently in scripting and elsewhere for obtaining a unique timestamp that can be parsed easily as an integer. The other options will not work.
12. 12. C. The `-list` option shows the available character sets on the system. The other options given for this question do not exist.
13. 13. C. The `LC_TIME` environment variable is used to control the display and behavior of the date and time, and it can be changed to a different locale in order to achieve the desired display and behavior of date and time formatting. The other options shown for this question do not exist.
14. 14. B. The `atq` command shows a list of jobs that have been scheduled with the `at` command. The other commands don't exist with the exception of option D, which shows the `at` command but with an invalid option, `-jobs`.

15. 15. D. Setting a user's shell to `/bin/false` will prevent them from logging in interactively to the system, such as with `ssh`. The other options shown for this question are all valid shells and would allow an interactive login.
16. 16. B. UTF-8 provides multibyte character encoding, and it is generally accepted as the standard for encoding moving forward. ISO-8859 is single-byte encoded. The other answers are not valid. UTF-8 is capable of encoding all of the characters defined by Unicode. Another popular, though legacy, encoding is ASCII.
17. 17. A. The `groupmod` command is used for this purpose, and the `-n` option is used to change the group name. The other commands listed do not exist.
18. 18. A. The `/var/spool/cron/crontabs` directory contains a file for each user who currently has one or more cron jobs or entries. Note that the other files listed here are not valid for this purpose.
19. 19. C. The `atrm` command removes jobs given their ID. The ID can be obtained with the `atq` command. The `atq` and `at -l` commands shown will list jobs but not delete them. The `rmat` command is not valid.
20. 20. D. The `tzselect` command will, by default, display a step-by-step menu to select a time zone. The eventual output will include a region/time zone line, such as `America/Chicago`, as output.
21. 21. B. The `getent` command is used to display entries based on the `/etc/nsswitch.conf` file. One use case for `getent` is when integrating with Microsoft Active Directory or another LDAP service to check if the connection can be made to the LDAP server. The `usermod` command is valid, but it is not used for this purpose, and the other commands shown for this question are not valid.
22. 22. B. The `/etc/login.defs` file contains various configuration items such as the minimum and maximum user and group IDs to be used on the system.
23. 23. C. The `/etc/crontab` file is a plaintext file that is treated as a system-wide cron file. As such, the file is generally not associated with any single user and it's not necessary to run a special command after editing this file.
24. 24. D. The `TZ` environment variable is used for this purpose and the general format is as shown, thus making option D the correct answer.
25. 25. A. The `/etc/cron.daily` directory contains files such as scripts that are executed daily. There are corresponding `cron.hourly`, `cron.weekly`, and `cron.monthly` directories that run on their respective schedules, as indicated by the name of the directory.
26. 26. C. Setting `LANG=C` is an alias for POSIX compatibility and will cause programs to bypass locale translations. The other options shown for `LANG` are not valid.
27. 27. B. The `-m` option causes the user's home directory to be created. By default, if this option isn't specified and `CREATE_HOME` has not been set, the home directory won't be created. The `-h` option displays help text and the other options shown are not valid.
28. 28. A. The `usermod -l` command locks an account by placing an `!` at the beginning of the encrypted password. If the user has another means to log in, such as with an `ssh` key, using `usermod -l` will not prevent their login. This option is frequently used when creating special purpose accounts.

29. 29. C. The `LC_ALL` variable can be used to set environment variables such as the locale, and the variable will then override others. This can be used when there is a need for a temporary change. The other variables listed here are not used for this purpose and are not created by default.
30. 30. A. The format when adding a username places the username between the schedule and the command to run, thereby making option A correct. The other options shown for this question are invalid. In the case of option B, there is no schedule. In the case of options C and D, the schedule is incorrectly formatted.
31. 31. C. The `passwd` command is used for this purpose. The `-a` option displays all users but requires the use of `-S` to indicate status. The `-S` option alone will not produce a report for all users, and the `-all` option is an alias for `-a`.
32. 32. D. The `chage` command is used for this purpose. The `-d` option sets the days since the last password change, and it is measured in days since January 1, 1970. The `-W` option is the number of days of warning for changing a password, and the `-l` option displays a list of the various settings related to the account.
33. 33. B. The file `/etc/anacrontab` contains information about the jobs, such as the job name and delay, among other information. The other files listed do not contain `anacron`-related information about jobs.
34. 34. A. The `ln` command is used for this purpose, and the `-s` option creates a symbolic link while `-f` forces or overwrites the destination. The other options or order of commands are not valid.
35. 35. B. The `/etc/cron.deny` file contains a list of users who cannot create cron scheduled tasks. The file `/etc/cron.allow` is used to provide a list of users who are allowed to create cron jobs. The other two files do not exist by default.
36. 36. B. The `/etc/shadow` file contains usernames, UIDs, and encrypted passwords and is not readable by any non-root user on the system due to the sensitive nature of the encrypted passwords. The `/etc/passwd` file contains usernames and UIDs but not encrypted passwords. The other two files listed for this question do not exist.
37. 37. D. There is no direct relationship between the UIDs and GIDs on a system. UIDs represent users, whereas GIDs represent group IDs. On some systems, the UID and GID number will match for regular users, but this is not a requirement and is more of a coincidence.
38. 38. B. The `dpkg-reconfigure` command is used to cause the configuration questions to be asked again. The `tzdata` package is the name of the package on Debian-based systems. The two `apt` commands shown are not valid.
39. 39. A. The `usermod` command is used for this purpose. The `-d` option changes the home directory, whereas `-m` moves the contents. The other commands shown for this question are not valid.
40. 40. D. The `-G` option is a list of supplemental groups to which the user will be added. A lowercase `-g` option provides the primary GID. The `-l` option causes the user not to be added to the `lastlog` and `faillog` databases. There is no `-x` option.
41. 41. A. The `crontab` command can be used for this purpose and the `-l` option is used to list the `crontab` entries. The `-u` option is needed to specify a user other than the current user.

42. **42.** A. The `-r` option creates a system user, which will typically entail no expiration, no home directory, and a UID below 1000. The `-s` option defines the shell and is not typically used for this purpose. The `-a` and `-S` options do not exist.
43. **43.** B. The `/etc/gshadow` file contains secure information such as an encrypted password for groups, where applicable. The `/etc/group` file contains general information on groups. The other two files listed as options do not exist.
44. **44.** C. The `LC_MONETARY` variable is used by certain programs to determine the localization for currency.
45. **45.** B. `groupdel` cannot delete groups unless there are no users who have the given group as their primary GID. There is no `-f` or `-r` option. The `groupadd` command can be used to add a new group to the system.
46. **46.** A. The `id` command shows the username, UID, primary group and GID, along with supplemental groups. The `passwd` and `chage` commands are not used for this purpose. There is no `getid` command.
47. **47.** D. The `-c` option changes the comment field in `/etc/passwd`. The comment field is typically associated with the real name of the account. The `-R` option indicates a chroot directory, while `-d` indicates a change of home directory. There is no `-n` option.
48. **48.** D. The `find` command should be used for this purpose. The correct syntax is shown in option D. The `grep` command will merely look in the specified files for the number 1501, and the `-u` option to `grep` includes byte offsets, which is not applicable for this question.

### Chapter 8: Essential System Services (Domain 108)

1. **1.** C. The `journalctl` command is used to work with the `systemd` journal. On `systemd`-based systems, `journalctl` is a central command for debugging and troubleshooting.
2. **2.** C. The kern facility receives messages from the kernel for logging purposes. Of the other options, `syslog` is used for logging messages about `syslog` itself. The other two options shown are not valid `syslog` facilities.
3. **3.** D. `ntp.org` provides a free service for time synchronization. When you use `pool.ntp.org` as the target, you will typically receive an NTP server that is geographically close to your location, or at least as close as possible. Setting your address to `127.0.0.1` or `192.168.1.100` will use a local server, but only if that server has an NTP service.
4. **4.** A. The service used for logging on a computer managed by `systemd` is called `systemd-journald`. You use `journalctl` to view logged entries rather than the standard Linux toolset.
5. **5.** B. The `newaliases` command re-creates the aliases database on servers running Postfix, sendmail, and qmail. There is no need to restart the mail server after running `newaliases`. The `alias` command shown in option C will create an alias for the command shell but is not related to Postfix.
6. **6.** D. Configuration files for CUPS are found in `/etc/cups`. However, it is also common to manage CUPS through its web interface. The other directories listed are not valid.
7. **7.** A. The `Allow` directive is used for this purpose and the addresses `192.168.1.1` through `192.168.1.127` signify a `/25` in CIDR notation, thereby making answer A correct. Note that option B, with a



/24 netmask would allow the addresses too but would also allow 192.168.1.128 through 192.168.1.255, which is larger than should be allowed.

8. 8. B. The `ntpdate` command provides a command-line interface that immediately changes or sets the time according to the NTP server given as its argument. The `ntpd` answer provided in option A will run the NTP daemon and would not be appropriate for a script. The other two commands are not valid.
9. 9. B. Typically, the `Connection refused` message from an NTP-related command means that the daemon is not running. There is no indication that the `ntpq` command is querying a different server; therefore, whether the network is up or down is irrelevant. The permission-based options for this answer are not valid based on the error message indicated.
10. 10. D. The `hwclock` command is used both to query and set the hardware clock, such as the one maintained by the system firmware or BIOS. The `ntpdate` command is used to set the local system time, but it is not related to the hardware clock. The other commands are not valid.
11. 11. B. Qmail directories are contained within `/var/qmail` by default. The queue directory is `/var/qmail/queue`. The other directories are not valid on a default configuration of qmail.
12. 12. D. The info severity level provides information messages for a given facility. Of the options given, `emerg` is used for emergency messages and not normally used by applications, whereas `debug` is the highest or most verbose level of logging available through `syslog`. Configuration for `syslog` is typically found in `syslog.conf` or `syslogd.conf` within the `/etc/` hierarchy.
13. 13. B. The `driftfile` configuration option sets the location of the driftfile for `ntpd`. The drift file helps to maintain time accuracy. The location shown is the default for Red Hat Enterprise Linux.
14. 14. A. The `mail` option is used to send the log to the specified e-mail address on completion of the `logrotate` process. The other options shown do not exist as options in `/etc/logrotate.conf`.
15. 15. C. The `journalctl` command is used for this purpose and the `--disk-usage` option displays the disk space used by journal log files, which are typically stored in `/var/log/journal`. Journal-related configuration is found in `/etc/systemd/journald.conf`.
16. 16. D. The `mailq` command is used on Postfix servers in order to view a summary of the current mail queue. Details of the queue include the ID of the mail being sent along with one or more of the e-mail addresses involved in the transaction. The `mailq` command may also work with newer versions of `sendmail`.
17. 17. C. The `ntpq` command provides an interactive, menu-like interface into the NTP server. You can use `ntpq` to check statistics on peers, for example. The `ntpdate` command shown as option B is used as a command-line means to set the time. The `ntpd` command shown as option A would execute the NTP daemon itself.
18. 18. D. The `format` is user: destination for the aliases file, thereby making option D correct. The other options are not valid syntax for the aliases file.
19. 19. B. The `-f` option indicates the file to which messages will be logged. The `-d` option is used for debugging, while `-v` prints the version of `klogd`. There is no `-l` option for `klogd`.

20. 20. C. Individual configuration files for various log file rotation policies are found in `/etc/logrotate.d`. This directory is included from the primary configuration file `/etc/logrotate.conf`.
21. 21. A. The `lpr` command places a file (or standard input) into the print queue for `lpd` to work with. The `lpq` command prints the current queue. There is no `lpx` command.
22. 22. C. The `-bp` option to the `sendmail` command prints information about the current queue. There are no `-queue` or `-f` options that are relevant for this question. The `-bi` option is used to work with the aliases database.
23. 23. A. The `-w` option sets the hardware clock to the current system time. The `-s` option does the opposite, setting the system time to the hardware clock. There is no `-a` or `-m` function for `hwclock`.
24. 24. D. TCP port 631 is used as the administrative interface into CUPS. Visiting an active CUPS server on that port will show the administration website for working with print queues and other configuration items related to CUPS.
25. 25. A. The `-q` option causes `sendmail` to attempt to deliver messages from the queue. Add the `-v` option to display verbose output.
26. 26. B. The requirements of multiple e-mail addresses prevent the use of `.forward`; therefore, it will need to be accomplished in `/etc/aliases`. The format for multiple e-mail addresses is to separate them with a comma, thereby making option B correct.
27. 27. A. The `-systohc` will set the hardware clock according to the current system time. The use of `-utc` is required in order to ensure that the time is set to UTC. If `-utc` is omitted, the time will default to whatever was used the last time the command was run, which could be UTC but might also be `localtime` instead. Therefore, the best option is A.
28. 28. D. The `postsuper -d` command deletes messages from the queue. The `ALL` keyword causes all messages to be deleted from the queue. You should take care when performing this action because it is irreversible. There is no `-remove` option to `postqueue` and the `-f` option for `postfix` is not relevant. The `rm -rf` command shown is not specific enough, and it is generally not recommended to remove files from a mail queue manually.
29. 29. A. The URL shown will display the jobs area of the local CUPS server with a query string name of `which_jobs` and a value of `completed`. The other URLs shown are not valid.
30. 30. C. Just as the `tail -f` command will continuously update the display as new content is added, so too does the `-f` option display new entries for `journalctl`. The `-t` option shows messages for the given syslog identifier. There is no `-tail` or `-l` option.
31. 31. B. The `$UDPServerRun` option is used for the purpose described. The port on which the server should listen is then provided as the value for this option. The other options shown are not valid configuration items for `rsyslogd`.
32. 32. A. The `postqueue -f` command is used to flush the queue. The command will process all of the e-mails that are awaiting delivery. The other commands are not valid for this purpose.
33. 33. C. The `-g` option specifies the maximum offset or skew that can be adjusted for when synchronizing time. When set to 0, there is no offset check.

34. 34. A. The `SystemMaxFileSize` option controls the size of the journal log file to ensure that a log does not cause problems related to disk usage. The `SystemMaxUse` option controls overall size of journal files and the default for `SystemMaxFileSize` is 1/8 of the `SystemMaxUse` setting to allow for rotation of files.
35. 35. C. The `lpstat` command is used for this purpose. The `lpstat` command displays information about printers, print jobs, and related information. The `-w` option specifies which jobs to display, completed or not completed. The `lpq` command shown as an option is used to view the queue, and the other options are not valid.
36. 36. D. The `postrotate` option within a configuration for log rotation can be used for this purpose. After `postrotate`, a line typically follows with the script or commands to execute. The other options shown for this question are not valid.
37. 37. B. SMTP operates on TCP port 25, and if other servers are contacting your SMTP server, then you'll need to listen on this port and allow traffic to it as well. Port 23 is used for Telnet, port 110 is POP3, and port 143 is IMAP, none of which are necessary for SMTP traffic.
38. 38. A. The `makemap` command is used to create the hashed database in the correct format for sendmail to use. The other commands are not valid for sendmail.
39. 39. A. The configuration file for `syslog-ng` is stored in `/etc/syslog-ng` and is named `syslog-ng.conf`. There is typically not an `/etc/syslog` directory, even on systems without `syslog-ng`.
40. 40. C. The application could theoretically use any of the logging facilities, depending on the type of application being developed. However, the requirement to log to a custom log file means that the logs will have a different name and possibly location than the standard logs. Therefore, logging to any of the standard or system-level facilities is not appropriate for this scenario, thereby making one of the local (local0 through local7) facilities appropriate.
41. 41. B. The `usermod` command with the `-aG` option is used to append a group onto the user's list of groups. In this case, the user needs to be a member of the `lpadmin` group.
42. 42. D. The `nocompress` option is used to prevent the log file from being compressed or zipped as part of the rotation process. This might be needed on systems where compression negatively affects performance or where additional processing is necessary.
43. 43. D. The `-s` option sets the date and time as specified within the command. If there is another means to set the date automatically, it may override the change. For example, if `ntpd` is running, that process may alter the date even after it has been set with `date -s`.
44. 44. B. The `mailstats` command is used for the purpose described. Of the other options, the `mailq` command will display the current mail queue but not statistics on mail that has been processed. The other two options are not valid commands.
45. 45. D. The `logger` command is used to send messages to syslog and can be executed in a shell script context in order to take advantage of the robustness of syslog without having to write separate log management into the script.
46. 46. A. The `systemctl` command is used for controlling services. In this case, `restart` should be sent to the CUPS service as denoted by the name `cups.service`.

47. 47. C. The use of `-` indicates that syslog does not need to sync to disk for every log entry. This can greatly improve performance for busy systems but may cause log entries to be lost if the sync process has not been run prior to a system crash or other issue.

48. 48. A. The `Port` configuration option is used for this purpose and is used as an alternative to the `Listen` directive. With the `Listen` directive you will specify `address:port`. However, option C, while valid syntactically, will only listen on the localhost IP address of `127.0.0.1` and not all interfaces.

### Chapter 9: Networking Fundamentals (Domain 109)

1. 1. A. The `netstat` command can be used for this purpose, and the `-r` option displays the current routes. The addition of `-n` prevents DNS lookups, which can help with performance.

2. 2. A. The `ifconfig` command can be used for this purpose, and it requires the addition of the `-a` option because the adapter is currently down. The `ifup` command can be used to bring up an interface, but it does not display information by default. The `netstat` command displays information about the network but not with the `-n` option.

3. 3. D. Private IP addresses are found within the `10.0.0.0/8`, `172.16.0.0/12`, and `192.168.0.0/16` ranges, thus making an address in the `143` range a public IP address.

4. 4. C. The `route` command is used for this purpose, and adding a route is done with the `add` option. The default gateway is added using the `default gw` keywords followed by the IP address of the gateway and the adapter.

5. 5. A. The `host` command enables changing of the query type with the `-t` option. Using `ns` as the type will query for the nameservers for a given domain. There is no `all` type, and the other options are also invalid.

6. 6. B. Traditionally, UDP/53 is used for DNS queries, but with a primary and secondary server it is assumed that zone transfers may occur. DNS zone transfers typically take place over TCP/53.

7. 7. B. The `-I` option enables the choice of interface. A lowercase `-i` option sets the interval, while `-a` indicates an audible ping. Finally, `-t` enables a TTL-based ping only.

8. 8. D. A `/27` with a netmask of `255.255.255.224` splits a subnet into four segments of 32 addresses, thus enabling 30 usable addresses.

9. 9. A. The `host` or `dig` commands can be used for this purpose by setting the type to `mx`. The `mx` type will query for the mail exchanger for the given domain. There is no `smtp` type.

10. 10. B. The localhost address for IPv6 can be written as `::1`. Addresses shown like `127` represent the IPv4 localhost range, but they are not written properly for IPv4 or IPv6.

11. 11. A. The `-T` option causes `traceroute` to use TCP packets. This option, which requires root privileges, can be helpful in situations where a firewall may be blocking `traceroute` traffic. The `-i` option chooses the interface, while the `-s` option chooses the source address. A lowercase `-t` option sets the Type of Service (ToS) flag.

12. 12. C. The `ifup` command is used to bring up network interfaces, and the `-a` option brings up those interfaces marked as `auto`. The `ifconfig -a` command displays information on all interfaces, and

there is no `ifstat` command. The `ifdown` command can be used to bring interfaces down or offline.

