Save 10%
on Exam Vouchers
Coupon Inside!

CompTIA
Linux+
POWERED BY LPI

and LPIC

PRACTICE TESTS

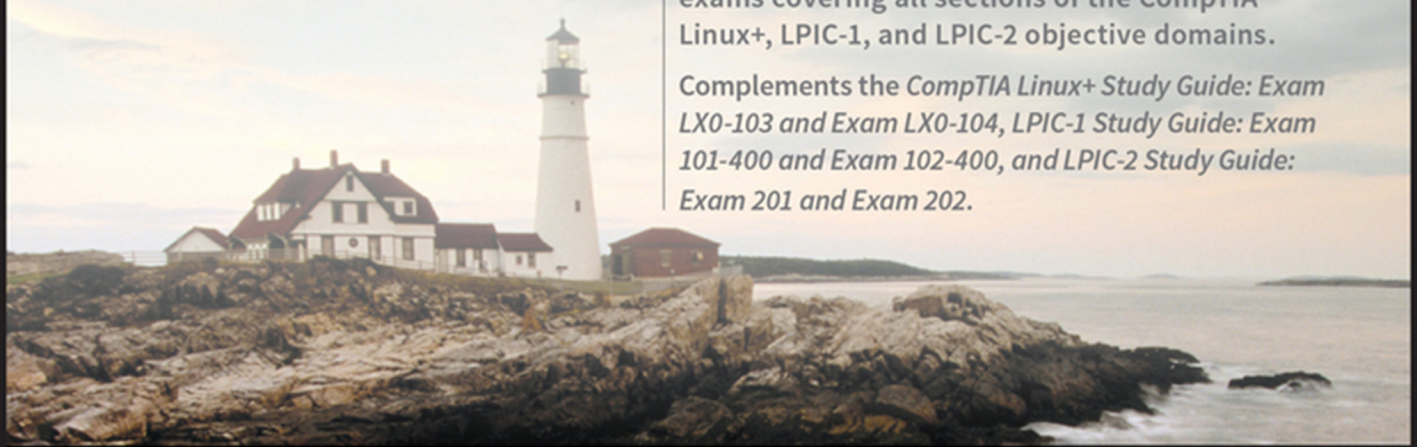
STEVE SUEHRING

CompTIA Authorized Quality Curriculum

CompTIA Authorized Partner Gold

Provides over 1,200 questions that include 4 practice exams covering all sections of the CompTIA Linux+, LPIC-1, and LPIC-2 objective domains.

Complements the *CompTIA Linux+ Study Guide: Exam LX0-103 and Exam LX0-104, LPIC-1 Study Guide: Exam 101-400 and Exam 102-400, and LPIC-2 Study Guide: Exam 201 and Exam 202.*



SYBEX
A Wiley Brand

Take the Next Step in Your IT Career

Save 10%

on Exam Vouchers*

(up to a $35 value)

CompTIA®

Get details at
sybex.com/go/comptiavoucher

*Some restrictions apply. See web page for details.

SYBEX®

CompTIA®

Linux+ and LPIC

Practice Tests

CompTIA®

Linux+ and LPIC

Practice Tests

Exams LX0-103/LPIC-1 101-400, LX0-104/LPIC-1 102-400, LPIC-2 201, and LPIC-2 202

Steven Suehring

SYBEX®
A Wiley Brand

Senior Acquisitions Editor: Kenyon Brown
Development Editor: Gary Schwartz
Technical Editor: Kevin Ryan
Production Editor: Rebecca Anderson
Copy Editor: Linda Recktenwald
Editorial Manager: Mary Beth Wakefield
Production Manager: Kathleen Wisor
Executive Editor: Jim Minatel
Book Designer: Judy Fung and Bill Gibson
Proofreader: Nancy Carrasco
Indexer: Ted Laux
Project Coordinator, Cover: Brent Savage
Cover Designer: Wiley
Cover Image: ©Getty Images Inc./Jeremy Woodhouse

Copyright © 2017 by John Wiley & Sons, Inc., Indianapolis, Indiana

Published simultaneously in Canada

ISBN: 978-1-119-37269-1
ISBN: 978-1-119-37270-7 (ebk.)
ISBN: 978-1-119-37271-4 (ebk.)

Manufactured in the United States of America

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 646-8600. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at `http://www.wiley.com/go/permissions`.

Limit of Liability/Disclaimer of Warranty: The publisher and the author make no representations or warranties with respect to the accuracy or completeness of the contents of this work and specifically disclaim all warranties, including without limitation warranties of fitness for a particular purpose. No warranty may be created or extended by sales or promotional materials. The advice and strategies contained herein may not be suitable for every situation. This work is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional services. If professional assistance is required, the services of a competent professional person should be sought. Neither the publisher nor the author shall be liable for damages arising herefrom. The fact that an organization or Web site is referred to in this work as a citation and/or a potential source of further information does not mean that the author or the publisher endorses the information the organization or Web site may provide or recommendations it may make. Further, readers should be aware that Internet Web sites listed in this work may have changed or disappeared between when this work was written and when it is read.

For general information on our other products and services or to obtain technical support, please contact our Customer Care Department within the U.S. at (877) 762-2974, outside the U.S. at (317) 572-3993 or fax (317) 572-4002.

Wiley publishes in a variety of print and electronic formats and by print-on-demand. Some material included with standard print versions of this book may not be included in e-books or in print-on-demand. If this book refers to media such as a CD or DVD that is not included in the version you purchased, you may download this material at `http://booksupport.wiley.com`. For more information about Wiley products, visit `www.wiley.com`.

Library of Congress Control Number: 2017934292

TRADEMARKS: Wiley, the Wiley logo, and the Sybex logo are trademarks or registered trademarks of John Wiley & Sons, Inc. and/or its affiliates, in the United States and other countries, and may not be used without written permission. CompTIA is a registered trademark of Computing Technology Industry Association, Inc. All other trademarks are the property of their respective owners. John Wiley & Sons, Inc. is not associated with any product or vendor mentioned in this book.

10 9 8 7 6 5 4 3 2 1

To Jakob and Owen.

Acknowledgments

After a certain point, writing acknowledgements becomes more difficult than writing the book itself. I've reached that point. I've stared at this page longer than any other one in this book. It's impossible to thank adequately everyone who contributes, directly or indirectly, to something like a book. So I won't. Well, okay, I will a bit.

Thanks to everyone at Delta Dental. I had a great experience, and it was an honor coming back. To the faculty at UWSP, thank you for welcoming and helping a new faculty member. Thank you Ken Brown and Gary Schwartz; it's been a pleasure working with you both on another book.

Thanks to everyone at Ski's, for providing the best of the best in both food and service. Of course, no acknowledgements section would be complete without a thank-you to Patti, Jess, Rob, Jim, and Tim at Partners, without whom these pages would have taken longer to write. And always, thank you Kent Laabs for keeping my gear habit going. Looking forward to the year.

About the Author

Steve Suehring is an Assistant Professor of Computing and New Media Technologies at the University of Wisconsin—Stevens Point. Prior to joining the faculty in 2015, Steve gained 20 years of field experience in a variety of technical engineering, system and network administration, and system architectural roles. Steve has written several books and has served as an editor for *LinuxWorld* magazine.

Contents

Introduction *xv*

Part I CompTIA Linux+/LPIC-1 1

Chapter 1 System Architecture (Domain 101) 3

Chapter 2 Linux Installation and Package Management(Domain 102) 13

Chapter 3 GNU and Unix Commands (Domain 103) 25

Chapter 4 Devices, Linux Filesystems, and the Filesystem Hierarchy Standard (Domain 104) 39

Chapter 5 Working with Shells, Scripting, and Data Management (Domain 105) 51

Chapter 6 Understanding User Interfaces and Desktops (Domain 106) 63

Chapter 7 Administrative Tasks (Domain 107) 73

Chapter 8 Essential System Services (Domain 108) 85

Chapter 9 Networking Fundamentals (Domain 109) 97

Chapter 10 Security (Domain 110) 109

Part II LPIC-2 119

Chapter 11 Capacity Planning (Topic 200) 121

Chapter 12 Linux Kernel (Topic 201) 129

Chapter 13 System Startup (Topic 202) 139

Chapter 14 Filesystems and Devices (Topic 203) 149

Chapter	**15**	**Advanced Storage Device Administration (Topic 204)**	**157**
Chapter	**16**	**Networking Configuration (Topic 205)**	**165**
Chapter	**17**	**System Maintenance (Topic 206)**	**175**
Chapter	**18**	**Domain Name Server (Topic 207)**	**183**
Chapter	**19**	**HTTP Services (Topic 208)**	**191**
Chapter	**20**	**File Sharing (Topic 209)**	**199**
Chapter	**21**	**Network Client Management (Topic 210)**	**207**
Chapter	**22**	**E-Mail Services (Topic 211)**	**215**
Chapter	**23**	**System Security (Topic 212)**	**223**
Chapter	**24**	**Practice Test 1**	**231**
Chapter	**25**	**Practice Test 2**	**243**
Chapter	**26**	**Practice Test 3**	**255**
Chapter	**27**	**Practice Test 4**	**267**
Appendix		**Answers to Review Questions**	**279**
Index			*369*

CompTIA

CompTIA Linux+ POWERED BY LPI

Becoming a CompTIA Certified IT Professional is Easy

It's also the best way to reach greater professional opportunities and rewards.

Why Get CompTIA Certified?

Growing Demand

Labor estimates predict some technology fields will experience growth of over 20% by the year 2020.* CompTIA certification qualifies the skills required to join this workforce.

Higher Salaries

IT professionals with certifications on their resume command better jobs, earn higher salaries and have more doors open to new multi-industry opportunities.

Verified Strengths

91% of hiring managers indicate CompTIA certifications are valuable in validating IT expertise, making certification the best way to demonstrate your competency and knowledge to employers.**

Universal Skills

CompTIA certifications are vendor neutral—which means that certified professionals can proficiently work with an extensive variety of hardware and software found in most organizations.

Learn

Learn more about what the exam covers by reviewing the following:

- Exam objectives for key study points.
- Sample questions for a general overview of what to expect on the exam and examples of question format.
- Visit online forums, like LinkedIn, to see what other IT professionals say about CompTIA exams.

Certify

Purchase a voucher at a Pearson VUE testing center or at CompTIAstore.com.

- Register for your exam at a Pearson VUE testing center:
- Visit pearsonvue.com/CompTIA to find the closest testing center to you.
- Schedule the exam online. You will be required to enter your voucher number or provide payment information at registration.
- Take your certification exam.

Work

Congratulations on your CompTIA certification!

- Make sure to add your certification to your resume.
- Check out the CompTIA Certification Roadmap to plan your next career move.

Learn more: **Certification.CompTIA.org/linuxplus**

* Source: CompTIA 9th Annual Information Security Trends study: 500 U.S. IT and Business Executives Responsible for Security
** Source: CompTIA Employer Perceptions of IT Training and Certification

© 2015 CompTIA Properties, LLC, used under license by CompTIA Certifications, LLC. All rights reserved. All certification programs and education related to such programs are operated exclusively by CompTIA Certifications, LLC. CompTIA is a registered trademark of CompTIA Properties, LLC in the U.S. and internationally. Other brands and company names mentioned herein may be trademarks or service marks of CompTIA Properties, LLC or of their respective owners. Reproduction or dissemination prohibited without written consent of CompTIA Properties, LLC. Printed in the U.S. 02190-Nov2015

Introduction

CompTIA Linux+ and LPIC Practice Tests is a companion volume to the *CompTIA Linux+ Study Guide*. This book helps you to prepare for the certification exams by testing your knowledge of the concepts and terminology being used on the exam. Within the book are 1,201 questions, answers, and explanations covering the range of topics necessary for the exams.

Each of the chapters within the book contains questions specific to a section of the exam. There are also four longer practice exams that encompass questions from a given domain. This book is intended to be used in conjunction with the corresponding certification-related books, and it can be used to find areas that you may need to emphasize for further study.

Linux+ Certification

CompTIA certifications are notable for the added benefits that can be found by certificate holders. Linux+ certification is a way to prove that you possess the knowledge necessary to perform job-related duties for Linux administration.

The Linux+ certification covers several important topics for Linux administration, and it helps to prepare you for the things you'll need to do with a Linux server. Included among the areas tested are installation, compiling and installing server software, and security. These topics are vital to the everyday job of a Linux administrator.

Importantly, the certification exams are not tied to a particular distribution but rather to the broad Linux ecosystem. This better prepares you for the variety of Linux flavors that you'll encounter at a given employer or job.

How This Book Is Organized

This book consists of two sections, each based on one of the two exams involved in the Linux+ and LPIC certification series. The book has a chapter dedicated to each of the relevant domains. At the end of the book, there are also four longer practice exams corresponding to a given set of domains.

Each chapter begins with a list of the objective domains covered in that chapter. While the questions themselves draw from those objectives, you can expect to draw on other knowledge relevant to being a Linux administrator.

The review questions and final review tests included in this book are *not* derived from the actual Linux+ exam questions. They serve to provide exposure to the underlying content and to deliver a comparable testing vehicle for you to prepare for the exam. It will not be a useful exercise to memorize the answers to these questions and assume that doing so will enable you to pass the exam. The underlying subject matter is the important focus of your studies so that you will be able to pass the exam.

Congratulations on the decision to demonstrate your Linux administration skills with this certification.

How to Use This Book and the Interactive Online Learning Environment and Test Bank

This book includes 1200 practice test questions, which will help you get ready to pass the Linux+ and LPIC exams. The interactive online learning environment that accompanies the CompTIA Linux+ and LPIC Practice Tests provides a rubust test bank to help you prepare for the certification exams and increase your chances of passing them the first time! By using this test bank, you can identify weak areas up front and then develop a solid studying strategy using each of these robust testing features.

The test bank also offers four practice exams. Take these practice exams just as if you were taking the actual exam (without any reference material). When you've finished the first exam, move on to the next one to solidify your test-taking skills. If you get more than 90 percent of the answers correct, you're ready to take the certification exams.

The Sybex Interactive Online Test Bank can be accessed at `http://www.wiley.com/go/Sybextestprep`.

CompTIA Linux+ Practice Tests: Objective Map

Objective	Chapter Number
101 System Architecture	**1**
101.1 Determine and configure hardware settings.	**1**
Enable and disable integrated peripherals	1
Configure systems with or without external peripherals such as keyboards	1
Differentiate between the various types of mass storage devices	1
Know the differences between coldplug and hotplug devices	1
Determine hardware resources for devices	1
Tools and utilities to list various hardware information (e.g., lsusb, lspci)	1
Tools and utilities to manipulate USB devices	1
Conceptual understanding of sysfs, udev, dbus	1
101.2 Boot the system.	**1**
Provide common commands to the boot loader and options to the kernel at boot time	1
Demonstrate knowledge of the boot sequence from BIOS to boot completion	1
Understanding of SysVinit and systemd	1
Awareness of Upstart	1
Check boot events in the log file	1

Objective	Chapter Number
101.3 Change runlevels/boot targets and shutdown or reboot system.	**1**
Set the default runlevel or boot target	1
Change between runlevels/boot targets including single user mode	1
Shutdown and reboot from the command line	1
Alert users before switching runlevels/ boot targets or other major system events	1
Properly terminate processes	1
102 Linux Installation and Package Management	**2**
102.1 Design hard disk layout.	**2**
Allocate filesystems and swap space to separate partitions or disks	2
Tailor the design to the intended use of the system	2
Ensure the /boot partition conforms to the hardware architecture requirements for booting	2
Knowledge of basic features of LVM	2
102.2 Install a boot manager.	**2**
Providing alternative boot locations and backup boot options	2
Install and configure a boot loader such as GRUB Legacy	2
Perform basic configuration changes for GRUB 2	2
Interact with the boot loader	2
102.3 Manage shared libraries.	**2**
Identify shared libraries	2
Identify the typical locations of system libraries	2
Load shared libraries	2

Objective	Chapter Number
102.4 Use Debian package management.	**2**
Install, upgrade and uninstall Debian binary packages	2
Find packages containing specific files or libraries that may or may not be installed	2
Obtain package information such as version, content, dependencies, package integrity and installation status (whether or not the package is installed)	2
102.5 Use RPM and YUM package management.	**2**
Install, re-install, upgrade and remove packages using RPM and YUM	2
Obtain information on RPM packages such as version, status, dependencies, integrity and signatures	2
Determine what files a package provides, as well as find which package a specific file comes from	2
103 GNU and Unix Commands	**3**
103.1 Work on the command line.	**3**
Use single shell commands and one line command sequences to perform basic tasks on the command line	3
Use and modify the shell environment including defining, referencing and exporting environment variables	3
Use and edit command history	3
Invoke commands inside and outside the defined path	3
103.2 Process text streams using filters.	**3**
Send text files and output streams through text utility filters to modify the output using standard UNIX commands found in the GNU textutils package	3
103.3 Perform basic file management.	**3**
Copy, move and remove files and directories individually	3
Copy multiple files and directories recursively	3

Objective	Chapter Number
Remove files and directories recursively	3
Use simple and advanced wildcard specifications in commands	3
Use find to locate and act on files based on type, size or time	3
Usage of tar, cpio and dd	3
103.4 Use streams, pipes and redirects.	**3**
Redirecting standard input, standard output and standard error	3
Pipe the output of one command to the input of another command	3
Use the output of one command as arguments to another command	3
Send output to both stdout and a file	3
103.5 Create, monitor and kill processes.	**3**
Run jobs in the foreground and background	3
Signal a program to continue running after logout	3
Monitor active processes	3
Select and sort processes for display	3
Send signals to processes	3
103.6 Modify process execution priorities.	**3**
Know the default priority of a job that is created	3
Run a program with higher or lower priority than the default	3
Change the priority of a running process	3
103.7 Search text files using regular expressions.	**3**
Create simple regular expressions containing several notational elements	3
Use regular expression tools to perform searches through a filesystem or file content	3

Objective	Chapter Number
103.8 Perform basic file editing operations using vi.	**3**
Navigate a document using vi	3
Use basic vi modes	3
Insert, edit, delete, copy and find text	3
104 Devices, Linux Filesystems and Filesystem Hierarchy Standard	**4**
104.1 Create partitions and filesystems.	**4**
Manage MBR partition tables	4
Use various mkfs commands to create various filesystems such as: ▪ ext2/ext3/ext4 ▪ XFS ▪ VFAT	4
Awareness of ReiserFS and Btrfs	4
Basic knowledge of gdisk and parted with GPT	4
104.2 Maintain the integrity of filesystems.	**4**
Verify the integrity of filesystems	4
Monitor free space and inodes	4
Repair simple filesystem problems	4
104.3 Control mounting and unmounting of filesystems.	**4**
Manually mount and unmount filesystems	4
Configure filesystem mounting on bootup	4
Configure user mountable removeable filesystems	4
104.4 Manage disk quotas.	**4**
Set up a disk quota for a filesystem	4
Edit, check and generate user quota reports	4

Objective	Chapter Number
104.5 Manage file permissions and ownership.	**4**
Manage access permissions on regular and special files as well as directories	4
Use access modes such as suid, sgid and the sticky bit to maintain security	4
Know how to change the file creation mask	4
Use the group field to grant file access to group members	4
104.6 Create and change hard and symbolic links.	**4**
Create links	4
Identify hard and/or soft links	4
Copying versus linking files	4
Use links to support system administration tasks	4
104.7 Find system files and place files in the correct location.	**4**
Understand the correct locations of files under the FHS	4
Find files and commands on a Linux system	4
Know the location and purpose of important files and directories as defined in the FHS	4
105 Shells, Scripting and Data Management	**5**
105.1 Customize and use the shell environment.	**5**
Set environment variables (e.g., PATH) at login or when spawning a new shell	5
Write BASH functions for frequently used sequences of commands	5
Maintain skeleton directories for new user accounts	5
Set command search path with the proper directory	5

Objective	Chapter Number
105.2 Customize or write simple scripts.	5
Use standard sh syntax (loops, tests)	5
Use command substitution	5
Test return values for success or failure or other information provided by a command	5
Perform conditional mailing to the superuser	5
Correctly select the script interpreter through the shebang (#!) line	5
Manage the location, ownership, execution and SUID rights of scripts	5
105.3 SQL data management	5
Use of basic SQL commands	5
Perform basic data manipulation	5
106 User Interfaces and Desktops	**6**
106.1 Install and configure X11.	**6**
Verify that the video card and monitor are supported by an X server	6
Awareness of the X font server	6
Basic understanding and knowledge of the X Window configuration file	6
106.2 Set up a display manager.	**6**
Basic configuration of LightDM	6
Turn the display manager on or off	6
Change the display manager greeting	6
Awareness of XDM, KDM and GDM	6

Objective	Chapter Number
106.3 Accessibility.	**6**
Basic knowledge of keyboard accessibility settings (AccessX)	6
Basic knowledge of visual settings and themes	6
Basic knowledge of assistive technology (AT)	6
107 Administrative Tasks	**7**
107.1 Manage user and group accounts and related system files.	**7**
Add, modify and remove users and groups	7
Manage user/group info in password/group databases	7
Create and manage special purpose and limited accounts	7
107.2 Automate system administration tasks by scheduling jobs.	**7**
Manage cron and at jobs	7
Configure user access to cron and at services	7
Configure anacron	7
107.3 Localization and internationalization.	**7**
Configure local settings and environment variables	7
Configure timezone settings and environment variables	7
108 Essential System Services	**8**
108.1 Maintain system time.	**8**
Set the system date and time	8
Set the hardware clock to the correct time in UTC	8
Configure the correct timezone	8
Basic NTP configuration	8
Knowledge of using the pool.ntp.org service	8
Awareness of the ntpq command	8

Objective	Chapter Number
108.2 System logging.	**8**
Configuration of the syslog daemon	8
Understanding of standard facilities, priorities and actions	8
Configuration of logrotate	8
Awareness of rsyslog and syslog-ng	8
108.3 Mail Transfer Agent (MTA) basics.	**8**
Create email aliases	8
Configure email forwarding	8
Knowledge of commonly available MTA programs (postfix, sendmail, qmail, exim) (no configuration)	8
108.4 Manage printers and printing.	**8**
Basic CUPS configuration (for local and remote printers)	8
Manage user print queues	8
Troubleshoot general printing problems	8
Add and remove jobs from configured printer queues	8
109 Networking Fundamentals	**9**
109.1 Fundamentals of Internet protocols.	**9**
Demonstrate an understanding of network masks and CIDR notation	9
Knowledge of the differences between private and public “dotted quad” IP addresses	9
Knowledge about common TCP and UDP ports (20, 21, 22, 23, 25, 53, 80, 110, 123, 139, 143, 161, 162, 389, 443, 465, 514, 636, 993, 995)	9
Knowledge about the differences and major features of UDP, TCP and ICMP	9
Knowledge of the major differences between IPv4 and IPv6	9
Knowledge of the basic features of IPv6	9

Objective	Chapter Number
109.2 Basic network configuration.	**9**
Manually and automatically configure network interfaces	9
Basic TCP/IP host configuration	9
Setting a default route	9
109.3 Basic network troubleshooting.	**9**
Manually and automatically configure network interfaces and routing tables to include adding, starting, stopping, restarting, deleting or reconfiguring network interfaces	9
Change, view or configure the routing table and correct an improperly set default route manually	9
Debug problems associated with the network configuration	9
109.4 Configure client side DNS.	**9**
Query remote DNS servers	9
Configure local name resolution and use remote DNS servers	9
Modify the order in which name resolution is done	9
110 Security	**10**
110.1 Perform security administration tasks.	**10**
Audit a system to find files with the suid/sgid bit set	10
Set or change user passwords and password aging information	10
Being able to use nmap and netstat to discover open ports on a system	10
Set up limits on user logins, processes and memory usage	10
Determine which users have logged in to the system or are currently logged in	10
Basic sudo configuration and usage	10

Objective	Chapter Number
110.2 Set up host security.	**10**
Awareness of shadow passwords and how they work	10
Turn off network services not in use	10
Understand the role of TCP wrappers	10
110.3 Securing data with encryption.	**10**
Perform basic OpenSSH 2 client configuration and usage	10
Understand the role of OpenSSH 2 server host keys	10
Perform basic GnuPG configuration, usage and revocation	10
Understand SSH port tunnels (including X11 tunnels)	10
200 Capacity Planning	**11**
200.1 Measure and Troubleshoot Resource Usage	**11**
Measure CPU usage.	11
Measure memory usage.	11
Measure disk I/O.	11
Measure network I/O.	11
Measure firewalling and routing throughput.	11
Map client bandwidth usage.	11
Match / correlate system symptoms with likely problems.	11
Estimate throughput and identify bottlenecks in a system including networking.	11
200.2 Predict Future Resource Needs	**11**
Use monitoring and measurement tools to monitor IT infrastructure usage.	11
Predict capacity break point of a configuration.	11

Objective	Chapter Number
Observe growth rate of capacity usage.	11
Graph the trend of capacity usage.	11
Awareness of monitoring solutions such as Icinga2, Nagios, collectd, MRTG and Cacti	11
201 Linux Kernel	**12**
201.1 Kernel components	**12**
Kernel 2.6.x, 3.x and 4.x documentation	12
201.2 Compiling a Linux kernel	**12**
/usr/src/linux/	12
Kernel Makefiles	12
Kernel 2.6.x, 3.x and 4.x make targets	12
Customize the current kernel configuration.	12
Build a new kernel and appropriate kernel modules.	12
Install a new kernel and any modules.	12
Ensure that the boot manager can locate the new kernel and associated files.	12
Module configuration files	12
Use DKMS to compile kernel modules.	12
Awareness of dracut	12
201.3 Kernel runtime management and troubleshooting	**12**
Use command-line utilities to get information about the currently running kernel and kernel modules.	12
Manually load and unload kernel modules.	12
Determine when modules can be unloaded.	12

Objective	Chapter Number
Determine what parameters a module accepts.	12
Configure the system to load modules by names other than their file name.	12
/proc filesystem	12
Content of /, /boot/, and /lib/modules/	12
Tools and utilities to analyse information about the available hardware	12
udev rules	12
202 System Startup	**13**
202.1 Customizing system startup	**13**
Systemd	13
SysV init	13
Linux Standard Base Specification (LSB)	13
202.2 System recovery	**13**
BIOS and UEFI	13
NVMe booting	13
GRUB version 2 and Legacy	13
grub shell	13
boot loader start and hand off to kernel	13
kernel loading	13
hardware initialisation and setup	13
daemon/service initialisation and setup	13
Know the different boot loader install locations on a hard disk or removable device.	13
Overwrite standard boot loader options and using boot loader shells.	13
Use systemd rescue and emergency modes.	13

Objective	Chapter Number
202.3 Alternate Bootloaders	**13**
SYSLINUX, ISOLINUX, PXELINUX	13
Understanding of PXE for both BIOS and UEFI	13
Awareness of systemd-boot and U-Boot	13
203 Filesystem and Devices	**14**
203.1 Operating the Linux filesystem	**14**
The concept of the fstab configuration	14
Tools and utilities for handling swap partitions and files	14
Use of UUIDs for identifying and mounting file systems	14
203.2 Maintaining a Linux filesystem	**14**
Tools and utilities to manipulate and ext2, ext3, and ext4	14
Tools and utilities to perform basic Btrfs operations, including subvolumes and snapshots	14
Tools and utilities to manipulate XFS	14
Awareness of ZFS	14
203.3 Creating and configuring filesystem options	**14**
autofs configuration files	14
Understanding of automount units	14
UDF and ISO9660 tools and utilities	14
Awareness of other CD-ROM filesystems (HFS)	14
Awareness of CD-ROM filesystem extensions (Joliet, Rock Ridge, El Torito)	14
Basic feature knowledge of data encryption (dm-crypt / LUKS)	14

Objective	Chapter Number
204 Advanced Storage Device Administration	**15**
204.1 Configuring RAID	**15**
Software RAID configuration files and utilities	15
204.2 Adjusting Storage Device Access	**15**
Tools and utilities to configure DMA for IDE devices including ATAPI and SATA	15
Tools and utilities to configure Solid State Drives including AHCI and NVMe	15
Tools and utilities to manipulate or analyse system resources (e.g. interrupts)	15
Awareness of sdparm command and its uses	15
Tools and utilities for iSCSI	15
Awareness of SAN, including relevant protocols (AoE, FCoE)	15
204.3 Logical Volume Manager	**15**
Tools in the LVM suite	15
Resizing, renaming, creating, and removing logical volumes, volume groups, and physical volumes	15
Creating and maintaining snapshots	15
Activating volume groups	15
205 Networking Configuration	**16**
205.1 Basic networking configuration	**16**
Utilities to configure and manipulate ethernet network interfaces	16
Configuring basic access to wireless networks	16

Objective	Chapter Number
205.2 Advanced Network Configuration	**16**
Utilities to manipulate routing tables	16
Utilities to configure and manipulate ethernet network interfaces	16
Utilities to analyze the status of the network devices	16
Utilities to monitor and analyse the TCP/IP traffic	16
205.3 Troubleshooting network issues	**16**
Location and content of access restriction files	16
Utilities to configure and manipulate ethernet network interfaces	16
Utilities to manage routing tables	16
Utilities to list network states	16
Utilities to gain information about the network configuration	16
Methods of information about the recognised and used hardware devices	16
System initialisation files and their contents (Systemd and SysV init)	16
Awareness of NetworkManager and its impact on network configuration	16
206 System Maintenance	**17**
206.1 Make and install programs from source	**17**
Unpack source code using common compression and archive utilities.	17
Understand basics of invoking make to compile programs.	17
Apply parameters to a configure script.	17
Know where sources are stored by default.	17
206.2 Backup operations	**17**
Knowledge about directories that have to be included in backups	17
Awareness of network backup solutions such as Amanda, Bacula, Bareos and BackupPC	17

Objective	Chapter Number
Knowledge of the benefits and drawbacks of tapes, CDR, disk or other backup media	17
Perform partial and manual backups.	17
Verify the integrity of backup files.	17
Partially or fully restore backups.	17
206.3 Notify users on system-related issues	**17**
Automate communication with users through logon messages.	17
Inform active users of system maintenance.	17
207 Domain Name Server	**18**
207.1 Basic DNS server configuration	**18**
BIND 9.x configuration files, terms and utilities	18
Defining the location of the BIND zone files in BIND configuration files	18
Reloading modified configuration and zone files	18
Awareness of dnsmasq, djbdns, and PowerDNS as alternate name servers	18
207.2 Create and maintain DNS zones	**18**
BIND 9 configuration files, terms and utilities	18
Utilities to request information from the DNS server	18
Layout, content and file location of the BIND zone files	18
Various methods to add a new host in the zone files, including reverse zones	18
207.3 Securing a DNS server	**18**
BIND 9 configuration files	18
Configuring BIND to run in a chroot jail	18
Split configuration of BIND using the forwarders statement	18

Objective	Chapter Number
Configuring and using transaction signatures (TSIG)	18
Awareness of DNSSEC and basic tools	18
Awareness of DANE and related records	18
208 HTTP Services	**19**
208.1 Basic Apache configuration	**19**
Apache 2.4 configuration files, terms and utilities	19
Apache log files configuration and content	19
Access restriction methods and files	19
mod_perl and PHP configuration	19
Client user authentication files and utilities	19
Configuration of maximum requests, minimum and maximum servers and clients	19
Apache 2.4 virtual host implementation (with and without dedicated IP addresses)	19
Using redirect statements in Apache's configuration files to customise file access	19
208.2 Apache configuration for HTTPS	**19**
SSL configuration files, tools and utilities	19
Generate a server private key and CSR for a commercial CA	19
Generate a self-signed Certificate	19
Install the key and certificate, including intermediate CAs	19
Configure Virtual Hosting using SNI	19
Awareness of the issues with Virtual Hosting and use of SSL	19
Security issues in SSL use, disable insecure protocols and ciphers	19

Objective	Chapter Number
208.3 Implementing Squid as a caching proxy	**19**
Squid 3.x configuration files, terms and utilities	19
Access restriction methods	19
Client user authentication methods	19
Layout and content of ACL in the Squid configuration files	19
208.4 Implementing Nginx as a web server and a reverse proxy	**19**
Nginx	19
Reverse Proxy	19
Basic Web Server	19
209 File Sharing	**20**
209.1 Samba Server Configuration	**20**
Samba 4 documentation	20
Samba 4 configuration files	20
Samba 4 tools and utilities and daemons	20
Mounting CIFS shares on Linux	20
Mapping Windows user names to Linux user names	20
User-Level, Share-Level and AD security	20
209.2 NFS Server Configuration	**20**
NFS version 3 configuration files	20
NFS tools and utilities	20
Access restrictions to certain hosts and/or subnets	20
Mount options on server and client	20
TCP Wrappers	20
Awareness of NFSv4	20

Objective	Chapter Number
210 Network Client Management	**21**
210.1 DHCP configuration	**21**
DHCP configuration files, terms and utilities	21
Subnet and dynamically-allocated range setup	21
Awareness of DHCPv6 and IPv6 Router Advertisements	21
210.2 PAM authentication	**21**
PAM configuration files, terms and utilities	21
passwd and shadow passwords	21
Use sssd for LDAP authentication	21
210.3 LDAP client usage	**21**
LDAP utilities for data management and queries	21
Change user passwords	21
Querying the LDAP directory	21
210.4 Configuring an OpenLDAP server	**21**
OpenLDAP	21
Directory based configuration	21
Access Control	21
Distinguished Names	21
Changetype Operations	21
Schemas and Whitepages	21
Directories	21
Object IDs, Attributes and Classes	21

Objective	Chapter Number
211 E-Mail Services	**22**
211.1 Using e-mail servers	**22**
Configuration files for postfix	22
Basic TLS configuration for postfix	22
Basic knowledge of the SMTP protocol	22
Awareness of sendmail and exim	22
211.2 Managing E-Mail Delivery	**22**
Understanding of Sieve functionality, syntax and operators	22
Use Sieve to filter and sort mail with respect to sender, recipient(s), headers and size	22
Awareness of procmail	22
211.3 Managing Mailbox Access	**22**
Dovecot IMAP and POP3 configuration and administration	22
Basic TLS configuration for Dovecot	22
Awareness of Courier	22
212 System Security	**23**
212.1 Configuring a router	**23**
iptables and ip6tables configuration files, tools and utilities	23
Tools, commands and utilities to manage routing tables	
Private address ranges (IPv4) and Unique Local Addresses as well as Link Local Addresses (IPv6)	23
Port redirection and IP forwarding	23
List and write filtering and rules that accept or block IP packets based on source or destination protocol, port and address	23
Save and reload filtering configurations	23

Objective	Chapter Number
212.2 Managing FTP servers	**23**
Configuration files, tools and utilities for Pure-FTPd and vsftpd	23
Awareness of ProFTPd	23
Understanding of passive vs. active FTP connections	23
212.3 Secure shell (SSH)	**23**
OpenSSH configuration files, tools and utilities	23
Login restrictions for the superuser and the normal users	23
Managing and using server and client keys to login with and without password	23
Usage of multiple connections from multiple hosts to guard against loss of connection to remote host following configuration changes	23
212.4 Security tasks	**23**
Tools and utilities to scan and test ports on a server	23
Locations and organisations that report security alerts as Bugtraq, CERT or other sources	23
Tools and utilities to implement an intrusion detection system (IDS)	23
Awareness of OpenVAS and Snort	23
212.5 OpenVPN	**23**
OpenVPN	23

CompTIA Linux+/LPIC-1

PART I

Chapter 1

System Architecture (Domain 101)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **101.1 Determine and Configure hardware settings**

- Enable and disable integrated peripherals
- Configure systems with or without external peripherals such as keyboards
- Differentiate between the various types of mass storage devices
- Know the differences between coldplug and hotplug devices
- Determine hardware resources for devices
- Tools and utilities to list various hardware information (e.g. lsusb, lspci, etc.)
- Tools and utilities to manipulate USB devices
- Conceptual understanding of sysfs, udev, hald, dbus
- The following is a partial list of the used files, terms, and utilities:
  - /sys
  - /proc
  - /dev
  - modprobe
  - lsmod
  - lspci
  - lsusb

✓ **101.2 Boot the System**

- Provide common commands to the boot loader and options to the kernel at boot time
- Demonstrate knowledge of the boot sequence from BIOS to boot completion

- Understanding of SysVinit and systemd
- Awareness of Upstart
- Check boot events in the log file
- The following is a partial list of the used files, terms and utilities:
  - dmesg
  - BIOS
  - bootloader
  - kernel
    - initramfs
    - init
    - SysVinit
    - system

✓ 101.3 Change runlevels/boot targets and shutdown or reboot system

- Set the default runlevel or boot target
- Change between runlevels/boot targets including single user mode
- Shutdown and reboot from the command line
- Alert users before switching runlevels/ boot targets or other major system events
- Properly terminate processes
- The following is a partial list of the used files, terms and utilities:
  - /etc/inittab
  - shutdown
  - init
  - /etc/init.d
  - telinit
  - system
  - systemctl
  - /etc/systemd/
  - /usr/lib/system/
  - wall

1. A Serial ATA (SATA) disk will use which of the following identifiers?
   - **A.** `/dev/hdX`
   - **B.** `/dev/sataX`
   - **C.** `/dev/sdX`
   - **D.** `/disk/sataX`
2. Which command enables you to view the current IRQ assignments?-
   - **A.** `view /proc/irq`
   - **B.** `cat /proc/interrupts`
   - **C.** `cat /dev/irq`
   - **D.** `less /dev/irq`
3. Which device is typically connected as the first floppy disk?
   - **A.** `/dev/hd0`
   - **B.** `/dev/flop0`
   - **C.** `/dev/fd0`
   - **D.** `/dev/sda`
4. Configuration of udev devices is done by working with files in which directory?
   - **A.** `/udev/devices`
   - **B.** `/devices/`
   - **C.** `/udev/config`
   - **D.** `/etc/udev`
5. Which command is used to load a module and its dependencies automatically?
   - **A.** `modprobe`
   - **B.** `lsmod`
   - **C.** `insmod`
   - **D.** `rmmod`
6. Which command is used to obtain a list of USB devices?
   - **A.** `usb-list`
   - **B.** `lsusb`
   - **C.** `ls-usb`
   - **D.** `ls --usb`
7. When working with hotplug devices, what is the location of scripts that are executed when a given device is inserted into the computer?
   - **A.** `/etc/usb`
   - **B.** `/etc/usb-dev`
   - **C.** `/dev/usb`
   - **D.** `/etc/hotplug/usb`

8. Which option given at boot time within the GRUB configuration will boot the system into single-user mode?
   - **A.** `single-user`
   - **B.** `su`
   - **C.** `single`
   - **D.** `root`

9. During boot of a system with GRUB, which key can be pressed to display the GRUB menu?
   - **A.** Shift
   - **B.** E
   - **C.** V
   - **D.** H

10. Which command can be used to view the kernel ring buffer in order to troubleshoot the boot process?
   - **A.** `lsboot`
   - **B.** `boot-log`
   - **C.** `krblog`
   - **D.** `dmesg`

11. During the initialization process for a Linux system using SysVinit, which runlevel corresponds to single-user mode?
   - **A.** Runlevel 5
   - **B.** Runlevel SU
   - **C.** Runlevel 1
   - **D.** Runlevel 6

12. On a system using SysVinit, in which directory are startup and shutdown scripts for services stored?
   - **A.** `/etc/init-d`
   - **B.** `/etc/init`
   - **C.** `/etc/sysV`
   - **D.** `/etc/init.d`

13. Which command can be used to reboot a system?
   - **A.** `init 6`
   - **B.** `shutdown -h -t now`
   - **C.** `init 1`
   - **D.** `refresh-system`

14. Which command would you use if you make changes to the `/etc/inittab` file and want those changes to be reloaded without a reboot?

A. `init-refresh`

B. `init 6`

C. `telinit`

D. `reload-inittab`

15. Which command displays the current runlevel for a system?

A. `show-level`

B. `init --level`

C. `sudo init`

D. `runlevel`

16. Within which folder are `systemd` unit configuration files stored?

A. `/etc/system.conf.d`

B. `/lib/system.conf.d`

C. `/lib/systemd/system`

D. `/etc/sysconfd`

17. Which explanation best describes the following, gathered with the `ls -la` command?

```
lrwxrwxrwx. 1 root root 35 Jul 8 2014 .fetchmailrc ->
.configs/fetchmail/.fetchmailrc
```

A. It is a file called `.fetchmailrc`, which is linked using a symbolic link.

B. It is a file called `.configs/fetchmail/.fetchmailrc`, which is owned by `lrwxrwxrwx`.

C. It is a directory called `.fetchmailrc`, which is owned by user `Jul`.

D. It is a local directory called `.configs/fetchmail/.fetchmailrc`.

18. Which command is used with `systemd` in order to list the available service units?

A. `systemd list-units`

B. `systemctl list-units`

C. `systemd unit-list`

D. `systemctl show-units`

19. Which option to `lspci` is used to display both numeric codes and device names?

A. `-numdev`

B. `-n`

C. `-nn`

D. `-devnum`

20. Which command can be used to obtain a list of currently loaded kernel modules?

A. `insmod`

B. `modlist`

C. `ls --modules`

D. `lsmod`

21. Which option to the `modprobe` command shows the dependencies for a given module?

A. `--show-options`

B. `--list-deps`

C. `--show-depends`

D. `--list-all`

22. Which command can you use to send a message to all users who are currently logged into a system?

A. `cat`

B. `wall`

C. `tee`

D. `ssh`

23. Which of the following is a good first troubleshooting step when a hard disk is not detected by the Linux kernel?

A. Unplug the disk.

B. Check the system BIOS.

C. Restart the web server service.

D. Run the `disk-detect` command.

24. Within which directory is information about USB devices stored?

A. `/etc/usbdevices`

B. `/var/usb`

C. `/lib/sys/usb`

D. `/proc/bus/usb`

25. Which option can be added to a GRUB configuration line to set or change the root partition at boot time to `/dev/sda2`?

A. `rootpartition={hd0,2}`

B. `root=/dev/sda2`

C. `root={hd0,3}`

D. `rootpartition=/dev/sda2`

26. Which key combination will enable you to edit the kernel options and then boot when using GRUB Legacy?

A. ESC for editing and Return to boot

B. V for editing and then Return to boot

C. E for editing and then B to boot

D. V for editing and then B to boot

27. The system on which you're working recently had a hard drive failure. A new hard drive has been installed, and it has had Linux restored from backup to the drive. However, the system will not boot and instead shows a `grub >` prompt. Within the `grub >` prompt, which command will show the current partitions as seen by GRUB?

A. `ls`

B. `showPart`

C. `partitionlist`

D. `ps`

28. If the kernel ring buffer has been overwritten, within which file can you look to find boot messages?

A. `/var/log/bootmessages`

B. `/var/log/mail.info`

C. `/var/adm/log/boot.info`

D. `/var/log/dmesg`

29. Which command and option can be used to determine whether a given service is currently loaded?

A. `systemctl --ls`

B. `telinit`

C. `systemctl status`

D. `sysctl -a`

30. Which command on a `systemd`-controlled system would place the system into single-user mode?

A. `systemctl one`

B. `systemctl isolate resuce.target`

C. `systemctl single-user`

D. `systemctl runlevel one`

31. Which command on a system controlled by Upstart will reload the configuration files?

A. `initctl reload`

B. `systemd reload`

C. `upstart --reload`

D. `ups -reload`

32. When working with a SysV system, which `chkconfig` option will display all services and their runlevels?

A. `--reload`

B. `--list`

C. `--all`

D. `--ls`

33. A drive connected to USB will be considered to be which type of device?

A. Medium

B. Coldplug

C. Hotplug

D. Sideplug

34. During the boot process, what is the next step after the kernel has taken over the initialization process and initializes devices?

A. The system BIOS initializes devices.

B. The system is placed in multi-user mode.

C. The boot loader initializes the kernel.

D. The root partition is mounted.

35. A legacy PATA disk is used to boot the system. You recently added an internal DVD drive to the computer, and now the system will no longer boot. What is the most likely cause?

A. The BIOS has identified the DVD drive as the first disk, and therefore the system can no longer find the Linux partition(s).

B. The hard drive became corrupt when the DVD drive was installed.

C. The hot swap option has not been enabled in the BIOS.

D. The DVD drive is not detected by the computer and needs to be enabled first in the BIOS and then in Linux prior to installation.

36. The system is using a temporary flash USB disk for data mounted at `/dev/sda1`. You need to remove the disk. Which of the following commands will enable the disk to be safely removed from the system?

A. `usbstop /dev/sda`

B. `umount /dev/sda1`

C. `unmount /dev/sda1`

D. `dev-eject /dev/sda1`

37. Within which partition will the EFI system partition typically be mounted?

A. `/etc/efi`

B. `/efi`

C. `/sys/efi`

D. `/boot/efi`

38. Assuming that a USB disk contains a single partition and is made available on `/dev/sdb`, which command mounts the disk in `/media/usb`?

A. `mount /dev/sdb1 /media/usb`

B. `usbconnect /dev/sdb0 /media/usb`

C. `mount /dev/sdb0 /media/usb`

D. `usbmount /dev/sdb1 /media/usb`

39. You have connected a USB disk to the system and need to find out its connection point within the system. Which of the following is the best method for accomplishing this task?

A. Rebooting the system

B. Viewing the contents of `/var/log/usb.log`

C. Connecting the drive to a USB port that you know the number of

D. Running `dmesg` and looking for the disk

40. Which of the following commands will initiate an immediate shutdown of the system?

A. `shutdown -c`

B. `halt`

C. `systemd stop`

D. `stop-system`

41. Which option within a `systemd` service file indicates the program to execute?

A. `StartProgram`

B. `ShortCut`

C. `ExecStart`

D. `Startup`

42. What is the command to display the default target on a computer running `systemd`?

A. `systemctl defaults`

B. `update-rc.d defaults`

C. `systemctl runlevel`

D. `systemctl get-default`

43. Which option of the `systemctl` command will change a service so that it runs on the next boot of the system?

A. `enable`

B. `startonboot`

C. `loadonboot`

D. `start`

44. Which of the following best describes the `/proc` filesystem?

A. `/proc` contains information about files to be processed.

B. `/proc` contains configuration files for processes.

C. `/proc` contains information on currently running processes, including the kernel.

D. `/proc` contains variable data such as mail and web files.

45. Which command will retrieve information about the USB connections on a computer in a tree-like format?

A. `lsusb -tree`

B. `lsusb --tree`

C. `lsusb -t`

D. `usblist --tree`

46. How many SCSI devices are supported per bus?

A. 7 to 15

B. 2 to 4

C. 12

D. 4

47. What is one reason why a device driver does not appear in the output of `lsmod`, even though the device is loaded and working properly?

A. The use of `systemd` means that drivers are not required for most devices.

B. The use of `initramfs` means that support is enabled by default.

C. The system does not need a driver for the device.

D. Support for the device has been compiled directly into the kernel.

48. Which option to `rmmod` will cause the module to wait until it's no longer in use to unload the module?

A. `-test`

B. `-f`

C. `-w`

D. `-unload`

Chapter 2

Linux Installation and Package Management(Domain 102)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **102.1 Design hard disk layout**

- Allocate filesystems and swap space to separate partitions or disks
- Tailor the design to the intended use of the system
- Ensure the /boot partition conforms to the hardware architecture requirements for booting
- Knowledge of basic features of LVM
- The following is a partial list of the used files, terms and utilities:
  - /(root) filesystem
  - /var filesystem
  - /home filesystem
  - /boot filesystem
  - swap space
  - mount points
  - partitions

✓ **102.2 Install a boot manager**

- Providing alternative boot locations and backup boot options
- Install and configure a boot loader such as GRUB Legacy

- Perform basic configuration changes for GRUB 2
- Interact with the boot loader
- The following is a partial list of the used files, terms, and utilities
  - menu.lst, grub.cfg and grub.conf
  - grub-install
  - grub-mkconfig
  - MBR

✓ 102.3 Manage shared libraries

- Identify shared libraries
- Identify the typical locations of system libraries
- Load shared libraries
- The following is a partial list of the used files, terms and utilities
  - ldd
  - ldconfig
  - /etc/ld.so.conf
  - LD_LIBRARY_PATH

✓ 102.4 Use Debian package management

- Install, upgrade and uninstall Debian binary packages
- Find packages containing specific files or libraries which may or may not be installed
- Obtain package information like version, content, dependencies, package integrity and installation status (whether or not the package is installed)
- The following is a partial list of the used files, terms and utilities:
  - /etc/apt/sources.list
  - dpkg
  - dpkg-reconfigure
  - apt-get
  - apt-cache
  - aptitude

✓ 102.5 Use RPM and YUM package management

- Install, re-install, upgrade and remove packages using RPM and YUM
- Obtain information on RPM packages such as version, status, dependencies, integrity and signatures
- Determine what files a package provides, as well as find which package a specific file comes from
- The following is a partial list of the used files, terms and utilities:
  - rpm
  - rpm2cpio
  - /etc/yum.conf
  - /etc/yum.repos.d/
  - yum
  - yumdownloader

1. When partitioning a disk for a mail server running Postfix, which partition/mounted directory should be the largest in order to allow for mail storage?
   - **A.** `/etc`
   - **B.** `/usr/bin`
   - **C.** `/mail`
   - **D.** `/var`
2. Which option within GRUB Legacy is used to indicate that a root partition contains a non-Linux kernel?
   - **A.** `initrd`
   - **B.** `non-linux`
   - **C.** `rootnoverify`
   - **D.** `root-win`
3. Which option within a partition mounting command will cause the partition to be mounted in such a way as to prevent execution of programs?
   - **A.** `execless`
   - **B.** `stoprun`
   - **C.** `noexec`
   - **D.** `norun`
4. Which command will output a new GRUB 2 configuration file and send the output to the correct location for booting?
   - **A.** `update-grub > /boot/grub/grub.cfg`
   - **B.** `update-grub boot > /boot/grub.cfg`
   - **C.** `grub-rc.d`
   - **D.** `grub-boot`
5. What is the maximum number of primary partitions available on an MBR partitioning system?
   - **A.** Two
   - **B.** Four
   - **C.** One
   - **D.** Five
6. Which command is used to update the links and cache for shared libraries on the system?
   - **A.** `ldcache`
   - **B.** `cache-update`
   - **C.** `link-update`
   - **D.** `ldconfig`

7. Which command and option are used to update a Debian system to the latest software?
   - **A.** `apt-update`
   - **B.** `apt-get upgrade`
   - **C.** `dpkg -U`
   - **D.** `apt-cache clean`

8. Which option given to a `yum` command will install a given package?
   - **A.** `update`
   - **B.** `configure`
   - **C.** `install`
   - **D.** `get`

9. What is the location of the home directory for the root user?
   - **A.** `/home/root`
   - **B.** `/home/su`
   - **C.** `/root`
   - **D.** `/`

10. When using rpm2cpio, by default, the output is sent to which location?
    - **A.** STDOUT
    - **B.** The file `cpio.out`
    - **C.** The file `a.out`
    - **D.** The file `/tmp/cpi.out`

11. When working with partitions on disk, you see the type 0x82. Which type of partition is this?
    - **A.** Linux
    - **B.** Linux swap
    - **C.** NTFS
    - **D.** FAT32

12. Which partition or directory structure typically holds most of the programs for a Linux system?
    - **A.** `/etc`
    - **B.** `/usr`
    - **C.** `/home`
    - **D.** `/var`

13. Your GRUB Legacy configuration includes a dual-boot option with Linux listed first and another operating system listed second. Which of the following options will boot to the Linux partition by default?
    A. `default=linux`
    B. `default=0`
    C. `default=1`
    D. `default=other`

14. Which file should you edit when using GRUB 2 in order to set things like the timeout?
    A. `/etc/default/grub`
    B. `/etc/grub/boot`
    C. `/etc/boot/grub.d`
    D. `/grub.d/boot`

15. Which `yum` option displays the dependencies for the package specified?
    A. `list`
    B. `deplist`
    C. `dependencies`
    D. `listdeps`

16. Which options for an `rpm` command will display verbose output for an installation along with progress of the installation?
    A. `-ivh`
    B. `-wvh`
    C. `--avh`
    D. `--ins-verbose`

17. Which of the following commands adds `/usr/local/lib` to the `LD_LIBRARY_PATH` when using Bash shell?
    A. `set PATH=/usr/local/lib`
    B. `export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/local/lib`
    C. `LD_LIBRARY_PATH=/usr/local/lib`
    D. `connectpath LD_LIBRARY_PATH=/usr/local/lib`

18. Which command can be used to download an RPM package without installing it?
    A. `yumdl`
    B. `yumdownloadonly`
    C. `yumdown`
    D. `yumdownloader`

19. Which command will search for a package named `zsh` on a Debian system?

A. `apt-cache search zsh`

B. `apt-get search zsh`

C. `apt-cache locate zsh`

D. `apt search zsh`

20. Which option within `/etc/default/grub` is used to configure the default operating system for boot?

A. `GRUB_OS`

B. `GRUB_ON`

C. `GRUB_DEFAULT`

D. `DEFAULT_OS`

21. When found in a GRUB configuration file, what does the `ro` option indicate?

A. Initially mount the root partition as read-only

B. Mount the kernel as read-only

C. Start the `init` program as read-once

D. Mount the root partition in Raised Object mode

22. Within which directory will you find the repositories used by YUM?

A. `/etc/yum.conf`

B. `/etc/repos`

C. `/etc/yum.conf.d`

D. `/etc/yum.repos.d`

23. Which `rpm` option can be used to verify that no files have been altered since installation?

A. `-V`

B. `-v`

C. `--verbose`

D. `--filesum`

24. Which option for the `grub-mkconfig` command sends output to a file instead of STDOUT?

A. `-STDOUT`

B. `--fileout`

C. `-o`

D. `-f`

25. The presence of `menu.lst` within the filesystem typically indicates which condition?

A. GRUB Legacy is in use on the system.

B. GRUB 2 is in use on the system.

C. An error has occurred creating the output to `menu.lst`.

D. The options for rescue boot have been changed.

26. Which command is used to determine the libraries on which a given command depends?

A. `ldconfig`

B. `librarylist`

C. `listdeps`

D. `ldd`

27. Which of the following is true of Linux swap space?

A. Swap is used to hold temporary database tables.

B. Swap is used as additional memory when there is insufficient RAM.

C. Swap is used by the mail server for security.

D. Swap is used to scrub data from the network temporarily.

28. Which of the following is not typically used to store libraries?

A. `/lib`

B. `/etc/lib`

C. `/usr/lib`

D. `/usr/local/lib`

29. Which of the following commands updates the package cache for a Debian system?

A. `apt-get cache-update`

B. `apt-cache update`

C. `apt-get update`

D. `apt-get upgrade`

30. Within which file are details of the current package repositories stored on a Debian system?

A. `/etc/apt.list`

B. `/etc/sources.list`

C. `/etc/apt/sources.list`

D. `/etc/apt.d/sources.list`

31. Of the following choices, which size would be most appropriate for the `/boot` partition of a Linux system?

A. Between 100 MB and 500 MB

B. Between 1 GB and 10 GB

C. `/boot` should not be partitioned separately.

D. Less than 5 MB

32. Which of the following commands initializes a physical disk partition for use with LVM?

A. `lvmcreate`

B. `pvcreate`

C. `fvcreate`

D. `lvinit`

33. Which of the following commands installs GRUB into the MBR of the second SATA disk?

A. `grub-install /dev/hdb2`

B. `grub-install /dev/sda2`

C. `grub-config /dev/sda`

D. `grub-install /dev/sdb`

34. Which command should be used to make changes to the choices made when a Debian package was installed?

A. `dpkg-reconfigure`

B. `dpkg -r`

C. `dpkg --reconf`

D. `apt-get reinstall`

35. Which command is used to create a logical volume with LVM?

A. `pvcreate`

B. `lvmcreate`

C. `lvcreate`

D. `volcreate`

36. What is the logical order for creation of an LVM logical volume?

A. Physical volume creation, volume group creation, logical volume creation

B. Physical volume creation, logical volume creation, volume group creation

C. Logical volume creation, physical volume creation, volume group creation

D. LVM creation, format, partition

37. Which of the Debian package management tools provides a terminal-based interface for management?

A. `apt-get`

B. `dpkg`

C. `apt-cache`

D. `aptitude`

38. Which option for `yum` performs a search of the package cache?

A. `seek`

B. `query`

C. `--search`

D. `search`

39. Which command option for `rpm` can be used to show the version of the kernel?

A. `rpm kernel`

B. `rpm -q kernel`

C. `rpm search kernel`

D. `rpm --list kern`

40. Assuming a menu entry of "Debian" in your GRUB configuration, which option in `/etc/default/grub` would set that as the default operating system to boot?

A. `GRUB_OS`

B. `GRUB_OS_DEF`

C. `GRUB_DEFAULT`

D. `GRUB_CONF`

41. Which option in `/etc/yum.conf` is used to ensure that the kernel is not updated when the system is updated?

A. `exclude=kernel*`

B. `exclude-kernel`

C. `updatekernel=false`

D. `include-except=kernel`

42. Which partition type should be created for a Linux system non-swap partition?

A. 82

B. 83

C. 84

D. L

43. Which command should be run after making a change to the `/etc/default/grub` file?

A. `grub`

B. `grub-mkconfig`

C. `grub-inst`

D. `reboot`

44. Which command searches for and provides information on a given package on a Debian system, including whether or not the package is currently installed?

A. `dpkg -i`

B. `dpkg -s`

C. `apt-cache`

D. `apt-info`

45. Which command is used to search for physical volumes for use with LVM?

A. `lvmcreate`

B. `pvcreate`

C. `lvmdiskscan`

D. `lvmscan`

46. Which option added to `yumdownloader` will also download dependencies?

A. `--deps`

B. `--resolve`

C. `--resdeps`

D. `-d`

47. Which of the following installs a previously downloaded Debian package?

A. `dpkg -i <package name>`

B. `apt-install <package name>`

C. `apt-slash <package name>`

D. `dpkg -U <package name>`

48. A hard drive is reported as hd(0,0) by the GRUB Legacy configuration file. To which of the following disks and partitions does this correspond?