13. 13. D. The `hostname` command is used to return the hostname and domain. When given the `-d` option, just the domain name is returned to STDOUT, thereby making it appropriate for use in a script.
14. 14. A. The `ip` command with the `monitor` option/subcommand will display netlink messages as they arrive. There is no `netlink` subcommand for `ip` and the `route` command will not work for this purpose.
15. 15. D. The `-6` option, as in `traceroute -6`, executes an IPv6 `traceroute`. The other options shown for this question are not valid. It would be rare for the `traceroute6` command not to be available and still have the `traceroute -6` command available.
16. 16. A. The syntax is `database: databasename` with additional databasenames separated by spaces, as shown in the correct option for this question.
17. 17. A. The `@` symbol is used to indicate a server to which the query will be sent directly. This can be quite useful for troubleshooting resolution problems by sending the query directly to an authoritative name server for the domain. Of the other options, `-t` sets the type and the other choices are not valid.
18. 18. D. SNMP traffic takes place on ports 161 and 162. Though the traffic is usually on UDP, the TCP ports are also reserved for SNMP. Ports 110 and 143 are used for POP3 and IMAP, respectively, while 23 and 25 are for Telnet and SMTP. Finally, ports 80 and 443 are for HTTP and HTTPS.
19. 19. A. The `getent` command is used for working with NSS databases, and `getent hosts` will display the available hosts using the databases configured in `/etc/nsswitch.conf`.
20. 20. D. A `/25` in CIDR notation represents half of a `/24` in address space, therefore making `255.255.255.128` the masked bits. The `255.255.255.0` answer is `/24` while `255.255.255.192` is `/26`. Finally, `255.255.0.0` is `/16`.
21. 21. C. The configuration option is called `nameserver`, and the value for the option is the IP address of the desired nameserver. There are several options that affect how name resolution is performed, such as the number of attempts and timeout. See `resolv.conf(5)` for more information.
22. 22. D. The `/etc/services` file contains standard port-to-protocol information based on the well-known and assigned ports from IANA. If you'd like to provide a custom name for the service, you can do so by editing this file. There is no `/etc/ports` or `/etc/p2p` file by default, and `/etc/ppp` is usually a directory for the point-to-point protocol daemon and related services.
23. 23. A. The `route` command can be used for this purpose, and the syntax includes the network range, denoted with the `-net` option, followed by the word `netmask` and the masked bits, followed by the word `gw` and the IP address of the gateway. The other options shown are invalid for a variety of reasons, including missing keywords and options and order.
24. 24. A. The `netstat` command is used for this purpose and the `-a` option displays all sockets, listening and non-listening. Note that it's frequently helpful to add the `-n` option, or combine them as in `netstat -an`, in order to prevent name lookup. Doing so can significantly improve performance of the command.

25. 25. A. The correct format is IP address followed by canonical hostname followed by any aliases for the host. You can use entries in `/etc/hosts` to override DNS lookups, which can be useful in preventing those names from resolving or to provide a different resolution.
26. 26. C. The `ifconfig` command for configuring interfaces begins with the device followed by the IP address, which is then followed by the `netmask` keyword and the netmask to add. Because this is a `/24`, the netmask is `255.255.255.0`.
27. 27. C. IPv4 addresses are 32 bits in length and IPv6 addresses are 128 bits. Both IPv4 and IPv6 can be used on internal and external networks alike, and there is indeed subnetting necessary with IPv6.
28. 28. D. ICMP is a layer 3 protocol, meaning that it does not use ports for communication. TCP/43 is used for whois, while port 111 is used for sunrpc. UDP/69 is used for TFTP.
29. 29. B. The `ip route` command can be used for this purpose, and its syntax uses a `change` command and the `via` keyword. The same operation could be completed with the `route` command, but that would require first deleting the existing gateway and then re-adding a new default gateway.
30. 30. C. Secure Shell, or `ssh`, operates on TCP port 22 by default. TCP/23 is used for Telnet; TCP/25 is SMTP, and TCP/2200 is not associated with a well-known service.
31. 31. B. The `nc` command is used to start `netcat`, and the `-l` option causes it to listen. The `-p` option is used to specify the port on which `netcat` will listen. The `-s` option specifies the local source address, and it is not used for this scenario.
32. 32. A. The `soa` type is used to query for Start of Authority records for a domain. Note that in many cases, `dig` will attempt to look up the domain within a given command and may not appear to have had an error. For example, when running option D (`dig -t auth example.com`), you will receive information about `example.com` and there will be a line in the output that `dig` has ignored the invalid type of `auth`.
33. 33. A. The `search` option is used for this purpose, and it can be provided with multiple domain names, each separated by a space or tab. The `domain` option is valid within `/etc/resolv.conf`, but it does not allow for multiple domain names.
34. 34. C. The `ping6` command is used to ping IPv6 addresses. Unique local addresses are the IPv6 equivalent of RFC 1918 private addresses in IPv4. In IPv6, `fc00::/7` is the unique local address space. Note that there is no `-6` option to the normal `ping` command.
35. 35. A. The `route` command can be used for this purpose and in the scenario described, a `reject` destination is used for the route. The other options shown are invalid because they use invalid options to the `route` command.
36. 36. B. The `tracepath` command provides the maximum transmission unit (MTU) of the hops, where possible. Both `tracert` and `tracepath` can be used internally or externally, and both provide IPv6 capabilities. Certain options with the `tracert` command can require root privileges, but not enough information was given in the question for that to have been the correct option. The `tracepath6` command provides native IPv6 capabilities.
37. 37. D. The `-c` option provides the count of the number of pings to send. The `-n` option specifies numeric output only, while `-p` specifies

the pattern to use for the packet content. Finally, the `-t` option sets the TTL.

38. 38. B. NXDOMAIN is the status for a non-existent domain or host, basically meaning that the host for which the query was sent does not exist. A normal status when there has not been an error is "NOERROR".

39. 39. A. In order to facilitate the scenario described, the syntax for `ifconfig` uses the device followed by the protocol, `inet6` in this case. Next, the keyword `add` is used to indicate that an additional IP address is being added. Finally, it is followed by the address itself.

40. 40. C. LDAP over SSL, or LDAPS, operates on port 636. Port 53 is used for DNS, port 389 is used for normal, non-SSL LDAP, and port 443 is used for HTTP over SSL.

41. 41. D. The best option for this question is to add an entry for the host in `/etc/hosts`. Doing so will always cause DNS queries to resolve to `127.0.0.1`. The other options are not as robust because they rely on `www.example.com` (<http://www.example.com>) always having the same IP address, or the solutions require additional maintenance to constantly add new IP addresses if `www.example.com` (<http://www.example.com>)'s IP address changes.

42. 42. A. The `ip route flush cache` command should be executed after changing the routes. The other commands shown for this question are not valid.

43. 43. A. SPF records are stored in the `txt` record type in DNS, thereby making `-t txt` the correct option for this question. Of the other answers, only `-t mx` is valid and returns the mail exchangers for the given domain.

44. 44. B. TCP is a connection-oriented protocol that uses a three-way handshake to establish a connection. ICMP does not use ports for communication, while UDP is connectionless. IP is the core Internet Protocol, and it does not use a handshake.

45. 45. D. There are 1,048,576 IP addresses in the `172.16.0.0` private range. There are 16,777,216 in the `10.0.0.0` range and 65,536 in the `192.168.0.0` range.

46. 46. C. The only viable possibility of those listed is that ICMP traffic is blocked. TCP traffic is obviously passing because of the ability to get there using HTTP, and DNS must also be working.

47. 47. C. The `G` signifies a gateway within the route table.

48. 48. A. The `axfr` type is a zone transfer, and the `@` symbol signifies the server to which the query will be sent. There is no `xfr` type, and option B is just a normal query for the domain sent to the specified server.

## Chapter 10: Security (Domain 110)

1. 1. A. If `/etc/nologin` exists, users will be prevented from logging into the system. The root user can still log in, assuming that root logins are enabled within the `ssh` configuration.

2. 2. B. The `find` command is used for this purpose, and the permission can be described as `4000` to indicate the presence of the `setuid` bit. The `-type` option can be used for changing the type of object to be returned, but it is not relevant for the scenario described.

3. 3. B. The `lsof` command can be used for this purpose, and with the `-i` option it will display the network ports along with their process. The `netstat` command will display network ports but not the process with the `-a` option. The `ps` command is used for processes but not network ports. Finally, there is no `netlist` command.
4. 4. A. The `fuser` command can be used to determine which process is using a given file. The `ls` command will show files, and `find` can be used to find files but not specifically for this purpose. The `ps` command does show processes but it is not necessarily tied to a particular file.
5. 5. D. The `chage` command is used for working with account aging information such as expiration date, password change, days between password changes, and so on. The `-l` option lists information for the given account. The `usermod` command is used to make changes to an account, and the other two commands are not valid.
6. 6. A. The `nmap` command is used to scan for open ports. The `nmap` command will scan for open TCP ports to the address or addresses specified. The other commands shown do not scan for open ports to external (off-host) IP addresses.
7. 7. B. The `ssh-keygen` command is used to create a key pair for use with `ssh` instead of a password. Of the other options, the `ssh` command does exist but the `-k` option is used to disable GSSAPI credential forwarding and not for the purpose described.
8. 8. B. The format is username (or other specifier) followed by `hard` or `soft`, depending on the limit type, then the keyword followed by the value for that given keyword.
9. 9. A. The file `authorized_keys`, stored in the `.ssh` directory in your home directory, contains public keys that are authorized to log in to the server using their corresponding private key.
10. 10. C. The `-p` option shows the process ID to which a given port is connected, and it is useful for displaying information about which process is listening on a given port. The `-a` option shows listening and non-listening sockets, while `-n` disables name lookups. The `-l` option shows listening sockets only.
11. 11. D. Loading of alternate files is accomplished using the `-f` option. Doing so facilitates exactly the scenario described, being able to examine logins from old log files. The `-a` option controls the location of the display for the host, while `-t` controls the display of the logins as of the specified date and time. There is no `-e` option.
12. 12. D. The `w` command shows currently logged-in users along with information such as uptime and load average. The `fuser` command is used to show open files, and the `-u` option to `ls` controls the display for file listings. There is no `listuser` command.
13. 13. A. The `-u` option is correct for this purpose. An uppercase `-U` option sets the user context for listing privileges. The `-s` option sets the shell, and the `-H` option sets the home directory.
14. 14. B. The `NOPASSWD` option causes `sudo` to not prompt for a password for a given `sudo` command. This is useful for scripted scenarios where a password prompt would cause problems.
15. 15. C. The `ulimit` command shows such limits, and the `-a` option shows all limits for the currently logged-in user. The other commands are not valid.



16. 16. C. The syntax to block access to every service uses the `ALL` keyword followed by the address or network to which the policy will apply.
17. 17. A. The correct format is `YYYY-MM-DD` for the `usermod` command.
18. 18. C. The `disable` option is used for the purpose described and can be set to `yes` or `no`. The other options are not valid for this scenario. Configuration for `xinetd` is controlled by `/etc/xinetd.conf`.
19. 19. A. The file is named `id_rsa` by default, and the public key is named `id_rsa.pub`. For DSA keys, the names are `id_dsa` and `id_dsa.pub`.
20. 20. C. The `-c` option executes a single command but does so without an interactive session. The `-s` option specifies the shell to be used. There is no `-u` or `-e` option for the `su` command.
21. 21. C. The `send-key` option followed by the name of the key sends the key to the key server specified by the `keyserver` option. This is a typical scenario for sending a locally generated public key to a public server for others to use. The other options shown as potential answers do not exist.
22. 22. B. There is no special option necessary in order to execute a single command on a remote host with `ssh`. The `-s` option requests a subsystem and is not related to this scenario. The `-e` option specifies an escape character.
23. 23. D. The `ssh-add` command is used to list currently loaded keys, and it is used in conjunction with `ssh-agent`. There is no `-l` option to `ssh-agent` and the `-l` option to `ssh` specifies the login name to use. There is no `ssh-list-keys` command.
24. 24. C. While any text editor can be used, it is highly recommended to use the `visudo` command to edit `/etc/sudoers`. Using `visudo` enables syntax checking, which will help to prevent issues with an invalid configuration causing problems for those who rely on `sudo`.
25. 25. A. The `systemctl` command will be used for this purpose, and the subcommand is `disable`. There is a `stop` subcommand, but it will only stop the given service rather than prevent it from starting on boot. The other options are invalid for various reasons including that they use `systemd` as the command name rather than `systemctl`.
26. 26. B. The `chage` command can be used for this purpose, and the `-E` option accepts days since 1/1/1970. There is no `-e` option to `passwd`, and `-l` for `usermod` will not perform the action described. There is no `chuser` command.
27. 27. A. Setting `-P0` will cause no ping requests to precede the scan, and it is useful for the scenario described. There is a `-s` option, but it is not used for this purpose. The other options are not valid.
28. 28. C. The `maxlogins` parameter is used to control the number of simultaneous logins for a given account.
29. 29. B. The file `ssh_known_hosts`, typically kept in `/etc/`, is used for the purpose described. Note that on some systems this file and other `ssh`-related configurations may be found in `/etc/ssh/`. The answers that indicate `~` or within `/root` are incorrect because the question specifies a server-wide list.
30. 30. C. The date of the last password change, as measured in days since January 1, 1970, is contained in the third field of a shadow entry. The expiration date would be the eighth field, as separated by colons.

31. 31. A. The format for local forwarding uses the `-L` option followed by the local port and then the remote host:port combination. This is typically followed by the `user@host` credential and destination information for the ssh connection itself.
32. 32. C. The option is called `X11Forwarding`, and it must be set to `yes` in order for the destination server to forward X-based windows to the local client computer. The other options shown are not valid.
33. 33. A. The `-gen-key` subcommand is used for the purpose described. The other options shown do not exist.
34. 34. D. The `%` is used to denote a group within `/etc/sudoers`, and it provides an excellent way to facilitate an administrative privileged group.
35. 35. A. The `-p` option sets the port for login, and it is useful for scenarios where you cannot use the host:port syntax. There is no `-P` or `@` option with ssh, and the `-l` option specifies the login name.
36. 36. A. The `-s` option sets the type of scan, and when followed by an uppercase `S`, it sets the option to `SYN`. The `T` option is a `Connect()` scan. There is no `Y` option or `-type` option for `nmap`.
37. 37. C. The `wtmp` file, stored in `/var/log` is used to store recent login information and must be read with the last command due to its format. The other logs listed for this question are not default logs found on a Linux system.
38. 38. A. The `-i` option for ssh is followed by the private key to use for authentication. Doing so implies that the public key is in the `authorized_keys` file on the remote host. The `-k` option disables sending of GSSAPI credentials, while `-f` is used to request backgrounding of ssh. There is no `-key` option.
39. 39. A. The `-n` option facilitates the scenario described, and it will exit non-zero rather than prompting. The `-i` option sets the login name, and it is not valid for this scenario. The `-q` and the `-noprompt` options do not exist.
40. 40. C. The `ssh-keygen` command is used for this purpose, and the `-t` option specifies the type of key to generate. There are no key-related generation options for the `ssh` command. Overall host keys are stored in `/etc/ssh/ssh_host_rsa_key` and `/etc/ssh/ssh_host_rsa_key.pub` for RSA keys, and `/etc/ssh/ssh_host_dsa_key` and `/etc/ssh/ssh_host_dsa_key.pub` for DSA keys.
41. 41. B. Lines can be commented out of `/etc/inetd.conf` with a pound sign or hash mark (`#`). After making changes to `/etc/inetd.conf`, you should restart the service. Many systems also utilize `/etc/inetd.d/` to store configuration files related to specific services.
42. 42. A. The `-L` option to `usermod` can be used to lock an account. The lowercase version, `-l`, is used to change a username. The other commands do not exist.
43. 43. B. The file `pubring.gpg`, found in `~/.gnupg`, contains the public keyring.
44. 44. C. The file `.gpg-v21-migrated`, when present, indicates that `gpg` version 2.1 or later is in use and the files have been migrated for that version or a later version.

45. ~~45~~. D. The `find` command is used for this purpose, and the `-perm` option is needed, specifically as the `2000` permission to indicate `setgid`. Note the use of `/` to indicate that the entire server will be searched. The `grep` command shown cannot be used for this purpose because it looks for the presence of the string `setgid` within files located in the current directory only.
46. ~~46~~. C. The `update-rc.d` command creates symbolic links from a service file in `/etc/init.d/` to the appropriate locations in `/etc/rc.d/*` for each runlevel. The other commands shown are not valid.
47. ~~47~~. A. Single-user mode is typically runlevel 1. In runlevel 1, no network services are started. Runlevel 2 has networking but typically not services. Runlevel 5 is full multiuser with networking, and runlevel 6 is reboot.
48. ~~48~~. C. The single dash `-` is the typical option passed to `su` for login. There is no `-u` or `-U` option, and the `-login` option does not exist. There is a `-login` option (with two dashes), but that is not what's shown.

### Chapter 11: Capacity Planning (Topic 200)

1. 1. D. The `-p` option to `iostat` displays information on devices and partitions. The `-c` option shows CPU utilization, and `-d` shows device utilization. There is no `-a` option.
2. 2. B. Filters are used within `iptraf` to define traffic that should be included or excluded when monitoring. For this scenario, you could define the source IP address as your own and the destination as that of the interface being monitored and then look specifically for destination port 22 for ssh.
3. 3. D. The `vmstat` command is used to display extended information about performance including blocks in and out. The `iptraf` command is used to provide network-level monitoring, and the other two commands listed are not valid.
4. 4. C. The `iostat` command is used to monitor disk usage, such as reads and writes on a per-process basis in real time. The `top` command does not provide disk usages, and `iostat` does not provide information in a per-process manner. Finally, `free` provides aggregate information on memory.
5. 5. D. Nagios provides advanced monitoring capabilities appropriate for the scenario described. Nagios works using various plugins that monitor numerous aspects of devices and systems. `ntop` and `mrtg` both provide graphical statistics but do not have the alerting capabilities specified.
6. 6. B. The `w` command shows a variety of useful information including load average, logged-in users, and other uptime information. The `uptime` command does not show who is currently logged in. There is no `swap` or `sysinfo` command.
7. 7. B. The `free` command shows current memory usage for both RAM and swap space, including total available, current amount used, and current amount free. The other commands shown as options do not exist.
8. 8. B. Pressing Shift+F within `top` enables you to choose which columns display as well as the sort order for these columns. In the scenario described, you can view the processes using the highest amount of memory.

9. **9.** A. The `df` command displays information on disk usage, and it can help with planning disk utilization over time. For example, if you note that disk utilization is increasing significantly, you can prepare to bring more disk online or even to change the log rotation schedule such that logs are rotated faster, thereby freeing up space.
10. **10.** C. `Cacti` is a graphing tool that uses both scripts for gathering performance data as well as SNMP. The graphs can help you visualize the performance of networks and systems alike. The `ps tree` command is used to show a tree-like structure of processes.
11. **11.** A. The `ps` command provides information on processor and memory usage for individual processes. You can use this information to predict capacity.
12. **12.** A. The `-p` option enables monitoring of one or more process IDs. If you're monitoring more than one process ID, separate each with a comma. The `-s` option sets the sort order. The `-a` and the `-e` options do not exist.
13. **13.** C. The `-a` option displays statistics for each socket, both listening and non-listening. Included in this information are the send and receive queues. This information can be used to gauge performance and potential bottlenecks.
14. **14.** B. The `iptraf` tool is used for monitoring network traffic in real time to provide statistics on usage and throughput. The tool is graphical in nature, but it is appropriate for use over an ssh connection without an X server installed. The other commands listed as options are not valid Linux commands.
15. **15.** C. The `ps tree` command displays current processes in a tree-like structure, with parent processes connected to child processes. The `ps tree` command makes it easy to see processes in a grouped format to check for potential high resource usage.
16. **16.** A. The `sar` command can be used for this purpose, and when provided with numbers in the format displayed, it will update every X seconds for Y executions, as in the answer with `sar -u 2 10`, which will update every two seconds for 10 executions.
17. **17.** A. The `htop` command enables advanced scenarios for working with processes through a graphical interface created with ncurses. This means that the interface is appropriate for use through ssh, for example.
18. **18.** C. The `wa` statistic shows time spent waiting for I/O, and it can be used to measure or find a bottleneck related to disk. The `us` statistic is time spent on user space processes, while `sy` is time spent on kernel processes. There is no statistic called `io` within `vmstat`.
19. **19.** C. The `-p` option to `ps tree` shows process IDs along with the standard `ps tree` output. The `-a` option displays command-line arguments for commands. There is no `-i` or `-b` option.
20. **20.** C. The `RSS` column is Resident Set Size, and it indicates the amount of physical RAM that is allocated to the given process.
21. **21.** B. The `lsof` command is used for this purpose, and it can help if there are large files that may be affecting performance. The `ls` command does not show whether a file is open.
22. **22.** B. The `l` key will list open files for a given process, assuming that `lsof` is installed. The `L` key performs a library trace if `ltrace` is available.