A. `/dev/hdb2`

B. `/dev/hda0`

C. `/dev/disk1`

D. `/dev/sda1`

Chapter 3

GNU and Unix Commands (Domain 103)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **103.1 Work on the command line**

- Use single shell commands and one line command sequences to perform basic tasks on the command line
- Use and modify the shell environment including defining, referencing and exporting environment variables
- Use and edit command history
- Invoke commands inside and outside the defined path
- The following is a partial list of the used files, terms and utilities:
  - bash
  - echo
  - env
  - export
  - pwd
  - set
  - unset
  - man
  - uname
  - history
  - .bash_history

✓ 103.2 Process text streams using filters

- Send text files and output streams through text utility filters to modify the output using standard UNIX commands found in the GNU textutils package
- The following is a partial list of the used files, terms and utilities:
  - cat
  - cut
  - expand
  - fmt
  - head
  - od
  - join
  - nl
  - paste
  - pr
  - sed
  - sort
  - split
  - tail
  - tr
  - unexpand
  - uniq
  - wc

✓ 103.3 Perform basic file management.

- Copy, move and remove files and directories individually
- Copy multiple files and directories recursively
- Remove files and directories recursively
- Use simple and advanced wildcard specifications in commands
- Using find to locate and act on files based on type, size, or time

- Usage of tar, cpio, and dd
- The following is a partial list of the used files, terms and utilities:
  - cp
  - find
  - mkdir
  - mv
  - ls
  - rm
  - rmdir
  - touch
  - tar
  - cpio
  - dd
  - file
  - gzip
  - gunzip
  - bzip2
  - xz
  - file globbing

✓ 103.4 Use streams, pipes and redirects

- Redirecting standard input, standard output and standard error
- Pipe the output of one command to the input of another command
- Use the output of one command as arguments to another command
- Send output to both stdout and a file
- The following is a partial list of the used files, terms and utilities:
  - tee
  - xargs

✓ 103.5 Create, monitor and kill processes

- Run jobs in the foreground and background
- Signal a program to continue running after logout
- Monitor active processes
- Select and sort processes for display
- Send signals to processes
- The following is a partial list of the used files, terms and utilities:
  - &
  - bg
  - fg
  - jobs
  - kill
  - nohup
  - ps
  - top
  - free
  - uptime
  - pgrep
  - pkill
  - killall
  - screen

✓ 103.6 Modify process execution priorities

- Know the default priority of a job that is created
- Run a program with higher or lower priority than the default
- Change the priority of a running process
- The following is a partial list of the used files, terms and utilities:
  - nice
  - ps
  - renice
  - top

✓ 103.7 Search text files using regular expressions

- Create simple regular expressions containing several notational elements
- Use regular expression tools to perform searches through a filesystem or file content
- The following is a partial list of the used files, terms and utilities:
  - grep
  - egrep
  - fgrep
  - sed
  - regex(7)

✓ 103.8 Perform basic file editing operations using vi

- Navigate a document using vi
- Use basic vi modes
- Insert, edit, delete, copy and find text
- The following is a partial list of the used files, terms and utilities:
  - vi
  - /, ?
  - h, j, k, l
  - i, o, a
  - c, d, p, y, dd, yy
  - ZZ, :w!, :q!, :e!

1. What command can be used to view the current settings for your environment when using Bash?
   - **A.** `environment`
   - **B.** `env`
   - **C.** `listenv`
   - **D.** `echoenv`

2. Assume that you're using the Bash shell and want to prevent output redirects from accidentally overwriting existing files. Which command and option can be used to invoke this behavior?
   - **A.** `setoutput -f`
   - **B.** `overwrite=no`
   - **C.** `overwrite -n`
   - **D.** `set -C`

3. Which command is used to access documentation on a Linux computer for a given command?
   - **A.** `doc`
   - **B.** `heredoc`
   - **C.** `man`
   - **D.** `manual`

4. Which of the following commands will print various information about the kernel and architecture, along with other details?
   - **A.** `info --sys`
   - **B.** `man sys`
   - **C.** `sysinfo`
   - **D.** `uname -a`

5. When using `sed` for a substitution operation, which option must be included so that the substitution applies to the entire line rather than just the first instance?
   - **A.** `g`
   - **B.** `a`
   - **C.** `r`
   - **D.** `y`

6. Which option for the `wc` command prints the number of lines given as input?
   - **A.** `-f`
   - **B.** `-a`
   - **C.** `-l`
   - **D.** `-o`

7. What is the default number of lines printed by the `head` and `tail` commands, respectively?
   - **A.** 10 for `head`, 5 for `tail`
   - **B.** 5 for `head`, 10 for `tail`
   - **C.** 10 for both `head` and `tail`
   - **D.** 3 for both `head` and `tail`

8. You are attempting to use `rmdir` to remove a directory, but there are still multiple files and other directories contained within it. Assuming that you're sure you want to remove the directory and all of its contents, what are the command and arguments needed to remove the directory and all of its contents?
   - **A.** `rm -f`
   - **B.** `rm -rf`
   - **C.** `rmdir -a`
   - **D.** `rmdir -m`

9. Which command will find directories with names beginning with 2014 located beneath the current directory?
   - **A.** `find ./ -name "2014"`
   - **B.** `find ./ -type d -name "2014"`
   - **C.** `find / -type d "2014"`
   - **D.** `find ./ -type d -name "2014*"`

10. Which of the following commands will provide the usernames in a sorted list gathered from the `/etc/passwd` file?
    - **A.** `cat /etc/passwd | awk -F: '{print $1}' | sort`
    - **B.** `sort /etc/passwd | cut`
    - **C.** `echo /etc/passwd`
    - **D.** `cat /etc/passwd | awk '{print $1}' | sort`

11. Which options to `ls` will produce output, including hidden (dot) files, in a list that is ordered such that the newest files are at the end of the output?
    - **A.** `-la`
    - **B.** `-lat`
    - **C.** `-latr`
    - **D.** `-ltr`

12. What will be the result if the `touch` command is executed on a file that already exists?
    - **A.** The access timestamp of the file will change to the current time when the `touch` command is executed.
    - **B.** The file will be overwritten.
    - **C.** There will be no change.
    - **D.** The file will be appended to.

13. Which option to both `mv` and `cp` will cause the command to prompt before overwriting files that already exist?
    - **A.** `-f`
    - **B.** `-Z`
    - **C.** `-r`
    - **D.** `-i`

14. Which of the following commands will send the contents of `/etc/passwd` to both stdout and a file called `passwordfile`?
    - **A.** `cat /etc/passwd > passwordfile`
    - **B.** `var /etc/passwd | passwordfile`
    - **C.** `cat /etc/passwd | tee passwordfile`
    - **D.** `echo /etc/passwd | stdout > passwordfile`

15. The current hierarchy on the server contains a directory called `/usr/local`. You need to create additional directories below that called `/usr/local/test/october`. Which command will accomplish this task?
    - **A.** `mkdir -p /usr/local/test/october`
    - **B.** `mkdir /usr/local/test/october`
    - **C.** `mkdir -r /usr/local/test/october`
    - **D.** `mkdir -f /usr/local/test/october`

16. Which option to the `cp` command will copy directories in a recursive manner?
    - **A.** `-v`
    - **B.** `-R`
    - **C.** `-Z`
    - **D.** `-i`

17. You have received a file that does not have a file extension. Which command can you run to help determine what type of file it might be?
    - **A.** `grep`
    - **B.** `telnet`
    - **C.** `file`
    - **D.** `export`

18. Which command will create an image of the `/dev/sda1` disk partition and place that image into a file called `output.img`?
    - **A.** `dd if=sda of=/dev/sda1`
    - **B.** `dd if=output.img of=/dev/sda1`
    - **C.** `dd if=/dev/sda1 of=output.img`
    - **D.** `echo /dev/sda1 > output.img`

19. What is the default delimiter used by the `cut` command?

A. Colon

B. Tab

C. Space

D. Comma

20. Which of the following will unzip and extract the contents of a file that has been tarred and gzipped?

A. `tar -zxf <file.tgz>`

B. `tar -xf <file.tgz>`

C. `tar -vz <file.tgz>`

D. `tar -fd <file.tgz>`

21. What command is used to bring a command to foreground processing after it has been backgrounded with an &?

A. `bg`

B. `fore`

C. `4g`

D. `fg`

22. You need to write a script that gathers all of the process IDs for all instances of Apache running on the system. Which of the following commands will accomplish this task?

A. `ps auwx | grep apache`

B. `pgrep apache`

C. `processlist apache`

D. `ls -p apache`

23. Which of the following command lines would monitor a single process called `nagios` in a continuous manner?

A. `top -n 1`

B. `top -p 23`

C. `ps -nagios`

D. `top -p`pidof nagios``

24. Users are reporting that various programs are crashing on the server. When examining logs, you see that certain processes are reporting out-of-memory conditions. Which command can you use to see the overall memory usage, including available swap space?

A. `tree`

B. `pgrep`

C. `uptime`

D. `free`

25. You are using the vi editor for changing a file and need to exit. You receive a notice indicating "No write since last change." Assuming that you want to save your work, which of the following commands will save your work and exit vi?

A. `:wq`

B. `:q!`

C. `dd`

D. `x`

26. What option is used to change the number of lines of output for the `head` and `tail` commands?

A. `-l`

B. `-f`

C. `-g`

D. `-n`

27. Which command can be used to determine the current load average along with information on the amount of time since the last boot of the system?

A. `uptime`

B. `sysinfo`

C. `bash`

D. `ls -u`

28. You need to start a long-running process that requires a terminal and foreground processing. However, you cannot leave your terminal window open due to security restrictions. Which command will enable you to start the process and return at a later time to continue the session?

A. `fg`

B. `bg`

C. `kill`

D. `screen`

29. You have attempted to stop a process using its service command and also using the `kill` command. Which signal can be sent to the process using the `kill` command in order to force the process to end?

A. `-15`

B. `-f`

C. `-9`

D. `-stop`

30. When working in the Bash shell, you need to redirect both stdout and stderr. Which of the following commands will redirect both stdout and stderr?

A. `1>2`

B. `>2`

C. `2>&1`

D. `>>`

31. Which command can be run to determine the default priority for processes spawned by the current user?

A. `prio`

B. `nice`

C. `renice`

D. `defpriority`

32. Which of the following `egrep` commands will examine `/etc/passwd` to find users who are using either `/bin/bash` or `/usr/bin/zsh` for their shell environment?

A. `grep sh /etc/passwd`

B. `egrep '/*/.sh$' /etc/passwd`

C. `grep '/*/.=sh$' /etc/passwd`

D. `egrep '/*/.?sh$' /etc/passwd`

33. Which option to the `man` command accesses a different level of documentation, for example, system call documentation?

A. `man 2 <argument>`

B. `progman <argument>`

C. `man --sys <argument>`

D. `man --list sys`

34. When editing with vi, which command changes into insert mode and opens a new line below the current cursor location?

A. `f`

B. `a`

C. `o`

D. `i`

35. Which `kill` signal can be sent in order to restart a process?

A. `-HUP`

B. `-RESTART`

C. `-9`

D. `-SIG`

36. Which of the following commands will display the last 50 lines of your command history when using Bash, including commands from the current session?

A. `bashhist 50`

B. `history 50`

C. `cat .bash_history`

D. `tail -f .bash_history`

37. You have backgrounded several tasks using &. Which command can be used to view the current list of running tasks that have been backgrounded?

A. `procs`

B. `plist`

C. `jobs`

D. `free`

38. Which of the following commands searches each user's `.bash_history` file to determine if the user has invoked the `sudo` command?

A. `find /home -name "bash_history" | grep sudo`

B. `find /home -name ".bash_history" | xargs grep sudo`

C. `find /home/.bash_history | xargs grep sudo`

D. `find /home -type history | xargs grep sudo`

39. Which command will watch the Apache log at `/var/log/httpd/access.log` and continually scroll as new log entries are created?

A. `watch /var/log/httpd/access.log`

B. `tail /var/log/httpd/access.log`

C. `tail -f /var/log/httpd/access.log`

D. `mon /var/log/httpd/access.log`

40. You are debugging a configuration file and the daemon indicates there is a problem on line 932. Which of the following commands will prepend line numbers onto the file?

A. `lines`

B. `wc -l`

C. `newline`

D. `nl`

41. You receive a file with a `.lzma` extension. Which command can you use to decompress this file?

A. `xz`

B. `lz`

C. `gz`

D. `bzip`

42. Which `find` command will locate files within the current directory that have been modified within the last 24 hours?

A. `find ./ -type f -mtime 1`

B. `find ./ -type f -mtime 24`

C. `find ./ -type f -mtime +1`

D. `find ./ type -f time 24`

43. Which command will move all files with a `.txt` extension to the `/tmp` directory?

A. `mv txt* tmp`

B. `move *txt /temp`

C. `mv *.txt /tmp`

D. `mv *.txt tmp`

44. Which command prints your current directory?

A. `cwd`

B. `curdur`

C. `cd`

D. `pwd`

45. Assume that you have a file called `zips.txt` that contains several postal zip codes, and you need to determine how many unique zip codes there are in the file. Which of the following commands can be used for that purpose?

A. `sort zips.txt | uniq -c`

B. `uniq zips.txt`

C. `count zips.txt`

D. `cat zips.txt | uniq -c`

46. When using Bash, how would you execute the last command starting with a certain string, even if that command was not the last one that you typed?

A. Precede the command with `!` and then the string to search for.

B. Search for the command in history.

C. Precede the command with `?` and then the string to search for.

D. This is not possible with Bash.

47. Which command can be used to kill all processes by using their name?

A. `killproc`

B. `killname`

C. `killall`

D. `kill -f`

48. You're working with a large file in vi, and you need to search for instances of a string earlier in the file. Which key will search backward in the file?

A. `/`

B. `h`

C. `?`

D. `x`

Chapter

4

Devices, Linux Filesystems, and the Filesystem Hierarchy Standard (Domain 104)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **104.1 Create partitions and filesystems**

- Manage MBR partition tables
- Use various mkfs commands to create various filesystems such as:
  - ext2
  - ext3
  - ext4
  - XFS
  - VFAT
- Awareness of ReiserFS and Btrfs
- Basic knowledge of gdisk and parted with GPT
- The following is a partial list of the used files, terms and utilities:
  - fdisk
  - gdisk
  - parted
  - mkfs
  - mkswap

✓ 104.2 Maintain the integrity of filesystems

- Verify the integrity of filesystems
- Monitor free space and inodes
- Repair simple filesystem problems
- The following is a partial list of the used files, terms and utilities:
  - du
  - df
  - fsck
  - e2fsck
  - mke2fs
  - debugfs
  - dumpe2fs
  - tune2fs
  - xfs tools (such as xfs_metadump and xfs_info)

✓ 104.3 Control mounting and unmounting of filesystems

- Manually mount and unmount filesystems
- Configure filesystem mounting on bootup
- Configure user mountable removeable filesystems
- The following is a partial list of the used files, terms and utilities:
  - /etc/fstab
  - /media
  - mount
  - umount

✓ 104.4 Manage disk quotas

- Set up a disk quota for a filesystem
- Edit, check and generate user quota reports

- The following is a partial list of the used files, terms and utilities:
  - quota
  - edquota
  - repquota
  - quotaon

✓ **104.5 Manage file permissions and ownership.**

- Manage access permissions on regular and special files as well as directories
- Use access modes such as suid, sgid and the sticky bit to maintain security
- Know how to change the file creation mask
- Use the group field to grant file access to group members
- The following is a partial list of the used files, terms and utilities:
  - chmod
  - umask
  - chown
  - chgrp

✓ **104.6 Create and change hard and symbolic links**

- Create links
- Identify hard and/or softlinks
- Copying versus linking files
- Use links to support system administration tasks
- The following is a partial list of the used files, terms and utilities:
  - ln
  - ls

✓ **104.7 Find system files and place files in the correct location.**

- Understand the correct locations of files under the FHS
- Find files and commands on a Linux system

- Know the location and purpose of important files and directories as defined in the FHS
- The following is a partial list of the used files, terms and utilities:
  - find
  - locate
  - updatedb
  - whereis
  - which
  - type
  - /etc/updatedb.conf

1. Which command can be used to determine the location of a given executable that would be run if typed from your current environment and location?
   - **A.** `which`
   - **B.** `what`
   - **C.** `whatis`
   - **D.** `when`

2. Which of the following commands will correctly change the group ownership of the file called `a.out` to users?
   - **A.** `chgrp users a.out`
   - **B.** `chgrp a.out users`
   - **C.** `groupchg a.out users`
   - **D.** `grpchg users a.out`

3. Another administrator made a change to one of the local scripts used for administrative purposes. The change was also immediately reflected in your copy of the script. However, when examining the file with `ls`, it appears to be a normal file. What is the likely cause of such a scenario?
   - **A.** The file was executed after edit.
   - **B.** The administrator copied the file to yours.
   - **C.** Your file is a hard link to the original.
   - **D.** The file has been restored from backup.

4. Which of the following commands shows the usage of inodes across all filesystems?
   - **A.** `df -i`
   - **B.** `ls -i`
   - **C.** `du -i`
   - **D.** `dm -i`

5. When running `fsck` on an ext3 filesystem, the process is taking longer than expected and requiring input from the administrator to fix issues. What option could be added to `fsck` next time so that the command will automatically attempt to fix errors without intervention?
   - **A.** `-o`
   - **B.** `-V`
   - **C.** `-y`
   - **D.** `-f`

6. After you insert a new hard drive into the system, what is the correct order to make the drive ready for use within Linux?
   - **A.** Use `fdisk` to create partitions and then mount the partitions.
   - **B.** Mount the partitions.
   - **C.** Use `fdisk` to create partitions and `mount -a` to mount all of the newly created partitions.
   - **D.** Use `fdisk` to create partitions, then format the partitions with something like `mkfs`, and then mount the partitions.

7. You are using a SAN (storage area network) that keeps causing errors on your Linux system due to an improper kernel module created by the SAN vendor. When the SAN sends updates, it causes the filesystem to be mounted as read-only. Which command and option can you use to change the behavior of the filesystem to account for the SAN bug?
   - **A.** `mount– --continue`
   - **B.** `tune2fs -e continue`
   - **C.** `mkfs --no-remount`
   - **D.** `mount -o remount`

8. Which of the following describes a primary difference between ext2 and ext3 filesystems?
   - **A.** ext3 was primarily a bugfix update to ext2.
   - **B.** ext3 includes journaling for the filesystem.
   - **C.** ext3 completely changed the tools needed for management of the disks.
   - **D.** ext3 has no significant differences.

9. Which option to `umask` will display the permissions to be used in a POSIX format?
   - **A.** `-P`
   - **B.** `-p`
   - **C.** `-S`
   - **D.** `-v`

10. Which option to `ln` creates a symlink to another file?
    - **A.** `-sl`
    - **B.** `-s`
    - **C.** `-l`
    - **D.** `--ln`

11. Which of the following commands can be used if you need to locate various elements of a given command, such as its binaries and man pages?
    - **A.** `whatis`
    - **B.** `find`
    - **C.** `whereis`
    - **D.** `ls`

12. Which option in `/etc/updatedb.conf` will remove a path from inclusion in the results?
    - **A.** `PRUNEPATHS`
    - **B.** `EXCLUDEPATHS`
    - **C.** `INCLUDEEXCLUDE`
    - **D.** `SEPARATEPATH`

13. According to the FHS, what is the correct location for site-specific data for a server?

A. `/etc`

B. `/var`

C. `/tmp`

D. `/srv`

14. Which of the following commands enables the sticky bit for a user on a file called `homescript.sh`?

A. `chmod +sticky homescript.sh`

B. `chmod 755 homescript.sh`

C. `chmod u+s homescript.sh`

D. `chown u+sticky homescript.sh`

15. Which option to the `mount` command will mount all filesystems that are currently available in `/etc/fstab`?

A. `-f`

B. `-d`

C. `-a`

D. `-m`

16. Which command is used to format a swap partition?

A. `fdisk`

B. `mkswap`

C. `formatswap`

D. `format -s`

17. Which command and option are used to display the number of times that a filesystem has been mounted?

A. `tune2fs -h`

B. `cat /etc/fstab`

C. `mount -a`

D. `less /etc/fsmnt`

18. Which option to `xfs_metadump` displays a progress indicator?

A. `-g`

B. `-p`

C. `-f`

D. `-v`

19. Which command is used to execute a check of user quotas on the filesystem?

A. `quota -u`

B. `runquota -u`

C. `qcheck -u`

D. `quotacheck -u`

20. The system is running out of disk space within the home directory partition and quotas have not been enabled. Which command can you use to determine the directories that might contain large files?

A. `du`

B. `df`

C. `ls`

D. `locate`

21. Which file contains information about the filesystems to mount, their partitions, and the options that should be used to mount them?

A. `/etc/filesystems`

B. `/etc/mounts`

C. `/etc/fstab`

D. `/srv/mounts`

22. According to the FHS, what is the proper mount point for removable media?

A. `/etc`

B. `/srv`

C. `/tmp`

D. `/media`

23. Which file contains information on currently mounted filesystems, including their mount options?

A. `/etc/mtab`

B. `/etc/fstab`

C. `/tmp/files`

D. `/etc/filesystems`

24. Which option to `umount` will cause the command to attempt to remount the filesystem in read-only mode if the unmounting process fails?

A. `-o`

B. `-r`

C. `-f`

D. `-v`

25. The `umask` command reports the mask as 022. What is the permission that will be in effect for a newly non-executable created file?

A. `u+rw, g+r, w+r`

B. `755`

C. `022`

D. `a+r`

26. When using `ls -la` to obtain a directory listing, you see an object with permissions of `lrwxrwxrwx`. What type of object is this?

A. It is a directory.

B. It is a symlink.

C. It is a temporary file.

D. It is a local file.

27. Which command and option will output a summary of quota usage across all filesystems that are currently read-write with quotas enabled?

A. `repq -a`

B. `repquota -a`

C. `quotarun -a`

D. `quota -u`

28. The `locate` command is reporting out-of-date information. Which command should be run in order to have the `locate` command update its database?

A. `locatedb -u`

B. `locate -u`

C. `updatedb`

D. `updatelocate`

29. Which shell built-in command can be used to determine what command will be run?

A. `type`

B. `when`

C. `find`

D. `help`

30. Which option to `chown` recursively changes the ownership?

A. `-f`

B. `-R`

C. `-a`

D. `-m`

31. Which of the following represents the correct format for the `/etc/fstab` file?

A. `<directory> <device> <type> <options>`

B. `<device> <type> <options>`

C. `<device> <type> <options> <directory> <dump> <fsck>`

D. `<device> <directory> <type> <options> <dump> <fsck>`

32. Which of the following commands is used to identify the UUID for partitions?

A. `blkid`

B. `ls`

C. `find`

D. `cat`

33. The `xfs_info` command is functionally equivalent to which command and option?

A. `xfs_test -n`

B. `xfs_list`

C. `tunexfs -i`

D. `xfs_growfs -n`

34. Which of the following commands will create a btrfs filesystem on the first SATA drive?

A. `mkfs /dev/sda1`

B. `mkfs.btrfs /dev/sda`

C. `mkfs.btr2fs /dev/sda1`

D. `mkfs -b /dev/sda`

35. Which option is set on a filesystem in order to enable user-level quotas?

A. `quotaon`

B. `enquota=user`

C. `usrquota`

D. `userquota`

36. You need to enable the web server (running as the `www-data` user and group) to write into a directory called `/home/webfiles`. Which commands will accomplish this task in the most secure manner?

A. `chgrp www-data /home/webfiles; chmod 775 /home/webfiles`

B. `chmod 777 /home/webfiles`

C. `chgrp www-data /home/webfiles; chmod 711 /home/webfiles`

D. `chmod 707 /home/webfiles`

37. Which command and option are used to set the maximum number of times that a filesystem can be mounted between running `fsck`?

A. `tune2fs -c`

B. `tune2fs -f`

C. `tune2fs -m`

D. `setmount`

38. Which command can be used to change the partitioning scheme for a disk, such as to change the size of existing partitions without deleting them?

A. `resize2fs`

B. `parted`

C. `mkfs`

D. `rfdisk`

39. Which of the following commands will mount a USB device at `/dev/sdb1` into the `/media/usb` directory, assuming a VFAT filesystem for the USB drive?

A. `mount -t vfat /dev/sdb1 /mnt`

B. `usbmount /dev/sdb1 /mnt/usb`

C. `mount -t vfat /dev/sdb1 /media/usb`

D. `mount -t usb /dev/sdb1 /mnt/usb`

40. Which option within `gdisk` will change the partition name?

A. `n`

B. `b`

C. `v`

D. `c`

41. Which option to the `dumpe2fs` command can be used to display blocks that are reserved because of being marked as bad?

A. `-v`

B. `-f`

C. `-b`

D. `-m`

42. Which options to `fsck` can be used to check all filesystems listed in `/etc/fstab` while excluding the root partition?

A. `-NR`

B. `-AM`

C. `-X`

D. `-C`

43. Which command is used to enable quotas on a filesystem that has been previously set up for quota usage?

A. `quotaenable`

B. `quotaon`

C. `quotau`

D. `enquota`

44. Which option in `/etc/fstab` sets the order in which the device is checked at boot time?

A. `options`

B. `dump`

C. `fsck`

D. `checkorder`

45. Which option to `quotacheck` is used to create the files for the first time?

A. `-f`

B. `-u`

C. `-m`

D. `-c`

46. The SAN has crashed and one of the filesystems in a Linux server has become significantly corrupt as a result. Which command and option can be used to attempt to examine the contents of the drive without causing more damage?

A. `fdisk -f`

B. `mke2fs -c`

C. `debugfs -c`

D. `ls -a`

47. Which option to the `find` command will search for files by their inode number?

A. `-inode`

B. `-type`

C. `-in`

D. `-inum`

48. Which option to `chgrp` will change group ownership of all files within a given directory?

A. `-directory`

B. `-d`

C. `-R`

D. `-V`

Chapter

5

Working with Shells, Scripting, and Data Management (Domain 105)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **105.1 Customize and use the shell environment**

- Set environment variables (e.g., PATH) at login or when spawning a new shell
- Write Bash functions for frequently used sequences of commands
- Maintain skeleton directories for new user accounts
- Set command search path with the proper directory
- The following is a partial list of the used files, terms and utilities:
  - source
  - /etc/bash.bashrc
  - /etc/profile
  - env
  - export
  - set
  - unset
  - ~/.bash_profile
  - ~/.bash_login
  - ~/.profile

- ~/.bashrc
- ~/.bash_logout
- function
- alias
- lists

✓ 105.2 Customize or write simple scripts

- Use standard sh syntax (loops, tests)
- Use command substitution
- Test return values for success or failure or other information provided by a command
- Perform conditional mailing to the superuser
- Correctly select the script interpreter through the shebang (#!) line
- Manage the location, ownership, execution and suid-rights of scripts
- The following is a partial list of the used files, terms and utilities:
  - for
  - while
  - test
  - if
  - read
  - seq
  - exec

✓ 105.3 SQL data management

- Use of basic SQL commands
- Perform basic data manipulation
- The following is a partial list of the used files, terms and utilities:
  - insert
  - update

- select
- delete
- from
- where
- group by
- order by
- join

1. Which command is used to read and execute commands from a file in the Bash shell?
   - **A.** `run`
   - **B.** `execute`
   - **C.** `source`
   - **D.** `func`
2. You need a command to be executed on logout for all users. Within which file should this be placed (assume that all users are using Bash)?
   - **A.** `~/.bash_logout`
   - **B.** `/etc/bash.bash_logout`
   - **C.** `/home/.bash_logout`
   - **D.** `/etc/bash_logout`
3. Which of the following commands removes an environment variable that has been set?
   - **A.** `profile --unset`
   - **B.** `env -u`
   - **C.** `set -u`
   - **D.** `import`
4. When setting the shebang line of a shell script, which of the following commands will help to determine the location of the interpreter automatically?
   - **A.** `#!/usr/bin/env bash`
   - **B.** `#!/bin/bash`
   - **C.** `#!env`
   - **D.** `/bin/int bash`
5. When querying a database, which of the following SQL statements retrieves all data from a table called `users`?
   - **A.** `SELECT ALL_DATA FROM users;`
   - **B.** `QUERY ALL FROM users;`
   - **C.** `SELECT * Table: Users;`
   - **D.** `SELECT * FROM users;`
6. Which of the following best describes the PS1 environment variable?
   - **A.** PS1 is used to set the location of the PostScript command.
   - **B.** PS1 is used to define the default shell prompt for Bash.
   - **C.** PS1 is used as a per-system variable.
   - **D.** PS1 is user defined and does not have a default value or setting.

7. Which of the following commands ensures that the `-la` options are used when the `ls` command is executed without other options?
   - **A.** `alias ls="ls -la"`
   - **B.** `ln -s ls ls -la`
   - **C.** `alias "ls -la" = ls`
   - **D.** `set ls`

8. What is the order in which user configuration files are located on login to a Bash shell?
   - **A.** `.bash_login`, `.profile`, `/etc/profile`
   - **B.** `.bash_profile`, `.bash_login`, `.profile`
   - **C.** `.profile`, `.bash_login`, `.bash_profile`
   - **D.** `.bash_login`, `.bash_profile`, `.profile`

9. Which variable within a Bash script is used to access the first command-line parameter?
   - **A.** `$ARG`
   - **B.** `$0`
   - **C.** `$1`
   - **D.** `$ARG0`

10. Which of the following provides the end for an `if` conditional in a Bash script?
    - **A.** `ex`
    - **B.** `}`
    - **C.** `]`
    - **D.** `fi`

11. Which of the following commands will delete all data from a table called `virtualusers` in MySQL on Linux?
    - **A.** `DELETE FROM VIRTUALUSERS;`
    - **B.** `DELETE FROM virtualusers;`
    - **C.** `DELETE * FROM virtualusers;`
    - **D.** `DELETE ALL FROM virtualusers;`

12. Which of the following commands displays the columns and column types within a given table?
    - **A.** `DESC`
    - **B.** `ASK`
    - **C.** `SELECT`
    - **D.** `DISPLAY`

13. Which of the following commands will print a list of six numbers beginning at 0?

A. `list 0-5`

B. `seq 0 1 5`

C. `echo 0-5`

D. `seq 0 1 6`

14. When creating a shell script, which of the following commands is used to display the contents of variables?

A. `var_dump`

B. `echo`

C. `ls`

D. `env`

15. A command has the following listing obtained with `ls -la`:

```
-rwsr-xr-x 1 suehring suehring 21 Nov 2 13:53 script.sh
```

What does the `s` denote within the user permissions in the listing?

A. The SUID bit has been set for this program.

B. This is a symlink.

C. The file will not be executable.

D. The file is a special system file.

16. Which of the following commands will execute a script and then exit the shell?

A. `run`

B. `source`

C. `./`

D. `exec`

17. Which sequence of characters will execute two commands but only if the first command exits successfully?

A. `--`

B. `&*`

C. `&&`

D. `&`

18. Which command within a shell script awaits user input and places that input into a variable?

A. `exec`

B. `get`

C. `read`

D. `prompt`

19. What characters are used to mark a sequence of commands as a function within a shell script?

A. Parentheses to declare the function (optional) and curly braces to contain the commands

B. Curly braces to declare the function and parentheses to contain the commands

C. Square brackets to declare the function and curly braces to contain the commands

D. Run quotes to denote the function

20. Assume that you are retrieving data from a MySQL database and need the data to be displayed in ascending numeric order based on a column called "`id`." Which of the following commands added to the `SELECT` statement accomplishes this task?

A. `ORDER BY id ASC;`

B. `ORDER BY id;`

C. `GROUP BY id;`

D. `GROUP BY id ASC;`

21. Which character sequence denotes an alternate command to execute if the preceding command does not exit successfully?

A. `&&`

B. `--`

C. `||`

D. `EL`

22. Which keyword(s) is/are used to begin an alternate condition within a Bash script?

A. `if`

B. `else if`

C. `elif`

D. `elsif`

23. Which of the following commands removes a currently defined aliased command?

A. `remove`

B. `rm`

C. `unalias`

D. `delete`

24. When sourcing a file in Bash, which `chmod` command would be necessary to provide the minimum privileges in order for the file to be sourced correctly, assuming that your current user owns the file?

A. `chmod 600`

B. `chmod 755`

C. `chmod 777`

D. `chmod 400`

25. Assuming that a space-separated list of values has been defined as such `LIST="one two three four"`, which of the following `for` loop constructs will iterate through the elements in the list?

A. `for LIST`

B. `for VAR in LIST`

C. `for VAR in $LIST`

D. `for $LIST -> $VAR`

26. Which type of join will be used in SQL when you see a statement such as `table1.id = table2.id`?

A. Inner

B. Outer

C. Left outer

D. Right outer

27. Which test within a shell script `while` loop will examine one value to see if it is less than another?

A. `-less`

B. `-lessThan`

C. `-lt`

D. `-lthan`

28. Which of the following tests will determine if a file exists in the context of a shell script?

A. `-a`

B. `-e`

C. `-m`

D. `-i`

29. Within which directory should you place files to have them automatically copied to a user's home directory when the user is created?

A. `/etc/userhome`

B. `/etc/templateuser`

C. `/etc/skel`

D. `/home/skel`

30. Which of the following represents the correct syntax for a SQL `UPDATE` statement?

A. `UPDATE <table> SET <column> = <newvalue> WHERE <column> = <value>`

B. `UPDATE <table> WHERE <column> = <newvalue>`

C. `UPDATE WHERE <column> = <newvalue>`

D. `UPDATE FROM <table> VALUE (<value>)`

31. Assume a MySQL table called `AUTHENTICATION` has three columns (`id`, `username`, `password`). Which of the following statements inserts a row into the table?

A. `INSERT id,username,password INTO AUTHENTICATION;`

B. `INSERT INTO AUTHENTICATION VALUES ('user','pass');`

C. `INSERT AUTHENTICATION ('', 'user','pass');`

D. `INSERT INTO AUTHENTICATION (username,password) VALUES ('user','pass');`

32. Which option to Bash will cause the shell to be executed without reading the initialization files?

A. `--no-rc`

B. `--no-init`

C. `--norc`

D. `--rc-none`

33. Which of the following creates an array in a bash script?

A. `ARRAY=(val1 val2)`

B. `ARRAY = "val1 val2"`

C. `ARRAY_PUSH($ARRAY,"val1","val2");`

D. `ARRAY{0} = "val1"`

34. Which option to declare statements displays output in a way that could then be used as input to another command?

A. `-o`

B. `-n`

C. `-p`

D. `-m`

35. You need to create a function that will be available each time that you log in to the system. Within which file should this function be placed?

A. `.bash_profile`

B. `.rc0`

C. `/etc/profile`

D. `.bash_run`

36. Which shell built-in command is used to display a list of read-only variables?

A. `ro`

B. `readonly`

C. `env-ro`

D. `ro-env`

37. Which of the following SQL keywords can be used with a `GROUP BY` clause?

A. `SELECT`

B. `INSERT`

C. `UPDATE`

D. `DELETE`

38. Which characters are used to denote the beginning and end of the test portion of a `while` loop in a shell script?

A. Parentheses `( )`

B. Curly braces `{ }`

C. Square brackets `[ ]`

D. Double-quotes `" "`

39. When using the `test` built-in with one argument, what will be the return if its argument is not null?

A. `false`

B. `true`

C. `unknown`

D. `-1`

40. Which environment variable is used when changing directory with the tilde character, such as `cd ~`?

A. `HOMEDIR`

B. `HOMEPATH`

C. `HOME`

D. `MAILPATH`

41. Which environment variable can be set if you wish to log users out of their shell automatically after a certain period of inactivity?

A. `TIMEOUT`

B. `TMOUT`

C. `TO`

D. `IDLETIME`

42. When using a `case` statement within a shell script, which sequence denotes the ending of the `case`/`switch` statement?

A. `caseend`

B. `esac`

C. `endcase`

D. `}`

43. Which of the following commands will obtain the date in seconds since the epoch and place it into a variable called `DATE` within a shell script?

A. `DATE="$(date +%s)"`

B. `DATE="date"`

C. `DATE="$(date)";`

D. `DATE="$date %s"`

44. Assume that you have a variable called `$FILEPATH` within a Bash shell script. Which characters can be used to ensure that the variable will be interpolated correctly regardless of where the variable appears within the script?

A. Dollar sign `$FILEPATH`

B. Curly braces `${FILEPATH}`

C. Parentheses `$(FILEPATH)`

D. Square brackets `$[FILEPATH]`

45. Which sequence is used to mark the beginning and end of the commands to execute within a `for` loop in a shell script?

A. Curly braces `{ }`

B. The keywords `do` and `done`

C. Semicolons `;`

D. Tabs

46. Which of the following tests will determine if a file exists and can be read by the user executing the test?

A. `-e`

B. `-s`

C. `-a`

D. `-r`

47. Which option to the declare command will create a variable that is read-only?

A. `-r`

B. `-ro`

C. `-p`

D. `-x`

48. Which character sequence is used to provide a default case when used within a case statement in a shell script?

A. `default:`

B. `=)`

C. `-->`

D. `*)`

Chapter 6

Understanding User Interfaces and Desktops (Domain 106)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **106.1 Install and configure X11.**

- Verify that the video card and monitor are supported by an X server
- Awareness of the X font server
- Basic understanding and knowledge of the X Window configuration file
- The following is a partial list of the used files, terms and utilities:
  - /etc/X11/xorg.conf
  - xhost
  - DISPLAY
  - xwininfo
  - xdpyinfo
  - X

✓ **106.2 Set up a display manager.**

- Basic configuration of LightDM
- Turn the display manager on or off
- Change the display manager greeting
- Awareness of XDM, KDM and GDM

- The following is a partial list of the used files, terms and utilities:
  - lightdm
  - /etc/lightdm/

✓ 106.3 Accessibility.

- Basic knowledge of keyboard accessibility settings (AccessX)
- Basic knowledge of visual settings and themes
- Basic knowledge of assistive technology (AT)
- The following is a partial list of the used files, terms and utilities:
  - Sticky/repeat keys
  - Slow/bounce/toggle keys
  - Mouse keys
  - High contrast/large print desktop themes
  - Screen reader
  - Braille display
  - Screen magnifier
  - On-screen keyboard
  - Gestures (used at login, for example gdm)
  - Orca
  - GOK
  - Emacspeak

1. Within which configuration file is the greeter configured for `lightdm`?
   - **A.** `/etc/lightdm/lightdm.conf`
   - **B.** `/etc/lightdm/greeter.conf`
   - **C.** `/etc/lightdm.conf`
   - **D.** `/var/lib/lightdm/lightdm.conf`
2. Which section in `/etc/X11/xorg.conf` is used to describe configurations for a given graphics card and monitor pair?
   - **A.** Server
   - **B.** Screen
   - **C.** VidMode
   - **D.** Video
3. When setting the frequency options for a given monitor, which of the following is not an available frequency unit?
   - **A.** uHz
   - **B.** MHz
   - **C.** kHz
   - **D.** M
4. Which command on a `systemd`-based system is used to disable booting into a GUI?
   - **A.** `systemctl gui-boot disable`
   - **B.** `systemctl set-default boot-gui false`
   - **C.** `systemctl set-default multi-user.target`
   - **D.** `systemctl set-default-multi false`
5. Assuming X forwarding has been enabled on the ssh server, which environment variable is used to set the location for newly spawned windows from within an ssh session?
   - **A.** `DISPLAY`
   - **B.** `XTERMINAL`
   - **C.** `XTERM`
   - **D.** `XDISP`
6. Within the greeter section of a display manager such as GDM, which option sets the welcome message for users logging in locally?
   - **A.** `LoginMessage`
   - **B.** `Login`
   - **C.** `WinGreet`
   - **D.** `Welcome`

7. Within GNOME, enabling sticky keys can be done by pressing which key five times in a row?
   - **A.** Ctrl
   - **B.** Enter
   - **C.** Shift
   - **D.** Tab

8. Which option in the Module section of the `xorg.conf` configuration file causes a default module to be unloaded or not loaded by default?
   - **A.** `Disable`
   - **B.** `Unload`
   - **C.** `LoadDisable`
   - **D.** `DisableLoad`

9. Which program is used in a GNOME environment as a screen reader?
   - **A.** Orca
   - **B.** Screed
   - **C.** Screen
   - **D.** Reader

10. Assuming a monitor currently set at 1024×768, which command will change the screen resolution such that icons and other elements appear larger?
    - **A.** `xterm -r 0`
    - **B.** `xset res 1024x768`
    - **C.** `xrandr -s 800x600`
    - **D.** `xVGA`

11. LightDM typically allows guest login by default. Which configuration option within SeatDefaults changes this to disallow guests?
    - **A.** `guest-login=false`
    - **B.** `guest=false`
    - **C.** `allowg=false`
    - **D.** `allow-guest=false`

12. When using XFree86 as the X server, which command will cause the X server to query for hardware and create a new configuration file?
    - **A.** `XFree86 --newconfig`
    - **B.** `XFree86 --query`
    - **C.** `XFree86 -configure`
    - **D.** `xf -config`

13. Which configuration option for X is used to configure the keyboard model?

A. `XkbLayout`

B. `XkbModel`

C. `XkbType`

D. `XkbInput`

14. Which configuration line within a Monitor section of an X server configuration file will set the vertical refresh rate between 55 and 75 hertz?

A. `Vert 55-75`

B. `VertRefresh 55.0–75.0`

C. `VertSync 55.0–75.0`

D. `RefreshMode 55.0–75.0`

15. From within an X session, which of the following commands shows information about the display, including resolution and color depth?

A. `xinfo`

B. `xterm`

C. `xwin`

D. `xdpyinfo`

16. Which AccelerationProfile for an input device such as a mouse enables linear acceleration (more speed and more acceleration)?

A. 0

B. -1

C. 6

D. 7

17. Which of the following directories is used by an X.org-based server for storage of fonts?

A. `/usr/share/fonts`

B. `/usr/X11/fonts`

C. `/etc/fonts`

D. `/var/font/xorg`

18. Native support for a Braille display requires a minimum of which kernel version?

A. 2.2.0

B. 2.4.22

C. 2.6.26

D. 3.2.1

19. Which configuration option in an `xorg.conf` file can be set to prevent a user from changing video modes using the Ctrl+Alt+Keypad Plus and Ctrl+Alt+Keypad Minus?
    - **A.** `DontZoom`
    - **B.** `Modes=No`
    - **C.** `NoModeSwitch`
    - **D.** `DontZap`

20. GNOME includes native on-screen keyboard functionality. Which of the following commands starts the on-screen keyboard?
    - **A.** `gok`
    - **B.** `osk`
    - **C.** `kb`
    - **D.** `oskb`

21. When using GDM as the display manager, which GUI program can be used to set options for the login window?
    - **A.** `gdmlogin`
    - **B.** `gdmconfig`
    - **C.** `gdmsetup`
    - **D.** `gdm`

22. When using KDE, which program provides magnification functionality?
    - **A.** `xmag`
    - **B.** `mag`
    - **C.** `pmag`
    - **D.** `kmag`

23. Which option in the SeatDefaults section of the `lightdm.conf` configuration file is used to disable the display of usernames for login?
    - **A.** `greeter-disable-user`
    - **B.** `greeter-enable-login`
    - **C.** `greeter-show-manual-login`
    - **D.** `greeter-disable-auto-login`

24. Within GNOME, which section of the GNOME Control Center is used to choose a high-contrast theme?
    - **A.** Display
    - **B.** Appearance
    - **C.** Locale
    - **D.** Contrast

25. Which of the following best describes the concept of a mouse gesture?

A. A mouse gesture enables special clicks, such as right-click context menu.

B. A mouse gesture facilitates use of programs by moving the mouse in a certain way.

C. A mouse gesture is used for login purposes.

D. A mouse gesture is used to capture screenshots.

26. In GNOME 3.9 or later, which keyboard shortcut activates the screen reader?

A. Super+R

B. Super+S

C. Ctrl+Super+S

D. Alt+Super+S

27. Assume that the display manager has been disabled on boot. Which command can be used after login to start the X server?

A. `xs`

B. `xstart`

C. `X -start`

D. `startx`

28. Which option in an `xorg.conf` configuration file configures the amount of time before the screen goes into blank mode but does not go into standby and is available on non-DPMS capable monitors?

A. `StandbyTime`

B. `BlankTime`

C. `SuspendTime`

D. `OffTime`

29. Which of the following commands helps you to determine information about a given window within an X session, including information on the window size and its position?

A. `xkbinfo`

B. `xdspy`

C. `xwininfo`

D. `xver`

30. Which option/button within GOK is used to show the keys that would be used in place of a mouse?

A. Mouse

B. MouseKeys

C. Movement

D. Compose

31. Which of the following commands allows a host named `cwa` to connect to the X server?

A. `xconnect cwa`

B. `xterm +cwa`

C. `xhost +cwa`

D. `xf cwa`

32. Which of the following options in the ssh configuration file needs to be enabled so that X sessions can be sent over an ssh connection?

A. `X11Connect yes`

B. `ForwardX11 yes`

C. `ForwardX yes`

D. `XForward yes`

33. Which configuration option in a Files section of an `xorg.conf` configuration file can be used to add a path in which the server will search for fonts?

A. `FontSection`

B. `Fonts`

C. `FontLoc`

D. `FontPath`

34. Which assistive technology is used to provide an input method for users who cannot type but can use a pointer, such as a mouse?

A. Keyboard

B. Sticky keys

C. Mouse keys

D. On-screen keyboard

35. Which assistive technology will ignore keys that are pressed in succession or held down?

A. Sticky keys

B. Mouse keys

C. Bounce keys

D. On-screen keyboard

36. When using LightDM, which key combination is used to revert to a terminal?

A. Alt+Ctrl+F2

B. Alt+Ctrl+F1

C. Ctrl+F1

D. Ctrl+Esc

37. Which option in the LightDM configuration enables automatic login for a specific user?

A. `auto-login`

B. `autologin-user`

C. `autologin`

D. `auto-login-user`

38. Which of the following is a legacy utility that can be used to set accessibility options on older systems?

A. `Xaccessibility`

B. `Xas`

C. `AccessX`

D. `setX`

39. Which command, when executed on a remote host, will send the display of X programs to the local client? (Assume the use of Bash for the shell.)

A. `export DISPLAY`

B. `env DISPLAY`

C. `setx HOST`

D. `export XHOST`

40. Which option in GOK is used to display the keys that correspond to a given application's menu?

A. `Menus`

B. `Activate`

C. `MenuKeys`

D. `Keys`

41. Which directory is used to store individual configuration files related to LightDM?

A. `/etc/light`

B. `/etc/lightdm/lightdm.conf.d`

C. `/usr/lightdm`

D. `/etc/lightdm.conf`

42. Which command will switch the system into an init in which the X server is not typically executed?

A. `telinit 6`

B. `telinit 1`

C. `telinit 3`

D. `telinit 5`

43. Which option within the Device section for a video card will set the amount of RAM available on the card?

A. `VRAM`

B. `RAM`

C. `VideoRam`

D. `vRam`

44. When configuring a Screen section in an X configuration file, the Display subsection can contain the color depth. What is the name of the option to set the color depth of the given display?

A. `ColorDepth`

B. `Depth`

C. `CDepth`

D. `colorDep`

45. Multiple server layouts can be created within an X configuration file. Which option is used to differentiate between the different server layout options?

A. `ID`

B. `Identifier`

C. `LayoutName`

D. `Layout`

46. Which command can be used to create a `fonts.scale` file definition when executed against the current directory?

A. `mkfontscale`

B. `mk.fonts`

C. `mkfontfile`

D. `fontmk`

47. What is the abbreviation used in X to signify a display that utilizes additional features such as extended power-saving capabilities?

A. DPMS

B. XPMS

C. DISPPWR

D. PWRD

48. What is the name of the accessibility function that provides an alternative to the Orca program to assist users that have visual impairments?

A. Viz

B. Emacspeak

C. Ahleah

D. vAssist

Chapter 7

Administrative Tasks (Domain 107)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **107.1 Manage user and group accounts and related system files**

- Add, modify and remove users and groups
- Manage user/group info in password/group databases
- Create and manage special purpose and limited accounts
- The following is a partial list of the used files, terms and utilities:
  - /etc/passwd
  - /etc/shadow
  - /etc/group
  - /etc/skel
  - chage
  - getent
  - groupadd
  - groupdel
  - groupmod
  - passwd
  - useradd
  - userdel
  - usermod

✓ **107.2 Automate system administration tasks by scheduling jobs**

- Manage cron and at jobs
- Configure user access to cron and at services

- Configure anacron
- The following is a partial list of the used files, terms and utilities:
  - /etc/cron.{d,daily,hourly,monthly,weekly}
  - /etc/at.deny
  - /etc/at.allow
  - /etc/crontab
  - /etc/cron.allow
  - /etc/cron.deny
  - /var/spool/cron/*
  - crontab
  - at
  - atq
  - atrm
  - anacron
  - /etc/anacrontab

✓ 107.3 Localization and internationalization

- Configure local settings and environment variables
- Configure timezone settings and environment variables
- The following is a partial list of the used files, terms and utilities:
  - /etc/timezone
  - /etc/localtime
  - /usr/share/zoneinfo
  - Environment variables:
    - LC_*
    - LC_ALL
    - LANG
    - TZ
  - /usr/bin/locale
  - tzselect

- tzconfig
- date
- iconv
- UTF-8
- ISO-8859
- ASCII
- Unicode

1. Which file contains user information, such as username and real name, and is readable by all users of the system?
   - **A.** `/etc/pass`
   - **B.** `/etc/shadow`
   - **C.** `/etc/passwd`
   - **D.** `/etc/userinfo`
2. Which of the following will execute a job through cron at 12:15 a.m. and 12:15 p.m. every day?
   - **A.** `0,12 15 * * *`
   - **B.** `15 0,12 * * *`
   - **C.** `15 * * * 0/12`
   - **D.** `*/12 * * * 15`
3. Which file is used to indicate the local time zone on a Linux server?
   - **A.** `/etc/timez`
   - **B.** `/etc/timezoneconfig`
   - **C.** `/etc/localtime`
   - **D.** `/etc/localtz`
4. Which file is used to provide a list of users that can add and delete cron jobs?
   - **A.** `/etc/cron.job`
   - **B.** `/etc/cron.allow`
   - **C.** `/etc/cron.users`
   - **D.** `/etc/crontab`
5. Which of the following commands removes an expiration from an account?
   - **A.** `sudo chage -l username`
   - **B.** `sudo chage -E -1 username`
   - **C.** `sudo chage -E now username`
   - **D.** `sudo chage --noexpire username`
6. Within which directory will you find files related to the time zone for various regions?
   - **A.** `/etc/timezoneinfo`
   - **B.** `/etc/zoneinfo`
   - **C.** `/var/zoneinfo`
   - **D.** `/usr/share/zoneinfo`

7. Which of the following commands schedules a series of commands to execute one hour from now?
   - **A.** `atq +1hr`
   - **B.** `at now + 1 hour`
   - **C.** `atq`
   - **D.** `at -1`

8. You need to delete a user from the system, including their home directory. Which of the following commands accomplishes this task?
   - **A.** `userdel`
   - **B.** `userdel -r`
   - **C.** `userdel -R`
   - **D.** `deluser`

9. Within which directory should you place files in order for the files to be copied to a user's home directory when the user is created?
   - **A.** `/etc/skel`
   - **B.** `/etc/homedir`
   - **C.** `/home/usertemplate`
   - **D.** `/etc/template`

10. Which job scheduler should you use if the computer on which you need to schedule the job is powered down at various times?
    - **A.** `cron.d`
    - **B.** `cron.hourly`
    - **C.** `anacron`
    - **D.** `at`

11. Which of the following commands provides the current date and time in a format of seconds since the epoch?
    - **A.** `date +%seconds`
    - **B.** `date +%s`
    - **C.** `date --seconds`
    - **D.** `date --now`

12. Which option to the `iconv` command shows the available character sets on a given system?
    - **A.** `--showchar`
    - **B.** `--show`
    - **C.** `--list`
    - **D.** `--all`

13. Which environment variable controls the format of dates and times, such as a 12-hour or 24-hour formatted clock?
    - **A.** `LOCALE_DATE`
    - **B.** `DATE_FORMAT`
    - **C.** `LC_TIME`
    - **D.** `LC_DATE`

14. Which command displays a list of jobs currently scheduled with `at`?
    - **A.** `atlist`
    - **B.** `atq`
    - **C.** `atl`
    - **D.** `at --jobs`

15. To which shell should a user be set if they are not allowed to log in interactively to the computer?
    - **A.** `/bin/bash`
    - **B.** `/bin/tcsh`
    - **C.** `/bin/zsh`
    - **D.** `/bin/false`

16. Which of the following encodings provides a multibyte representation of characters?
    - **A.** ISO-8859
    - **B.** UTF-8
    - **C.** ISO-L
    - **D.** UFTMulti

17. Which of the following commands changes a group called `DomainAdmins` to `DomainUsers`?
    - **A.** `groupmod -n DomainAdmins DomainUsers`
    - **B.** `groupchg DomainAdmins DomainUsers`
    - **C.** `chgroup DomainAdmins DomainUsers`
    - **D.** `group -N DomainAdmins DomainUsers`

18. Within which directory would you find a list of files corresponding to the users who have current cron jobs on the system?
    - **A.** `/var/spool/cron/crontabs`
    - **B.** `/var/spool/jobs`
    - **C.** `/etc/cron`
    - **D.** `/etc/cron.users`

19. Which command deletes an `at` job with an ID of `3`?

A. `atq`

B. `at -l`

C. `atrm 3`

D. `rmat 3`

20. Which command can be used to view the available time zones on a system and obtain output that can be used in scripts for setting the time zone?

A. `tzd`

B. `/etc/locale`

C. `tzdata`

D. `tzselect`

21. You need to determine if LDAP integration is working correctly. In order to do so, you would like to obtain a list of users, as read by `/etc/nsswitch.conf`. Which command can be used for this purpose?

A. `getuser`

B. `getent`

C. `usermod`

D. `userlist`

22. What is the name of the configuration file that contains information about group and user addition, such as the maximum and minimum user and group IDs to be used when adding users and groups?

A. `/etc/groupinfo`

B. `/etc/login.defs`

C. `/etc/login.info`

D. `/etc/loginlist`

23. Which of the following is used as a system-wide cron file?

A. `/etc/cron.d`

B. `/etc/cron.sys`

C. `/etc/crontab`

D. `/etc/cron.tab`

24. Which of the following lines added to `.profile` in a user's home directory will set their time zone to Central time?

A. `TZ=/Central; export TZ`

B. `TIMEZONE='America/Chicago'; export TIMEZONE`

C. `set TZ=/Central`

D. `TZ='America/Chicago'; export TZ`

25. Within which directory will you find scripts that are scheduled to run through cron every 24 hours?

A. `/etc/cron.daily`

B. `/etc/cron.weekly`

C. `/etc/cron.hourly24`

D. `/etc/crontab`

26. Which of the following values for the `LANG` variable will configure the system to bypass locale translations where possible?

A. `LANG=COMPAT`

B. `LANG=NONE`

C. `LANG=C`

D. `LANG=END`

27. When running `useradd`, which option needs to be specified in order for the user's home directory to be created?

A. `-h`

B. `-m`

C. `-x`

D. `-a`

28. Which of the following commands locks out password-based login for a user but does not prevent other forms of login?

A. `usermod -L`

B. `userdel -r`

C. `useradd -h`

D. `userlock`

29. If you need to reconfigure all locale variables and settings temporarily for a given session, which environment variable can be used?

A. `LC_LIST`

B. `LC_GLOBAL`

C. `LC_ALL`

D. `ALL_LOCALE`

30. Which of the following will run a command called `/usr/local/bin/changehome.sh` as the `www-data` user when placed in `/etc/crontab`?

A. `1 1 * * * www-data /usr/local/bin/changehome.sh`

B. `www-data changehome.sh`

C. `*/1 www-data changehome.sh`

D. `* * */www-data /usr/local/bin/changehome.sh`

31. Which of the following commands produces a report listing the last password change date for all users on the system?

A. `passwd -a`

B. `passwd -S`

C. `passwd -a -S`

D. `passwd --all`

32. Assume that passwords must be changed every 60 days. Which command will change the date of the user's last password change without the user actually changing the account password?

A. `chage -f`

B. `chage -W`

C. `chage -l`

D. `chage -d`

33. Which of the following files is used by `anacron` for reading configuration information related to jobs?

A. `/etc/anacron.d`

B. `/etc/anacrontab`

C. `/etc/anacron.config`

D. `/etc/anacron.conf`

34. Which of the following commands will set the system-wide time zone to `America/Los_Angeles`?

A. `ln -sf /usr/share/zoneinfo/America/Los_Angeles /etc/localtime`

B. `ln -sf America/Los_Angeles; /etc/localtime`

C. `ln -sd /etc/localtime /usr/share/timezone/America/Los_Angeles`

D. `ln -sf /etc/localtime /usr/share/zoneinfo/America/Los_Angeles`

35. Which file contains a list of users who are not allowed to create cron scheduled tasks?

A. `/etc/cron.users`

B. `/etc/cron.deny`

C. `/etc/cron.allow`

D. `/etc/cron.userlist`

36. Which file contains a list of usernames, UIDs, and encrypted passwords?

A. `/etc/passwd`

B. `/etc/shadow`

C. `/etc/encpass`

D. `/etc/grouppass`

37. Which of the following best describes the relationship between UIDs and GIDs on a Linux system?

A. The UID and GID are the same across the system for a given user.

B. Each user has a UID and GID that are the same and are created when the user is created.

C. The UID represents the user, whereas the GID is a globally unique user id.

D. There is no direct relationship between UIDs and GIDs.

38. Which command on a Debian-based system can be used to change the time zone using the package-based tools?

A. `dpkg-reconfigure time`

B. `dpkg-reconfigure tzdata`

C. `apt-select tzdata`

D. `apt-config timezone`

39. Which command is used to change a user's home directory to `/srv/data/username` and move the contents at the same time?