23. 23. D. The steal column shows the percentage of time that was spent waiting due to the hypervisor stealing cycles for another virtual processor.
24. 24. B. While all of the commands and programs listed are typically available on modern Linux distributions, all of them need to be installed separately except the `top` command, which is usually available for performance troubleshooting and monitoring.
25. 25. A. Load average with the `uptime` command is displayed in 1-, 5-, and 15-minute increments.
26. 26. B. The `/proc/swaps` file can be used to gather information quickly, especially within a script, on swap space.
27. 27. C. The `ntop` program monitors network interfaces and provides web-based reporting on bandwidth utilization by protocol and host. Both `mrtg` and `Nagios` can provide similar information but typically not on a per-protocol or per-host basis.
28. 28. B. Providing information from `ps` in a wide format can be helpful for viewing the command line of a given command. The `a` option displays all processes while the `o` option enables the choice of columns for output.
29. 29. A. When no interval or count are provided, the gathered statistics are displayed for each interval in which statistics were gathered. For example, if `sar` gathered statistics every five minutes since the last restart, then each of those data points is displayed.
30. 30. C. The `-i` option is needed for this case, and the format for the port is preceded by a colon.
31. 31. C. The `-m` option causes the disk-related statistics to use megabytes as the scale rather than the default kilobytes.
32. 32. B. If the Stat column within the output of a `ps` command shows D, then there is a process in uninterruptible sleep, meaning that it cannot be killed and is typically waiting on I/O. A process in SI is in normal sleep for a multithreaded process. Rebooting the server is the only way to clear processes that are in uninterruptible sleep, assuming that they don't wake up of their own accord. Finally, the `-n` option to `vmstat` selects how the header is displayed.
33. 33. B. The `-d` option is used to set the delay, and the interval is tenths of a second, thereby needing 100 such intervals to equal 10 seconds.
34. 34. A. The `vmstat` command displays both memory and CPU usage information. The `iostat` command does not display memory information. Once you know the command, then it's a matter of the correct syntax for per-second updates for 10 seconds.
35. 35. D. The `netstat -s` command displays aggregate statistical information for networking, including the total packets received and the number of packets forwarded. The `ifconfig` command does not show packets forwarded. The `ls` command is not used for networking, and the `ipstat` command does not exist.
36. 36. A. On a system with one processor, a load average of 1.00 would indicate high utilization. However, with two processors that load average equals approximately 50% capacity. Even at 50% capacity, it might be a good idea to examine what is causing that utilization with the `top` or `ps` command.

37. 37. B. When a 0 interval with no value for count is sent as an argument to `sar`, the overall averages since last restart will be displayed, and the program will exit.

### Chapter 12: Linux Kernel (Topic 201)

1. 1. B. The `make oldconfig` command will integrate the existing configuration file into the new configuration for the kernel. You still need to take care for items that have moved or changed within the new kernel to ensure that the configuration is correct.

2. 2. A. Kernel source code is usually kept in `/usr/src/linux`.

3. 3. D. The `xz` command is used to both compress and decompress files. When used with the `-d` option, the file provided as an argument is then decompressed.

4. 4. A. The legacy `zImage` format is limited to 512 KB in size, while `bzImage` does not have such a limitation.

5. 5. B. The `menuconfig` target provides a graphical-styled interface for choosing kernel options, and it is appropriate to use over an `ssh` connection. Be careful compiling a kernel over `ssh`, though. If you choose the wrong options, the server may not boot successfully. Thus, make sure that you have another means to access the console.

6. 6. A. The `mkinitrd` command is used on older systems to create the initial RAM disk. The initial RAM disk is used to load—some might say preload—essential modules for things like disks and other vital components needed for booting.

7. 7. C. When available, `bzip2` is used to compress a `bzImage`. `bzImage` describes a different format for compressed kernel images that can go above the 512 KB limit that normally applies to a `zImage`.

8. 8. B. The kernel config is placed in `/usr/src/linux/.config`. It's a good idea to make a backup of this file in case you need to re-create the kernel from source in the future or for reference.

9. 9. B. The `lsmod` command is used to display currently loaded modules. This is useful for scenarios where you are migrating from the stock or distribution-provided kernel to a custom kernel and need to know which modules to compile into the new kernel.

10. 10. B. The `clean` target removes most compiled files, though some may be left such as those related to kernel compilation. The `mrproper` `make` target removes compiled files from previous compiles of the kernel but also cleans the `.config` file as well. The `config` target is used to configure options for the kernel but should not be used until after `mrproper`.

11. 11. B. The `LOCALVERSION` option, found within the General Setup area, can be used to append custom versioning based on your local needs.

12. 12. C. Dynamic Kernel Module Support (`dkms`) is used for building kernel modules outside the kernel source tree.

13. 13. B. The `depmod` command is used to create a list of modules. The list is kept in a file called `modules.dep`, the location of which is dependent on the distribution of Linux in use.

14. 14. D. The `udevadm` command is used to work with the `udev` interface to the kernel, and the `monitor` subcommand displays kernel uevents and other `udev` events in real time.

15. **15. A.** The `lsusb` command displays information about the USB kernel interface. The `-t` option causes that display to be formatted in a tree-like structure that can be helpful for visualizing how the devices are connected to the computer.
16. **16. A.** The `-a` option displays all values and their current settings for `sysctl`. The `-b` option is binary and displays values without any newlines. The `-d` option is an alias for `-h`, which is help display. There is no `-c` option.
17. **17. B.** The `modprobe` command examines dependencies for a given module and loads both the dependencies and the requested module.
18. **18. B.** The `deb-pkg` target creates `.deb` files that are then suitable for management through the Debian package management system. Similar targets are available on other systems, such as `rpm-pkg` for Red Hat and CentOS systems.
19. **19. B.** The `uname` command is used for this purpose, and the `-r` option displays the kernel version number.
20. **20. C.** Information for `sysctl` is found within `/proc/sys`. Within that directory is a hierarchy of directories eventually leading to a normal file, the contents of which are the value for the variable.
21. **21. C.** Rules related to `udev` are stored in `/etc/udev/rules.d`. The `/etc/udev` hierarchy contains the `udev.conf` configuration file along with other components related to the configuration of `udev`.
22. **22. A.** The `modinfo` command provides information on a given kernel module. You can use `modinfo` to find out the parameters needed for a given module and the modules on which it depends, among other information. The `modprobe` command is used to load a module. There is no `tracemod` or `modlist` command.
23. **23. C.** Within `/usr/src/linux/Documentation` you will find extensive documentation on the kernel source code, including instructions on how to compile the kernel as well as the various elements found within the kernel itself.
24. **24. B.** The `-k` option shows the kernel driver associated with a given PCI device, and it can also be helpful when planning a new kernel compile. The `-t` option displays information in a tree-like structure, and `-n` uses numbers instead of device names. There is no `-a` option.
25. **25. C.** The `insmod` command inserts a module into the running kernel. It does not, however, attempt to resolve dependencies but rather outputs an error if there are dependent modules or kernel symbols that are not available.
26. **26. B.** The `-r` option removes the named kernel modules and attempts to remove any modules on which the named module depends, where possible. The `-d` option sets the root directory for modules, while `-v` is verbose and `-f` forces the module to load.
27. **27. B.** The `modules_install` make target is used to install modules that have been previously compiled using the modules target. The `instmod` and `modinst` targets are not valid.
28. **28. B.** The `/etc/modprobe.d` directory is used for storing configuration information related to modules such as that used for blacklisting purposes but also for other configuration information such as `udev` and module options.

29. **29. C.** The `lsmod` command displays a list of currently loaded modules. Included in the list is the size of the module in memory and what, if anything, is currently using the module.
30. **30. B.** The `dracut` command is used to create the initial RAM disk for newer systems and has replaced the legacy `mkinitrd` command used for the same purpose.
31. **31. B.** The `rmmod` command removes modules from a running system. In order to use `rmmod`, the module cannot be in use or depended on by other currently loaded modules. The other commands shown are not valid.
32. **32. B.** Variables and values placed in `/etc/sysctl.conf` will take effect on boot. The other files listed are not valid.
33. **33. D.** The file `/proc/kallsyms` provides a way to view the currently loaded kernel symbols. This can be helpful for resolving module dependencies. Note that on legacy systems, this file might be called `/proc/ksyms`.
34. **34. B.** The `-show-depends` option displays the dependencies for a given module. The other options are not valid for the `modprobe` command.
35. **35. A.** The `systool` utility can be used to show currently loaded options for a given module. The `modinfo -r` command is not valid, and while `modinfo` shows information about a module, it does not include core size and other settings. The `lsmod` command cannot be used for this purpose, and there is no `infmod` command.
36. **36. B.** The `/proc/sys/kernel` hierarchy contains vital configuration information for a kernel. These settings can be changed on a running system.
37. **37. C.** The kernel ring buffer, or log messages related to the kernel, can be viewed using the `dmesg` command. The messages normally rotate displaying the latest messages only, but this can be changed through configuration options.

### Chapter 13: System Startup (Topic 202)

1. **1. B.** The `/etc/systemd/system` directory is the recommended location to store unit files for `systemd`. The other locations are not valid.
2. **2. C.** The `systemctl` command is used for this purpose and then with the `daemon-reload` subcommand. The `reboot` option would work to reload the `systemd` configuration but is not correct because it requires the entire server to reboot, which is not what this question asked.
3. **3. B.** The `/etc/inittab` file contains the various runlevels and what to run at the given runlevel. For example, runlevel 1 is single user, runlevel 6 is reboot, and so on. The other files listed do not exist.
4. **4. B.** The SYSLINUX bootloader is used for FAT filesystems to create rescue disks and to assist with the installation of Linux in general. Syslinux also describes an overall project containing other specialty bootloaders. The other options listed for this question are not valid bootloaders, though.
5. **5. A.** ESP uses the legacy FAT filesystem type for its underlying format. There is a specification for how the ESP partition must be created on top of the FAT format for bootloaders and kernel images. Note that the partition is typically FAT32, but it can be FAT16 if only Linux systems will reside on the drive.



6. 6. C. `initrd` is used for an initial root filesystem for early drivers. `initrd` is configured to load within the grub configuration file for a given operating system.
7. 7. B. The `fsck` command is used to diagnose and repair hard drive problems in Linux. The `defrag` command is not available in Linux.
8. 8. D. The `telinit` command can be used for this purpose, and passing 1 as the argument will switch the system into single-user mode. The other commands shown are not valid.
9. 9. A. The `-install` option is used followed by the partition to which `extlinux` will be installed for boot.
10. 10. C. The format for the `mount` command is `[partition] [target]`, thereby making option C correct. The other options are not valid because the arguments are in the wrong order.
11. 11. B. The command to install GRUB is `grub-install`, and the first SATA drive is `/dev/sda`. A device listed as `hda` is typically a PATA drive, thereby making those options incorrect.
12. 12. D. The `-n` option changes the boot order for the next boot only and boots from the specified partition. The `-b` along with `-8` modifies and then deletes the option. The `-o` option sets the boot order. The `-c` option creates a boot number.
13. 13. A. ISOLINUX provides a means by which CD-ROMs formatted as ISO 9660 can be booted. It's very common to have live CDs or rescue/recovery CDs that use ISOLINUX for boot. The other bootloaders are not valid for this purpose or don't exist.
14. 14. A. The `/usr/lib/systemd` hierarchy contains files related to `systemd` configuration. The user directory within the hierarchy is used for user unit files, and the system files are stored in `/usr/lib/systemd/system`.
15. 15. B. Due to the decidedly insecure decisions made with the design of Microsoft's UEFI, a shim is often needed to enable Linux to boot on a system with UEFI. The file `shim.efi` can be used as an initial bootloader for this purpose.
16. 16. A. Priority order for `systemd` configuration files are those within the `/etc` hierarchy, followed by files in the `/run` hierarchy, and then followed by files in the `/lib` hierarchy.
17. 17. D. Scripts for starting and stopping services are located in `/etc/init.d` on a SysV init-based system. The other directories listed within this option are not valid.
18. 18. C. The `systemd-delta` command is used to determine overridden configuration files. Of the other commands, `diff` is valid, but not for this purpose. The `systemctl` command is also valid, but again not for the purpose described.
19. 19. B. The `chkconfig --list` command displays all services that will be executed on boot along with the setting for each service for each runlevel. Of the other commands, the `init` command is valid, but it does not have a `--bootlist` option. The other commands are invalid.
20. 20. B. The `bcfg` command within the UEFI shell is used to configure bootloaders on a UEFI-based system. The command can accept various parameters to configure how the bootloader and kernel will load on boot. Of the other commands shown, `grub-install` is valid but not within the UEFI shell.

21. 21. B. The Master Boot Record, or MBR, is the first sector on a disk, and it contains information about the structure of the disk. If the MBR becomes corrupt, all data on the disk may be lost. The other options shown for this question are not valid.
22. 22. A. The bootloader is mounted into `/boot/efi`. The other directories do not exist.
23. 23. D. The `rescue.target` is used to assist in recovery by loading a minimal base system and then going to a shell akin to single-user mode or runlevel 1.
24. 24. A. The configuration file is called `isolinux.cfg`, and it is typically located in `/boot/isolinux` or `/isolinux`. The other options shown are not valid filenames for this question.
25. 25. D. The file `pxelinux.0` must exist within `/tftpboot` on the TFTP server in order for a system to use PXELINUX for booting. The other files are not valid or necessary for PXELINUX.
26. 26. D. The `update-rc.d` utility can be used to manage SysV init scripts on Debian or Ubuntu and other distributions. When using `update-rc.d`, you supply the script name and the utility will take care of creating symlinks to the appropriate runlevels.
27. 27. B. The `e` key, when pressed at the right time during boot, will send you into the GRUB shell, where you can change parameters related to boot such as the kernel options and other related parameters.
28. 28. B. The `systemctl` command is used for this purpose, and the `get-default` subcommand will display the default target for boot. On many distributions, the default target is `graphical.target`. The other subcommands shown for this question are not valid.
29. 29. A. The `-r` option repairs the filesystem, while the `-y` option causes `fsck` to assume "yes" instead of prompting. The `-v` option is verbosity. There is no `-m` or `-x` option for `fsck`.
30. 30. D. The `-boot-directory` option enables you to specify an alternate location for GRUB images rather than the default `/boot`. The other options shown for this question are not valid.
31. 31. D. The `isolate` subcommand followed by the desired target is used to switch between runlevels with a `systemd`-based system. The other subcommands shown are not valid for `systemctl`.
32. 32. C. The runlevel defined as `initdefault` is the default runlevel for the system. The other options shown do not exist.
33. 33. B. The `initramfs` system is used instead of `initrd` to create the filesystem-based loading process for key drivers that are needed for boot.
34. 34. A. The `systemctl` command is used for this purpose, and the `set-default` subcommand is necessary to affect the desired behavior. The target file is simply called `multi-user.target`.
35. 35. C. The `shim.efi` bootloader loads another bootloader, which is `grubx64.efi` by default. The other options are not valid filenames for the purpose described.
36. 36. D. The `/etc/rc.d` hierarchy contains symbolic links to files found within `/etc/init.d`. These symlinks are then used for executing the scripts at the appropriate runlevel. For example, on boot the system

will execute the scripts found in the `runlevel` directory for each runlevel executed at boot time.

37. 37. A. `default.target` is the default target unit that is activated by `systemd` on boot. The default target then starts other services based on the dependencies.

#### Chapter 14: Filesystems and Devices (Topic 203)

1. 1. D. The file `/etc/mtab` lists the currently mounted filesystems. The `/etc/fstab` file lists overall filesystems for the computer, but it does not distinguish between mounted or unmounted filesystems. The other options listed for this question do not exist.
2. 2. C. The `-t` option sets the filesystem type as `ext2`, `ext3`, or `ext4`. The `mke2fs` command is typically symlinked from `/sbin/mkfs.ext2`, `/sbin/mkfs.ext3`, and `/sbin/mkfs.ext4`. The `-f` option forces `mke2fs` to create a filesystem. The `-a` and `-e` options do not exist.
3. 3. B. The file `/etc/auto.master` contains the configuration for `autofs`. The other files listed as options are not valid for this scenario.
4. 4. C. The `mkisofs` command creates an ISO filesystem, which can then be written to a CD or DVD. The other commands listed are not valid.
5. 5. A. The `cryptsetup` command is used to set up and help configure `dm-crypt` volumes. The other commands shown for this question are not valid.
6. 6. B. The `mkswap` command is used to format a swap partition. The other commands are not valid.
7. 7. B. The `-c` option sets the maximum mount count. The `-C` option sets the current number of mounts. The `-b` and `-a` options do not exist.
8. 8. D. The `-f` option, also known as `fake`, is helpful for situations where you need to debug the mount process or when you need to add an entry into `/etc/mtab` for a previously mounted filesystem. The `-l` option shows labels, and `-v` is verbose. There is no `-q` option.
9. 9. C. The letters `ro` indicate that the filesystem has been mounted read-only, meaning that it is not possible to perform a write to the filesystem. The other possible option is `rw`, indicating that the filesystem has been mounted as read-write.
10. 10. C. Bad blocks are shown with the `-b` option. The `-f` option forces `dumpe2fs` to perform the requested operation, and the other command options do not exist.
11. 11. D. `btrfs` is based on the copy-on-write principle, and it is generally considered more advanced than `ext4` and its predecessors. `FAT` is a legacy filesystem primarily used for DOS and its follow-ons, like Windows.
12. 12. B. The `xfs_info` command, which is functionally equivalent to `xfs_grow -n`, displays information about an XFS-formatted filesystem.
13. 13. A. The `blkid` command shows information about partitions including their type, their UUID, and other basic information. The other commands shown for options do not exist.

14. 14. C. The `-t` option, which can accept a comma-separated list of types, specifies that only filesystems of the listed type are to be unmounted. This is useful in conjunction with the `-a` option, which unmounts all filesystems except `/proc`. The `-v` option is verbose and `-f` forces the operation to continue.
15. 15. D. The `sync` command writes unwritten data to the disk immediately, and it is useful to run just prior to attempting an unmount operation.
16. 16. B. The `swapon` command enables swap space, making it available for use as virtual memory. The `mkswap` command formats the space. The other two commands are not valid.
17. 17. C. The `-f` option specifies that `xfs_check` should check the contents of the named file for consistency. The `-v` option sets verbosity, and there is no `-d` or `-a` option.
18. 18. B. The `-w` option causes `debugfs` to open the filesystem in read-write mode. There is also a `-c` option to open in catastrophic mode for filesystems with significant damage. The `-rw`, `-r`, and `-n` options are not valid.
19. 19. D. The `smartd` daemon monitors SMART-compatible disks for notable events, and it can be configured to send alerts when events occur. The other commands listed are not valid for this scenario.
20. 20. A. The `-f` option forces `fsck` to run on an otherwise clean filesystem. This can be helpful for times when you suspect that there is an error on the filesystem, and you need to verify this as part of the troubleshooting process. This can also be helpful to prepare the filesystem for conversion, such as might be the case with a tool like `btrfs-convert`.
21. 21. A. The block size for import or restore must match the block size used on export or dump. Block size is specified with the `-b` option, thus making option A correct. The other options are not valid for `xfsrestore`.
22. 22. B. A filesystem with the word `defaults` for its mount options will be mounted read-write (`rw`), `suid`, with the ability to have executables (`exec`). The filesystem will be auto-mounted (`auto`), but users will not be able to mount it (`nouser`). Character and block special devices will be interpreted (`dev`), and operations on the disk will be performed in an asynchronous manner (`async`).
23. 23. D. The `smartctl` command controls how SMART monitoring is done for a given device, assuming that the `smartmon` utilities have been installed. The `smartd` option represents the overall daemon for monitoring SMART events.
24. 24. A. Within `/etc/fstab`, the filesystem to be mounted (such as `/dev/sda1`) is found first, followed by the destination location to which the filesystem will be mounted. The type of filesystem follows next, along with any options needed for the filesystem. The dump utility indicator follows the options, and finally the pass or `fsck` order is last. The last field determines the order in which filesystems are checked by `fsck` on boot.
25. 25. A. Password-based Key Derivation Function 2 (PBKDF2) is used for key derivation for the password-based cryptography used with LUKS. SSL is Secure Sockets Layer, and it is typically used for encryption of HTTP traffic. Both RSA and DSA are encryption algorithms, but they are not related to this question.
26. 26. B. The `btrfs subvolume create` command creates a `btrfs` subvolume. The other commands are not valid.