A. `usermod -d /srv/data/username -m`

B. `homedir -m /srv/data/username`

C. `userex -m /srv/data/username`

D. `userchg /m /srv/data/username -d`

40. Which option to `useradd` will add additional groups for a user?

A. `-g`

B. `-x`

C. `-l`

D. `-G`

41. Which command will list the cron entries for a given user as denoted by `<username>`?

A. `crontab -l -u <username>`

B. `crontab -u <username>`

C. `cron -u <username>`

D. `cronent -u <username>`

42. Which option to `useradd` creates a system user rather than a normal user?

A. `-r`

B. `-s`

C. `-a`

D. `-S`

43. Which file contains encrypted password information for groups?

A. `/etc/group`

B. `/etc/gshadow`

C. `/etc/gsecure`

D. `/etc/group.conf`

44. Which locale-related variable is used for currency-related localization?

A. `LC_MONE`

B. `LC_CURRENCY`

C. `LC_MONETARY`

D. `LC_CURR`

45. Which of the following best describes the use of the `groupdel` command?

A. You may force group deletion with the `-f` option.

B. If a user's primary group is to be deleted, that user must be deleted first or have their primary group changed.

C. `groupdel` can be run at any time, regardless of group membership.

D. The `-r` option for `groupdel` will recursively change a user's GIDs after group deletion.

46. Which of the following commands displays the UID, primary group, and supplemental groups for a given user?

A. `id`

B. `getid`

C. `passwd`

D. `chage`

47. Which option to the `usermod` command is used to change a given user's real name?

A. `-R`

B. `-n`

C. `-d`

D. `-c`

48. Assume that you have deleted a user account with UID 1501, including the `-r` option. Which command should you also run to look for other files that might have been owned by the user?

A. `find -id 1501`

B. `grep 1501 *`

C. `grep -u 1501 *`

D. `find / -uid 1501`

Chapter

8

Essential System Services (Domain 108)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **108.1 Maintain system time**

- Set the system date and time
- Set the hardware clock to the correct time in UTC
- Configure the correct timezone
- Basic NTP configuration
- Knowledge of using the pool.ntp.org service
- Awareness of the ntpq command
- The following is a partial list of the used files, terms and utilities:
  - /usr/share/zoneinfo
  - /etc/timezone
  - /etc/localtime
  - /etc/ntp.conf
  - date
  - hwclock
  - ntpd
  - ntpdate
  - pool.ntp.org

✓ **108.2 System logging**

- Configuration of the syslog daemon
- Understanding of standard facilities, priorities and actions
- Configuration of logrotate

- Awareness of rsyslog and syslog-ng
- The following is a partial list of the used files, terms and utilities:
  - syslog.conf
  - syslogd
  - klogd
  - /var/log/
  - logger
  - logrotate
  - /etc/logrotate.conf
  - /etc/logrotate.d/
  - Journalctl
  - /etc/systemd/journald.conf
  - /var/log/journal/

✓ 108.3 Mail Transfer Agent (MTA) basics

- Create email aliases
- Configure email forwarding
- Knowledge of commonly available MTA programs (postfix, sendmail, qmail, exim) (no configuration)
- The following is a partial list of the used files, terms and utilities:
  - ~/.forward
  - sendmail emulation layer commands
  - newaliases
  - mail
  - mailq
  - postfix
  - sendmail
  - exim
  - qmail

✓ 108.4 Manage printers and printing

- Basic CUPS configuration (for local and remote printers)
- Manage user print queues
- Troubleshoot general printing problems
- Add and remove jobs from configured printer queues
- The following is a partial list of the used files, terms and utilities:
  - CUPS configuration files, tools and utilities
  - /etc/cups
  - lpd legacy interface (lpr, lprm, lpq)

1. Which of the following commands is used to examine the `systemd` journal or log file?
   - **A.** `journallist`
   - **B.** `ctlj`
   - **C.** `journalctl`
   - **D.** `jctl`
2. Which system logging facility is used for messages from the kernel?
   - **A.** syslog
   - **B.** kernel
   - **C.** kern
   - **D.** system
3. To what server address can you set an NTP client in order to receive time from a regionally local server?
   - **A.** `127.0.0.1`
   - **B.** `192.168.1.100`
   - **C.** `ntp.example.com`
   - **D.** `pool.ntp.org`
4. What is the name of the `systemd` service that provides logging facilities?
   - **A.** `systemd-journald`
   - **B.** `systemd-loggingd`
   - **C.** `systemd-syslog`
   - **D.** `systemd-logger`
5. Which command must you run after making a change to email aliases on a server running Postfix?
   - **A.** `service postfix restart`
   - **B.** `newaliases`
   - **C.** `alias -n`
   - **D.** `postfix -e`
6. Within which directory hierarchy will you find configuration files related to printing with the CUPS printing system?
   - **A.** `/etc/cupsd`
   - **B.** `/etc/cups.d`
   - **C.** `/etc/CUPS`
   - **D.** `/etc/cups`

7. Which access control directive in a CUPS configuration file configures the system to accept connections from the local network with addresses from `192.168.1.1` through `192.168.1.127`?
   - **A.** `Allow 192.168.1.0/25`
   - **B.** `Allow 192.168.1.0/24`
   - **C.** `Allow 127.0.0.0/8`
   - **D.** `AllowHosts 192.168.1.0`

8. Which of the following commands will set the date immediately and can be used from the command line in a script?
   - **A.** `ntpd`
   - **B.** `ntpdate pool.ntp.org`
   - **C.** `settime`
   - **D.** `time`

9. When executing the `ntpq` command, you receive a message like "`read: Connection refused`." What would this typically indicate?
   - **A.** The network is down.
   - **B.** The NTP daemon is not running.
   - **C.** The use of NTP is administratively prohibited.
   - **D.** The current user does not have permission to execute `ntpq`.

10. Which command is used to query and work with the hardware clock on the system?
    - **A.** `hwc`
    - **B.** `ntpdate`
    - **C.** `systime`
    - **D.** `hwclock`

11. Within which directory will you find the mail queue on a qmail server?
    - **A.** `/var/spool/qmail`
    - **B.** `/var/qmail/queue`
    - **C.** `/var/spool/mailq`
    - **D.** `/var/spool/qmail/queue`

12. Which syslog level is used to provide informational messages?
    - **A.** kern
    - **B.** emerg
    - **C.** debug
    - **D.** info

13. Within `/etc/ntp.conf`, which of the following configuration lines sets the location of the drift file?
    A. `drift /var/lib/ntp/drift`
    B. `driftfile /var/lib/ntp/drift`
    C. `drift-file /var/lib/ntp/drift`
    D. `driftconfig /var/lib/ntp/drift`

14. Which configuration option in `/etc/logrotate.conf` will cause the log to be emailed to `admin@example.com` when the logrotation process runs for the selected log?
    A. `mail admin@example.com`
    B. `sendmail admin@example.com`
    C. `maillog admin@example.com`
    D. `logmail admin@example.com`

15. Which of the following commands is used to determine the amount of disk space used by `systemd` journal log files?
    A. `journalctl --disk`
    B. `journalctl -du`
    C. `journalctl --disk-usage`
    D. `journalctl -ls`

16. Which of the following commands displays the current mail queue on a Postfix server?
    A. `qmail`
    B. `mailqueue`
    C. `mail -q`
    D. `mailq`

17. When running the NTP daemon, which command can you execute to work with the NTP server in an interactive mode?
    A. `ntpd`
    B. `ntpdate`
    C. `ntpq`
    D. `ntp-interactive`

18. Assume that you want all email for the root user to be sent to `admin@example.com`. Which of the following lines in `/etc/aliases` will accomplish this task?
    A. `admin@example.com -> root`
    B. `root -> admin@example.com`
    C. `root, admin@example.com`
    D. `root: admin@example.com`

19. When working with `klogd`, which option can be used to control the file to which messages are logged?

A. `-d`

B. `-f`

C. `-v`

D. `-l`

20. Within which directory will you find configuration files for various logs that are to be rotated with `logrotate`?

A. `/etc/logrotate`

B. `/etc/logs`

C. `/etc/logrotate.d`

D. `/var/spool/logrotate`

21. Which of the following commands places a file into the print queue?

A. `lpr`

B. `lpd`

C. `lpq`

D. `lpx`

22. Which of the following options to the `sendmail` command will print information about the mail queue?

A. `-bi`

B. `-queue`

C. `-bp`

D. `-f`

23. Which function of the `hwclock` command will set the hardware clock to the current system time?

A. `-w`

B. `-s`

C. `-a`

D. `-m`

24. What is the default port for the CUPS administrative web interface?

A. `tcp/53`

B. `tcp/8080`

C. `udp/456`

D. `tcp/631`

25. Which of the following commands causes sendmail to attempt to deliver the messages in its queue?

A. `sendmail -q`

B. `sendmail -b`

C. `sendmail -f`

D. `sendmail -v`

26. You need to create an email address to accept email for `abuse@example.com`. However, you would like to have abuse reports sent to multiple email addresses within your organization. Which of the following will send email destined for the abuse account to `admin@example.com` and `security@example.com`?

A. Create a `.forward` file in the home directory for the abuse user and forward email accordingly.

B. Within `/etc/aliases`, add this: `abuse: admin@example.com,security@example.com`.

C. Create a `.forward` file for root and forward email accordingly.

D. Within `/etc/aliases`, add this: `abuse: admin@example.com\tsecurity@example.com`.

27. Which of the following commands sets the hardware clock to UTC based on the current system time?

A. `hwclock --systohc --utc`

B. `hwclock --systohc --localtime`

C. `hwclock --systohc`

D. `hwclock --systoutc`

28. You need to delete all of the messages from the queue on a postfix server. Which of the following commands will perform this action?

A. `postqueue -remove`

B. `rm -rf`

C. `postfix -f`

D. `postsuper -d ALL`

29. Which of the following URLs can be used to view a list of completed print jobs in CUPS?

A. `http://localhost:631/jobs?which_jobs=completed`

B. `http://localhost:631?completed`

C. `http://localhost:631/?completed`

D. `http://cups/jobs=completed`

30. Which option to the `journalctl` command will continuously update the display as new log entries are created?

A. `-tail`

B. `-t`

C. `-f`

D. `-l`

31. Assuming that the `$ModLoad imudp` configuration option has been set in the configuration for `rsyslogd`, which of the following additional options is necessary to configure the port on which the server will listen?

A. `$Port 514`

B. `$UDPServerRun 514`

C. `$Listen 514`

D. `$UDPListen 514`

32. Which of the following commands causes the mail queue to be processed on a Postfix server?

A. `postqueue -f`

B. `postqueue -D`

C. `postfix -q`

D. `postsuper -q`

33. When running `ntpd`, the server will not adjust or synchronize if the time is skewed from the NTP server by a significant amount of time. Which option to `ntpd` disables this and causes the synchronization process to continue even if there is large skew?

A. `ntpd -noskew`

B. `ntpd -skewcheck=off`

C. `ntpd -g 0`

D. `ntpd -s 0`

34. Which option in `journald.conf` controls the maximum file size for individual journal logs?

A. `SystemMaxFileSize`

B. `MaxFile`

C. `LogFileSize`

D. `LogSize`

35. Which command can be executed to view completed print jobs?

A. `lpstat -q`

B. `lpq`

C. `lpstat -W completed`

D. `lpqueue -c`

36. When configuring a log file for rotation, you need to execute a command to run a script after log file rotation. Which option within the configuration can be used to facilitate this behavior?

A. `after-rotate`

B. `run-script`

C. `rotatecomplete`

D. `postrotate`

37. You are deploying an Exim server and need to work with the firewall to ensure that the proper incoming ports are open. Which protocol and port should you allow inbound for normal SMTP traffic?

A. `TCP/23`

B. `TCP/25`

C. `TCP/110`

D. `TCP/143`

38. Which command should be executed after making a change to the sendmail access database `/etc/access`?

A. `makemap`

B. `makedb`

C. `newaccess`

D. `rebuilddb`

39. When working with `syslog-ng`, which of the following is the correct path and filename for the primary configuration file?

A. `/etc/syslog-ng/syslog-ng.conf`

B. `/etc/syslog/syslog-ng.conf`

C. `/etc/syslog-ng/ng.conf`

D. `/etc/syslog-ng/ngd.conf`

40. A developer has created an application and wants to take advantage of syslog for logging to a custom log file. Which facility should be used for an application such as this?

A. syslog

B. kern

C. local#

D. user

41. A user needs to work with printer-related items. Which of the following commands adds the user (called username in the options) to the appropriate group for this purpose?

A. `usermod -aG printerusers username`

B. `usermod -aG lpadmin username`

C. `usermod -gA lpadm username`

D. `usermod -a lpadm username`

42. Which option within a `logrotate` configuration file disables compression of the log file?

A. `compressoff`

B. `limitcompress`

C. `nocompression`

D. `nocompress`

43. Which option to the `date` command can be used to set the date and time?

A. `date -f`

B. `date -t`

C. `date --change`

D. `date -s`

44. Which command can be used to gather and display statistics about mail processed on a server running sendmail?

A. `mailq`

B. `mailstats`

C. `statmail`

D. `sendmailstats`

45. When running from a shell script, which command enables logging to syslog?

A. `logd`

B. `login`

C. `logit`

D. `logger`

46. Which of the following commands can be used to restart CUPS on a server running `systemd`?

A. `systemctl restart cups.service`

B. `systemctl restart cups`

C. `systemctl reboot cups.target`

D. `systemctl restart cups.target`

47. When viewing the syslog configuration, you notice a minus sign (-) preceding several log files. What is the significance of the - in the configuration?

A. The use of - indicates that the log may be rotated any time.

B. The use of - indicates that the system can utilize other logging facilities when appropriate.

C. The use of - omits the disk sync process for every entry into the log.

D. The use of - comments out the line.

48. Which option in a CUPS configuration file causes the daemon to listen on all interfaces on port 631?

A. `Port 631`

B. `Listen All:631`

C. `Listen 127.0.0.1:631`

D. `Port All:631`

Chapter 9

Networking Fundamentals (Domain 109)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **109.1 Fundamentals of Internet protocols**

- Demonstrate an understanding of network masks and CIDR notation
- Knowledge of the differences between private and public "dotted quad" IP addresses
- Knowledge about common TCP and UDP ports (20, 21, 22, 23, 25, 53, 80, 110, 123, 139, 143, 161, 162, 389, 443, 465, 514, 636, 993, 995)
- Knowledge about the differences and major features of UDP, TCP and ICMP
- Knowledge of the major differences between IPv4 and IPv6
- Knowledge of the basic features of IPv6
- The following is a partial list of the used files, terms and utilities:
  - /etc/services
  - IPv4, IPv6
  - Subnetting
  - TCP, UDP, ICMP

✓ **109.2 Basic network configuration**

- Manually and automatically configure network interfaces
- Basic TCP/IP host configuration

- Setting a default route
- The following is a partial list of the used files, terms and utilities:
  - /etc/hostname
  - /etc/hosts
  - /etc/nsswitch.conf
  - ifconfig
  - ifup
  - ifdown
  - ip
  - route
  - ping

✓ 109.3 Basic network troubleshooting

- Manually and automatically configure network interfaces and routing tables to include adding, starting, stopping, restarting, deleting or reconfiguring network interfaces
- Change, view or configure the routing table and correct an improperly set default route manually
- Debug problems associated with the network configuration
- The following is a partial list of the used files, terms and utilities:
  - ifconfig
  - ip
  - ifup
  - ifdown
  - route
  - host
  - hostname
  - dig
  - netstat
  - ping

- ping6
- traceroute
- traceroute6
- tracepath
- tracepath6
- netcat

✓ 109.4 Configure client side DNS

- Query remote DNS servers
- Configure local name resolution and use remote DNS servers
- Modify the order in which name resolution is done
- The following is a partial list of the used files, terms and utilities:
  - /etc/hosts
  - /etc/resolv.conf
  - /etc/nsswitch.conf
  - Host
  - Dig
  - getent

1. Which of the following commands shows the current default route without performing DNS lookups on the IP address(es) involved?
   - **A.** `netstat -rn`
   - **B.** `netstat -n`
   - **C.** `netstat -r`
   - **D.** `netstat -f`

2. You are having difficulty with an interface on the server, and it is currently down. Assuming that there is not a hardware failure on the device itself, which command and option can you use to display information about the interface?
   - **A.** `ifconfig -a`
   - **B.** `ifup`
   - **C.** `netstat -n`
   - **D.** `ifconfig`

3. Which of the following is not used as a private address for internal, non-Internet, use?
   - **A.** `172.16.4.2`
   - **B.** `192.168.40.3`
   - **C.** `10.74.5.244`
   - **D.** `143.236.32.231`

4. Which of the following commands adds a default gateway of `192.168.1.1` for interface eth0?
   - **A.** `route add default gateway 192.168.1.1 eth0`
   - **B.** `eth0 --dg 192.168.1.1`
   - **C.** `route add default gw 192.168.1.1 eth0`
   - **D.** `route define eth0 192.168.1.1`

5. Which option for the `host` command will query for the authoritative nameservers for a given domain?
   - **A.** `-t ns`
   - **B.** `-t all`
   - **C.** `-ns`
   - **D.** `-named`

6. Which port(s) and protocol(s) should be opened in a firewall in order for the primary and secondary name servers to communicate for a given domain?
   - **A.** UDP/53
   - **B.** Both TCP/53 and UDP/53
   - **C.** TCP/53
   - **D.** UDP/53 and TCP/503

7. Which option for the `ping` command enables you to choose the interface from which the ICMP packets will be generated?
   - **A.** `-i`
   - **B.** `-I`
   - **C.** `-t`
   - **D.** `-a`

8. You need to split a subnet to enable four subnets with up to 30 hosts each. Which subnet mask, in CIDR notation, facilitates this scenario?
   - **A.** `/25`
   - **B.** `/24`
   - **C.** `/32`
   - **D.** `/27`

9. Which of the following commands queries the mail servers for the domain `example.com`?
   - **A.** `dig example.com mx`
   - **B.** `dig example.com`
   - **C.** `host -t smtp example.com`
   - **D.** `dig example.com smtp`

10. Which of the following addresses represents the localhost in IPv6?
    - **A.** `0:1`
    - **B.** `::1`
    - **C.** `127:0:1`
    - **D.** `:127:0:0:1`

11. Which option to the `traceroute` command will use TCP SYN packets for the path trace?
    - **A.** `-T`
    - **B.** `-t`
    - **C.** `-s`
    - **D.** `-i`

12. Which of the following commands will attempt to bring online all interfaces marked as auto within the networking configuration?
    - **A.** `ifconfig -a`
    - **B.** `ifup auto`
    - **C.** `ifup -a`
    - **D.** `ifstat`

13. In a scripting scenario, which command will return the domain name configured for the server?
    A. `dnsname`
    B. `fqdn`
    C. `hostname`
    D. `hostname -d`

14. Which command can be used to listen for netlink messages on a network?
    A. `ip monitor`
    B. `netlink -a`
    C. `ip netlink`
    D. `route`

15. If the `traceroute6` command is not available, which option to the `traceroute` command can be used for an IPv6 traceroute?
    A. `-ipv6`
    B. `-net6`
    C. `-v6`
    D. `-6`

16. Which of the following configuration lines in `/etc/nsswitch.conf` causes a lookup for group information to use local files first and then to use LDAP?
    A. `group: files ldap`
    B. `lookup: group [local ldap]`
    C. `group: [local ldap]`
    D. `group: localfiles ldap`

17. Which of the following `dig` commands sends the query for `example.com` directly to the server at `192.168.2.5` rather than to a locally configured resolver?
    A. `dig example.com @192.168.2.5`
    B. `dig -t 192.168.2.5 example.com`
    C. `dig -s 192.168.2.5 example.com`
    D. `dig server=192.168.2.5 example.com`

18. Which ports need to be allowed through the firewall for SNMP traffic?
    A. Ports 23 and 25
    B. Ports 110 and 143
    C. Ports 80 and 443
    D. Ports 161 and 162

19. Which of the following commands will enumerate the hosts database?

A. `getent hosts`

B. `gethosts`

C. `nslookup`

D. `host`

20. Which of the following netmasks is used for a subnet described with a `/25` in CIDR notation?

A. `255.255.255.0`

B. `255.255.0.0`

C. `255.255.255.192`

D. `255.255.255.128`

21. Which of the following configuration lines will set the DNS server to `192.168.1.4` using `/etc/resolv.conf`?

A. `dns 192.168.1.4`

B. `dns-server 192.168.1.4`

C. `nameserver 192.168.1.4`

D. `name-server 192.168.1.4`

22. When examining open ports on the server, you see that TCP port 3000 is listed with no corresponding protocol name, such as smtp, imaps, and so on. In which file would you find a list of port-to-protocol translations that could be customized to add this new port?

A. `/etc/ports`

B. `/etc/p2p`

C. `/etc/ppp`

D. `/etc/services`

23. Which of the following commands adds a route to the server for the network `192.168.51.0/24` through its gateway of `192.168.51.1`?

A. `route add -net 192.168.51.0 netmask 255.255.255.0 gw 192.168.51.1`

B. `route add -net 192.168.51/24 gw 192.168.1.51`

C. `route -net 192.168.51.0/24 192.168.51.1`

D. `route add 192.168.51.1 -n 192.168.51.0//255.255.255.0`

24. Which of the following commands shows network services or sockets that are currently along with sockets that are not listening?

A. `netstat -a`

B. `netlink -a`

C. `sockets -f`

D. `opensock -l`

25. Which of the following represents a correct configuration line for `/etc/hosts`?

A. `192.168.1.4 cwa.braingia.org cwa`

B. `cwa.braingia.org cwa 192.168.1.4`

C. `cwa.braingia.org 192.168.1.8 alias cwa`

D. `alias cwa.braingia.org cwa 192.168.1.4`

26. Which of the following commands configures the `eth0` device with an IP address of `192.168.1.1` in a `/24` network?

A. `ifconfig eth0 192.168.1.1/24`

B. `ifconfig eth0 192.168.1.1/255.255.255.0`

C. `ifconfig eth0 192.168.1.1 netmask 255.255.255.0`

D. `ifconfig 192.168.1.1 netmask 255.255.255.0 eth0`

27. Which of the following describes a primary difference between IPv4 and IPv6?

A. IPv4 is for internal networks only, while IPv6 is for public networks.

B. IPv4 is for public networks, while IPv6 is for internal networks.

C. IPv4 uses a 32-bit address, while IPv6 uses a 128-bit address.

D. With IPv6, there is no subnetting necessary.

28. On which port does ICMP operate?

A. TCP/43

B. UDP/111

C. UDP/69

D. ICMP does not use ports.

29. Which of the following commands will change the default gateway to `192.168.1.1` using `eth0`?

A. `ip route default gw 192.168.1.1`

B. `ip route change default via 192.168.1.1 dev eth0`

C. `ip route default gw update 192.168.1.1`

D. `ip route update default 192.168.1.1 eth0`

30. Which of the following ports is used for Secure Shell communication?

A. TCP/23

B. TCP/25

C. TCP/22

D. TCP/2200

31. Which options for `netcat` will create a server listening on port 8080?

A. `netcat -p 8080`

B. `nc -l -p 8080`

C. `nc -p 8080`

D. `nc -s 8080`

32. Which of the following commands displays the Start of Authority information for the domain `example.com`?

A. `dig example.com soa`

B. `dig example.com authority`

C. `dig example.com -auth`

D. `dig -t auth example.com`

33. Assume that you want to enable local client services to go to hosts on the network without needing to qualify the name fully by adding the domain for either `example.com` or `example.org`. Which option in `/etc/resolv.conf` will provide this functionality?

A. `search`

B. `domain`

C. `local-domain`

D. `local-order`

34. Which of the following commands sends an IPv6 ping to a unique local address?

A. `ping -6 127.0.0.1`

B. `ping6 fddi/128`

C. `ping6 fdd6:551:b09f::`

D. `ping -6 fdd6:551:b09f::`

35. Which of the following commands prevents traffic from reaching the host `192.168.1.3`?

A. `route add -host 192.168.1.3 reject`

B. `route -nullroute 192.168.1.3`

C. `route add -null 192.168.1.3`

D. `route add -block 192.168.1.3`

36. Which of the following describes a primary difference between `traceroute` and `tracepath`?

A. The `traceroute` command requires root privileges.

B. The `tracepath` command provides the MTU for each hop whereas `traceroute` does not.

C. The `tracepath` command cannot be used for tracing a path on an external network.

D. The `traceroute` command is not compatible with IPv6.

37. Which of the following commands will emulate the `ping` command in Microsoft Windows, where the `ping` is sent for four packets and then exits?

A. `ping -n 4`

B. `ping -t 4`

C. `ping -p 4`

D. `ping -c 4`

38. You are troubleshooting a DNS problem using the `dig` command, and you receive a `"status: NXDOMAIN"` message. Which of the following best describes what NXDOMAIN means?

A. NXDOMAIN means that you have received a non-authoritative answer for the query.

B. NXDOMAIN means that the domain or host is not found.

C. NXDOMAIN indicates a successful query.

D. NXDOMAIN signifies a new domain record has been added.

39. Which of the following commands configures `eth1` with an additional IPv6 address of `fdd6:551:b09e::`?

A. `ifconfig eth1 inet6 add fdd6:551:b09e::/128`

B. `ifconfig add fdd6:551:b09e::`

C. `ifconfig fdd6:551:b09e:: eth1`

D. `ifconfig eth1 fdd6:551:b09e`

40. On which port does LDAP over SSL operate?

A. Port 53

B. Port 389

C. Port 636

D. Port 443

41. You need to prevent local clients from going to a certain host, `www.example.com`, and instead redirect them to a localhost. Which of the following is a method to override DNS lookups for the specified host?

A. Add a firewall entry for the IP address of `www.example.com` to prevent traffic from passing through it.

B. Delete `www.example.com` from the route table using the `route` command.

C. Add a null route to prevent access to the IP address for `www.example.com`.

D. Add an entry for `www.example.com` in `/etc/hosts` to point to `127.0.0.1`.

42. Which of the following commands should be executed after running `ip route` change?

A. `ip route flush cache`

B. `ip route reload`

C. `ip route cache reload`

D. `ip route restart`

43. Which option should be used to send a DNS query for an SPF record with dig?

A. `-t txt`

B. `-t spf`

C. `-t mx`

D. `-t mailspf`

44. Which of the following protocols uses a three-way handshake?

A. ICMP

B. TCP

C. UDP

D. IP

45. How many IP addresses are available in the `172.16.0.0` private range in IPv4?

A. /32

B. 16,777,216

C. 65,536

D. 1,048,576

46. When troubleshooting a connectivity issue, you have found that you can reach a server via the web but cannot ping it. Which of the following best describes a possible cause for this scenario?

A. TCP traffic has been blocked at the firewall.

B. The DNS lookup is failing.

C. ICMP traffic has been blocked.

D. There is a reject route in place.

47. When viewing the available routes using the `route` command, one route contains flags `UG` while the others contain `U`. What do the letters `UG` signify in the route table?

A. The `G` signifies that the route is good.

B. The `G` signifies that the route is unavailable.

C. The `G` signifies that this is a gateway.

D. The `G` signifies that the route is an aggregate.

48. Which of the following commands requests a zone transfer of `example.org` from the server at `192.168.1.4`?

A. `dig example.org @192.168.1.4 axfr`

B. `dig example.org @192.168.1.4`

C. `dig example.org @192.168.1.4 xfer`

D. `dig example.org #192.168.1.4 xfer`

Chapter

10

Security (Domain 110)

THE FOLLOWING COMPTIA LINUX+/LPIC-1 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **110.1 Perform security administration tasks**

- Audit a system to find files with the suid/sgid bit set
- Set or change user passwords and password aging information
- Being able to use nmap and netstat to discover open ports on a system
- Set up limits on user logins, processes and memory usage
- Determine which users have logged in to the system or are currently logged in
- Basic sudo configuration and usage
- The following is a partial list of the used files, terms and utilities:
  - find
  - passwd
  - fuser
  - lsof
  - nmap
  - chage
  - netstat
  - sudo
  - /etc/sudoers
  - su
  - usermod
  - ulimit
  - who, w, last

✓ 110.2 Set up host security

- Awareness of shadow passwords and how they work
- Turn off network services not in use
- Understand the role of TCP wrappers
- The following is a partial list of the used files, terms and utilities:
  - /etc/nologin
  - /etc/passwd
  - /etc/shadow
  - /etc/xinetd.d/*
  - /etc/xinetd.conf
  - /etc/inetd.d/*
  - /etc/inetd.conf
  - /etc/inittab
  - /etc/init.d/*
  - /etc/hosts.allow
  - /etc/hosts.deny

✓ 110.3 Securing data with encryption

- Perform basic OpenSSH 2 client configuration and usage
- Understand the role of OpenSSH 2 server host keys
- Perform basic GnuPG configuration, usage and revocation
- Understand SSH port tunnels (including X11 tunnels)
- The following is a partial list of the used files, terms and utilities:
  - ssh
  - ssh-keygen
  - ssh-agent
  - ssh-add
  - ~/.ssh/id_rsa and id_rsa.pub
  - ~/.ssh/id_dsa and id_dsa.pub
  - /etc/ssh/ssh_host_rsa_key and ssh_host_rsa_key.pub
  - /etc/ssh/ssh_host_dsa_key and ssh_host_dsa_key.pub
  - ~/.ssh/authorized_keys
  - /etc/ssh_known_hosts
  - gpg
  - ~/.gnupg/*

1. You need to prevent users temporarily from logging into the system using ssh or another means. Which of the following describes one method for accomplishing this task?
   - **A.** Use the command `touch /etc/nologin`.
   - **B.** Disable sshd.
   - **C.** Remove `/etc/login`.
   - **D.** Add a shadow file.

2. Which of the following commands searches the entire filesystem for files with the `setuid` bit set?
   - **A.** `find ./ -perm suid`
   - **B.** `find / -perm 4000`
   - **C.** `find / -type suid`
   - **D.** `find / -type f -perm setuid`

3. Which of the following commands displays the currently open ports and the process that is using the port?
   - **A.** `netstat -a`
   - **B.** `lsof -i`
   - **C.** `ps auwx`
   - **D.** `netlist`

4. You are attempting to unmount a filesystem using the `umount` command. However, when you do so, you receive a message indicating that the filesystem is in use. Which of the following commands can be used to determine what process is keeping a filesystem open?
   - **A.** `fuser`
   - **B.** `ls`
   - **C.** `find`
   - **D.** `ps`

5. Which of the following commands displays account information such as expiration date, last password change, and other related details?
   - **A.** `usermod -l`
   - **B.** `userinfo -a`
   - **C.** `chageuser -l`
   - **D.** `chage -l`

6. Which of the following commands scans the IP address `192.168.1.154` for open ports?
   - **A.** `nmap 192.168.1.154`
   - **B.** `lsof 192.168.1.154`
   - **C.** `netstat 192.168.1.154`
   - **D.** `netmap 192.168.1.154`

7. Which command is used to create a public/private key pair for use with ssh?
   A. `ssh -k`
   B. `ssh-keygen`
   C. `ssh-genkey`
   D. `ssh -key`

8. Which of the following configuration options sets a hard limit of 25 processes for a user called suehring in `/etc/security/limits.conf`?
   A. `suehring hard proc 25`
   B. `suehring hard nproc 25`
   C. `suehring proc 25 hard-limit`
   D. `proc 25 suehring hard`

9. Within which file should you place public keys for servers from which you will accept key-based ssh authentication?
   A. `~/.ssh/authorized_keys`
   B. `~/.ssh/keys`
   C. `~/.ssh/keyauth`
   D. `~/.sshd/authkeys`

10. The system on which you are working does not have the `lsof` command installed, and you are not allowed to install software without going through four levels of approval and scheduling the installation weeks in advance. However, the `netstat` command is available. Which option to `netstat` will show the process ID to which a given network port is connected?
    A. `-a`
    B. `-n`
    C. `-p`
    D. `-l`

11. You need to look at information on logins beyond that which is captured by the current log file for the `last` command. Which option to the `last` command can be used to load information from an alternate file?
    A. `-a`
    B. `-t`
    C. `-e`
    D. `-f`

12. You need to examine who is currently logged in to the system. Which of the following commands will display this information?
    A. `listuser`
    B. `fuser`
    C. `ls -u`
    D. `w`

13. You need to execute a command as a specific user. Which of the following commands enables this to occur?

A. `sudo -u`

B. `sudo -U`

C. `sudo -s`

D. `sudo -H`

14. Which option in `/etc/sudoers` will cause the specified command to not prompt for a password?

A. `PASSWORD=NO`

B. `NOPASSWD`

C. `NOPASSWORD`

D. `NOPROMPT`

15. Which of the following commands will display the cputime, memory, and other limits for the currently logged-in user?

A. `reslimit`

B. `limitres -a`

C. `ulimit -a`

D. `proclimit -n`

16. Which line within the `/etc/hosts.deny` file will prevent any host within the `192.168.1.0/24` network from accessing services that operate from xinetd?

A. `BLOCK: 192.168.1.0/24`

B. `REJECT: 192.168.1.0`

C. `ALL: 192.168.1.0/255.255.255.0`

D. `NONE: 192.168.1/255.255.255.0`

17. When expiring a user account with `usermod -e`, which of the following represents the correct date format?

A. `YYYY-MM-DD`

B. `MM/DD/YYYY`

C. `DD/MM/YY`

D. `MM/DD/YY HH:MM:SS`

18. Which of the following directives in a configuration file found within `/etc/xinetd.d` will prevent the service from starting?

A. `enable no`

B. `start no`

C. `disable yes`

D. `boot no`

19. You are using an RSA-based key pair for SSH. By default, what is the name of the private key file in `~/.ssh`?
    - **A.** `id_rsa`
    - **B.** `id_rsa.priv`
    - **C.** `id_rsa.key`
    - **D.** `rsa_key.priv`

20. Which option to the `su` command will execute a single command with a non-interactive session?
    - **A.** `-s`
    - **B.** `-u`
    - **C.** `-c`
    - **D.** `-e`

21. After specifying the `keyserver`, which option to `gpg` is used to specify the key to send to the key server?
    - **A.** `key-name`
    - **B.** `keyname`
    - **C.** `send-key`
    - **D.** `sendkey`

22. Which of the following best describes the method to use with ssh in order to execute a single command on a remote server?
    - **A.** Use the `-e` option followed by the command.
    - **B.** Send the command after the other options as part of the command line.
    - **C.** Use the `--execute` option followed by the command.
    - **D.** Use the `-s` option followed by the command.

23. When using `ssh-agent`, which command and option lists the currently loaded keys?
    - **A.** `ssh-agent -l`
    - **B.** `ssh -l`
    - **C.** `ssh-list-keys`
    - **D.** `ssh-add -l`

24. Which of the following commands should be used to edit the `/etc/sudoers` file?
    - **A.** Any text editor such as vi or emacs
    - **B.** `editsudo`
    - **C.** `visudo`
    - **D.** `visudoers`

25. Which of the following commands can be used to stop a given service, such as `httpd.service`, from starting on boot with a `systemd`-based system?

A. `systemctl disable httpdservice`

B. `systemctl stop httpd.service`

C. `systemd disable httpd.service`

D. `systemd enable httpd.service boot=no`

26. Which of the following commands will set an account to expire based on the number of days elapsed since January 1, 1970?

A. `passwd -e`

B. `chage -E`

C. `usermod -l`

D. `chguser`

27. You are using `nmap` to scan a host for open ports. However, the server is blocking ICMP echo requests. Which option to `nmap` can you set in order to continue the scan?

A. `-P0`

B. `-no-ping`

C. `-s0`

D. `-ping-0`

28. Which option within `/etc/security/limits.conf` is used to control the number of times that a given account can log in simultaneously?

A. `nlogins`

B. `loginmax`

C. `maxlogins`

D. `loginlimit`

29. Which file can be used to store a server-wide cache of hosts whose keys are known for ssh?

A. `/etc/sshd_known_hosts`

B. `/etc/ssh_known_hosts`

C. `~/.ssh/known_hosts`

D. `/root/ssh_known_hosts`

30. Within the following entry in `/etc/shadow`, to what does the number `15853` refer?

```
mail:*:15853:0:99999:7:::
```

A. The UID of the mail user

B. The number of files owned by mail

C. The date of the last password change (since 1/1/1970)

D. The number of days until the account expires

31. Which of the following commands sets up a local port forwarding session on local port 5150 to remote port 80 of `www.example.com`?

A. `ssh -L 5150:www.example.com:80`

B. `ssh 5150:www.example.com`

C. `ssh -p 5150 www.example.com`

D. `ssh -e 5150 www.example.com:80`

32. Which option must be enabled in `/etc/sshd_config` on the destination server in order for X11 forwarding to work?

A. `XForward yes`

B. `Xenable yes`

C. `X11Forwarding yes`

D. `Xconnection yes`

33. Which of the following commands generates a GnuPG key pair?

A. `gpg --gen-key`

B. `gpg --key`

C. `gpg --send-key`

D. `gpg --create-key`

34. Which of the following represents a group called `admins` within `/etc/sudoers`?

A. `@admins`

B. `admins`

C. `-admins`

D. `%admins`

35. Which option to ssh is used to set the port for the remote host?

A. `-p`

B. `-P`

C. `-l`

D. `@`

36. Which option to `nmap` sets the scan to use TCP SYN packets for finding open ports?

A. `-sS`

B. `-sT`

C. `-sY`

D. `-type SYN`

37. Which of the following logs is used by the last command for detailing recent logins?

A. `/var/log/last`

B. `/var/log/all.log`

C. `/var/log/wtmp`

D. `/var/log/logins`

38. Which option to ssh enables the use of a key for authentication?

A. `-i`

B. `-k`

C. `-f`

D. `--key`

39. In a scripting scenario, you need to prevent sudo from prompting for credentials or for any other reason. Which option to sudo is used to indicate this?

A. `-n`

B. `--noprompt`

C. `-i`

D. `-q`

40. Which of the following commands generates an RSA key for use with ssh?

A. `ssh -key rsa`

B. `ssh --gen-key rsa`

C. `ssh-keygen -t rsa`

D. `ssh-keygen rsa`

41. You need to disable a service found in `/etc/inetd.conf`. Which of the following is used as a comment character in that file?

A. `-`

B. `#`

C. `/`

D. `%`

42. Which of the following commands can be used to lock an account?

A. `usermod -L`

B. `usermod -l`

C. `passwdlock`

D. `lockacct`

43. Which file is used as the default storage for public keyrings for gpg?

A. `publickeys.gpg`

B. `pubring.gpg`

C. `public.gpg`

D. `pubkeys.gpg`

44. Which file in `~/.gnupg`, if present, indicates that files have been migrated to gpg version 2.1 or later?

A. `.gpg-v21`

B. `.gpg-updated`

C. `.gpg-v21-migrated`

D. `.gpg-files-v21`

45. Which of the following commands searches a server for files with the `setgid` bit enabled?

A. `find / -perm 4000`

B. `find ./ -perm setgid`

C. `grep setgid *`

D. `find / -perm 2000`

46. Which of the following commands creates links within `/etc/rc.d/*` for starting and stopping services on a Debian system?

A. `createsym`

B. `startstop-service`

C. `update-rc.d`

D. `createconfig`

47. Which runlevel is typically used for single-user mode, as indicated in `/etc/inittab`?

A. 1

B. 2

C. 5

D. 6

48. Which option to the `su` command is used to obtain the normal login environment?

A. `-u`

B. `-U`

C. `-`

D. `-login`

LPIC-2

PART II

Chapter 11

Capacity Planning (Topic 200)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **200.1 Measure and troubleshoot resource usage**

- Measure CPU usage.
- Measure memory usage.
- Measure disk I/O.
- Measure network I/O.
- Measure firewalling and routing throughput.
- Map client bandwidth usage.
- Match / correlate system symptoms with likely problems.
- Estimate throughput and identify bottlenecks in a system including networking.
- The following is a partial list of the used files, terms and utilities:
  - iostat
  - iotop
  - vmstat
  - netstat
  - ss
  - iptraf
  - pstree, ps
  - w
  - lsof
  - top

- htop
- uptime
- sar
- swap
- processes blocked on I/O
- blocks in
- blocks out

✓ 200.2 Predict future resource needs

- Use monitoring and measurement tools to monitor IT infrastructure usage.
- Predict capacity break point of a configuration.
- Observe growth rate of capacity usage.
- Graph the trend of capacity usage.
- Awareness of monitoring solutions such as Icinga2, Nagios, collectd, MRTG and Cacti
- The following is a partial list of the used files, terms and utilities:
  - diagnose
  - predict growth
  - resource exhaustion

1. When using `iostat` to assess performance, which option displays information on a per-partition basis for block devices?
   - **A.** `-a`
   - **B.** `-c`
   - **C.** `-d`
   - **D.** `-p`

2. When using `iptraf` for monitoring over an ssh connection, all of the traffic from your ssh session is showing up within the monitor. Which of the following is used to exclude and/or include traffic from the `iptraf` monitor?
   - **A.** Area
   - **B.** Filter
   - **C.** Exclusion
   - **D.** Selector

3. Which of the following commands displays blocks in and blocks out as related to I/O?
   - **A.** `iorpt`
   - **B.** `iptraf`
   - **C.** `vmswap`
   - **D.** `vmstat`

4. Which of the following commands can be used to display real-time information about disk usage on a per-process basis?
   - **A.** `iostat`
   - **B.** `top`
   - **C.** `iotop`
   - **D.** `free`

5. You need to deploy a monitoring solution that enables alerts along with advanced scripted responses based on configurable performance conditions. Which of the following software packages performs these tasks?
   - **A.** MySQL
   - **B.** ntop
   - **C.** mrtg
   - **D.** Nagios

6. Which of the following commands can be used to display a list of currently logged-in users along with the current load average and time since last reboot?
   - **A.** `uptime`
   - **B.** `w`
   - **C.** `swap`
   - **D.** `sysinfo`

7. Which of the following commands provides an overview of current memory usage along with swap space and its current utilization?
   - **A.** `mem`
   - **B.** `free`
   - **C.** `pstat`
   - **D.** `swap`

8. Which of the following describes a method for changing the sort order when using the `top` command such that the highest memory utilizers will be shown at the top of the list?
   - **A.** Within `top`, type **o** and then select mem.
   - **B.** Within `top`, press Shift+F, scroll to %MEM, press **s** to select, and then press **q** to quit.
   - **C.** Within `top`, press **S** and then select %MEM.
   - **D.** Within `top`, press Shift+S, select %MEM, then press **q** to quit.

9. Which of the following commands can be used to display the current disk utilization?
   - **A.** `df`
   - **B.** `du`
   - **C.** `diskutil`
   - **D.** `diskuse`

10. Which of the following monitoring tools can use SNMP and scripts to collect data for performance-related graphing?
    - **A.** `ptop`
    - **B.** `pstree`
    - **C.** `Cacti`
    - **D.** `Grafr`

11. Which tool can be used to measure the memory usage of individual processes in order to aid in capacity planning?
    - **A.** `ps`
    - **B.** `iotop`
    - **C.** `iostat`
    - **D.** `ifconfig`

12. Which option to `htop` enables monitoring of a single process ID?
    - **A.** `-p`
    - **B.** `-a`
    - **C.** `-e`
    - **D.** `-s`

13. Which of the following `netstat` options displays the send and receive queues for each socket?
    - **A.** `-r`
    - **B.** `-M`

C. `-a`

D. `-v`

14. Which of the following tools provides an ncurses-based graphical tool for network monitoring that can be used over an ssh connection?

A. `ipmon`

B. `iptraf`

C. `ipconfig`

D. `netmon`

15. Which of the following commands enables a sorted and grouped list of processes, grouped into a parent/child display?

A. `ps`

B. `psdisp`

C. `pstree`

D. `ptree`

16. Which of the following commands displays CPU-related performance information a total of 10 times gathered every two seconds?

A. `sar -u 2 10`

B. `sar -u 10 2`

C. `sar -u 2`

D. `uptime -t`

17. Which of the following tools provides an ncurses-based interface for working with processes, including viewing, changing priority, and killing the processes?

A. `htop`

B. `ptop`

C. `libtop`

D. `restop`

18. When viewing statistics with `vmstat`, which statistic represents the time that the CPU spent waiting for I/O?

A. sy

B. us

C. wa

D. io

19. Which option to the `pstree` command displays process IDs along with the normal output?

A. `-i`

B. `-b`

C. `-p`

D. `-a`

20. When viewing information with `ps`, what does the RSS column indicate?

A. Real Swap Size

B. Remaining Swap Space

C. Resident Set Size

D. Recommended Set Space

21. Which of the following commands displays a list of currently open files along with their sizes?

A. `ls`

B. `lsof`

C. `lsio`

D. `ls -o`

22. When using `htop` to monitor a process interactively, which key can be used to display open files for the selected process?

A. L

B. l

C. f

D. o

23. When working in a virtual server environment, which column within `iostat` output shows the amount (percentage) of time spent in an involuntary wait scenario due to the hypervisor?

A. proc

B. wait

C. user

D. steal

24. Which of the following performance-monitoring commands is available by default in most modern Linux installs and does not need to be installed as a separate package?

A. `Icinga2`

B. `top`

C. `sar`

D. `Nagios`

25. What time intervals are represented by the three numbers in the load average output obtained with the `uptime` command?

A. 1, 5, and 15 minutes

B. 5, 10, and 15 minutes

C. 10, 30, and 60 seconds

D. 1, 3, and 5 minutes

26. Which of the following files contains information about the swap space including the currently used amount of swap and the disk partitions used for the swap space?

A. `/proc/swapinfo`

B. `/proc/swaps`

C. `/proc/swap`

D. `/etc/swap.conf`

27. Which of the following tools provides a web interface for network-related statistics such as bandwidth usage per protocol and host?

A. `mrtg`

B. `Nagios`

C. `ntop`

D. `htop`

28. Which option to the `ps` command displays information in a wide format?

A. `z`

B. `w`

C. `a`

D. `o`

29. When no interval or count is provided for the `sar` command, what information is used as output?

A. Statistics gathered since last restart

B. Current load average

C. Statistics on current utilization

D. Average I/O

30. Which of the following `lsof` commands will display all open connections for port 80?

A. `lsof -i 80`

B. `lsof 80`

C. `lsof -i :80`

D. `lsof -i -80`

31. Which option to `iostat` causes the display to output in megabytes?

A. `-k`

B. `-l`

C. `-m`

D. `-o m`

32. When viewing information with `vmstat`, you notice that there are two processes in the b column, indicating uninterruptible sleep. How do you find which specific processes are currently in uninterruptible sleep mode?

A. Add the `-n` option to `vmstat`.

B. Use `ps` and look for D in the Stat column.

C. Use `ps` and look for Sl in the Stat column.

D. Reboot the server.

33. When working with `htop`, which of the following options sets the delay between updates to 10 seconds?

A. `-d 10`

B. `-d 100`

C. `-f 10`

D. `-f 100`

34. Which of the following commands and options displays performance information including memory and CPU usage every second for 10 seconds?

A. `vmstat 1 10`

B. `iostat 10 1`

C. `vmstat 10 1`

D. `iostat 1 10`

35. Which of the following commands displays the number of packets forwarded by the kernel?

A. `ls`

B. `ipstat`

C. `ifconfig -a`

D. `netstat -s`

36. You are using a two-processor system and notice that the one-minute load average is 1.00. What does this mean for performance?

A. One of the processors was idle 50% of the time.

B. The system is constrained by the CPUs because it is at 100% capacity.

C. The CPU utilization cannot be determined from this information.

D. One of the processors was idle 25% of the time.

37. What is the expected output when providing a 0-increment value to the `sar` command with no count value provided?

A. Statistics from the beginning of time

B. Average utilization since last restart

C. Continuously updated statistics

D. An error will occur.

Chapter 12

Linux Kernel (Topic 201)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **201.1 Kernel components**

- Kernel 2.6.x, 3.x and 4.x documentation
- The following is a partial list of the used files, terms and utilities:
  - /usr/src/linux/
  - /usr/src/linux/Documentation/
  - zImage
  - bzImage
  - xz compression

✓ **201.2 Compiling a Linux kernel**

- /usr/src/linux/
- Kernel Makefiles
- Kernel 2.6.x, 3.x and 4.x make targets
- Customize the current kernel configuration.
- Build a new kernel and appropriate kernel modules.
- Install a new kernel and any modules.
- Ensure that the boot manager can locate the new kernel and associated files.
- Module configuration files
- Use DKMS to compile kernel modules.
- Awareness of dracut

- The following is a partial list of the used files, terms and utilities:
  - mkinitrd
  - mkinitramfs
  - make
  - make targets (all, config, xconfig, menuconfig, gconfig, oldconfig, mrproper, zlmage, bzlmage, modules, modules_install, rpm-pkg, binrpm-pkg, deb-pkg)
  - gzip
  - bzip2
  - module tools
  - /usr/src/linux/.config
  - /lib/modules/kernel-version/
  - depmod
  - dkms

✓ 201.3 Kernel runtime management and troubleshooting

- Use command-line utilities to get information about the currently running kernel and kernel modules.
- Manually load and unload kernel modules.
- Determine when modules can be unloaded.
- Determine what parameters a module accepts.
- Configure the system to load modules by names other than their file name.
- /proc filesystem
- Content of /, /boot/, and /lib/modules/
- Tools and utilities to analyse information about the available hardware
- udev rules
- The following is a partial list of the used files, terms and utilities:
  - /lib/modules/kernel-version/modules.dep
  - module configuration files in /etc/

- /proc/sys/kernel/
- /sbin/depmod
- /sbin/rmmod
- /sbin/modinfo
- /bin/dmesg
- /sbin/lspci
- /usr/bin/lsdev
- /sbin/lsmod
- /sbin/modprobe
- /sbin/insmod
- /bin/uname
- /usr/bin/lsusb
- /etc/sysctl.conf, /etc/sysctl.d/
- /sbin/sysctl
- udevmonitor
- udevadm monitor
- /etc/udev/

1. You are upgrading the kernel that has been previously compiled on the same server. Which of the following commands incorporates the contents of the existing kernel configuration into the new kernel?
   - **A.** `config --merge`
   - **B.** `make oldconfig`
   - **C.** `merge config`
   - **D.** `int configs`

2. Within which directory is the kernel source typically kept?
   - **A.** `/usr/src/linux`
   - **B.** `/usr/linux/kernel`
   - **C.** `/usr/source/kernel`
   - **D.** `/etc/kernelsrc`

3. Which of the following commands unzips a kernel source file that has been compressed with xz compression?
   - **A.** `xz -c`
   - **B.** `xz -u`
   - **C.** `xz -f`
   - **D.** `xz -d`

4. Which of the following compressed kernel images is limited to a maximum size of 512 KB?
   - **A.** zImage
   - **B.** bzImage
   - **C.** kImage
   - **D.** lImage

5. Which `make` target provides a curses-based interface into kernel compilation to help select options within the kernel?
   - **A.** `config`
   - **B.** `menuconfig`
   - **C.** `cursesconfig`
   - **D.** `cleanconfig`

6. You are working with a legacy CentOS 5 system and need to re-create the initial RAM disk. Which of the following commands is used for this purpose?
   - **A.** `mkinitrd`
   - **B.** `mkramdisk`
   - **C.** `mkdisk --init`
   - **D.** `mkfs.init`

7. Which compression method is used for creation of a bzImage?
   - **A.** zip
   - **B.** lzip
   - **C.** bzip2
   - **D.** bzip3

8. When compiling a kernel, the final configuration is placed into which of the following files?
   - **A.** `/usr/src/linux/.kernelcfg`
   - **B.** `/usr/src/linux/.config`
   - **C.** `/usr/src/linux/.kconfig`
   - **D.** `/usr/src/linux/kernel.cfg`

9. Which of the following commands is used to display the currently loaded modules on a running system?
   - **A.** `ls -mod`
   - **B.** `lsmod`
   - **C.** `listmod`
   - **D.** `mod --list`

10. Which of the following `make` targets should be used in order to ensure that most compiled files from a previous compile are removed?
    - **A.** `config`
    - **B.** `clean`
    - **C.** `proper`
    - **D.** `mrproper`

11. Which kernel configuration option enables you to add information such as a custom version number to the kernel version?
    - **A.** CUSTVER
    - **B.** LOCALVERSION
    - **C.** CUSTOMVERSION
    - **D.** APPENDVER

12. Which of the following tools is used to create kernel modules, even if the source is outside the kernel source tree?
    - **A.** `kbuild`
    - **B.** `mkmod`
    - **C.** `dkms`
    - **D.** `modbuild`

13. Which of the following commands creates a list of modules and their dependencies?
    A. `lsmod`
    B. `depmod`
    C. `modlist`
    D. `listmod`

14. Which of the following commands is used to view kernel-related udev events in real time?
    A. `udevls all`
    B. `lsudev -f`
    C. `udevmon -a`
    D. `udevadm monitor`

15. Which of the following commands displays USB-related information from the kernel in a tree-like structure?
    A. `lsusb -t`
    B. `usblist --tree`
    C. `usbtree`
    D. `usblist -t`

16. Which option to `sysctl` displays all values and their current settings?
    A. `-a`
    B. `-b`
    C. `-d`
    D. `-c`

17. Which of the following commands installs a kernel module, including dependencies?
    A. `lsmod`
    B. `modprobe`
    C. `modinst`
    D. `instmod`

18. Which of the following `make` targets can be used to create a Debian package of a kernel image and related files?
    A. `kpkg`
    B. `deb-pkg`
    C. `bin-deb`
    D. `deb-bin`

19. Which of the following commands displays the current kernel version?

A. `kver`

B. `uname -r`

C. `uptime -k`

D. `kerver`

20. Within which directory hierarchy are the names and values for `sysctl` gathered?

A. `/sysctl`

B. `/etc/sysctl.info`

C. `/proc/sys`

D. `/proc/sysctl`

21. Within which directory are rules related to udev stored?

A. `/etc/udev.conf`

B. `/etc/udev.conf.d`

C. `/etc/udev/rules.d`

D. `/etc/udev.d`

22. Which command is used to determine the modules on which another module depends?

A. `modinfo`

B. `modlist`

C. `modprobe`

D. `tracemod`

23. Within which directory will you typically find the documentation related to kernel source?

A. `/usr/src/Documentation`

B. `/usr/share/kerneldocs`

C. `/usr/src/linux/Documentation`

D. `/usr/share/kernel/Documentation`

24. Which option to `lspci` displays the kernel driver in use for the given PCI device?

A. `-t`

B. `-k`

C. `-n`

D. `-a`

25. Which of the following commands inserts a module into the running kernel but does not resolve dependencies?

A. `lsmod`

B. `modinstall`

C. `insmod`

D. `moduleinst`

26. Which option to `modprobe` will remove a module and attempt to remove any unused modules on which it depends?

A. `-v`

B. `-r`

C. `-d`

D. `-f`

27. Which of the following `make` targets is used to install previously compiled modules?

A. `modules`

B. `modules_install`

C. `instmod`

D. `modinst`

28. Within which of the following directories will you find blacklist information for modules loaded with `modprobe`?

A. `/etc/blacklist`

B. `/etc/modprobe.d`

C. `/etc/blacklist.mod`

D. `/etc/modprobe`

29. Which of the following commands displays a list of currently loaded modules?

A. `depmod`

B. `depmod -a`

C. `lsmod`

D. `listmod`

30. When working with a CentOS 6 system, which command is used to create the initial RAM disk?

A. `mkinit`

B. `dracut`

C. `mkraminit`

D. `mkinitfs`

31. Which command is used to remove a kernel module from a running system?

A. `modrm`

B. `rmmod`

C. `modremove`

D. `removemod`

32. If you'd like a value set with the `sysctl` command to take effect on boot, within which file should you place the variable and its value?

A. `/etc/sysctl.cfg`

B. `/etc/sysctl.conf`

C. `/lib/sysctl`

D. `/var/sysctl.conf`

33. Within which file will you find a list of the currently available kernel symbols?

A. `/proc/kernelsyms`

B. `/etc/kernel.conf`

C. `/etc/lsyms`

D. `/proc/kallsyms`

34. Which of the following options to `modprobe` will show the dependencies for a module?

A. `--show-deps`

B. `--show-depends`

C. `--deps`

D. `--list-depends`

35. Which of the following commands can be used to show the various pieces of information related to a currently loaded module, including core size and settings for options?

A. `systool -v -m <module>`

B. `modinfo -r <module>`

C. `lsmod <module>`

D. `infmod <module>`

36. Which directory contains various elements and configuration information about the kernel, such as the release number, domain name, location of `modprobe`, and other settings?