27. 27. C. The `-z` option sets the maximum size for files to be included in the dump. The `-b` option sets the block size, but it is not related to what is being asked for in this scenario. The `-s` option sets the path for inclusion in the dump, and `-p` sets the interval for progress indicators.
28. 28. C. The `-e` option sets the behavior, such as continue, remount read-only, or panic when an error occurs at the filesystem level. The `-f` option forces whatever operation you're requesting to continue, even if there are errors. The `-d` and `-k` options are not valid.
29. 29. D. The `-n` option causes `mount` not to write to `/etc/mtab`, and it is particularly useful for the scenario described. The `-a` option mounts all filesystems in `/etc/fstab`. There is no `-b` or `-m` option.
30. 30. A. The `swapoff` command deactivates swap space, thereby making it unavailable as virtual memory on the system. The other commands shown as options are not valid.
31. 31. A. The `where=` directive specifies the location for the final mounted filesystem.
32. 32. C. The `-show` option displays information about the swap spaces on the computer, including how much swap space is currently being used. The `-a` option activates all swap spaces. There is no `-list` option and `-h` displays help.
33. 33. A. The `mkfs.fat` or `mkfs.vfat` commands are valid for creation of FAT filesystems. There is no `-f` option to `mkfs` and there is no `mkfat` command.
34. 34. D. The `tune2fs` command is used for working with `ext2`, `ext3`, and `ext4` filesystems. The `-j` option adds a journal. The other commands are not valid.
35. 35. A. The `snapshot` subcommand of `btrfs subvolume` creates a snapshot. The other commands shown are not valid.
36. 36. A. The `-l` option forces the log to be cleared or zeroed out, which may cause a loss of data. The `-v` option sets verbose output, while `-V` prints the version. The `-d` option performs a dangerous repair, which can be used on a read-only filesystem.
37. 37. C. The `-o` option enables the setting of one or more options for the `mount` command and `ro` is read-only. Note that the `-r` option will also mount as read-only. The other options shown are not valid.

### Chapter 15: Advanced Storage Device Administration (Topic 204)

1. 1. B. The file `/etc/mdadm.conf` is the configuration file used for RAID setups that use `md`. The other files listed are not valid.
2. 2. D. A partition type `oxFD` is used for software RAID arrays. This can be set or viewed using a tool such as `fdisk`. The other options shown are not valid partition types.
3. 3. C. The `/dev/disk/by-id` directory contains symbolic links to `/dev/sd`, such as `/dev/sda`. Because WWIDs can be used to identify a device across systems, they are often used within the context of SANs. The other directories listed as options do not exist.
4. 4. A. The `iscsiadm` command is used for administration of iSCSI devices on a Linux system. The other options shown for this question are not valid.

5. 5. C. The `pvdisk` command shows information about a given physical volume. You can use `pvdisk` to view the device on which the PV is built along with the extent size of the PV. The other commands shown are not valid.
6. 6. D. The `DEVICE` configuration line contains a list of devices that can be used for an array. The keyword `DEVICE` is then followed by a space-separated list of devices.
7. 7. B. Logical unit numbers (LUNs) that contain the characters `fc` are those found through Fibre Channel. Therein lies the difference between options B and C, where option C contains the letters `scsi`, which would usually represent a local disk. The other options are not valid.
8. 8. C. The `multipath` command is used for administration of devices such as LUNs and can be used for finding the path to LUNs for a server, such as in a SAN configuration. The other commands are not valid, with the exception of `ls`, which is valid; however, the option shown is not related to LUNs but rather to a combination of various flags to the `ls` command.
9. 9. C. The `fstrim` command is used to remove blocks that are not in use. The `fstrim` command is frequently used in a SAN configuration to give back unused storage to the SAN. The `fstrim` command can also be used with solid-state drives for the same purpose. The other commands shown are not valid.
10. 10. B. NVMe-capable drives are named `/dev/nvme*`. No special drivers are needed other than those found in the native kernel on a modern system. The other answers do not exist as paths by default.
11. 11. A. The `scsi_id` command generates a SCSI identifier based on page 0x80 or 0x83 of the vital product data on a device. The other commands are not valid.
12. 12. D. AOE, or ATA over Ethernet, sends ATA commands directly over Ethernet. AOE commands are sent at a lower layer of the OSI model than TCP/IP or even IP, but they are not routable. The other acronyms shown are valid but not for the purpose described. PXE is a boot protocol, POE is used for power over Ethernet, and iSCSI is a storage protocol, though not related to ATA.
13. 13. B. The `hdparm` command can be used to get or set values related to the low-level configuration of drive settings for both IDE and SATA devices. The other commands shown for this question are not valid.
14. 14. A. The next step is typically to create a volume group (or more than one) with `vgcreate` based on the newly created physical volumes.
15. 15. B. The `-E` option signals that an extended option follows, such as `stripe_width`. The `-f` option forces an operation but should not be necessary for this solution, and the `-e` option sets the behavior on error. There is no `-extend` option.
16. 16. D. The file `/proc/mdstat` contains information on RAID arrays including RAID personalities found on the system, the devices that compose the array, and other pertinent information. The other files shown are not valid.
17. 17. A. The `iscsid` daemon creates and maintains connections to iSCSI targets, making them available in Linux. The `iscsiadm` command is used for administrative purposes, and the other commands shown are not valid.

18. 18. C. The `nvme` module, available on modern systems, is used as a driver for NVMe devices on Linux. You can examine the `nvme` module with the `modinfo` command.
19. 19. B. The directory `/sys/class/fc_host` contains other directories based on the Fibre Channel connections available. Within those host directories will be found the WWN (World Wide Name) in a file called `port_name`. The other directory hierarchies are not valid.
20. 20. A. The `-create` option enables creation of a RAID array that will use `md`. The typical argument is the `/dev/mdN` device. The other options listed are not valid for `mdadm`.
21. 21. B. The file `iscsid.conf`, typically found in either `/etc/` or `/etc/iscsid/`, is used for configuration related to the `iscsi` daemon. The other configuration files are not valid for `iscsid`.
22. 22. C. The `/dev/mapper` directory contains information about multipath devices such as logical volumes. The other directories are not valid.
23. 23. C. The `-monitor` option is used to actively watch an array for issues such as disk failure. The monitoring can be done as a daemon and run in the background, thereby alerting when there is an issue.
24. 24. A. The `-o ro` option mounts the drive in read-only mode. The `rw` mode is read-write. Mounting in read-only is useful if you need to diagnose the drive without potentially destroying any information on the drive. The other options are not valid.
25. 25. B. The `lvcreate` command is used to create a logical volume from previously created physical devices and volume groups. Using `lvcreate` is the final of three steps in the process for using LVM prior to actually using the logical volume.
26. 26. B. The `MAILADDR` option sets the destination address for mail about RAID events that are noted by `mdadm` when in monitor mode.
27. 27. A. The `vgscan` command looks for both physical volumes and volume groups related to an LVM configuration. The `vgscan` command is run at system startup, but it can also be run manually. The other commands are not valid.
28. 28. D. A partition type of `oxFD` is used for software RAID arrays. This can be set or viewed using a tool such as `fdisk`. The other options shown are not valid partition types.
29. 29. C. The `pvscan` command displays a list of physical volumes on a given server. The PVs displayed are those that have been initialized with `pvcreate` for use with LVM.
30. 30. B. The interactive console is accessed by calling `multipathd` with the `-k` option. Once in the console, you can obtain help by typing `help`. The other options shown are not valid for `multipathd`.
31. 31. A. The `-a` or `-available` (sometimes known as `-activate`) option sets whether the logical volume can be used. There is no `-b` or `-c` option, and the `-d` option is used for debugging.
32. 32. A. The file `lvm.conf` is a primary configuration file for LVM. Within `lvm.conf`, typically found in `/etc/` or `/etc/lvm/`, you can set things like filters for devices to include or exclude from the `vgscan` process. The other commands shown are not valid.

33. 33. B. The `snapshot` option creates a snapshot of a logical volume. The other options shown are not valid.
34. 34. C. The `-w` option writes a new value to the given kernel parameter. The `-a` and `-A` options both list all values. There is no `-k` option.
35. 35. D. The `sdparm` command is similar to the `hdparm` command. Whereas `hdparm` is used for IDE and SATA, `sdparm` is used for SCSI devices. The other commands shown are not valid.
36. 36. A. The directory `/etc/fcoe` contains information related to the FCoE configuration on a given system. The other directories are not valid for FCoE.
37. 37. D. The `lspci` command is used for this purpose. NVME devices are listed with the name `nVME` or `NVMe`; therefore, adding `-i` to `grep` will make the search case insensitive. You'd use this in order to ensure that the devices are detected. The other commands are not valid, with the exception of the `lspci` command, but you cannot `grep` for `scsi` for this scenario.

### Chapter 16: Networking Configuration (Topic 205)

1. 1. C. The `ip` command defaults to the `INET` family if not otherwise specified with the `-f` option. The command attempts to guess the correct family and falls back to `INET`. The other families listed as options for this command are not valid for use with the `ip` command.
2. 2. B. The `ifconfig` command is used for this purpose, followed by the interface. The `hw` keyword is used for the hardware address, which is then followed by the hardware class, in this case `ether`. That is followed by the new MAC address (not depicted in the options). The other commands are not valid.
3. 3. D. The `-n` option causes `route` to use numeric values only, performing no name resolution. This option is useful for the scenario described. The `-e` option causes the output to be in `netstat` format. There is no `-d` or `-f` option for the `route` command.
4. 4. A. Because you're working with MAC addresses, the `arp` command will be used. The `-d` option removes or deletes an ARP entry, which would be appropriate here so that the MAC address resolution occurs again. The `netstat` command is not used for this purpose. The `hostname` and `dig` commands work with name resolution but not for MAC addresses or the ARP table.
5. 5. A. The `iw` command is used for this purpose. When you're using `iw` with a specific device, the `dev` keyword appears next followed by the device name. Finally, the command to execute on that device, in this case the `link` command, is used.
6. 6. B. The `iwconfig` command, which is similar to the `ifconfig` command, works with an individual wireless interface to set and display parameters. Of the other commands, the `ifconfig` command is valid but not used for wireless. The other commands are not valid.
7. 7. C. The `iwlist` command can be used for this purpose, and the `scan` subcommand is used to look for local access points and wireless networks. The `iwconfig` command does not have a `scan` subcommand. Likewise, there is no subcommand called `get` for the `iwlist` command, and there is no `iw-scan` command.
8. 8. B. The `-o` option removes newlines from the output, thereby making the output more suitable for the `grep` command. The `-l` option specifies the number of loops for the `ip addr flush`



command; The `-f` option specifies the protocol family. There is no `-n` option.

9. 9. B. The `mtu` option can be used to set the value for the maximum transmission unit (MTU) for a given interface. The `metric` option sets the interface metric. The other options are not valid.
10. 10. B. A route will need to be added in order to utilize the reject destination, thereby making option B correct. Option C deletes the route but does not create a reject route. Option D deletes the default route, and option A is not valid.
11. 11. A. The `-s` option creates an ARP table entry. The `-d` option removes an entry. The `-c` and `-add` options do not exist.
12. 12. A. The `ss` command provides many of the same functions as `netstat`, but it can show some extended information, such as memory allocation for a given socket. The `free` command shows memory usage but not by socket. The other two commands do not exist.
13. 13. D. The `-t` option shows TCP connections, while `-a` shows active sockets. The `-n` option disables name resolution.
14. 14. C. This solution requires a way to filter out the `bind` user; therefore, answers that `grep` for `bind` or specify `bind` as the user are incorrect. However, the `ls` command allows for negation with the caret `^` character. Therefore, listing all files except `bind` requires the syntax shown.
15. 15. D. The `-f` option is a flood ping. This will effectively cause the interface to send and receive large amounts of traffic, usually making it easier to find on a switch. The `-a` option is an audible ping, emitting a sound on ping. The `-c` option sends a certain count of pings. There is no `-e` option.
16. 16. B. The `netcat` command provides a method for opening and communicating on both sides, server and client, for a TCP connection. The `netcat` command avoids some of the issues with Telnet capturing characters specific to the Telnet protocol. The `netstat` command does not test connectivity, and `ping` does not do so at the TCP level. There is no `nettest` command.
17. 17. C. The `-D` option lists the interfaces on a given computer. The `-d` option dumps compiled matching code, and `-i` selects an interface. There is no `-a` option.
18. 18. B. The `-R` option requires that an attempt at name resolution be performed. The `-n` option does the opposite; that is, it disables name resolution. There is no `-b` or `-a` option.
19. 19. A. The `ping6` command performs the same as the IPv4 `ping` command, but it does so for IPv6. The other commands are not valid on Linux.
20. 20. B. The `ip` command can be used for this purpose. When used with the `addr` object and the `-6` option, only information about IPv6 addresses will be shown. The first option, simply `ip addr`, will show all addresses including IPv4. The other commands are not valid.
21. 21. A. The `ifconfig` command is used for this purpose, and ARP can be disabled by preceding the word `arp` with a minus sign, as shown. If no minus sign is present, then ARP will be enabled. The other commands will not work for this scenario.

22. 22. C. The `dev` option specifies the device to use for the route being specified. This is a typical use case for many routes to reduce the chances of the kernel guessing incorrectly. The other options shown for this question are not valid.
23. 23. C. The `-p` option shows the process IDs associated with a given socket within the `ss` output. The `-a` option is for all sockets, while `-l` is for listening sockets. The `-f` option is used to specify the protocol family.
24. 24. A. The `-i` option shows interface information in a table-like format. Information such as transmit and receive bytes as well as the MTU for the interface and other information is shown. The `-r` option shows routes, while `-l` shows listening sockets. There is no `-t` option.
25. 25. D. The `/etc/network` directory contains information on network interfaces and contains directories that further contain scripts to be executed when interfaces are brought up or down. The other directories listed do not exist.
26. 26. C. The `-I` option tells `traceroute` to use ICMP for requests. The `-T` option is TCP SYN. The `-A` option performs AS path lookups, and the `-i` option configures `traceroute` to use the specified interface.
27. 27. B. The `mtr` command provides a unique way to view real-time information about each hop in a route between hosts. Both the `traceroute` and `route` commands are valid, but the options shown for each are not. There is no `liveroute` command.
28. 28. C. Internally, the `hostname` command uses `gethostname`. This can be useful to know when troubleshooting address resolution issues such as conflicting results for host naming. The other functions are not valid.
29. 29. A. The `grep` command and the `-i` option should be used in order to make the `grep` case-insensitive. When used with `-v`, `grep` will exclude the argument, thus doing the opposite of what's needed here. The kernel ring buffer will probably not contain information about DHCP, therefore making `dmesg` not the correct option.
30. 30. B. Only alphanumerics, minus/dash, and dot are valid for hosts in `/etc/hosts`.
31. 31. B. Options within `/etc/resolv.conf` are preceded with the `options` keyword followed by one or more options such as `debug`.
32. 32. B. The `-c` option clears the kernel ring buffer after the first read. The `-C` option clears it immediately. The `-e` option displays relative time and local time. There is no `-a` option.
33. 33. D. The `systemctl` command is used for this purpose. Adding the `-u` option specifies the unit for which journal entries are desired.
34. 34. A. The `/etc/hostname` file typically contains only the hostname of the local computer rather than the hostname and domain name. This is then read at boot time to set the hostname for the computer. The `/etc/hosts` file contains information on various hosts for name resolution purposes. The other files do not exist.
35. 35. C. The `/etc/sysconfig/network-scripts` directory contains configuration information for a Red Hat system. The other directories shown do not exist.
36. 36. B. The `traceroute6` command is used for tracing IPv6 routes. The other commands do not exist.

37. 37. C. The `PARANOID` wildcard specifies that the hostname and IP must match. The `ALL` keyword is also a valid wildcard in TCP Wrappers for use in both `/etc/hosts.allow` and `/etc/hosts.deny`.

### Chapter 17: System Maintenance (Topic 206)

1. 1. C. The kernel sources now use xz compression. Previously, these sources had used bzip2, and prior to that they used gzip. There is no xy compression algorithm.
2. 2. C. The `-a` option provides archive mode, which is a substitute for several other options. The `-r` option is recursive, the `-o` option indicates that ownership should be preserved, and the `-f` option enables a filter.
3. 3. A. The `-c` option indicates the creation of a tar file. The `-d` option is used for diffing or differencing between two tar files, the `-b` option provides block size, and `-f` specifies the file for use with tar.
4. 4. C. The `-remove-files` option removes files from the filesystem after adding them to the archive. The `-r` option appends files to the end of an archive, the `-d` option provides a diff between the filesystem and an archive, and the `-f` option specifies the file.
5. 5. D. The `-p` option specifies the number of slashes to be stripped from the beginning of the path for patching. Both the `-p1` and `-p0` options are quite common. The `-s` option specifies silent operation. There is no `-strip` option.
6. 6. A. According to the `man(1)` page for the `make` command, the name `Makefile`, with an uppercase M, is the recommended name for the file. The name `makefile` is valid as a default, but it is not the recommended option. The other files are not valid as default names.
7. 7. D. The `clean` target is typically included in most Makefiles for projects in order to remove files leftover from a previous compilation. The other targets are not valid.
8. 8. D. The `configure` script, which is usually included in source code packages, customizes the software based on the local environment. The other script names shown are generally not used.
9. 9. B. The `/usr/src` directory is the recommended location for source code according to the Filesystem Hierarchy Standard. Many administrators use `/usr/local/src` instead, but this is not specified in the FHS.
10. 10. B. The `gunzip` command is used to uncompress files that have been compressed using gzip compression.
11. 11. C. The `bs` option is used to specify block size. Various suffixes are possible such as M, which is equivalent to megabytes, and K, which is equivalent to kilobytes.
12. 12. C. The `tapetype` directive defines a friendly name for a destination. The destination is then further configured within a corresponding `define` directive. The other directives are not valid for Amanda.
13. 13. D. Tape devices are found within `/dev/st*`, thereby making `st0` the first device.
14. 14. C. The `/etc/issue` file is used to provide a message to users, such as a login banner, prior to local login. The other files shown are not valid for the purpose described.