A. `/proc/sys/kmod`

B. `/proc/sys/kernel`

C. `/proc/kernel`

D. `/proc/kernel/sys`

37. Which of the following commands displays messages in the kernel ring buffer?

A. `kring`

B. `ringbuf`

C. `dmesg`

D. `kmesg`

Chapter

13

System Startup (Topic 202)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **202.1 Customising system startup**

- Systemd
- SysV init
- Linux Standard Base Specification (LSB)
- The following is a partial list of the used files, terms and utilities:
  - /usr/lib/systemd/
  - /etc/systemd/
  - /run/systemd/
  - systemctl
  - systemd-delta
  - /etc/inittab
  - /etc/init.d/
  - /etc/rc.d/
  - chkconfig
  - update-rc.d
  - init and telinit

✓ **202.2 System recovery**

- BIOS and UEFI
- NVMe booting
- GRUB version 2 and Legacy

- grub shell
- boot loader start and hand off to kernel
- kernel loading
- hardware initialisation and setup
- daemon/service initialisation and setup
- Know the different boot loader install locations on a hard disk or removable device.
- Overwrite standard boot loader options and using boot loader shells.
- Use systemd rescue and emergency modes.
- The following is a partial list of the used files, terms and utilities:
  - mount
  - fsck
  - inittab, telinit and init with SysV init
  - The contents of /boot/, /boot/grub/ and /boot/efi/
  - EFI System Partition (ESP)
  - GRUB
  - grub-install
  - efibootmgr
  - UEFI shell
  - initrd, initramfs
  - Master boot record
  - systemctl

✓ 202.3 Alternate bootloaders

- SYSLINUX, ISOLINUX, PXELINUX
- Understanding of PXE for both BIOS and UEFI
- Awareness of systemd-boot and U-Boot

- The following is a partial list of the used files, terms and utilities:
  - syslinux
  - extlinux
  - isolinux.bin
  - isolinux.cfg
  - isohdpfx.bin
  - efiboot.img
  - pxelinux.0
  - pxelinux.cfg/
  - uefi/shim.efi
  - uefi/grubx64.efi

1. Within which directory should `systemd` unit files that you create be stored?
   - **A.** `/etc/system`
   - **B.** `/etc/systemd/system`
   - **C.** `/usr/share/systemd`
   - **D.** `/usr/share/system`

2. Which of the following commands should you execute after making changes to `systemd` service configurations in order for those changes to take effect?
   - **A.** `systemd reload`
   - **B.** `reboot`
   - **C.** `systemctl daemon-reload`
   - **D.** `systemctl reboot`

3. Which of the following files contains the runlevels for the system along with a reference to the corresponding `rc` file?
   - **A.** `/etc/runlevels`
   - **B.** `/etc/inittab`
   - **C.** `/etc/rc`
   - **D.** `/etc/runlevel`

4. Which bootloader can be used for FAT filesystems and might be used for a rescue disk?
   - **A.** SYSBOOT
   - **B.** SYSLINUX
   - **C.** TIELINUX
   - **D.** FATLINUX

5. Which filesystem format type is used for the EFI System Partition (ESP)?
   - **A.** FAT
   - **B.** EXT4
   - **C.** NTFS
   - **D.** EXT3

6. Which of the following is used to provide an early filesystem-based loading process for key drivers needed to continue the boot process?
   - **A.** `bootrd`
   - **B.** `driverload`
   - **C.** `initrd`
   - **D.** `initdrv`

7. When booting a system, you receive an error similar to "No init found" and are then placed at an `initramfs` prompt. You need to check the hard drive for errors. Which of the following commands performs an error check on a hard drive partition in Linux?
   - **A.** `defrag`
   - **B.** `fsck`
   - **C.** `checkfs`
   - **D.** `chkfs`

8. Which of the following commands places the system in single-user mode?
   - **A.** `tellinit 1`
   - **B.** `chginit 1`
   - **C.** `telinet 1`
   - **D.** `telinit 1`

9. Which of the following commands installs `extlinux` into the `/boot` partition?
   - **A.** `extlinux --install /boot`
   - **B.** `extlinux --inst /boot`
   - **C.** `extlinux -boot`
   - **D.** `extlinux /boot install`

10. Which of the following commands mounts `/dev/sda1` in the `/boot` partition?
    - **A.** `mount /dev/sda /boot`
    - **B.** `mount /boot /dev/sda1`
    - **C.** `mount /dev/sda1 /boot`
    - **D.** `mount -dev sda1 /boot`

11. Which of the following commands installs GRUB into the master boot record (MBR) of the first SATA drive?
    - **A.** `grub-install /dev/hda`
    - **B.** `grub-install /dev/sda`
    - **C.** `grub-install /dev/hd0,0`
    - **D.** `grub -i /dev/hda`

12. Which of the following commands changes the boot order for the next boot?
    - **A.** `efibootmgr -c`
    - **B.** `efibootmgr -b -B`
    - **C.** `efibootmgr -o`
    - **D.** `efibootmgr -n`

13. Which bootloader can be used with ISO9660 CD-ROMs?
    A. ISOLINUX
    B. EFIBOOT
    C. ISOFS
    D. BOOTISO

14. Within which directory are `systemd` user unit files placed by installed packages?
    A. `/usr/lib/systemd/user`
    B. `/usr/lib/systemd/system`
    C. `/usr/systemd`
    D. `/usr/system`

15. When using UEFI, which of the following files can be used as a bootloader?
    A. `shim.uefi`
    B. `shim.efi`
    C. `shim.fx`
    D. `efi.shim`

16. Which of the following describes the priority order for configuration files with `systemd`?
    A. Files in `/etc`, files in `/run`, and then files in `/lib`
    B. Files in `/run`, files in `/etc`, and then files in `/lib`
    C. Files in `/lib`, files in `/run`, and then files in `/etc`
    D. Files in `/lib`, files in `/etc`, and then files in `/run`

17. Which directory on a SysV init-based system contains scripts that are used for starting and stopping services?
    A. `/etc/rc.int`
    B. `/etc/boot`
    C. `/etc/bootscripts`
    D. `/etc/init.d`

18. Which of the following commands is used to find overriding configuration files on a `systemd`-based system?
    A. `diff`
    B. `systemctl -diff`
    C. `systemd-delta`
    D. `systemctl configoverride`

19. Which of the following commands on a Red Hat system lists all of the files set to be executed on boot along with their setting for each runlevel?
    A. `rlevel`
    B. `chkconfig --list`

C. `bootldr --list`

D. `init --bootlist`

20. Which of the following commands, executed from within the UEFI shell, controls the boot configuration?

A. `bootcfg`

B. `bcfg`

C. `grub-install`

D. `grcfg`

21. Which of the following can be identified as an initial sector on a disk that stores information about the disk partitioning and operating system location?

A. Minimal Boot Record (MBR)

B. Master Boot Record (MBR)

C. Init sector

D. Master Partition Table (MPT)

22. Once booted, within which directory is the EFI bootloader mounted?

A. `/boot/efi`

B. `/etc/boot/efi`

C. `/etc/efi`

D. `/boot/loader`

23. To which target can a `systemd`-based system be set in order to assist with recovery?

A. `recovery.target`

B. `recover.target`

C. `target.recover`

D. `rescue.target`

24. Which of the following configuration files is used for ISOLINUX?

A. `isolinux.cfg`

B. `isolinux.conf`

C. `isolin.cfg`

D. `isolinux.conf.d`

25. Which file must exist within `/tftpboot` on the TFTP server for a system that will use PXELINUX for its bootloader?

A. `pxelinux.tftp`

B. `pxelinux.boot`

C. `pxelinux.conf`

D. `pxelinux.0`

26. Which utility can you use on a Debian or Ubuntu system to manage SysV init scripts, such as setting them to run on boot?

A. `bootorder`

B. `bootloader`

C. `configchk`

D. `update-rc.d`

27. Which key when pressed during the operating system selection menu is used to enable editing of the parameters related to boot with GRUB?

A. v

B. e

C. r

D. y

28. Which of the following commands displays the default target for a `systemd`-based system?

A. `systemctl list-unit-default`

B. `systemctl get-default`

C. `systemctl get-unit-default`

D. `systemctl get-default-unit`

29. Which options to the `fsck` command will find errors and automatically assume that it should repair the errors that it finds?

A. `-ry`

B. `-vy`

C. `-my`

D. `-xy`

30. Which option to `grub-install` will place the GRUB images into an alternate directory?

A. `--boot-dir`

B. `-b`

C. `-boot`

D. `--boot-directory`

31. Which `systemctl` subcommand is used to switch runlevels?

A. `switch`

B. `move`

C. `runlevel`

D. `isolate`

32. When examining the `/etc/inittab` file, which option signifies the default run level to which the system will boot?

A. `default`

B. `defaultboot`

C. `initdefault`

D. `defaultlvl`

33. Which of the following is used instead of `initrd` to provide an early filesystem for essential drivers?

A. `initnext`

B. `initramfs`

C. `initialize`

D. `initfs`

34. Which of the following commands sets the default `systemd` target to multi-user?

A. `systemctl set-default multi-user.target`

B. `systemd set-default multi-user.target`

C. `systemctl set-def muser.target`

D. `systemd set-def muser.target`

35. Using a shim for booting a UEFI-based system, which of the following files is loaded after `shim.efi`?

A. `grubx64.cfg`

B. `grub.conf`

C. `grubx64.efi`

D. `efi.boot`

36. Within which hierarchy are files from `/etc/init.d` linked so that the files are executed during the various runlevels of a SysV system?

A. `/etc/rc.S`

B. `/etc/rc`

C. `/etc/boot/rc`

D. `/etc/rc.d`

37. What is the name of the unit to which a `systemd` system is booted in order to start other levels?

A. `default.target`

B. `init.target`

C. `initial.target`

D. `load.target`

Chapter

14

Filesystems and Devices (Topic 203)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **203.1 Operating the Linux filesystem**

- The concept of the fstab configuration
- Tools and utilities for handling swap partitions and files
- Use of UUIDs for identifying and mounting file systems
- Understanding of systemd mount units
- The following is a partial list of the used files, terms and utilities:
  - /etc/fstab
  - /etc/mtab
  - /proc/mounts
  - mount and umount
  - blkid
  - sync
  - swapon
  - swapoff

✓ **203.2 Maintaining a Linux filesystem**

- Tools and utilities to manipulate and ext2, ext3 and ext4
- Tools and utilities to perform basic Btrfs operations, including subvolumes and snapshots
- Tools and utilities to manipulate XFS
- Awareness of ZFS

- The following is a partial list of the used files, terms and utilities:
  - mkfs (mkfs.*)
  - mkswap
  - fsck (fsck.*)
  - tune2fs, dumpe2fs and debugfs
  - btrfs, btrfs-convert
  - xfs_info, xfs_check, xfs_repair, xfsdump and xfsrestore
  - smartd, smartctl

✓ 203.3 Creating and configuring filesystem options

- autofs configuration files
- Understanding of automount units
- UDF and ISO9660 tools and utilities
- Awareness of other CD-ROM filesystems (HFS)
- Awareness of CD-ROM filesystem extensions (Joliet, Rock Ridge, El Torito)
- Basic feature knowledge of data encryption (dm-crypt / LUKS)
- The following is a partial list of the used files, terms and utilities:
  - /etc/auto.master
  - /etc/auto.[dir]
  - mkisofs
  - cryptsetup

1. Within which file is a list of the currently mounted filesystems stored?
   - **A.** `/etc/fstab`
   - **B.** `/etc/curmount`
   - **C.** `/var/spool/files`
   - **D.** `/etc/mtab`
2. Which option to `mke2fs` sets the type of filesystem to be created?
   - **A.** `-f`
   - **B.** `-a`
   - **C.** `-t`
   - **D.** `-e`
3. Which of the following files is the default configuration file for the `autofs` automounter?
   - **A.** `/etc/autofs`
   - **B.** `/etc/auto.master`
   - **C.** `/etc/autofs.conf`
   - **D.** `/etc/automounter.conf`
4. Which of the following commands is used to create an ISO filesystem?
   - **A.** `mkiso`
   - **B.** `mkfsiso`
   - **C.** `mkisofs`
   - **D.** `isofs-mk`
5. Which of the following commands is used to configure `dm-crypt` volumes?
   - **A.** `cryptsetup`
   - **B.** `dm-cryptsetup`
   - **C.** `dm-setup`
   - **D.** `dm-crypts`
6. Which command is used to format a swap partition?
   - **A.** `mkfs -swap`
   - **B.** `mkswap`
   - **C.** `format -swap`
   - **D.** `mksw`
7. Which option to the `tune2fs` command sets the maximum mount count before the system will automatically run `fsck` on the partition on boot?
   - **A.** `-b`
   - **B.** `-c`
   - **C.** `-C`
   - **D.** `-a`

8. Which option to the `mount` command can be used to simulate the mount process without actually mounting the filesystem?
   - **A.** `-q`
   - **B.** `-v`
   - **C.** `-l`
   - **D.** `-f`

9. When viewing `/proc/mounts`, you see a filesystem with the letters `ro` in the fourth column. To what do the letters `ro` refer?
   - **A.** relative option
   - **B.** realtime option
   - **C.** read only
   - **D.** relative only

10. Which option to `dumpe2fs` displays the bad blocks for a given partition?
    - **A.** `-bb`
    - **B.** `-C`
    - **C.** `-b`
    - **D.** `-f`

11. Which of the following filesystem types features copy-on-write?
    - **A.** ext3
    - **B.** ext4
    - **C.** FAT
    - **D.** btrfs

12. Which of the following commands displays filesystem geometry for an XFS filesystem?
    - **A.** `xfsinfo`
    - **B.** `xfs_info`
    - **C.** `xfs -info`
    - **D.** `xfs --info`

13. Which of the following commands can be used to display information such as the UUID for partitions on a system?
    - **A.** `blkid`
    - **B.** `blockdev`
    - **C.** `devinfo`
    - **D.** `uuidinfo`

14. Which option to the `umount` command will cause it to unmount only filesystems of the specified type?

A. `-v`

B. `-f`

C. `-t`

D. `-a`

15. Which command causes unwritten data to be written to disk immediately?

A. `write`

B. `wrnow`

C. `connwrite`

D. `sync`

16. Which command is used to activate swap space on a system?

A. `mkswap`

B. `swapon`

C. `swapact`

D. `actswap`

17. Which option to `xfs_check` is used to verify a filesystem that is stored in a file?

A. `-v`

B. `-a`

C. `-f`

D. `-d`

18. Which option to `debugfs` causes the filesystem to be opened in read-write mode rather than the default read-only?

A. `-rw`

B. `-w`

C. `-r`

D. `-n`

19. Which daemon is responsible for monitoring Self-Monitoring, Analysis, and Reporting Technology–compatible hard drives?

A. `smartmon`

B. `smarty`

C. `sartd`

D. `smartd`

20. Which option to the `fsck` command causes it to run the check even if the filesystem is apparently marked as clean?

A. `-f`

B. `-m`

C. `-a`

D. `-c`

21. You are performing an `xfsrestore`. The `xfsdump` was executed with a block size of 4M. Which option do you need to invoke on `xfsrestore` in order for it to use this dump successfully?

A. `-b 4M`

B. `-g 1M`

C. `-i 1M`

D. `-k 1028K`

22. You see the word `defaults` within `/etc/fstab`. Which options are encompassed within the `defaults`?

A. `ro`, `exec`, `auto`

B. `rw`, `suid`, `dev`, `exec`, `auto`, `nouser`, `async`

C. `rw`, `exec`, `auto`, `nouser`, `async`

D. `rw`, `exec`, `nouser`, `async`, `noauto`, `suid`

23. Which of the following commands is used to administer and configure how SMART monitoring is done?

A. `smartmon`

B. `smartconf`

C. `smartd`

D. `smartctl`

24. Which of the following is the correct format for a filesystem in `/etc/fstab`?

A. `<filesystem> <mountpoint> <type> <options> <dump> <pass>`

B. `<mountpoint> <filesystem> <type> <options> <dump> <pass>`

C. `<mountpoint> <filesystem> <type> <options> <pass> <dump>`

D. `<filesystem> <mountpoint> <type> <dump> <pass> <options>`

25. Which key derivation function is used by LUKS?

A. PBKDF2

B. SSL

C. RSA

D. DSA

26. Which of the following commands creates a btrfs subvolume?

A. `btrfs create subvolume`

B. `btrfs subvolume create`

C. `btrfs sv create`

D. `btrfs svcreate`

27. Which of the following options to `xfsdump` sets the maximum size for files to be included in the dump?

A. `-p`

B. `-s`

C. `-z`

D. `-b`

28. Which option to the `tune2fs` command sets the behavior when a filesystem error occurs?

A. `-f`

B. `-d`

C. `-e`

D. `-k`

29. The `/etc` filesystem has been mounted as read-only for a recovery process. You need to mount another partition. Which option to the `mount` command causes it not to write to `/etc/mtab`?

A. `-a`

B. `-m`

C. `-b`

D. `-n`

30. Which of the following commands deactivates swap space?

A. `swapoff`

B. `swap -off`

C. `unmountswap`

D. `uswap`

31. Within the [mount] section of a `systemd` mount unit, which directive specifies the location for mounting the chosen filesystem?

A. `Where=`

B. `Location=`

C. `List=`

D. `Dest=`

32. Which of the following `swapon` options displays information on the size of swap space along with its used space?

A. `--list`

B. `-a`

C. `--show`

D. `-h`

33. Which of the following commands can be used to format a FAT filesystem?

A. `mkfs.fat`

B. `mkfs -f`

C. `mkfs --fat`

D. `mkfat`

34. Which of the following commands adds a journal to an existing ext3 filesystem?

A. `tune2fs -jrn`

B. `e2fs -x`

C. `tune3fs`

D. `tune2fs -j`

35. Which of the following commands creates a snapshot of a btrfs subvolume?

A. `btrfs subvolume snapshot`

B. `btrfs snapshot --create`

C. `btrfs create snapshot`

D. `btrfs --create`

36. Which option to `xfs_repair` will force log zeroing, even if there may be metadata within the log?

A. `-L`

B. `-v`

C. `-d`

D. `-V`

37. Which of the following commands mounts a filesystem in read-only mode?

A. `mount read-only`

B. `mount --read`

C. `mount -o ro`

D. `mount -or`

Chapter

15

Advanced Storage Device Administration (Topic 204)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **204.1 Configuring RAID**

- Software RAID configuration files and utilities
- The following is a partial list of the used files, terms and utilities:
  - mdadm.conf
  - mdadm
  - /proc/mdstat
  - partition type 0xFD

✓ **204.2 Adjusting Storage Device Access**

- Tools and utilities to configure DMA for IDE devices including ATAPI and SATA
- Tools and utilities to configure Solid State Drives including AHCI and NVMe
- Tools and utilities to manipulate or analyse system resources (e.g. interrupts)
- Awareness of sdparm command and its uses
- Tools and utilities for iSCSI
- Awareness of SAN, including relevant protocols (AoE, FCoE)

- The following is a partial list of the used files, terms and utilities:
- hdparm, sdparm
  - nvme
  - tune2fs
  - fstrim
  - sysctl
  - /dev/hd*, /dev/sd*, /dev/nvme*
  - iscsiadm, scsi_id, iscsid and iscsid.conf
  - WWID, WWN, LUN numbers

✓ 204.3 Logical Volume Manager

- Tools in the LVM suite
- Resizing, renaming, creating, and removing logical volumes, volume groups, and physical volumes
- Creating and maintaining snapshots
- Activating volume groups
- The following is a partial list of the used files, terms and utilities:
  - /sbin/pv*
  - /sbin/lv*
  - /sbin/vg*
  - mount
  - /dev/mapper/
  - lvm.conf

1. Which file is used as a configuration file for RAID devices that use the `md` driver?
   - **A.** `/etc/md.conf`
   - **B.** `/etc/mdadm.conf`
   - **C.** `/etc/md.cfg`
   - **D.** `/etc/md/md.conf`

2. Which partition type is used to indicate a software RAID array, such as that built with `mdadm`?
   - **A.** 0xmd
   - **B.** -x-
   - **C.** 0xRD
   - **D.** 0xFD

3. When working with World Wide Identifiers (WWIDs), within which directory on a Red Hat server will you find symlinks to the current `/dev/sd` device names?
   - **A.** `/dev/disk/wwid`
   - **B.** `/dev/wwid`
   - **C.** `/dev/disk/by-id`
   - **D.** `/dev/sd.wwid`

4. Which of the following commands is used to perform administration related to iSCSI on a Linux server?
   - **A.** `iscsiadm`
   - **B.** `iscsiadmin`
   - **C.** `iscsi`
   - **D.** `scsiadm`

5. Which of the following commands displays information about a given physical volume in an LVM setup?
   - **A.** `pvdisp`
   - **B.** `pvlist`
   - **C.** `pvdisplay`
   - **D.** `pvl`

6. Which of the following configuration lines informs the `md` program that the first partition on both `sda` and `sdb` are eligible for use in a RAID array?
   - **A.** `DEV sda1 sdb1`
   - **B.** `DEV /dev/sda1 /dev/sdb1`
   - **C.** `DEVICE sda0 sdb0`
   - **D.** `DEVICE /dev/sda1 /dev/sdb1`

7. When viewing information in `/dev/disk/by-path` using the command `ls -l`, which of the following filenames represents a LUN from Fibre Channel?
   - **A.** `/dev/fc0`
   - **B.** `pci-0000:1a:00.0-fc-0x500601653ee0025f:0x0000000000000000`
   - **C.** `pci-0000:1a:00.0-scsi-0x500601653ee0025f:0x0000000000000000`
   - **D.** `/dev/fibre0`

8. Which of the following commands displays path information for LUNs?
   - **A.** `luninfo -a`
   - **B.** `ls -lun`
   - **C.** `multipath -l`
   - **D.** `dm-multi`

9. Which command is used to remove unused filesystem blocks from thinly provisioned storage?
   - **A.** `thintrim`
   - **B.** `thtrim`
   - **C.** `fstrim`
   - **D.** `fsclean`

10. You have purchased new SSD hardware that uses the NVMe protocol, but you cannot find the disks in the normal `/dev/sd*` location in which you have traditionally found such storage. In which location should you look for these drives?
    - **A.** `/dev/nd*`
    - **B.** `/dev/nvme*`
    - **C.** `/dev/nv*`
    - **D.** `/dev/nvme/*`

11. Which of the following commands can be used to generate a unique SCSI identifier?
    - **A.** `scsi_id`
    - **B.** `scsi_identifier`
    - **C.** `id_scsi`
    - **D.** `lsid`

12. Which storage protocol features the ability to send ATA commands over Ethernet?
    - **A.** iSCSI
    - **B.** PXE
    - **C.** POE
    - **D.** AOE

13. Which command can be used to set parameters for IDE and SATA devices on Linux?

A. `hdparam`

B. `hdparm`

C. `hdc`

D. `hdcontrol`

14. After creating the physical volumes for an `md` RAID setup, what is the typical next step?

A. Create one or more volume groups with `vgcreate`.

B. Reboot the server.

C. Start the array.

D. Link the physical volumes to virtual groups with `vgcreate`.

15. When using `tune2fs` to set an extended option such as `stripe_width`, which command-line option is needed to signify that an extended option follows?

A. `-extend`

B. `-E`

C. `-e`

D. `-f`

16. Which file contains information about the current `md` RAID configuration such as the personalities?

A. `/proc/raidinfo`

B. `/proc/rhyinfo`

C. `/proc/mdraid`

D. `/proc/mdstat`

17. Which of the following daemons is in charge of maintaining connections to iSCSI targets?

A. `iscsid`

B. `iscsiadm`

C. `iscsimgr`

D. `iscsim`

18. Which module can be examined with `modinfo` for information related to the NVMe driver?

A. `nvmeid`

B. `sata`

C. `nvme`

D. `nvmemod`

19. Which of the following directory hierarchies contains information such as the WWN for Fibre Channel?

A. `/sys/class/wwn`

B. `/sys/class/fc_host`

C. `/sys/class/fclist`

D. `/sys/class/fc/wwn`

20. Which option to `mdadm` is used to create a new array?

A. `--create`

B. `--start`

C. `--begin`

D. `--construct`

21. Which of the following files is used as a configuration file for `iscsid`?

A. `iscsid.cfg`

B. `iscsid.conf`

C. `iscsidaemon.conf`

D. `iscsi.cfg`

22. Information about logical volumes can be found in which of the following directories?

A. `/dev/lvinfo`

B. `/dev/map`

C. `/dev/mapper`

D. `/dev/lvmap`

23. Which option to `mdadm` watches a RAID array for anomalies?

A. `--mon`

B. `--watch`

C. `--monitor`

D. `--examine`

24. When troubleshooting a failed `md` RAID array, you need to mount one of the drives in read-only mode. Which option will mount the drive in read-only?

A. `-o ro`

B. `read-only`

C. `-o rw`

D. `-op ro`

25. Which of the following commands creates a logical volume with LVM?

A. `lvc`

B. `lvcreate`

C. `lvlist`

D. `lvmake`

26. When running `mdadm` in monitor mode, which option within `/etc/mdadm.conf` sets the destination for email if an issue is discovered?

A. MAILTO

B. MAILADDR

C. MAILFROM

D. MAILDEST

27. Which of the following commands looks for LVM physical volumes and volume groups involved in an LVM configuration?

A. `vgscan`

B. `lvmscan`

C. `lvlist`

D. `pvlist`

28. Which partition type is used to indicate a software RAID array, such as that built with `mdadm`?

A. 0xmd

B. -x-

C. 0xRD

D. 0xFD

29. Which of the following commands is used to display a list of physical volumes involved in LVM?

A. `pvdisp`

B. `pvlist`

C. `pvscan`

D. `pvmm`

30. Which of the following options to the `multipathd` command will enter the interactive console?

A. `-c`

B. `-k`

C. `-f`

D. `-n`

31. Which option to `lvchange` sets whether the logical volume is available?

A. `-a`

B. `-b`

C. `-c`

D. `-d`

32. Within which file can you configure a filter for devices when using `vgscan`?

A. `lvm.conf`

B. `vg.conf`

C. `vgscan.conf`

D. `lv.cfg`

33. Which option to `lvcreate` will create a snapshot of a logical volume?

A. `snap`

B. `snapshot`

C. `ss`

D. Snapshots are not created with `lvcreate`.

34. Which option is given to `sysctl` to change one of the kernel parameters?

A. `-a`

B. `-k`

C. `-w`

D. `-A`

35. Which of the following commands is used to access and change values for SCSI devices?

A. `scsiparm`

B. `scsiparam`

C. `sdlist`

D. `sdparm`

36. Which of the following directories contains configuration information for Fibre Channel over Ethernet (FCoE) on Linux?

A. `/etc/fcoe`

B. `/etc/fibrecoe`

C. `/etc/fibredev`

D. `/etc/fc`

37. Which of the following commands will examine the PCI subsystem for NVMe-based devices?

A. `psnvme`

B. `lsnvme`

C. `lspci | grep scsi`

D. `lspci | grep -i nvme`

Chapter 16

Networking Configuration (Topic 205)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **205.1 Basic networking configuration**

- Utilities to configure and manipulate Ethernet network interfaces
- Configuring basic access to wireless networks
- The following is a partial list of the used files, terms and utilities:
  - ip
  - ifconfig
  - route
  - arp
  - iw
  - iwconfig
  - iwlist

✓ **205.2 Advanced network configuration**

- Utilities to manipulate routing tables
- Utilities to configure and manipulate Ethernet network interfaces
- Utilities to analyse the status of the network devices

- Utilities to monitor and analyse the TCP/IP traffic
- The following is a partial list of the used files, terms and utilities:
  - ip
  - ifconfig
  - route
  - arp
  - ss
  - netstat
  - lsof
  - ping, ping6
  - nc
  - tcpdump
  - nmap

✓ 205.3 Troubleshooting network issues

- Location and content of access restriction files
- Utilities to configure and manipulate Ethernet network interfaces
- Utilities to manage routing tables
- Utilities to list network states.
- Utilities to gain information about the network configuration
- Methods of information about the recognised and used hardware devices
- System initialisation files and their contents (Systemd and SysV init)
- Awareness of NetworkManager and its impact on network configuration

- The following is a partial list of the used files, terms and utilities:
  - ip
  - ifconfig
  - route
  - ss
  - netstat
  - /etc/network/, /etc/sysconfig/network-scripts/
  - ping, ping6
  - traceroute, traceroute6
  - mtr
  - hostname
  - System log files such as /var/log/syslog, /var/log/messages and the systemd journal
  - dmesg
  - /etc/resolv.conf
  - /etc/hosts
  - /etc/hostname, /etc/HOSTNAME
  - /etc/hosts.allow, /etc/hosts.deny

1. When using the `ip` command, which protocol family is used as the default if not otherwise specified?
   - **A.** TCPIP
   - **B.** IP
   - **C.** INET
   - **D.** ARP

2. Which of the following commands changes the MAC address of eth0?
   - **A.** `ifmac eth0`
   - **B.** `ifconfig eth0 hw ether`
   - **C.** `ifconfig eth0 mac`
   - **D.** `ifconfig eth0 hw mac`

3. You are using the `route` command to view routes. However, name resolution is taking a long time and causing a delay in the response from the `route` command. Which option to `route` can be added to cause it to not perform name resolution?
   - **A.** `-d`
   - **B.** `-e`
   - **C.** `-f`
   - **D.** `-n`

4. You have replaced a device on the network but used the IP address from another active device. Which command can be run to remove the MAC address entry from your computer so that it performs the address resolution again?
   - **A.** `arp -d`
   - **B.** `netstat -rn`
   - **C.** `hostname`
   - **D.** `dig`

5. Which of the following commands displays information such as link status about the wireless device `wlan0`?
   - **A.** `iw dev wlan0 link`
   - **B.** `wlan0 list`
   - **C.** `iw wlan0 -l`
   - **D.** `iw dev link`

6. Which command is used for setting parameters such as the essid, channel, and other related options for a wireless device?
   - **A.** `ifconfig`
   - **B.** `iwconfig`
   - **C.** `wlancfg`
   - **D.** `iconf`

7. Which of the following commands can be used to scan for available wireless networks?
   - **A.** `iwlist get`
   - **B.** `iwconfig scan`
   - **C.** `iwlist scan`
   - **D.** `iw-scan`

8. When looking to parse the output of the `ip` command, which option can be set to remove newlines such that the output could be piped to the `grep` command?
   - **A.** `-n`
   - **B.** `-o`
   - **C.** `-l`
   - **D.** `-f`

9. You need to set the MTU to a specific value for a network interface. Which option to `ifconfig` facilitates this?
   - **A.** `-mtu`
   - **B.** `mtu`
   - **C.** `metric`
   - **D.** `addrmtu`

10. Which of the following commands creates a reject route for the network `172.16.3.0/24`?
    - **A.** `route del 172.16.3.0/24`
    - **B.** `route add -net 172.16.3.0 netmask 255.255.255.0 reject`
    - **C.** `route del -net 172.16.3.0 netmask 255.255.255.0`
    - **D.** `route del default`

11. Which option to the `arp` command creates a new entry for a given IP address to a MAC address pair?
    - **A.** `-s`
    - **B.** `-c`
    - **C.** `-d`
    - **D.** `--add`

12. Which of the following commands shows network sockets and their allocated memory?
    - **A.** `ss -m`
    - **B.** `mpas`
    - **C.** `mem`
    - **D.** `free`

13. Which options to `netstat` shows both active and listening TCP sockets and connections?
    - **A.** `-tu`
    - **B.** `-f`
    - **C.** `-an`
    - **D.** `-ta`

14. Which of the following commands lists open files belonging to all processes except those owned by the user `bind`?
    - **A.** `lsof -i`
    - **B.** `lsof -u bind`
    - **C.** `lsof -u ^bind`
    - **D.** `lsof | grep bind`

15. When troubleshooting a potential hardware problem, you need to determine which physical interface is being used for a certain address. One way to accomplish this is with the `ping` command in order to monitor the activity lights on the device. Which of the following options to `ping` will flood the interface with ECHO_REQUEST packets?
    - **A.** `-e`
    - **B.** `-a`
    - **C.** `-c`
    - **D.** `-f`

16. Which of the following commands can be used to test network connectivity at the TCP level instead of Telnet?
    - **A.** `netstat`
    - **B.** `nc`
    - **C.** `nettest`
    - **D.** `ping`

17. Which option to `tcpdump` displays a list of available interfaces on which `tcpdump` can operate?
    - **A.** `-a`
    - **B.** `-d`
    - **C.** `-D`
    - **D.** `-i`

18. Which option to `nmap` will cause it always to perform name resolution?
    - **A.** `-n`
    - **B.** `-R`
    - **C.** `-b`
    - **D.** `-a`

19. Which command provides a method for sending ICMP requests for IPv6?

A. `ping6`

B. `pingv6`

C. `tracert`

D. `6ping`

20. Which of the following commands displays information about addresses, specifically only IPv6 addresses, currently in use on the computer?