15. 15. A. The `-delete` option removes files that no longer exist on the host system when syncing with archive mode in `rsync`. The other options shown are not valid for `rsync`.
16. 16. D. The `wall` command displays a message to all logged-in users. The command is sometimes used to communicate an impending reboot or shutdown of the server. The other commands shown are not valid.
17. 17. B. The `-exclude` option excludes files matching a pattern from the archive. This option can greatly reduce the size of an archive by excluding unnecessary files from the archive. The `-x` option is the only other valid option that extracts files from an archive.
18. 18. C. The contents of the file `motd`, an abbreviation for Message of the Day, are displayed when a user logs in successfully. Among the other options, the contents of `/etc/issue` are displayed prior to local login. The other filenames are not valid for this purpose.
19. 19. B. The `-f` option specifies the filename and `-v` is verbose, making both of those options required based on the scenario. The `-x` option extracts from the archive.
20. 20. C. Executing the `configure` script from the current directory typically means prefacing the script name with `./`, as shown in the correct option.
21. 21. A. The `-z` option will uncompress a tar file that has been compressed with `gzip`. The `-x` option extracts, while `-c` creates a tar file. Finally, `-f` specifies the tar file to work with.
22. 22. B. The file `/etc/issue.net` is used to provide a message for remote logins such as Telnet. The other files listed are not valid for the purpose described.
23. 23. D. The `poweroff` target of `systemd`, accessed using the `systemctl` command, is used for halting the system and then attempting to remove power on compatible systems. The `halt` target stops the system but does not attempt to remove power, while `reboot` simply restarts the system. There is no `stop` target.
24. 24. A. The `uname` command displays information about the kernel, processor type, and other relevant components that might be helpful when compiling software.
25. 25. D. The `-modify-window` option modifies how file synchronization is determined. The default behavior is to match to the nearest second. This option is useful for synchronizing between filesystem types, such as Microsoft FAT, which don't have the precision of Linux-based filesystems.
26. 26. B. The `-b` option specifies that a backup should be made during the patching process. The `-l` option tells `patch` to ignore whitespace. The `-r` option specifies a reject file. There is no `-a` option.
27. 27. D. The `install` target installs the final compiled files in their appropriate location and makes them executable, if applicable. Of the other options, `distclean` is sometimes included as a target to return source files to their pristine state. The other targets listed are not valid.
28. 28. C. Compression using the `xz` program is indicated with the `-J` option. The `-j` option indicates `bzip2` compression. The `-x` and `-c` options are extract and create, respectively.

29. 29. B. The `-size-only` option examines whether the files being synchronized are the same size. This can be helpful for situations where there may be significant time skew or other issues preventing the normal differencing mechanisms from working properly. The other options shown are not valid for `rsync`.
30. 30. A. The `-decompress` option uncompresses an `xz` file, while the `-stdout` option sends the output to standard out. The other options shown are not valid.
31. 31. B. The `-c` option sends output to `STDOUT`. The `-d` option decompresses, while `-f` forces an operation. Finally, `-s` reduces the memory footprint for `bzip2`.
32. 32. D. The Bacula Director configuration file is called `/etc/bacula/bacula-dir.conf` by default. The other files are not normally used as part of a Bacula configuration.
33. 33. B. The `rewind` subcommand for the `mt` command rewinds the tape to the beginning. This subcommand can be shortened to `rew` instead of `rewind`. The other subcommands shown do not work with `mt`.
34. 34. A. The `-r` option is needed to specify reboot and the format for counting time from now. It is prefaced with a plus sign (+), thereby making option A correct. Of the other commands, specifying `+15` without the `-r` option simply shuts down the computer in 15 minutes, and specifying the time as `00:15`, as in option D, will reboot the computer at 12:15 a.m.
35. 35. B. The `-q` option suppresses all warnings. The `-v` option is verbose, while `-L` displays the license. The `-r` option is recursive.
36. 36. C. The `-e` option, also available as `-rsh=ssh`, uses `ssh` as the means for transport, thereby ensuring an encrypted tunnel over which the synchronization process will occur. The other options shown are not valid.
37. 37. B. The `-help` option is usually included with the `configure` script as a means to list the other available options. Because every `configure` script is customized for a given source code package, the other options may vary. Even `-help` may not always be available, depending on whether the source code author included it.

## Chapter 18: Domain Name Server (Topic 207)

1. 1. A. The file named `named.conf`, located in `/etc/` or `/etc/bind/`, is the default configuration file for the BIND server. The file typically loads or includes other configuration files for specific configurations.
2. 2. B. The `allow-query` directive sets the hosts from which DNS queries will be allowed for the nameserver. This can be helpful for situations where there may be untrusted clients that can reach the nameserver.
3. 3. B. The `-1` or `-HUP` signal reloads the given process. The `-15` signal is the default terminate signal, while `-2` is an interrupt signal. The `-9` signal is for kill, and it is considered bad practice except in emergencies when the process doesn't respond to normal signals.
4. 4. A. The `-a` option enables specification of the algorithm to use, while `-n` specifies the name type to use such as `zone`, `host`, or others. There is no `-d` or `-e` option.
5. 5. B. The `named-checkzone` command examines a zone file for obvious syntax errors that would prevent BIND from using the file.

The `named-compilezone` file does the same thing as `named-checkzone` but sends the output directly to a file instead.

6. 6. A. The lowest priority number wins for MX records, thereby making it the highest priority MX record for the domain.
7. 7. D. DNS typically uses UDP port 53, except for zone transfers, in which case TCP port 53 is used because of the size of the request for most zones.
8. 8. A. The directory `/var/named` stores zones. On Debian, this directory is `/var/cache/bind`. The `/etc/named` directory is used by some distributions as a location for configuration files.
9. 9. C. The `rndc` command is used to control a BIND server, including controlling it over a remote connection. The other commands shown are not valid.
10. 10. D. The `axfr` type can be used with `dig` to request a zone transfer. The client from which you request the zone transfer will need to be authorized to initiate a transfer.
11. 11. B. The `listen-on` directive sets the IP address or addresses on which the daemon will operate. The other directives are not valid.
12. 12. C. The home directory should be set in `/etc/passwd`, and it should be set to the chroot directory. The other files listed are not valid.
13. 13. A. The `dnssec-signzone` command is used to sign DNS zones when using DNSSEC. The other commands do not exist.
14. 14. A. Setting `-a` as an option to the `host` command sets the query type to ANY. The `-c` option sets the class, and the `-d` option turns on debugging. There is no `-b` option.
15. 15. C. The correct format for a CNAME requires a trailing dot, which represents the only difference between answers C and D.
16. 16. A. The `only` option, as in `forward only`, is used to indicate that the server should only forward queries and not attempt to answer them directly. The `first` option forwards the query, and if no response is received, then it attempts to perform the query itself. The other options are not valid.
17. 17. B. The `blackhole` option provides a list of addresses that will not be allowed to receive answers for queries. This can be helpful for security reasons. The other options are not valid.
18. 18. B. The `daemontools` package is required in order to install `djbdns`. BIND9 is not typically used when `djbdns` is used, and `qmail` is not required.
19. 19. D. The `named-checkconf` command is used to verify the configuration of BIND. When no configuration file is given, it is assumed that `/etc/named.conf` represents the configuration file.
20. 20. C. TTL, or time to live, values are provided in seconds by default, thereby making 28,800 equal to eight hours.
21. 21. B. The value 1800 represents the retry value for the zone. The refresh is 3600, while the default TTL is 86400. Finally, the serial is 2016070400.

22. 22. C. TXT records are used to create resource records in support of SPF. MX is used for SMTP servers.
23. 23. B. The mail exchanger is defined as Priority MX Hostname in the format shown.
24. 24. C. The `.digrc` file, found in a user's home directory, can be used to set defaults for use of the `dig` command. There is no `dig` configuration file found in `/etc`.
25. 25. A. The `-bind` option for the `mount` command, which has nothing to do with the BIND daemon itself, enables mounting or remounting a portion of the filesystem in another location. This is helpful for facilitating working with BIND configuration files in a chroot environment.
26. 26. D. The zone type of hint is used with the root zone file. When setting up a zone for which the server is authoritative, the type is master or slave. There is no recurse type.
27. 27. A. The `rndc` command can be used for this purpose and, when given the `reload` subcommand, will reload the zones for the server.
28. 28. D. The `allow-transfer` directive specifies the hosts that are allowed to request a transfer of the zone. The other options shown are not valid.
29. 29. D. POP3 servers do not have a specific type in DNS. The MX type indicates mail exchanger, or SMTP server.
30. 30. C. The `allow-recursion` option is useful for situations where certain clients can query the nameserver for its authoritative names but not request recursion.
31. 31. A. The correct format is `named-checkzone <zone> <zonefile>`. No other options are required.
32. 32. D. The only available algorithm for `rndc` is `hmac-md5`, and the key can be generated with `dnssec-keygen`. The other options shown are encryption or hashing algorithms but are not used for the scenario described.
33. 33. B. The `version none`; directive within a BIND configuration file tells BIND not to return version information. The other directives are not valid.
34. 34. C. The `-z` option tells `named-checkconf` to verify the master zones as part of the verification process. The other options are not valid.
35. 35. B. An individual TTL on a record means that it will take up to that many seconds for the change to propagate. New requests will begin seeing the change immediately after restart, but external resolvers may cache for up to the TTL value before requesting another resolution.
36. 36. A. The `pdns-server` package is available on Debian and `pdns` on Red Hat. Red Hat will require installation from EPEL.
37. 37. B. The `rndc` command can be used for this purpose with the `reconfig` subcommand. Because the scenario includes changes to the `named.conf` configuration file, a simple `rndc reload` is not appropriate.

#### Chapter 19: HTTP Services (Topic 208)

1. 1. B. The `<VirtualHost>` directive begins a stanza that facilitates serving websites using virtual servers. The other directives are not valid for Apache.
2. 2. D. The `htpasswd` command creates or updates credentials for native Apache authentication using `htaccess`. The `passwd` command is valid, but it does not work with `htaccess`. The other commands are not valid.
3. 3. C. The `configtest` option verifies the configuration file syntax, and it is quite helpful in order to prevent a situation where the server cannot restart due to a fatal error in the configuration. The other options are not valid for the `apachectl` command.
4. 4. A. The `openssl` command is used for this purpose with the `genrsa` option. An output file is specified with `-out`. The other commands containing `openssl` all contain an invalid option, and the final command is `openssh` and it is not used for this scenario.
5. 5. B. The `AuthUserFile` directive works with `mod_auth_basic` and `mod_authn_file` to tell Apache the location of the file that will be used for authentication.
6. 6. C. The `ServerName` directive provides the hostname for the virtual server. The other directives are not used.
7. 7. A. The `SSLEngine` option needs to be set to `On` for SSL to be enabled for a given site or server. The other options are not valid.
8. 8. D. The `index` option enables the administrator to set a space-separated list of valid index files for the server, such as `index.html`, `index.htm`, and `index.php`. The other options listed for this question are not valid.
9. 9. B. The `acl` configuration directive creates an access control list. Access control lists are powerful features of a Squid proxy setup and can include networks, MAC addresses, ports, browsers, and much more.
10. 10. C. It can be desirable at times not to display the version of Apache in use. Some say that doing so might help security. However, this type of "security through obscurity" may not be entirely effective.
11. 11. C. Server Name Indication, or SNI, facilitates serving multiple virtual hosts from the same IP address even when SSL is used. Without SNI, each SSL-based virtual host would require its own IP address. The other technologies are not valid for this scenario.
12. 12. A. The `SSLCACertificateFile` directive enables specification of a single PEM file containing CA certificates for client authentication.
13. 13. B. The `AuthName` directive sets a friendly display value that is shown within the authentication pop-up window. The other values shown do not have any effect within Apache2.
14. 14. D. The `LoadModule` directive is used for this purpose and accepts the name of the module followed by its filename.
15. 15. A. The `req` option begins the CSR generation process, typically also requiring `-new` as an additional option. The other subcommands are not valid.
16. 16. B. The `DocumentRoot` directive sets the default directory from which documents are served, both inside and outside a virtual host



stanza. The `ServerRoot` directive sets the overall root directory for the server and is not related to virtual hosts or document serving. The other two options are not valid Apache directives.

17. 17. D. The file `php.ini`, typically located within the `/etc/` hierarchy, depending on distribution, is used as the primary configuration file for PHP. The other files are not used by PHP.
18. 18. C. The `Options` directive is used for this purpose and the option to exclude is `Indexes`. Options are included or excluded by a plus or minus sign, respectively. There is no option named `Default`.
19. 19. A. The syntax shown will redirect the user to a 404 page in the event that they attempt to navigate to the `.git` directory. The other options will not work because of syntax errors.
20. 20. B. The `SSLCertificateKeyFile` directive points to the location of the private key for an SSL configuration. The other options shown are not valid directives.
21. 21. B. Squid listens on port 3128 by default. The other ports listed are valid but are not the default port for Squid.
22. 22. C. The `mod_authz_host` module is used for authorization based on IP address or hostname. The other modules are not valid for a default Apache configuration for the purpose described.
23. 23. A. The default name for the primary log file for Apache is `access_log`. This file may sometimes be called `access.log`, depending on the distribution. The name of the file along with what is recorded in the log can be customized.
24. 24. B. The `http_access` directive is combined with `ACL` directives to define access to use the Squid proxy. The other directives are not valid for use in Squid.
25. 25. C. The `AccessFileName` directive can be used to set the access filename to something other than `.htaccess`.
26. 26. B. Apache explains within the documentation that higher performance is achieved by storing the directives related to user authentication within the main server configuration when possible. The only reason not to do this is so that the authentication directives are accessible by the user. There is no scenario to store user authentication configuration information in a `mod_rewrite` block or in a module, as was the case for two of the four options for this question.
27. 27. D. The `AuthGroupFile` directive facilitates the scenario described. Users must be authenticated, and then a directory or other resource can be associated with the group file to enable users in the file to access the resource. The other directives shown are not valid.
28. 28. B. The `apachectl` command can be used for this purpose, and when given the `status` argument will print status information for the server. The other arguments for `apachectl` are not valid.
29. 29. A. A 405, Method not allowed, response will be sent when `TraceEnable` is off. A 100 code is continue, while 302 is redirect and 200 is OK.
30. 30. C. The `-c` option creates a new file. The `-b` option is batch mode. The `-e` and `-f` options do not exist for `htpasswd`.

31. 31. A. Log format sequences begin with a percent sign, and %D logs the time taken to service the request in microseconds. The %T sequence logs the time taken to service the request, but it requires a preceding unit of time to log. The %t sequence is the time of day when the request was received.
32. 32. B. The Alias directive is used for this purpose. The format calls for the destination followed by the location to be aliased, thereby making option B correct. There is no Connect directive in Apache.
33. 33. B. The SetHandler directive is used for this purpose. SetHandler should be set to perl-script for mod\_perl to work. There is a LoadModule required for mod\_perl, but its arguments include mod\_perl and the location of the mod\_perl module.
34. 34. C. The proxy\_pass directive, found within a location stanza in nginx, enables proxying of requests for that location to the specified URL. The other directives are not valid for nginx.
35. 35. C. The StartServers directive determines the number of child processes that will start initially. This number will change as requests are received, especially simultaneous requests. On busy servers, the StartServers directive may need to be increased, as will other related directives to ensure adequate performance.
36. 36. D. The LogFormat directive sets the parameters that are stored in a log file. The LogFormat directive sets up a logging profile that can then be used elsewhere within the configuration. The other options are not valid.
37. 37. C. The Require directive is used for this, and when requiring a specific user, the directive is followed by the keyword user and then the user to allow. The other directives shown are not valid for Apache.

## Chapter 20: File Sharing (Topic 209)

1. 1. B. The configuration files for Samba are located in /etc/samba. The directory is not named for a specific version of Samba. The other directories listed do not exist by default.
2. 2. B. The nmbd daemon is responsible for NetBIOS name service request handling. The smbd daemon is responsible for file and print sharing and winbindd provides user and group information. There is no daemon called samba.
3. 3. D. The smbcontrol command can be used to send messages to smbd, nmbd, or winbindd. When using the destination of all, the message will be sent to all three daemons. There are several message types that can be sent with smbcontrol, one of which is reload-config. There is a shutdown message, but that would be disruptive to users and would not reload the configs until restart.
4. 4. D. The file /etc/exports contains definitions of filesystems to be shared using NFS. The other files are not valid for use with NFS.
5. 5. A. Spacing is important within an NFS export configuration. This is the primary difference between option A and option C, regarding a space between the hostname and the (rw) configuration directive. With option A, where there is no space, www.example.com is allowed read-write access to the share. With option C, where there is a space, www.example.com is allowed only read access while everyone else is allowed read-write.
6. 6. B. The -k option enables Kerberos authentication for the net command. The -a option indicates that non-interactive mode should be used, and -l sets the log directory. There is no -b option.

7. 7. D. The `username map` option, which is set to a file containing the username mappings, is used to provide translation between a Windows username and the username on Linux for each user. The other options shown are not valid in a Samba configuration.
8. 8. C. A percent sign (%) is used to separate the username from the password, as in this example with a username of `Administrator` and a password of `adminpass: -U Administrator%adminpass`.
9. 9. C. Wildcards are specified with a \* or ? for NFS; therefore \*.example.org indicates that all hosts directly under example.org can connect. Note that the wildcard match is not hierarchical, meaning that subdomains underneath \*.example.org are not included (www.chicago.example.org, for example).
10. 10. D. The `cifs` filesystem type is used for mounting Samba shares. The `vfat` filesystem is used to mount native Windows filesystems, and `ext4` is a native Linux filesystem. There is no `win` type.
11. 11. C. The `mount` command can be used for this purpose, and when given the `-t cifs` argument it will show all mounted CIFS filesystems. There is no `smb` filesystem type, and the `ls` command with `-cifs` options will display various file listings but none specific to the CIFS filesystem.
12. 12. D. Setting the security parameter to `share` indicates that share-level security will be used. The parameter is set as in `security = share`. The other options shown for this question are not valid.
13. 13. B. The `-m` option to `rpcinfo` displays statistics for `rpcbind`. The `-s` and `-l` options are used to display lists of programs and entries for the specific program. There is no `-e` option for `rpcinfo`.
14. 14. B. The `showmount` command is used for this purpose, and when given the `-e` option it displays the exports for the server. Among the other options, the `mount` command is valid but not with the given options.
15. 15. C. The `/etc/fstab` file utilizes a specific format calling for the filesystem device, in this case `src.example.com:/source`, followed by the mount destination, in this case `/srv/source`, and then followed by the filesystem type. For this scenario, the filesystem type is `nfs`. Options for the filesystem along with default mount order are typically also included in `/etc/fstab`.
16. 16. A. The `-3` option shows only NFSv3 statistics. There are also corresponding `-2` and `-4` options for NFSv2 and NFSv4, respectively. The other options shown do not exist.
17. 17. B. The `/proc/mounts` file shows currently mounted filesystems. The `/etc/fstab` file shows filesystems that could be mounted but may not currently be mounted. The other files shown are not valid.
18. 18. A. When used with TCP Wrappers, as in `hosts.allow` and `hosts.deny`, the `portmap` service must use IP addresses. Therefore, option A is correct.
19. 19. B. The `-l` option displays a list of locks. The `-l` option sets the base directory for logging. There is no `-o` or `-m` option for `smbstatus`.
20. 20. B. The `smbpasswd` command is used for management of Samba credentials. When given the `-a` option, a new user is created. Of the other commands, the `passwd` command is valid but does not have a `-samba` option. The other commands are not valid.

21. 21. A. The browsable option, set to yes or no, configures whether a given share can be seen by browsing. When set to no, users must know the share name in order to interact with it.
22. 22. D. The dbcheck command for samba-tool verifies the location of the Active Directory database. The other commands are not used with samba-tool.
23. 23. C. The [global] section of the Samba configuration file enables setting of the log file. The other sections shown are not valid.
24. 24. C. The testparm command can be used to verify the syntax within Samba configuration files. The other commands shown are not valid.
25. 25. B. The exportfs command is used for several administrative tasks related to NFS. When given the -ra option, the /etc/exports file is reread, a new export list is created, and the shares are created.
26. 26. A. The -R option specifies the resolve order for names used with smbclient. For example, setting the value of the -R option to wins specifies that the WINS server should be used for name resolution. The -d option specifies the debug level.
27. 27. C. The -l option logs all successful mountd requests. Of the other options, the -n option allows non-root requests, and -r allows regular files to be served through RPC requests.
28. 28. B. The read only option, set to yes or no, defines whether users connecting to a given share can perform read/write operations on the share. The other options shown are not valid for Samba.
29. 29. C. The smbd daemon listens on TCP ports 139 and 445. Port 443 is used for HTTPS, and ports 161 and 162 are used for SNMP.
30. 30. C. The root\_squash option changes the privileges of root when using an NFS share from a remote client. The root user will have the lowest privileges possible. The other options are not valid for NFS.
31. 31. B. The net command is used for this solution, and when given the groupmap list subcommand and option, a mapping of Windows to Linux groups will be shown. The other commands are not valid.
32. 32. A. The -p option shows current portmappings for the various RPC-related services on the host. The -m option shows statistics. There is no -c or -f option for rpcinfo.
33. 33. B. The -x option deletes a user from the Samba user database. The -d option disables the account. The -e option enables the account. There is no -o option.
34. 34. C. The smbclient command can be used for this purpose, and when given the -l option and a hostname, the command will show the services available on that host. The other commands shown are not valid.
35. 35. C. The configuration shown, with %S.log, will create a separate log file for each share. All of the other options contain syntax errors that make them invalid for the Samba configuration file.
36. 36. D. The nmblookup command can be used to test NetBIOS-related services on a network.
37. 37. D. The exportfs command with the -u and -a options unexports all directories. Another way to accomplish this task would be to stop

the NFS daemons, but that option was not given among the choices.

### Chapter 21: Network Client Management (Topic 210)

1. 1. A. The `ddns-update-style` option configures whether a server performs a DNS update when leases are created or confirmed. The other options are not valid for use with DHCP.
2. 2. A. The `subnet` keyword is used for this purpose as well as a `netmask` parameter. The `netmask` shown will provide 126 usable addresses.
3. 3. B. The `hardware ethernet` directive is used to specify the MAC address for a given host to which the reservation will be tied. The other options are not used within DHCP.
4. 4. C. The directory `/etc/pam.d` stores configuration files for individual PAM-aware services. Each service typically has its own file that is managed for that service according to its usage of PAM. Of the other options, none of the directories are the default directories used for PAM.
5. 5. A. The standard port for LDAP is 389, and that is the port on which `slapd` listens for connections. Port 3389 is RDP, while 3306 is MySQL. Finally, 110 is POP3.
6. 6. D. The `ldapadd` command is used to add entries into the OpenLDAP database.
7. 7. C. DHCP traffic, which uses UDP, communicates on ports 67 and 68. Of the other ports, only 143 is widely used but as the port for IMAP and not related to UDP.
8. 8. D. The `slapd_db_recover` command can be used to help recover an OpenLDAP database that has become corrupt or otherwise invalid. The remaining options for this question are not valid commands.
9. 9. C. The domain suffix search order can be set through a DHCP option. The option name is `domain-search` and the values are separated by a comma.
10. 10. A. The directory `/var/lib/ldap` stores database files related to the OpenLDAP deployment on a given server. The other directories shown are not valid for this purpose.
11. 11. C. The `pam_nologin.so` module facilitates a scenario whereby non-root logins are prevented when `/etc/nologin` exists. This module must be specified within the configuration file for a given service. For example, within the `sshd` PAM configuration file, the following line creates this configuration for `ssh`:  
`account required pam_nologin.so`
12. 12. D. The LDAP Data Interchange Format (LDIF) is an open format, defined in RFC 2849, which enables import and export of LDAP entries. The file formats TXT and CSV are valid but not for the purpose described. There is no specific file format known as LDAP.
13. 13. C. The `pam_unix.so` module is used for standard login. The man page for `pam_unix.so` indicates that it is for "traditional password authentication." The other modules listed are not standard PAM modules, though there is a similar `pam_auth` or `squid_pam_auth` module for Squid.
14. 14. B. The `clients` section within an interface in `radvd.conf` enables configuration of specific clients to which route advertisements will be

sent. The other options listed for this question are not valid directives in `radvd.conf`.

15. 15. B. Debug level 64 provides configuration processing debug information. Debug level 1 traces function calls, while level 8 shows connection management. Debug level 0 is no debug.
16. 16. B. The `max-lease-time` directive, followed by the number of seconds, specifies the amount of time that a given host can have a lease before it is purged. The other options shown are not valid in a `dhcpd.conf` configuration file.
17. 17. B. The DHCPDISCOVER message being logged is coming from a client. The client is beginning the process of obtaining an IP address from the DHCP server.
18. 18. A. Within `nsswitch.conf`, the `passwd` line contains information about authentication. The format is as shown in the correct answer. Local authentication is accomplished using the `files` keyword for the normal `passwd` file. There is typically a similar line called `shadow`, assuming that the server is using shadow passwords. The `shadow` line follows a similar format.
19. 19. B. The `pam_cracklib.so` module enforces password strength options. The other files listed are not valid PAM modules.
20. 20. B. The `-c` option specifies an alternate configuration file for `sssd`. The `-f` option sends debug output to a file. There is no `-a` or `-m` option for `sssd`.
21. 21. C. DHCP failover communicates on port 647. DHCP failover is helpful to provide redundancy for this important service. Ports 67 and 68 are used for normal DHCP traffic, while 389 is for LDAP.
22. 22. C. The `router's` option defines the default gateway for a given DHCP lease. Like other options, routers can be specified at the subnet level or for an individual host. The other options are not valid for the purpose described.
23. 23. C. The `slapcat` command dumps the slapd database in LDIF format. The other commands are not valid.
24. 24. D. The `pam_limits.so` module is responsible for enforcement of limits such as those mentioned in the problem as well as several others like the maximum size of files, memory usage, and so on. The other modules listed are not valid.
25. 25. C. The `slapindex` command generates indexes based on slapd databases. The other commands are not valid.
26. 26. D. There are multiple ways to specify log levels and debugging for `slapd`, including by keyword, by integer, or as shown in the question, by hex. All of the values shown are valid for `loglevel`. No debugging is 0, trace is 1, stats logging is 256 or 512 depending on type, and packets sent and received is integer 16 or hex 0x10.
27. 27. D. The `-j` option enables specification of a line from which the import will be started. It is useful in the scenario described where the import needs to be restarted due to error. The `-f` option specifies an alternate location for the `slapd` configuration file. The `-q` option is quick mode, with less checking, and `-l` specifies the input file.
28. 28. D. Beginning with OpenLDAP version 2.3, `slapd-config` is used for configuration of OpenLDAP, as documented at <http://www.openldap.org/doc/admin24/slapdconf2.html>

(<http://www.openldap.org/doc/admin24/slapdconf2.html>). The other commands are not valid.

29. 29. B. The `changetype add` creates a new entry in the LDAP database. The other `changetypes` are not valid.
30. 30. B. Specifying one `-L` indicates LDIFv1 format. The next `-L` turns off comments in the output, and a third `-L` suppresses the version. The other options are not valid for the described scenario.
31. 31. C. The port for LDAPS or LDAP over SSL is 636. Port 389 is standard, non-SSL LDAP. Port 443 is used for HTTPS, and 3128 is used for Squid proxies.
32. 32. B. The `pam_listfiles.so` module is used to create scenarios whereby you can create files that control authentication and authorization through the PAM system. The other files are not valid for the scenario described.
33. 33. A. The `-n` option shows the results without actually making changes to the LDAP database. The other options are not valid for the scenario described.
34. 34. B. The filter `(objectClass=*)` is used when there is no filter provided for `ldapsearch`. The other filters shown are not valid with `ldapsearch`.
35. 35. A. The `pam_555.so` module is used for integration of SSSD into the PAM authentication system. The other modules are not valid.
36. 36. B. The `ldap_uri` option sets the URI of the LDAP server for use with SSSD. The other options are not valid for use in `555d.conf`.
37. 37. B. The `deny unknown-clients` configuration directive will cause the DHCP server to deny addresses when a client requests an address through DHCP. The other options shown are not valid.

## Chapter 22: E-Mail Services (Topic 211)

1. 1. A. The `postsuper` command is used for management of various items with Postfix, including deletion of individual messages from the mail queue. The other commands will not work for the purpose described.
2. 2. C. The `/var/spool/postfix` directory contains directories and files related to the mail queue for Postfix. The other directories listed are not valid for this scenario.
3. 3. B. PEM format is used for public and private keys with a Postfix TLS configuration. The other methods listed are valid cryptographic algorithms or systems but not for the scenario described.
4. 4. D. The `fileinto` keyword is used to define the destination for mail that matches one or more conditions within Sieve. The other configuration keywords are not valid.
5. 5. D. The directory `/etc/postfix` contains files related to the configuration of Postfix on a given server. While the other directories shown are valid names, they are not the default location for Postfix-related configs.
6. 6. B. The file `.procmailrc`, found in a user's home directory, is used by Procmail for processing messages on a per-user basis. The other files are not used by Procmail in a default configuration.

7. 7. D. The format is `local-address: destination-address`. Each destination address is separated by a comma. The difference between answers C and D is that the question specifically asked for addresses `@example.com`, and since the question didn't specify whether this server was the server for `@example.com`, the destination addresses needed to be fully qualified.
8. 8. C. The `mailq` command displays the current mail queue for a Postfix server. The other commands are not valid, though there is popular mail server software named `qmail`.
9. 9. A. The `postqueue` command will be used for this purpose, and when given the `-f` option, it will flush the queue immediately. The other commands and options do not meet the intended purpose for the scenario.
10. 10. B. The `postsuper` command is used for this purpose, specifically with the `-d` option. When given the `ALL` keyword, all messages will be deleted from the queue.
11. 11. A. The `newaliases` command will rebuild the `/etc/aliases` database so that changes will be noted by the mail daemon. The other commands shown are not valid.
12. 12. B. The `keep` action causes the message to be preserved in the mailbox. The other verbs shown are not valid Sieve actions.
13. 13. D. The `postcat` command shows the contents of a message from the Postfix queue. The other commands shown are not valid.
14. 14. D. The `doveadm` command is used for this solution. The option called `who` produces a list of the users who are currently logged in, their PIDs, and their IP addresses. There is no `list` option for `doveadm` or `dovecot`, and likewise there is no `users` option for the `dovecot` command.
15. 15. B. The `discard` keyword is used to specify that a message should be deleted. It is usually followed by the `stop` keyword in order to indicate that no further processing needs to be done for that message.
16. 16. A. The `postqueue -p` command and option view the pending queue. The `postqueue -f` command and option cause the queue to be flushed. The other commands shown are valid but their options are not.
17. 17. C. The `redirect` action will be used but must be accompanied by the `:copy` keyword in order to retain a copy of the message. There are no `forward` or `duplicate` keywords in Sieve.
18. 18. B. The `:days` keyword sets how frequently the vacation auto-responder will reply to a given sender. For example, setting `:days 1` means that the same sender will receive a vacation auto-response once a day at most. The other keywords are not valid.
19. 19. C. The `qshape` command displays information regarding the number and age of the messages in the Postfix incoming and active queues. Other queues can be viewed using the command as well. The other commands shown as options for this question are not valid.
20. 20. A. The `doveconf` command displays configuration parameters related to Dovecot, including the setting name and its value. The `dovecot` command is valid, as is the `doveadm` command. However, the options shown for both of those commands are not valid. There is no `doveconfig` command.



21. 21. A. There is an implicit keep action if no other action takes precedence or otherwise handles the e-mail within a set of actions. There is a `discard` action, but it is not the default. There is no action called `shred` or `forward`.
22. 22. B. The `mynetworks` parameter sets the networks or hosts that are allowed to relay through the Postfix server. The other options are not valid. Note that there are parameters related to relaying, such as `relayhost`, but those are typically used to set the destination for relaying rather than allow relaying through the server.
23. 23. D. The `doveadm` command, when used with the `auth` option, tests authentication for a given user. There is a `dovecot` command, but the command does not have `auth` or `testauth` options. Likewise, there is no `testauth` option to `doveadm`.
24. 24. D. The `m4` command compiles a native Sendmail configuration into the final Sendmail configuration file. A standard redirect is used to send the output to its final destination.
25. 25. A. The `postconf` command is used for this purpose, and when given the `-d` option it displays all parameters in the current Postfix configuration. Note that the only other command shown that is valid is `postfix`, but that command uses `-c` to specify the configuration directory and not for the purpose described in the scenario for this question.
26. 26. C. The file `/var/log/mail.err` contains errors related to mail delivery. However, on some systems, mail-related errors may go to a different log such as `/var/log/mail.log` or `/var/log/mail.info` or similar.
27. 27. B. The `inet_listener` directive creates a stanza for a listening port within Dovecot. Additional parameters can be specified relating to the given listener within the `inet_listener` stanza.
28. 28. A. SMTP uses TCP port 25 by default. Port 110 is POP3, and 143 is IMAP. Port 2525 is not a well-known port.
29. 29. C. The `mailq_path` parameter contains the path to the mail queue for Postfix. You can use this to diagnose problems with the queue directories. The other parameters shown are not valid in Postfix.
30. 30. D. The `EHLO` command indicates Extended Hello syntax, and it is followed by the host from which communication has been initiated. Of the other options, the `HELO` option is valid, but it is not the Extended Hello syntax specified in the question.
31. 31. B. Sieve uses `elsif` for definition of an alternate condition. The other forms of this keyword are valid for many languages but not for Sieve. There is no `alt` keyword.
32. 32. B. The `:contains` keyword looks through an object such as an address to see if there is a matching string within it. The other keywords shown are not valid.
33. 33. A. The `process_limit` option specifies the maximum login processes for a Dovecot server. The parameter is set on a per-service basis.
34. 34. D. The `:domain` keyword matches on just the domain portion of an address in Sieve. The other keywords shown are not valid.
35. 35. B. The default port for IMAPS is 993. POP3 uses 110 for unencrypted communication and 995 for encrypted communication.

The default port for unencrypted IMAP is 143.

36. 36. A. The Exim configuration file is `/etc/exim/exim4.conf` by default on Debian, but it may be named as shown for the other options when using other Linux distributions.

37. 37. B. The `postscreen_tls_security_level` option sets the security level for the postscreen server. This option should be used instead of the `postscreen_use_tls` and `smtpd_use_tls` options.

### Chapter 23: System Security (Topic 212)

1. 1. A. The `PermitRootLogin` directive, set to `yes` or `no`, determines whether the root user can log in directly. The other options shown are not valid.

2. 2. B. The file `vsftpd.conf` contains the configuration for `vsftpd`. The file can be found in `/etc` or within a subdirectory such as `/etc/vsftpd`.

3. 3. B. The `PREROUTING` chain, part of the `nat` table, contains rules that are applied as packets arrive. A common use for this chain is to apply redirect rules. Among the other answers, `REDIRECT` may appear valid, but it is in fact a target and not a chain. The other options shown are not valid.

4. 4. A. The primary configuration file for OpenSSH is `/etc/ssh/ssh_config`. The other options shown are not valid.

5. 5. C. The `iptables-save` command creates a file with the currently running iptables rules. The file can then be applied the next time the server is restarted. The other commands shown are not valid.

6. 6. B. The `-H` option causes Pure FTPd not to resolve host names. The `-n` option is used for quota enforcement, and the `-r` option is used to indicate that existing files should not be overwritten. The `-z` option allows anonymous users to read directories and files that are preceded with a dot.

7. 7. D. The `ssh-keygen` command generates a public and private key pair that can be used for user authentication between a client and server. The other commands shown are not valid.

8. 8. B. The `telnet` command can be used for this purpose and, for SMTP, requires the use of a port as shown in the correct answer for this question. There is no `smtp-test` command, and specifying the port by name or not specifying the port will not work.

9. 9. D. The `iptables -n` option causes iptables not to resolve host names or port names. The `-L` option lists current rules. There is no `-a` option.

10. 10. C. The `-i` option disables uploads by anonymous users. The `-a` option keeps users in their home directory unless they are a member of a specified group. The `-m` option prevents anonymous download if the CPU load on the server is above a threshold. The `-n` option is used for quota enforcement.

11. 11. A. The `Port` option specifies the port on which the OpenSSH server daemon will listen. Clients will need to specify the port using `-p` or with colon notation in order to connect to the server. The other options shown are not valid.

12. 12. B. The `push` directive is used to send a route to clients on connection. In this case, the network and netmask are sent, with `255.255.255.0` being appropriate for a `/24`. The other options are not valid.
13. 13. B. The `nmap` command is used for this purpose, and the `-sT` option performs a TCP Connect to the specified host or network. The other commands are not valid.
14. 14. D. The `/etc/fail2ban` directory contains configuration files related to fail2ban. The other directories shown are not valid.
15. 15. A. The `-i` option specifies the identity file or key that will be used for authentication. The server must have a copy of the public key and be configured for key-based authentication in order for the authentication to be successful. The `-p` option specifies the port. The `-k` option disables forwarding of GSSAPI credentials and is not related to the described scenario. The `-l` option specifies the username to use for authentication.
16. 16. B. The `ip6tables-save` command saves the currently running IPv6 iptables configuration. The other commands shown are not valid. Most of the IPv6 commands related to iptables are of the form `ip6tables`.
17. 17. B. The `PermitEmptyPasswords` directive, when set to yes or no, specifies whether empty passwords can be used for authentication. Enabling empty passwords would be a specialized use case and generally not recommended. The other options shown are not valid.
18. 18. C. The `-P` option sets the policy for a given chain in `iptables`. In this case, the chain is `INPUT` and the policy necessary is `DROP`.
19. 19. B. OpenVPN listens on UDP port 1194 by default. The other combinations are not the valid OpenVPN configuration.
20. 20. B. The `Protocol` directive specifies the version of the SSH protocol that should be used. Currently, version 2 is recommended. The other options shown are not valid.
21. 21. B. The `DROP` target silently discards packets that match the rule. An ICMP unreachable message is sent back for `REJECT`. In general, `DROP` is preferred in order to reduce the chances of Denial of Service (DoS) or other information-gathering issues.
22. 22. D. The file `authorized_keys` contains keys that can then be used for authentication when the corresponding private key is sent by the client. The other files are not valid.
23. 23. B. The `-m` match limit, along with the configuration options shown, creates the scenario described. There will be three log entries per minute. This can be useful to prevent Denial of Service by filling up log files or overwhelming the server I/O while another attack is under way.
24. 24. C. The `-X` option enables X11 application forwarding through an SSH connection. The `-A` option is used for authentication agent forwarding, and `-F` indicates a per-user configuration file. There is no `-X11` option.
25. 25. C. The `lsof -i` command and option can be used for this purpose. A list of processes and ports will be shown and can then be used to determine which actual process is listening on the port. Of the other commands, `tcpdump` is valid but will not show the information necessary to solve the problem described. The other commands are not valid.

26. 26. A. The INPUT chain is used, and when used with the -A option, it will append a rule to the chain. The -p option specifies the protocol, ICMP in this case, and the -j option specifies the target, ACCEPT, in this case. The -P option specifies a policy and is not used for this scenario.
27. 27. D. The AllowTcpForwarding configuration directive determines whether port forwarding will be allowed through the SSH server. When enabled, clients can forward ports through their SSH connections. The other directives are not valid.
28. 28. B. The INPUT chain will be used, and a rule needs to be appended with -A. The ALL option when specifying protocol means that all protocols will be included in the rule. The -s option specifies the source, which in this case is a single IP address. Finally, the DROP target silently discards packets. There is no BLOCK or DISCARD target, and the ACCEPT target will not block but will accept all traffic.
29. 29. A. A rule will be appended to the INPUT chain with -A. In this case, the protocol should be specified with -p TCP and a destination port of 2222. The source address indicated, 0/0, applies the rule to all hosts. The ACCEPT target will be used.
30. 30. B. Echoing a 1 to the /proc/sys/net/ipv4/ip\_forward file enables forwarding of IP packets. This is necessary in order to utilize NAT and for other uses. There is no /proc/sys/net/ipv4/nat file.
31. 31. D. The listen\_ipv6 directive is used to indicate that IPv6 will be enabled for vsftpd. The other directives shown are not valid.
32. 32. C. The PubkeyAuthentication directive determines whether key-based authentication can be used with the server. The other directives shown are not valid.
33. 33. A. The logpath directive determines the log file that will be monitored for failures by fail2ban. This file is used as part of a larger configuration for a given jail. The other directives are not valid for fail2ban.
34. 34. D. The ssh-copy-id command sends an identity to a remote server that can then be used for key-based authentication. The other commands shown are not valid.
35. 35. B. The ip6tables command is used for creation and maintenance of a firewall for IPv6. The ip6tables command is similar to the iptables command in form.
36. 36. C. The push directive is used, and it requires the use of dhcp-option, in this case, DNS 192.168.2.1. The other formats and options are not valid.
37. 37. A. The local\_enable directive specifies whether users will be able to log in to the server. This option would not be used in cases where the FTP server is anonymous only.

#### Chapter 24: Practice Test 1

1. 1. B. The /proc filesystem stores information about running processes on the system. The /etc filesystem is used for configuration information, and /dev is used for device information. The /environment filesystem does not exist on a default Linux system.
2. 2. C. The /etc/modprobe.d directory contains information related to the modprobe configuration. This can be overridden with the -C option on the command line.

3. 3. A. The `-g` option to `wall` sends the input to the specified group. Answer B will send the output to all users, while answers C and D will not work.
4. 4. B. The `SIGTERM` signal is the default signal sent with the `systemctl kill` command.
5. 5. B. The `-e` option to `dmesg` displays the time in local time and the delta in a format that is typically easier to work with. The `-rel` option does not exist. The `-f` option specifies the logging facility, and `-t` does not display time at all.
6. 6. B. The `init` process is typically associated with the initial process ID of 1 to indicate that it is the process from which others are spawned. Killing PID 1 will typically and immediately halt the system.
7. 7. C. The `lspci` command shows the PCI devices in the system, and the `-k` option shows the kernel driver being used by the given device. The `lsusb` command will not accomplish the task requested, and the `ls` command with `-pci` will not display the correct information. There is no `showpci` command.
8. 8. C. The `-no-wall` option will cause `telinit` not to send a `wall` command to logged-in users about the state change. The other options listed in this problem do not exist.
9. 9. A. The `class/net` hierarchy within `/sys` contains information on the network configuration for the computer. It is a symlink to the devices hierarchy, where the device will be listed by its address rather than the logical etho name.
10. 10. D. A logical location to begin troubleshooting is within the system BIOS to ensure that the drive is being detected by the computer.
11. 11. C. The `dbus-monitor` program, which requires an X display, can be used to monitor `dbus`. The other programs and options listed for this question do not exist.
12. 12. A. The `udev` service is called `systemd-udev.service` within a `systemd` environment.
13. 13. A. The system can be scheduled to shut down at a certain time, and that time should be entered in 24-hour format, as shown in the answer.
14. 14. C. The `-s` option changes the signal to be sent from its default of `SIGTERM`. The new signal must be one of the main signal types such as `SIGINT` or `SIGSTOP`.
15. 15. D. The `list-unit-files` command shows the files available, while `-type=service` limits those files to the services, in the same way that `chkconfig --list` returns a list of services.
16. 16. A. The `-C` option sets the location of the cache to be updated instead of the default `/etc/ld.so.cache`. The lowercase option, `-c`, changes the format of the cache, while `-v` sets verbose mode. The `-f` option does not exist.
17. 17. C. The `-P` option to `dpkg` will purge a package from the system, including the configuration files associated with the package. The `apt-cache clean` command will clean the package cache but not an individual package, and the `apt-get remove` command will remove a package but not associated configuration files.

18. 18. C. The `deb-src` prefix is used to indicate that a given repository contains source packages. The `deb` prefix in option A would indicate normal packages. The other options are not valid.
19. 19. B. The `-U` option is used to upgrade a package. Adding `-v` for verbose and `-h` for hash marks will print additional information and progress, as requested by the problem.
20. 20. A. The `-y` or `--assume-yes` option will do what it says, that is, assume that you will answer yes and therefore not prompt. The other options do not exist.
21. 21. A. The `exclude` option within `/etc/yum.conf` is a space-separated list of packages that accepts wildcards and cannot be installed or upgraded. The other options listed in this question do not exist.
22. 22. C. The `ldconfig` command is used to work with the library cache and the `-p` option prints the directories and libraries in the cache. The `-C` option informs `ldconfig` to use a different cache. The `ldd` command prints the library dependencies for a given command, but the options given don't exist for `ldd`.
23. 23. D. The `baseurl` option is used to set the URL and must be fully qualified, meaning that it must include the protocol such as `http://` or `file://`.
24. 24. B. The `apt-cache dump` command will display a listing of the available packages and their respective dependencies. The other commands and options listed in this problem do not exist.
25. 25. A. The `/boot` directory almost certainly exists but has not been partitioned into its own space. The `/boot` partition would not be hidden from `lsblk` if it was indeed a separate partition.
26. 26. B. The `/var/cache` hierarchy contains cached data for both package management tools. In the case of `yum`, cached data is stored in `/var/cache/yum`, and in the case of a Debian-based system, cached data is stored in `/var/cache/apt`.
27. 27. A. The Master Boot Record (MBR) is the typical location for the bootloader to be stored on a BIOS-based system.
28. 28. D. The `/` filesystem is the root filesystem. If separate partitions have not been created, the `/` filesystem will be the beginning of the hierarchy and will contain all other directories in the same partition.
29. 29. A. The `--output` option configures the location for output of the command instead of `STDOUT`.
30. 30. C. The tilde key (`~`) is used as a substitute for a given user's home directory. The other options shown here will not work for the purpose described.
31. 31. A. The `dd` command is used for this purpose, and in this case it takes an input file with the `if` option and an output destination with the `of` option. The `bs` option signals that the block size for writing should be 1 megabyte.
32. 32. D. The `history` command displays history from the current session and can be used for the purpose described. The `.bash_history` file is written on session close, by default.

33. 33. C. The `-boot-directory` option will install the boot images into the directory specified. This might be helpful for non-standard installs or at times when you need to mount the boot partition separately. The other options listed in this question do not exist.
34. 34. A. The `update-grub` command should be executed in order to make changes take effect in the menu and when changes have been made to the GRUB configuration. The other commands listed in this question do not exist.
35. 35. B. The `export` command is used for this purpose and accepts a name=value pair, as shown in the answer. The other commands are not valid with the exception of the `echo` command, which will simply echo the argument to the console.
36. 36. C. The `HISTFILESIZE` option configures the number of commands to keep in the history file. The other variables are not valid within Bash.
37. 37. D. The `-b` option configures the body numbering format for `n1`, which by default will not number blank lines. The `-a` format option will number all lines including blanks. The `-a` option is not for the `n1` command, and the `-n` option configures the numbering format and would require an additional argument in order to be valid.
38. 38. D. The `od` command is used to create octal output. The `cat` command will show the file as it exists on disk. The other two commands are not valid.
39. 39. A. The `pr` command formats text for printing, including the date and page numbers at the top of each page. Adding the `-d` option causes the output to be double-spaced. The `cat` command will display output but will not be paginated in such a way. The other two commands are not valid.
40. 40. A. The `-n` option is used to change the number of lines. Adding the `+N` after the `-n` option begins the `tail` process at the `N`th line within the file.
41. 41. C. The `-i` option causes the unique test to be done while ignoring the case of the element to be matched.
42. 42. C. The `awk` command shown can be used for this purpose. The `-F` option sets the field separator, and the `OFS` option sets the output field separator.
43. 43. C. The `-a` option is equivalent to the `-d` and `-R` options, which preserve links and copy recursively, respectively. The `-b` option creates a backup, and `-f` forces the copy.
44. 44. A. When in command mode, typing a number followed by an uppercase `G` will immediately move the cursor to that line number. The `/23` option will search for the number 23 in the file. The `i23` option will insert the number 23, and finally `ZZ` will exit `Vi`.
45. 45. A. The `-d` option changes the update interval and can be helpful on a busy system where `top` may be affecting performance. The `-n` option sets the number of iterations to run. There is no `-t` or `-f` option for `top`.
46. 46. B. The `ps -e` command is used to display all processes, while the `-o` option configures the columns to display.
47. 47. A. The `grep` command can be used for this purpose. Note the difference between `grep -r` and `grep -ri`. The question did not ask

for case insensitivity, and therefore the use of `-i` in option B makes it incorrect.

48. 48. B. The `find` command will be used for this purpose. Setting the directory from which to begin the `find` is required, along with the expression, which in this case is files beginning with `DB`.

49. 49. B. Load average information is gathered from `/proc/loadavg`, while uptime information is stored on `/proc/uptime`.

50. 50. C. The `-f` option will force the `umount` to occur. The `-fake` option is essentially a dry run in that it won't actually unmount a filesystem. The other two options do not exist.

51. 51. C. The `-r` option will perform an interactive repair. The `-f` option forces the operation, while `-y` and `-a` are both variations of non-interactive repair.

52. 52. D. The `/etc/mtab` file is updated dynamically as filesystems are mounted and unmounted. The `/etc/fstab` file is not dynamically updated.

53. 53. B. The `-s` option displays output in human-readable format. The `-p` option is used to print the raw grace period. The `-h` option displays help, and the `-f` (lowercase) does not exist, though `-F` (uppercase) would change the report format.

54. 54. B. The `-B` option changes the format and `-T` sets the scale to terabytes. The other options do not exist.

55. 55. A. The `e2image` program can be used to create an image of metadata that can help with drive recovery. The resulting image file can be used with programs like `dumpe2fs` and `debugfs`.

56. 56. C. The `-c` option checks for bad blocks. The `-b` option sets the block size. There is no `-a` or `-d` option.

57. 57. B. The `chown` command is used for this purpose, and it can be used to set both the user and group for ownership.

58. 58. B. The `HISTSIZE` value is the current session history. `HISTFILESIZE` configures the number of lines to keep in the `.bash_history`.

59. 59. C. The `GRUB_RECORDFAIL_TIMEOUT` option is used to configure the behavior of the system in the event of a failed boot. Setting the value to `-1` will display the GRUB menu and not continue booting. Setting to `0` will cause the menu to not display. Setting to a value greater than or equal to `1` will cause the menu to display for that many seconds.

60. 60. A. The `-s` option displays a summary, while `-h` displays it in a human-readable format.

61. 61. D. The `-L` option tells `find` to follow symlinks. The `-H` and `-P` options are both variations to tell `find` not to follow symlinks, while the `-S` option does not exist.

## Chapter 25: Practice Test 2

1. 1. A. The `/etc/hosts.deny` file is part of TCP Wrappers along with `/etc/hosts.allow`. Both provide a basic mechanism for configuration of access from remote hosts to network services.



2. 2. B. The WHERE clause can be used to limit the rows returned or affected by a SELECT, UPDATE, or DELETE statement. Within a GROUP BY, the HAVING keyword is used.
3. 3. C. The alias command uses the alias name followed by an equals sign followed by the command to be aliased. In this case, because the command to be aliased contains spaces, it needs to be contained in quotation marks.
4. 4. C. Shell scripting syntax uses the format shown, with square brackets around the condition to be tested and double-equals for a string test. Variables are preceded by a dollar sign as shown.
5. 5. A. The export command is necessary so that any variables that are manually defined in your current session become available to child processes. The source command executes the file and can be used for the purpose described, but it requires an additional argument. The let and def commands are not valid.
6. 6. C. The source command is the functional equivalent of a single dot (.). The set command exists, but it is not used for this purpose. The other commands are not valid.
7. 7. A. The syntax for setting the PATH separates the new path with a colon, as shown in the correct option. A primary difference between the correct and incorrect options for this question is in how the actual specified path is shown.
8. 8. A. The correct syntax is as shown. Note that a semicolon is required when the commands are included on one line, as shown in the answer.
9. 9. C. The mail command with -s for the subject is necessary, followed by the e-mail address for the mail. Then input is redirected to the mail command using /etc/hostname.
10. 10. C. The /etc/skel directory contains files that are a skeleton of a user's home directory when their account is created. The other directories listed do not exist by default.
11. 11. B. The syntax at a minimum sees the UPDATE keyword, followed by the table name, and then followed by the SET keyword.
12. 12. A. The command shown launches speech output for Orca. The other commands contain options that are invalid and thus will not work.
13. 13. D. The Universal Access section, which can be found by typing Universal Access from within an Ubuntu GUI interface, enables configuration of accessibility options.
14. 14. B. The kbdrate command is used for the purpose described and can help with accessibility. The other commands shown are not valid.
15. 15. A. The configuration files can be found in the /etc/lightdm hierarchy or /usr/share/lightdm. The other directory locations do not exist by default.
16. 16. A. The DISPLAY variable controls the destination and screen for displaying GUI applications. Setting this variable facilitates forwarding of X applications over ssh.
17. 17. D. The xwininfo command is used to gather information about windows. The other commands shown are not valid.

18. 18. B. The `xhost` command is used to control who can make connections for both users and hosts to a given X server. The other commands are not valid.
19. 19. B. The `-f` option sets the days between expiration and disabled for an account. The `-g` option is used to set the group ID, while `-e` is used to set the overall expiration date.
20. 20. A. The `getent` command can be used for the purpose described, and it will display the aliases on the server by examining the aliases database. The other commands are not valid, and in the case of the `mail` command shown it will simply attempt to send mail to an address known as aliases.
21. 21. C. The `ALL: ALL` syntax will cause all hosts to be denied. This means that you must explicitly authorize hosts and networks using `/etc/hosts.allow`.
22. 22. B. The current at jobs for all users are shown when `atq` is executed as superuser.
23. 23. A. The `tzconfig` command can be used on a Debian system to set the time zone. The other commands listed do not exist.
24. 24. C. The `-r` option to the `crontab` command removes all cron entries for a given user. The `-l` option lists cron jobs, while the `-e` edits the `crontab`. There is no `-d` option.
25. 25. A. The `-u` option specifies the user. The `-l` option lists the cron jobs and `-e` edits them. There is no `-d` or `-m` option.
26. 26. C. The `locale` command is used for this purpose, and the `-m` option displays the available character maps. There is no `charmap` or `mapinfo` command.
27. 27. B. Timezone information is found within the `/usr/share/zoneinfo` hierarchy. The other directories listed do not typically exist by default.
28. 28. A. The `userdel` command, given no other options, does not delete their home directory. When given the `-r` option, the command will delete the home directory and mail spool file. There is no `-h` or `-p` option for the `userdel` command.
29. 29. D. The `-gid` option is used to specify group ownership for the `find` command. The `-group` option does exist, but since the question specified that the group had already been deleted, the `-gid` must be used instead. There is a `-user` option, but that searches by name and not group ID.
30. 30. B. The `groupmod` command is used for this purpose, and the `-n` option followed by the new group name is used to change the name. There is no `groupchg` command.
31. 31. D. The `journalctl` command is used to view and parse log file entries on `systemd`-based systems that maintain logs in a special format. The `logger` command can be used to create log entries, and the other commands shown do not exist.
32. 32. A. The default location on a Red Hat system is `/var/lib/ntp/drift`. The other locations shown do not exist by default. Within `/etc/ntpd.conf`, the location of the drift file can be changed with the `driftfile` option.

33. 33. A. The `-o` option, followed by either 1 or 2, enables `ntpd` compatibility with older NTP servers. The default, when no `-o` option is specified, is version 3. The `-v` option tells `ntpd` to be verbose, while the `-e` option sets the authentication timeout.
34. 34. D. The directory `/var/log/journal` is used to store journal log files for `systemd`-based systems. The other directories do not exist by default.
35. 35. C. The `-m` option sets the mail program to use when mailing logs. It is set to `/usr/bin/mail -s` by default. There is no `-o` option and `-v` is verbose. The `-s` option to the `logrotate` command sets the state file to use.
36. 36. A. The `-u` option configures the output to UTC regardless of the time zone. The `-s` option sets the time, and there is no `-v` or `-t` option.
37. 37. D. The `lprm` command is used to remove print jobs on a system that uses the `lp` system for printing. There is no `lpdel` or `rmprint` command. There is an `rm` command, but it's not used for working with print queues.
38. 38. C. The `<<<` character combination reads input from STDIN or Standard Input and uses it as the body of the message for the `mail` command.
39. 39. C. The `groupdel` command is used to remove a group from a system. There can be no members of the group remaining or the command will fail.
40. 40. C. The `lp` `syslog` facility sends messages from the `lp` subsystem to `syslog`. The `auth` facility is used for security-related messages. The other listed options are not `syslog` facilities.
41. 41. D. The `255.255.254.0` subnet mask is equivalent to a `/23`. The `255.255.255.0` subnet mask is a `/24`. The subnet mask `255.255.255.255` is `/32` and `255.255.0.0` is a `/16`.
42. 42. A. The `/etc/hosts` file will be examined first, and then a DNS query will be sent based on the configuration shown.
43. 43. D. Standard LDAP traffic is TCP port 389 on the server. TCP port 25 is SMTP, 443 is HTTPS, and 143 is IMAP.
44. 44. C. The `-l` option to `ssh` changes the username sent for authentication. This can be useful for scripting scenarios where the `@` notation cannot be used. The `-v` option is verbose mode, and `-i` is the identity file to use. There is no `-u` option.
45. 45. D. The `-n` option disables name resolution for addresses involved in the `ping` request/reply. The `-D` option returns a timestamp, while `-d` sets the `SO_DEBUG` option. Finally, `-f` is a flood ping.
46. 46. A. The `ifconfig` command shows various statistics about the interfaces on a Linux system, including whether the interface is up or down, its packets and bytes, queue length, and other information. The other commands listed do not exist.
47. 47. B. The `-6` option causes `dig` to use IPv6 for communication.
48. 48. B. The current limit is six domains and 256 total characters for the search option in `/etc/resolv.conf`.

49. **49. C.** The `-C` option shows SOA for each of the DNS name servers listed as authoritative for the domain. The `-a` option sends an ANY query, while `-N` sets the number of dots for the domain to be considered absolute. There is no `-n` option.
50. **50. A.** The entire `127.0.0.0/8` range is available for local host addresses. Therefore, an answer would need to be in this range. The proper format for `/etc/hosts` is IP address followed by name followed by alias, which makes answer A correct.
51. **51. C.** The `-ignore-errors` option tells `ifup` to continue even if there are otherwise fatal errors. The `-h` option outputs help. There is no `-C` or `-continue` option.
52. **52. C.** The `-u` option unlocks an account that was locked using the `-l` option. The `-w` option sets the warn days, and `-S` prints the status.
53. **53. C.** When connecting to an alternate port, you can use the `-p` option to set the port or use a colon to separate the host from the port.
54. **54. A.** If `/etc/cron.allow` exists, then `/etc/cron.deny` is ignored and only those users listed in `/etc/cron.allow` can create cron jobs.
55. **55. B.** The `mailto` configuration option sets the destination for e-mails related to `sudo`. The other options listed are not valid for `sudo`.
56. **56. B.** The `who` command displays who is currently logged in and the date and time they logged in. The `whois` command displays information about domains. The other commands are not valid.
57. **57. C.** Port 123 is used for NTP communication by default. Port 161 is SNMP, while Port 139 is NetBIOS and Port 194 is IRC.
58. **58. D.** A UDP scan can be initiated with `-sU`. A scan of `-sT` is a normal TCP scan, and `-sS` is a SYN scan. There is no `-sP` option.
59. **59. C.** The `ssh-keyscan` command can be used to retrieve a host key from a remote ssh host, and it is helpful in scripting scenarios to prevent prompting for a host key on initial connect. There is an `ssh-keygen` command, but it is used to work with keys that are local.
60. **60. B.** The `+D` option is used to search an entire directory tree for files that are open by processes. The `-d` option does essentially the same thing, but it does not go into subdirectories. The `-f` option is typically used in combination with other options to control path name interpretation. The `-i` option lists files or processes with open ports.

### Chapter 26: Practice Test 3

1. **1. A.** The `-delay` option sets the interval between checks of array health. The argument value is in seconds. The other options shown are not valid.
2. **2. A.** The `-assemble` option starts an array that has been previously stopped. The other options are not valid.
3. **3. B.** The `sfdisk` command can be used for this purpose, and when given the `-id` argument, you can specify the disk and partition on which to operate. The partition type `fd` is Linux RAID.
4. **4. D.** The WWID, or World Wide Identifier, is a unique and system-independent way to identify an individual SCSI device such as that which might be seen when using a SAN or iSCSI device. Of the other

options, a `/dev/sd` device is not persistent across systems or reboots. The other options do not exist.

5. 5. A. The discovery mode is used to discover iSCSI targets. The other options are not valid modes for `iscsiadm`.

6. 6. C. The `vgscan` command is used to build the LVM cache file. The cache file keeps a list of current LVM devices. The other commands shown are not valid.

7. 7. B. The `sysctl` command can be used to view various kernel parameters including the current hostname. That is the primary difference between looking at `sysctl` and examining `/etc/hostname` or `/etc/hosts`. The `sysctl` command will give the current value, which was specified as a criterion in the question.

8. 8. A. The Banner option within the `sshd_config` file provides a means by which an administrator can display a message to people logging in with ssh.

9. 9. D. The `-prefix` option sets the destination prefix or directory into which the resulting compiled code will be installed, typically meaning the binaries from a compile process. The other options shown are not valid in most configure scripts.

10. 10. D. The archive option, invoked with `-a`, is equivalent to several other options with `rsync`, such as recursive, preservation of groups and ownership, and others.

11. 11. A. The `-D` option disables printing of messages to the console. The `-E` option turns such printing back on. There is no `-O` or `-off` option for `dmesg`.

12. 12. B. The `-g` option displays multicast information. The `-r` option displays route information, and `-a` displays sockets. There is no `-m` option for `netstat`.

13. 13. C. The `-r` option causes the `ip` command to attempt to resolve IP addresses. The `-f` option specifies the protocol family. There is no `-n` or `-a` option to the `ip` command.

14. 14. A. The `ss` command is used, and when given the `-o` option, timer information is displayed. The `netstat -rn` command shows route information but not sockets or timing, and `ping -f` is a flood ping and not related. The `ls -l` command displays files in a long listing format.

15. 15. D. The `dd` command typically takes arguments for input file (`if`) and output file (`of`) in the format shown.

16. 16. C. All of the addresses shown are in private ranges. The only one with the correct netmask is `255.255.255.0`, which is equivalent to 24 masked bits.

17. 17. B. The `-b` option creates a backup of destination files. The `-a` option is archive, `-c` uses a checksum for determining which files to transfer, and `-d` includes directories but not necessarily recursive copying within the directories.

18. 18. D. The `-p` option preserves permissions. The `-x` option extracts, while `-z` unzips with `gzip`. The `-v` option is verbose.

19. 19. C. The `!H` sequence indicates host unreachable. Network unreachable is `!N`.

20. 20. A. The `-m` option specifies how the packet should be marked or tagged. The `-a` option is audible ping, while `-p` enables specification of custom padding. There is no `-k` option.
21. 21. D. The environment variable `TAPE` can be used to specify the device on which `mt` will operate. The other environment variables are not used by the `mt` command.
22. 22. C. The `/etc` directory and its subdirectories typically contain configuration files that would be necessary in order to re-create the system in a restoration scenario. The `/var` directory usually contains variable information, while `/opt` may be used for several other purposes. The `/bin` directory contains binaries that can usually be reinstalled.
23. 23. B. The `-i` option tells `patch` to ignore whitespace. This might be necessary when the `patch` file doesn't match exactly what's needed. The `-p` option sets the level of directory for the `patch`, while `-e` informs `patch` to interpret as an `ed` script. There is no `-w` option for `patch`.
24. 24. C. The `-i` option sets the interval between ping requests for `iscsiadm`. The `-a` option sets the IP address in ping mode, `-o` sets a database operation, and there is no `-e` option.
25. 25. B. The `-C` option checks the power mode on drives that support the operation. The `-a` option gets or sets the sector count, `-d` gets or sets the `using_dma` option, and the `-f` option syncs and flushes the buffer cache for the drive on exit.
26. 26. D. The file `/proc/swaps` contains information on the swap spaces available on a given computer. The other files do not exist by default.
27. 27. B. The `rescue` target boots the system into rescue mode, from which system recovery can be performed. The other targets listed are not valid.
28. 28. B. The `-r` option displays a report including CPU time and exit status about the just-completed `fsck` operation. The `-f` option forces whatever operation is being requested, `-s` serializes `fsck` operations, and `-l` creates an exclusive flock.
29. 29. C. The `allnoconfig` target answers `no` to every question when creating a new config for kernel compilation. Of the other options, only the `config` target is valid and is used to create a normal config, prompting for answers to portions of the kernel to include.
30. 30. D. The file `/proc/meminfo` provides a wealth of information about memory usage and utilization. Much of this information is displayed by various commands, but the canonical source for those commands is usually found in this file. Of the other options, only `/proc/cpuinfo` is valid and that file provides information on the CPU(s) for the computer.
31. 31. B. The `-p` option shows the parameters for a given module. The other options are not valid for the `modinfo` command.
32. 32. C. The `-k` option displays the kernel driver for a given PCI device. The `-d` option selects devices from the specified vendor. The other options are not valid.
33. 33. D. The `udevadm` command should be used for this purpose, and the `hwdb` mode works with the hardware database. The `-u` option updates the database.

34. 34. A. The `systemd-delta` command helps to sort out the scenario described by showing overridden, masked, and other file conflicts and ordering. The other commands and options shown are not valid.
35. 35. B. The `grub-install` command is used for this scenario. SCSI disks are located in `/dev/sd*` by default, with the first disk being `/dev/sda` and the second `/dev/sdb`. Option D is incorrect because it lists both `/dev/sdb` and the partition number (2).
36. 36. D. The `blkid` command displays the UUID and other relevant information for appropriate devices. The other commands shown are not valid.
37. 37. C. LUKS encryption is the default mode for the `dm-crypt` command. Other modes include `plain`, `loopaes`, and `tcrypt`.
38. 38. B. The `-b` option accepts a parameter of the file containing the El Torito boot image. The boot image must be 1200, 1440, or 2880 KB in size. The other options are not valid with `mkisofs`.
39. 39. C. An exit code of 64 means that some disks failed the trim process. An exit code of 0 is success, 1 is general failure, and 32 is all failed.
40. 40. D. The correct option is `-s` for the `arp` command, and the format is `address` followed by `hardware address`. The `-d` option deletes an entry, and `-a` displays all entries.
41. 41. B. The `txpower` option displays available transmit power for the interface. The `power` option is available, and it lists the power management modes for the interface. The other two are not valid.
42. 42. D. An Xmas scan is available using the `-sX` mode of `nmap`. The `-sT` mode is a TCP connect and `-sS` is TCP SYN. There is no `-sP` option.
43. 43. A. The `-s` option sets the snapshot length, or `snaptlen`, of the capture instead of its default of 65535 bytes. The `-l` option provides line buffering, `-c` stops after the indicated count of packets is received, and `-d` dumps compiled packet-matching code into a format that is readable.
44. 44. B. The `-r` option reverses the journal, displaying the newest entries first. The `-n` option shows the most recent N events, `-f` is follow, and `-b` tells `journalctl` to show a message from a specific boot ID.
45. 45. B. The file `/etc/lvm/.cache`, which is built using the `vgscan` command, is the default location for LVM devices that have been discovered on the system. The other file locations described are not valid for the purpose described.
46. 46. D. There is no port for ICMP. The protocol itself does not use ports.
47. 47. D. The `emergency` target can be used in situations where rescue mode cannot recover the system. The other targets are not valid.
48. 48. A. As specified in the question, you need to remove both group and user ownership; therefore, both `-g` and `-o` are needed. The other options are not valid, though you can remove individual options from an archive process with `-no-g` and `-no-o`, which would be equivalent to removing the `-g` and `-o` options from the command.

49. 49. B. The `-r` option bypasses the routing tables and enables sending packets directly using an interface. The `-A` option is adaptive ping, while `-b` enables sending pings to a broadcast address. The `-q` option is quiet output.
50. 50. A. The `tracert` command uses UDP by default and chooses 33434 as its first port. This setting can be configured to another port or to use ICMP but not IGMP.
51. 51. C. The devices at `/dev/nst*` are non-rewinding tapes; therefore, index 0 would be the first such device. The devices at `/dev/st*` are normal SCSI tape devices.
52. 52. A. The `/var` directory typically contains temporary or changeable information. However, mail spool files are usually stored in `/var/mail` or `/var/spool/mail`. The `/etc` directory contains configuration information, and `/usr` contains binaries and other files that can be reinstalled if necessary. The `/mail` directory does not exist by default.
53. 53. B. The `-b` option makes a copy of the original file before patching. This can be particularly useful in a scripted scenario where several files are patched in succession. The `-d` option causes a change directory prior to patching, while `-c` tells `patch` to interpret the patch file as a normal diff file. The `-s` option causes `patch` to work in silent mode.
54. 54. D. The `-g` option shows drive geometry that includes the specified information. The `-h` option displays help, and the `-w` option performs a reset of the device. There is no `-e` option to `hdparm`.
55. 55. B. The `--no-wall` option suppresses the warning from being sent to logged-in users. The other options are not valid.
56. 56. C. The `-C` option can be used to display a progress indicator on the `fsck` operation. The `-f` option forces the operation, while `-p` and `-d` do not exist.
57. 57. C. The `tinyconfig` target provides the smallest possible kernel config. The other targets are not valid for the kernel.
58. 58. D. The file `/etc/udev/hwdb.bin` contains the hardware database for `udev`, gathered from information in `/usr/lib/udev/hwdb.d/` and `/etc/udev/hwdb.d/`.
59. 59. B. The `--diff` option displays differences among overridden files with `systemd-delta`. The other options shown are not valid for use with `systemd-delta`.
60. 60. B. The `-U` option enables specification of the UUID for a given mount. The `-t` option specifies the filesystem type, while `-i` keeps the mount internal-only and does not call the filesystem helper command. There is no `-u` option to `mount`.

#### Chapter 27: Practice Test 4

1. 1. C. The `notify` directive, set to `yes` or `no`, specifies whether slave servers will be notified of changes to the zone. The other options are not valid.
2. 2. A. The `-b` option enables specification of the key size. The `-a` option specifies the algorithm. The `-f` option sets the flag in the `key/dnskey` record. There is typically no `-e` option, but it may tie into a large exponent on certain versions of Linux.



3. 3. B. The `-q` option suppresses output entirely, thereby making the command print nothing on success. The exit code of 0 for success is returned, however, so the command could still be used in a scripted scenario. The `-f` option specifies the format of the zone. The `-s` option has no effect for `named-checkzone`, and there is no `-p` option.
4. 4. B. The class of record for most BIND zones is IN, meaning an Internet class. The other options are not valid classes.
5. 5. C. The `rndc` command listens on port 953 by default. Port 53 is used for DNS but not `rndc`. Port 530 is RPC and port 1053 is not one of the defined well-known ports.
6. 6. C. Start of authority records are known as SOA records. NS records are name server, and A is a normal address record. IN is the class for the record and not directly related to the question being asked.
7. 7. A. The `@` symbol can be used as a means to set the server for the `dig` command query. The other options shown are not valid.
8. 8. D. The `forwarders` directive is a list of addresses to which requests will be forwarded from the server. The other options are not valid.
9. 9. A. The `query-source` directive sets the IP address from which queries will appear to originate. This is useful in multi-homed scenarios where the server may not correctly choose which interface to use. The other options are not valid.
10. 10. A. The `-D` option dumps the zone file in canonical format. The other options are not valid for this purpose.
11. 11. B. The `-t` option, followed by the directory, tells `named-checkconf` to read included files relative to the specified directory.
12. 12. A. The `-B` option specifies that the program should use `bcrypt` for passwords. The `-C` option sets the computing time used for `bcrypt`. The `-b` option sets batch mode, and the `-m` option specifies `md5` for the passwords.
13. 13. C. The `ServerTokens` directive affects how the version number, or even whether the version number, is returned on server-generated documents. The other directives shown are not valid.
14. 14. D. The file `httpd.conf` is the primary configuration file for Apache2 servers. It is typical for `httpd.conf` to include one or several other files and directories that contain further configuration information. The `httpd.conf` file is typically located within the `/etc/` hierarchy, though its exact subdirectory varies greatly depending on the distribution of Linux.
15. 15. B. The `http_port` directive sets the port on which Squid listens for connections. By default, Squid listens on port 3128. The other options shown are not valid.
16. 16. B. The `SSLCertificateFile` directive sets the location of the public key file for an SSL hosting scenario. The `SSLCertificateKeyFile` sets the location of the private key. The other directives are not valid.
17. 17. C. The `SSLCipherSuite` directive enables the selection of cryptographic ciphers available on a server. This can be quite helpful for limiting the ciphers to ones that are believed to be secure at any given moment.

18. 18. C. The format is `GroupName: name1 name2 name3`, thereby making option C the correct answer.
19. 19. A. The `%b` sequence is used to log the number of bytes including the HTTP header. The `%B` sequence logs the number of bytes excluding the HTTP header. Log sequences are preceded with a percent sign, thus making the other options incorrect.
20. 20. C. The `-newca` option begins the process of creating a new certificate authority through the `ca.pl` script, which is a helper for the `openssl` commands related to certificate generation and management.
21. 21. C. Files related to SSL are typically stored in either `/etc/ssl` (or a subdirectory therein) or within the `/etc/pki` hierarchy. There is no `/etc/private` or `/usr/share/ssl` directory.
22. 22. D. The `nmbd` daemon listens on UDP port 137. Ports 139 and 445 are used by the `smbd` daemon, and port 143 is IMAP and not related to Samba.
23. 23. A. The `force-election` message type, sent to `nmbd`, forces a browse master election. The other message types are not valid with `smbcontrol`.
24. 24. B. The `ads` mode enables integration within an Active Directory environment. The `rpc` mode is available for remote procedure call environments. The other two modes are not valid.
25. 25. C. The `@` character is used to specify an NIS netgroup to use an exported NFS filesystem. The other syntax examples shown are not valid.
26. 26. A. Credentials are included as an option. Options are specified with `-o`. The username and password can be specified as shown. There is no `credentials` command-line argument.
27. 27. C. The security level of `domain` is used for Active Directory–based domain security mode. A trust is established between the domain controller and the Samba server in this scenario.
28. 28. A. The `-a` option displays the hostname or IP address along with the mounted directory for NFS exports. The `-d` option displays only the directory. There is no `-b` or `-c` option.
29. 29. B. The `smbstatus` command is used for this purpose. When given the `-S` option, a list of shares is displayed. The other commands shown are not valid.
30. 30. B. If a user already exists when `smbpasswd` receives the `-a` option, the user's password is simply changed to the new password.
31. 31. B. The port can be set with `-p`. It's worth noting that attempting to run Samba on a non-standard port will likely cause problems for devices that cannot specify a custom port for the share. The `-d` option sets the debug level, while the other options are not valid.
32. 32. D. The `fixed-address` directive reserves the specified IP address for the given host in DHCP. When that host asks for an IP address, it will receive the specified address. The other options are not valid in a `dhcpd.conf` configuration file.
33. 33. A. The `ldapadd` command requires that the OpenLDAP server be online when adding entries. `slapadd` does not have this requirement.

Both work on local databases.

34. 34. C. The `IgnoreIfMissing` option within an interface section of `radvd.conf` changes the behavior of `radvd` when the given interface does not exist at startup. The other options shown are not valid for `radvd`.
35. 35. B. The `default-lease-time` option, followed by the number of seconds for the lease, is used to specify the time that a client can have a lease before asking for a new lease. The other options are not valid.
36. 36. C. The file `/etc/nsswitch.conf` contains information for Name Service Switch (NSS). The format is as shown in the correct answer. Local files are known as `files`, and LDAP is known as `ldap` within the `/etc/nsswitch.conf` file.
37. 37. C. The `[sssd]` section defines general parameters for use with the SSSD system. Sections are noted with brackets, as in the answer shown.
38. 38. A. The file `limits.conf`, located in `/etc` or `/etc/security`, provides basic configuration related to the `pam_limits.so` module. Other related files may also be found in `/etc/security/limits.d` on certain distributions.
39. 39. B. The `-l` option enables specification of a file to which output will be written rather than to `STDOUT`. The `-f` option enables the command to point to a different `slapd` configuration file. The `-d` option specifies debug and `-o` enables specification of extended options.
40. 40. B. The `modify changetype` specifies that an entry will be changed. The other changetypes are not valid.
41. 41. A. The `mail` attribute resides in `inetOrgPerson`. Other attributes in `inetOrgPerson` include `homePhone`, `gn` (givenName), and others. Of the other options, only `organization` is a valid objectClass.
42. 42. D. The `gt` operator is used to test for greater-than conditions with Sieve. The `ge` operator tests whether a value is greater than or equal to. The other operators are not used with Sieve.
43. 43. B. The `/etc/dovecot` directory is used for configuration files related to the Dovecot e-mail daemon. The other directories are not used by default for Dovecot.
44. 44. B. The `sendmail` command to view the queue uses the `-bp` option. For mail servers like Postfix, there are emulation commands like `sendmail -bp` that are available for compatibility purposes.
45. 45. C. The `postsuper` command is used for this purpose. When given the `-d ALL` argument, all messages will be deleted. However, because the question specified only the deferred queue, then the keyword `deferred` is added in order to limit the scope of the deletion.
46. 46. D. The `-b` option causes `postcat` to display only the body of the message rather than the envelope (`-e`) and header (`-h`), which are the default (`-beh`) for the command. There is no `-m` option.
47. 47. B. An `if` statement will perform a conditional test with Sieve. In this case, the `size` test is needed and will use the `:over` structure for comparison. The `messagesize` and `message` will not work, but it's worth noting that the greater-than sign can be used with Sieve.

48. 48. B. The `doveadm` command is used, specifically with the `pw` argument. The command will then prompt for a password (twice) and display the resulting encrypted password as output.
49. 49. A. The `message_size_limit` parameter is used to set the default maximum message size for any single message delivered by or to a Postfix server. The default is 10,240,000 bytes.
50. 50. C. The `:all` address-part is the entire Internet address, and it is the default when no other address-part has been specified. The other options are not valid address-parts.
51. 51. A. The `RCPT TO` portion of the SMTP conversation is where the destination address is specified. The other options shown are not part of the SMTP conversation for mail delivery.
52. 52. D. The `REDIRECT` target is used for creation of a redirection within iptables. It is typically used within the `PREROUTING` chain. The other targets are not valid.
53. 53. A. The `-T` option limits bandwidth for authenticated users. The `-t` option does the same but for anonymous users. The `-B` option starts Pure-FTPd in the background, and `-b` indicates that Pure-FTPd will ignore the RFC standard in order to work with FTP clients that don't adhere to the standard.
54. 54. B. The `nc` command can be used for this purpose and requires that a port be specified, which is 80 in this case. The other formats for the `nc` command will not work.
55. 55. C. The `-F` option flushes or clears rules out of a given iptables chain. The option is useful at the beginning of an iptables script in order to clear existing rules in preparation for a new ruleset. The `-P` option sets the policy for the chain.
56. 56. A. The `AllowUsers` directive is used to specify users who will be allowed to log in to the server. The other options shown are not valid.
57. 57. B. Echoing 1 to `/proc/sys/net/ipv4/conf/all/rp_filter` prevents packets from exiting on a different interface than the one on which they arrived. The `rp` in `rp_filter` is an abbreviation for reverse path.
58. 58. D. The `-L` option sets up local port forwarding, and it is therefore required for this scenario. It is followed by the local port and then the host/port to which connections will be forwarded. The other options are invalid for the purpose described in this scenario. The `-p` option connects on a specific port but does not create a port forward.
59. 59. B. The file `/etc/services` contains port-number-to-name translation for a given server. The file contains well-known ports and can be customized on a per-server basis.
60. 60. A. The `-log-prefix` option specifies the string that will be prepended when a log entry is created by iptables. The other options shown are not valid for use with iptables.