A. `ip addr`

B. `ip -6 addr`

C. `ip6add`

D. `ipv6addr`

21. Which of the following commands will disable ARP on the interface `eth0`?

A. `ifconfig eth0 -arp`

B. `ip eth0 noarp`

C. `ifconfig eth0 noarp`

D. `if eth0 disable arp`

22. Which option to the `route` command forces the kernel to use the specified device for the route rather than attempting to determine the correct device?

A. `inet`

B. `addr`

C. `dev`

D. `device`

23. Which option to the `ss` command shows the process IDs associated with the socket?

A. `-l`

B. `-a`

C. `-p`

D. `-f`

24. Which option to `netstat` displays interface information in a table-like format that might be suitable for use with scripting?

A. `-i`

B. `-r`

C. `-t`

D. `-l`

25. On a Debian system, within which directory hierarchy will you find configuration information and directories to hold scripts to be run when an interface is brought up or taken down?

A. `/etc/netconf`

B. `/etc/netconfig`

C. `/etc/net.conf.d`

D. `/etc/network`

26. Which option to `traceroute` causes the command to use ICMP for requests?

A. `-T`

B. `-A`

C. `-I`

D. `-i`

27. Which of the following commands provides a live traceroute of the route between two hosts, updating the information for each hop in near real time?

A. `traceroute --live`

B. `mtr`

C. `route -update`

D. `liveroute`

28. Which programmatic function is used by the `hostname` command internally?

A. `getaddr`

B. `gethost`

C. `gethostname`

D. `getname`

29. Which of the following commands will examine the system log for information regarding DHCP activity?

A. `grep -i dhcp /var/log/syslog`

B. `grep -v dhcp /var/log/syslog`

C. `grep -vi dhcp /var/log/kern.log`

D. `dmesg | grep dhcp`

30. Which of the following characters are valid for hostnames in `/etc/hosts`?

A. Alphanumerics, minus, underscore, and dot

B. Alphanumerics, minus, and dot

C. Alphanumerics and dot

D. Alphanumerics

31. Which of the following configuration lines in `/etc/resolv.conf` enables debugging?

A. `debug`

B. `options debug`

C. `option debug`

D. `enable-debug`

32. Which option to `dmesg` clears the contents after they have been read once?

A. `-C`

B. `-c`

C. `-a`

D. `-e`

33. Which of the following commands views `systemd` journal entries for the `NetworkManager` unit?

A. `systemd NetworkManager`

B. `systemd NetworkCtl`

C. `systemctl NetworkManager`

D. `systemctl -u NetworkManager`

34. Which file is read at boot to set the local computer's hostname?

A. `/etc/hostname`

B. `/etc/hosts`

C. `/etc/localhost`

D. `/etc/networkhost`

35. Which of the following directories on a Red Hat system contains network interface configuration information?

A. `/etc/network-scripts`

B. `/etc/system/network`

C. `/etc/sysconfig/network-scripts`

D. `/etc/sysconfig/net.d`

36. Which `traceroute` command is used exclusively for IPv6 route traces?

A. `trace6`

B. `traceroute6`

C. `tracert6`

D. `6trace`

37. Which wildcard can be used in `/etc/hosts.allow` to specify a match for a host whose name does not match its IP address?

A. `*`

B. `ALL`

C. `PARANOID`

D. `NAMEMATCH`

Chapter 17

System Maintenance (Topic 206)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **206.1 Make and install programs from source**

- Unpack source code using common compression and archive utilities.
- Understand basics of invoking make to compile programs.
- Apply parameters to a configure script.
- Know where sources are stored by default.
- The following is a partial list of the used files, terms and utilities:
  - /usr/src/
  - gunzip
  - gzip
  - bzip2
  - xz
  - tar
  - configure
  - make
  - uname
  - install
  - patch

✓ 206.2 Backup operations

- Knowledge about directories that have to be include in backups
- Awareness of network backup solutions such as Amanda, Bacula, Bareos and BackupPC
- Knowledge of the benefits and drawbacks of tapes, CDR, disk or other backup media
- Perform partial and manual backups.
- Verify the integrity of backup files.
- Partially or fully restore backups.
- The following is a partial list of the used files, terms and utilities:
  - /bin/sh
  - dd
  - tar
  - /dev/st* and /dev/nst*
  - mt
  - rsync

✓ 206.3 Notify users on system-related issues

- Automate communication with users through logon messages.
- Inform active users of system maintenance
- The following is a partial list of the used files, terms and utilities:
  - /etc/issue
  - /etc/issue.net
  - /etc/motd
  - wall
  - shutdown
  - systemctl

1. Which of the following compression programs is used for compression of the official kernel source code?
   - **A.** gzip2
   - **B.** bzip2
   - **C.** xz
   - **D.** xy
2. Which option to the `rsync` command provides archive mode?
   - **A.** `-r`
   - **B.** `-o`
   - **C.** `-a`
   - **D.** `-f`
3. Which option to the `tar` command creates a tar file?
   - **A.** `-c`
   - **B.** `-b`
   - **C.** `-f`
   - **D.** `-d`
4. Which option to tar removes files after adding them to the archive?
   - **A.** `-r`
   - **B.** `-d`
   - **C.** `--remove-files`
   - **D.** `-f`
5. Which of the following `patch` commands strips the leading slash from the path for files to patch?
   - **A.** `patch -p0`
   - **B.** `patch -strip 1`
   - **C.** `patch -s0`
   - **D.** `patch -p1`
6. Which of the following is the recommended name for a file containing commands and relationships used with the `make` command?
   - **A.** `Makefile`
   - **B.** `makefile`
   - **C.** `make.file`
   - **D.** `Makefile.txt`

7. Which `make` target is commonly used as a standard convention for removing extraneous files from a previous `make` process?
   - **A.** `cleanup`
   - **B.** `next`
   - **C.** `netbuild`
   - **D.** `clean`

8. Which script, typically included with source code, is used to check dependencies and prepare the Makefile with customizations based on the system?
   - **A.** `config`
   - **B.** `installer`
   - **C.** `prep`
   - **D.** `configure`

9. According to the Filesystem Hierarchy Standard (FHS), within which directory should source code be placed?
   - **A.** `/usr/local/src`
   - **B.** `/usr/src`
   - **C.** `/src`
   - **D.** `/home/source`

10. You have downloaded a source file with the extension `.gz`. Which of the following commands will uncompress the file?
    - **A.** `unzip`
    - **B.** `gunzip`
    - **C.** `dezip`
    - **D.** `uncomp`

11. Which of the following `dd` commands reads and writes bytes one megabyte at a time?
    - **A.** `dd bsl=1024M`
    - **B.** `dd size=1M`
    - **C.** `dd bs=1M`
    - **D.** `dd rw=1M`

12. Which configuration directive for Amanda defines a name for the type of tape (or device) to be used as a backup destination?
    - **A.** `dest`
    - **B.** `index`
    - **C.** `tapetype`
    - **D.** `desttype`

13. Which of the following devices is the location of the first SCSI tape device detected at boot?
    A. `/dev/st`
    B. `/dev/sd0`
    C. `/dev/sd1`
    D. `/dev/st0`

14. Which of the following files should be used to display a message to users prior to logging in locally?
    A. `/etc/loginmesg`
    B. `/etc/logmessage.txt`
    C. `/etc/issue`
    D. `/etc/banner`

15. Which option to the `rsync` command, when used in archive mode, will remove files that no longer exist on the host?
    A. `--delete`
    B. `--remove`
    C. `-del`
    D. `-rem`

16. Which of the following commands broadcasts a message to all logged-in users?
    A. `bcast`
    B. `broadcast`
    C. `show`
    D. `wall`

17. When creating a tar archive, you need to exclude certain files from the archive. Which option facilitates this scenario?
    A. `-x`
    B. `--exclude`
    C. `--ex`
    D. `--remove`

18. Which file contains a message that is then displayed after a successful login?
    A. `/etc/loginbanner`
    B. `/etc/issue`
    C. `/etc/motd`
    D. `/etc/message`

19. Which of the following `tar` commands is used to extract from a file named `archive.tar` in such a manner that the contents are printed to STDOUT during extraction?
    - **A.** `tar -cvf archive.tar`
    - **B.** `tar -xvf archive.tar`
    - **C.** `tar -zf archive.tar`
    - **D.** `tar -yvf archive.tar`

20. Which of the following commands will properly execute the `configure` script for a source code package, assuming that you have already changed into the source code directory?
    - **A.** `configure./`
    - **B.** `./config`
    - **C.** `./configure`
    - **D.** `exec config`

21. Which of the following options to the `tar` command can be used to uncompress a file that has been compressed using gzip?
    - **A.** `-z`
    - **B.** `-x`
    - **C.** `-c`
    - **D.** `-f`

22. Which of the following files can be used to provide a message to users logging in remotely with a protocol such as Telnet?
    - **A.** `/etc/telnet.msg`
    - **B.** `/etc/issue.net`
    - **C.** `/etc/login.msg`
    - **D.** `/etc/telnet.login`

23. Which of the following commands turns off the computer, including removing power, if possible?
    - **A.** `systemctl halt`
    - **B.** `systemctl reboot`
    - **C.** `systemctl stop`
    - **D.** `systemctl poweroff`

24. Which of the following commands outputs information about the kernel version and processor architecture?
    - **A.** `uname -a`
    - **B.** `lskern`
    - **C.** `kern -v`
    - **D.** `proc info`

25. Which option to the `rsync` command changes the resolution for determining file modifications?

A. `--mod-time`

B. `--modify-time`

C. `--mod-res`

D. `--modify-window`

26. Which option to the `patch` command creates a backup of files being patched?

A. `-r`

B. `-b`

C. `-l`

D. `-a`

27. Which target for `make`, typically included in the Makefile for most projects, will place compiled files into their final destination and perform other operations such as making the appropriate files executable?

A. `list`

B. `distclean`

C. `run`

D. `install`

28. Which option to the `tar` command indicates xz compression?

A. `-x`

B. `-c`

C. `-J`

D. `-j`

29. Which option to the `rsync` command examines only the file size as a means of determining whether the file should be synchronized?

A. `--filesize`

B. `--size-only`

C. `--list-size`

D. `--file-size`

30. Which of the following xz options is used to uncompress a file and send the uncompressed contents to STDOUT?

A. `--decompress --stdout`

B. `--deout`

C. `--uncomp --stdout`

D. `-out -u`

31. Which of the following options to bzip2 sends the output to STDOUT?

A. `-s`

B. `-c`

C. `-d`

D. `-f`

32. Which of the following files is typically used as the Bacula Director configuration file?

A. `/etc/bacula/bacula.cfg`

B. `/etc/bacula.cfg`

C. `/etc/bacula-dir.conf`

D. `/etc/bacula/bacula-dir.conf`

33. Which of the following commands rewinds a tape when using the `mt` command?

A. `mt reverse`

B. `mt rewind`

C. `mt goback`

D. `mt operation=back`

34. Which of the following `shutdown` commands reboots the system in 15 minutes?

A. `shutdown -r +15`

B. `shutdown +15`

C. `shutdown -15`

D. `shutdown -r 00:15`

35. Which option to the `gzip` command will suppress all warning messages and might be useful in a situation where output is not appropriate?

A. `-v`

B. `-q`

C. `-L`

D. `-r`

36. Which option to `rsync` specifies that the remote shell or transport for the synchronization process should use SSH?

A. `-t ssh`

B. `--overssh`

C. `-e ssh`

D. `-F ssh`

37. Which option to a `configure` script will typically produce a list of available options for the command?

A. `--list`

B. `--help`

C. `--show`

D. `--get`

Chapter 18

Domain Name Server (Topic 207)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **207.1 Basic DNS server configuration**

- BIND 9.x configuration files, terms and utilities
- Defining the location of the BIND zone files in BIND configuration files
- Reloading modified configuration and zone files
- Awareness of dnsmasq, djbdns, and PowerDNS as alternate name servers
- The following is a partial list of the used files, terms and utilities:
  - /etc/named.conf
  - /var/named/
  - rndc
  - named-checkconf
  - kill
  - host
  - dig

✓ **207.2 Create and maintain DNS zones**

- BIND 9 configuration files, terms and utilities
- Utilities to request information from the DNS server
- Layout, content and file location of the BIND zone files
- Various methods to add a new host in the zone files, including reverse zones

- The following is a partial list of the used files, terms and utilities:
  - /var/named/
  - zone file syntax
  - resource record formats
  - named-checkzone
  - named-compilezone
  - masterfile-format
  - dig
  - nslookup
  - host

✓ 207.3 Securing a DNS server

- BIND 9 configuration files
- Configuring BIND to run in a chroot jail
- Split configuration of BIND using the forwarders statement
- Configuring and using transaction signatures (TSIG)
- Awareness of DNSSEC and basic tools
- Awareness of DANE and related records
- The following is a partial list of the used files, terms and utilities:
  - /etc/named.conf
  - /etc/passwd
  - DNSSEC
  - dnssec-keygen
  - dnssec-signzone

1. Which configuration file is used as the default configuration for a BIND server?
   - **A.** `named.conf`
   - **B.** `named.cfg`
   - **C.** `bind.cfg`
   - **D.** `bind.conf`
2. Which directive within a BIND configuration specifies the addresses or networks that are allowed to query the nameserver?
   - **A.** `query-addresses`
   - **B.** `allow-query`
   - **C.** `query-allow`
   - **D.** `query-auth`
3. Which signal to the `kill` command can be used to signal that BIND should reload, including its configuration?
   - **A.** `-15`
   - **B.** `-1`
   - **C.** `-9`
   - **D.** `-2`
4. What option to `dnssec-keygen` specifies the algorithm to use for the key?
   - **A.** `-a`
   - **B.** `-n`
   - **C.** `-d`
   - **D.** `-e`
5. Which of the following describes a fundamental difference between `named-compilezone` and `named-checkzone`?
   - **A.** `named-checkzone` and `named-compilezone` do the same thing.
   - **B.** `named-checkzone` checks a zone for syntax errors; `named-compilezone` checks a zone for syntax errors and sends output to a file.
   - **C.** `named-checkzone` performs syntax checking, while `named-compilezone` converts the zone to a different format.
   - **D.** `named-checkzone` performs syntax checking, while `named-compilezone` prepares the zone for usage with BIND.
6. When creating MX records for a zone, which of the following is the highest priority mail exchanger?
   - **A.** 0
   - **B.** 10
   - **C.** 20
   - **D.** 100

7. On which protocol and port are zone transfer requests sent?
   - **A.** UDP/53
   - **B.** ICMP/53
   - **C.** TCP/143
   - **D.** TCP/53

8. Within which of the following directories are zone files stored for BIND?
   - **A.** `/var/named`
   - **B.** `/etc/named`
   - **C.** `/var/cache/named`
   - **D.** `/var/named.zones`

9. Which of the following commands is used to control a BIND name server?
   - **A.** `bind-config`
   - **B.** `named-config`
   - **C.** `rndc`
   - **D.** `rdmc`

10. Which type can be used with the `dig` command to test a zone transfer?
    - **A.** `xfr`
    - **B.** `transfer`
    - **C.** `zxfr`
    - **D.** `axfr`

11. Which BIND configuration directive sets the IP addresses on which the daemon will listen?
    - **A.** `listeners`
    - **B.** `listen-on`
    - **C.** `listen-in`
    - **D.** `ip-listeners`

12. When configuring BIND for a chroot scenario, within which of the following files should you set the home directory for the chroot user to use with `bind`?
    - **A.** `/etc/bind.home`
    - **B.** `/etc/bind.user`
    - **C.** `/etc/passwd`
    - **D.** `/etc/bindauth`

13. Which command is used to sign a DNS zone for DNSSEC?
    - **A.** `dnssec-signzone`
    - **B.** `signzone`
    - **C.** `bind-signzone`
    - **D.** `dnssec-sign`

14. Which option to the `host` command sets the query type to ANY?

A. `-a`

B. `-b`

C. `-c`

D. `-d`

15. Which of the following correctly creates a `CNAME` record between the hostname `www` and the host `web.example.com`?

A. `www CNAME web.example.com`

B. `web.example.com CNAME www`

C. `www IN CNAME web.example.com.`

D. `www IN CNAME web.example.com`

16. Which option to the `forward` directive in BIND sets the server as a forwarding server?

A. `only`

B. `first`

C. `now`

D. `required`

17. When running a recursive nameserver, which of the following options refuses to provide answers to queries from the given addresses?

A. `deny-hosts`

B. `blackhole`

C. `deny-query`

D. `deny-answer`

18. Which of the following is a prerequisite for installing djbdns?

A. BIND9

B. `daemontools`

C. qmail

D. bind-tools

19. Which command can be used to verify that a BIND configuration file is valid?

A. `bind9-ver`

B. `bind-check`

C. `config-check`

D. `named-checkconf`

20. Which of the following TTL values represents eight hours?

A. 8

B. 480

C. 28800

D. 86400

21. Assuming the following portion of a BIND zone file, what does the value 1800 represent?

```
@ IN SOA cwa.example.org. root.example.org. (
2016070400
3600
1800
604800
86400 )
```

A. Refresh

B. Retry

C. Default TTL

D. Serial

22. Which type of resource record is used for SPF records?

A. SPF

B. MX

C. TXT

D. MAIL

23. Which of the following defines an MX record with a priority of 10?

A. `MX 10 mail.example.com.`

B. `10 MX mail.example.com.`

C. `mail.example.com 10 MX`

D. `mail.example.com MX 10`

24. Within which file can per-user default settings be created for the `dig` command?

A. `/etc/dig.cfg`

B. `/etc/dig.conf`

C. `~/.digrc`

D. `~/.dig.conf`

25. Which option to the `mount` command is helpful to facilitate running BIND in a chroot environment?

A. `--bind`

B. `--chroot`

C. `--lift`

D. `--secure`

26. When setting up a recursive name server, which type of zone is set up for the root hints file?

A. Master

B. Slave

C. Recurse

D. Hint

27. After making changes to a DNS zone, which of the following commands can be used to reload the zones so that the changes take effect?

A. `rndc reload`

B. `rndc restart-zones`

C. `rndc zone-reload`

D. `rndc-rel`

28. Which configuration option within a BIND zone configuration specifies the hosts that are allowed to request a zone transfer?

A. `allow-axfr`

B. `allow-xfr`

C. `allow-trans`

D. `allow-transfer`

29. Which type of DNS record is used for specifying a POP3 server?

A. POP

B. PO

C. MX

D. There is no specific type for POP3 servers.

30. Which directive within a BIND configuration enables specification of the hosts or networks that are allowed to perform a recursive lookup using the server?

A. `allow-recurs`

B. `allow-recursive`

C. `allow-recursion`

D. `allow-rec`

31. Which of the following is the correct format for a `named-checkzone` command?

A. `named-checkzone <zone> <zonefile>`

B. `named-checkzone -z <zone>`

C. `named-checkzone -f <zonefile>`

D. `named-checkzone <zonefile> <zone>`

32. Which algorithm must be used for `rndc` authentication when generating a key with `dnssec-keygen`?

A. sha1

B. sha256

C. md5

D. hmac-md5

33. Which of the following configuration directives tells BIND not to divulge its version?

A. `allow-version { none }`

B. `version none;`

C. `allow-query-version { none; }`

D. `query-version no;`

34. Which option to `named-checkconf` is used to perform a test of all master zones noted in the config file?

A. `-l`

B. `-f`

C. `-z`

D. `-d`

35. You have specified 300 as the TTL for an individual record within your zone, and the zone itself has an 86400 default TTL. When making a change to that individual record, how long will it take for the change to propagate to external resolvers after you have restarted BIND?

A. Up to 86400 seconds

B. Up to 300 seconds

C. The change is immediate after restart.

D. It is impossible to tell from the information given.

36. Which of the following packages will install the PowerDNS authoritative nameserver on Debian and Red Hat, respectively?

A. `pdns-server` on Debian and `pdns` on Red Hat

B. `pdns` on Debian and `pdns-server` on Red Hat

C. `pdns` on both Debian and Red Hat

D. `pdns-server` on both Debian and Red Hat

37. Which of the following commands can be used to restart a BIND server so that changes to the `named.conf` file take effect?

A. `rndc reload`

B. `rndc reconfig`

C. `named reboot`

D. `restart bind`

Chapter 19

HTTP Services (Topic 208)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **208.1 Basic Apache configuration**

- Apache 2.4 configuration files, terms and utilities
- Apache log files configuration and content
- Access restriction methods and files
- mod_perl and PHP configuration
- Client user authentication files and utilities
- Configuration of maximum requests, minimum and maximum servers and clients
- Apache 2.4 virtual host implementation (with and without dedicated IP addresses)
- Using redirect statements in Apache's configuration files to customize file access
- The following is a partial list of the used files, terms and utilities:
  - access logs and error logs
  - .htaccess
  - httpd.conf
  - mod_auth_basic, mod_authz_host and mod_access_compat
  - htpasswd
  - AuthUserFile, AuthGroupFile
  - apachectl, apache2ctl
  - httpd, apache2

✓ **208.2 Apache configuration for HTTPS**

- SSL configuration files, tools and utilities
- Generate a server private key and CSR for a commercial CA

- Generate a self-signed Certificate
- Install the key and certificate, including intermediate CAs
- Configure Virtual Hosting using SNI
- Awareness of the issues with Virtual Hosting and use of SSL
- Security issues in SSL use, disable insecure protocols and ciphers
- The following is a partial list of the used files, terms and utilities:
  - Apache2 configuration files
  - /etc/ssl/, /etc/pki/
  - openssl, CA.pl
  - SSLEngine, SSLCertificateKeyFile, SSLCertificateFile
  - SSLCACertificateFile, SSLCACertificatePath
  - SSLProtocol, SSLCipherSuite, ServerTokens, ServerSignature, TraceEnable

✓ 208.3 Implementing Squid as a caching proxy

- Squid 3.x configuration files, terms and utilities
- Access restriction methods
- Client user authentication methods
- Layout and content of ACL in the Squid configuration files
- The following is a partial list of the used files, terms and utilities:
  - squid.conf
  - acl
  - http_access

✓ 208.4 Implementing Nginx as a web server and a reverse proxy

- Nginx
- Reverse Proxy
- Basic Web Server
- The following is a partial list of the used files, terms and utilities:
  - /etc/nginx/
  - nginx

1. Which directive within an Apache configuration file facilitates serving websites for more than one domain using a single IP address?
   - **A.** `<VirtualServer>`
   - **B.** `<VirtualHost>`
   - **C.** `<VirtContainer>`
   - **D.** `<Virtualization>`
2. Which command is used to creates or update credentials for htaccess scenarios?
   - **A.** `passwd`
   - **B.** `apachepasswd`
   - **C.** `htpass`
   - **D.** `htpasswd`
3. Which option to the `apachectl` command examines the configuration files to verify that there are no syntax errors?
   - **A.** `verifyconfig`
   - **B.** `configver`
   - **C.** `configtest`
   - **D.** `testconfig`
4. Which of the following commands generates a private key for use with SSL and places it into the file `/etc/ssl/example.com.private`?
   - **A.** `openssl genrsa -out /etc/ssl/example.com.private`
   - **B.** `openssl generate-private > /etc/ssl/example.com.private`
   - **C.** `openssl genpriv > /etc/ssl/example.com.private`
   - **D.** `openssh genkey -out /etc/ssl/example.com.private`
5. Which of the following configuration directives for Apache works with the `mod_auth_basic` and `mod_authn_file` modules to specify the filename for authentication?
   - **A.** `AuthFile`
   - **B.** `AuthUserFile`
   - **C.** `AuthenticationFile`
   - **D.** `AuthN_File`
6. Which directive within a `<VirtualHost>` stanza in an Apache configuration is used to specify the name of the virtual server?
   - **A.** `Server`
   - **B.** `VirtualServer`
   - **C.** `ServerName`
   - **D.** `ServerInfo`

7. Which option in an Apache configuration enables the SSL configuration for a given website or server?
   - **A.** `SSLEngine`
   - **B.** `SSLDirect`
   - **C.** `SSLEnable`
   - **D.** `SSLConnect`

8. Which option within an http section for nginx is used to configure the names of valid index files?
   - **A.** `indexFiles`
   - **B.** `index_files`
   - **C.** `indexfile`
   - **D.** `index`

9. When creating a Squid proxy configuration, you need to create an access control list for the local network. Which configuration option creates an access control list for Squid?
   - **A.** `accesscontrol`
   - **B.** `acl`
   - **C.** `access-control`
   - **D.** `access-control-list`

10. Which of the following configuration directives prevents Apache from printing version information on documents generated by the server?
    - **A.** `ServerDocs Off`
    - **B.** `Signature Off`
    - **C.** `ServerSignature Off`
    - **D.** `ServerStatus Off`

11. Which of the following technologies enables name-based virtual hosting over SSL using a single IP address?
    - **A.** Server Naming (SN)
    - **B.** Extended Virtual Host (EVH)
    - **C.** Server Name Indication (SNI)
    - **D.** Advanced Virtual Hosting (AVH)

12. Which Apache configuration directive sets the name of the PEM file containing CA certificates for clients?
    - **A.** `SSLCACertificateFile`
    - **B.** `SSLCaCertFile`
    - **C.** `SSLCAFile`
    - **D.** `CACertificateFile`

13. Which Apache2 configuration option sets the name that is displayed in the pop-up window for authentication when using Basic authentication?
    A. `AuthDisplay`
    B. `AuthName`
    C. `AuthList`
    D. `FriendlyName`

14. Which of the following Apache configuration lines enables the `php7_module` located at `modules/libphp7.so`?
    A. `Load php7_module modules/libphp7.so`
    B. `Module php7_module modules/libphp7.so`
    C. `LoadMod php7_module modules/libphp7.so`
    D. `LoadModule php7_module modules/libphp7.so`

15. Which subcommand of `openssl` is used to create a Certificate Signing Request (CSR)?
    A. `req`
    B. `csr`
    C. `gencsr`
    D. `newcsr`

16. Which Apache configuration directive sets the default directory for documents to be served for a given virtual host?
    A. `ServerRoot`
    B. `DocumentRoot`
    C. `DefaultLoc`
    D. `DefaultDocRoot`

17. Which of the following files represents the primary configuration file for PHP?
    A. `php.conf`
    B. `php.cfg`
    C. `php.config`
    D. `php.ini`

18. Which of the following lines within an Apache configuration disables the display of files in a directory for which no default document exists?
    A. `Options +Default`
    B. `Options -Default`
    C. `Options -Indexes`
    D. `Options +Indexes`

19. Which of the following `RedirectMatch` directives will provide a Page Not Found error to the user if they attempt to view the `.git` directory?
    A. `RedirectMatch 404 /\\.git(/|$)`
    B. `RedirectMatch PageNotFound /.git/`
    C. `RedirectMatch 404 .git`
    D. `RedirectMatch .git 404`

20. Which of the following directives for an Apache configuration tells the server the location of the SSL private key?
    A. `SSLKeyFile`
    B. `SSLCertificatePrivateKey`
    C. `SSLCertificateKeyFile`
    D. `SSLPrivateKey`

21. On which port does Squid listen by default?
    A. 3000
    B. 3128
    C. 5150
    D. 10300

22. Which of the following modules provides authorization for Apache based on a hostname or IP address?
    A. `mod_auth_ipaddress`
    B. `mod_auth_host`
    C. `mod_authz_host`
    D. `mod_auth_dns`

23. Within which log file does Apache record requests to the server?
    A. `access_log`
    B. `access-log`
    C. `access.txt`
    D. `syslog`

24. Which directive in a Squid configuration configures whether a given ACL can use the proxy?
    A. `access_allow`
    B. `http_access`
    C. `proxy_access`
    D. `enable_access`

25. Which of the following Apache configuration lines changes the name of the `.htaccess` file to `.accesslist`?
    A. `Access .accesslist`
    B. `AccessFile .accesslist`

C. `AccessFileName ".accesslist"`

D. `AuthFile ".accesslist"`

26. According to the Apache documentation, what is the preferred location for directives related to user authentication?

A. Within a `.htaccess` file

B. Within the main server configuration

C. Inside a `mod_rewrite` block

D. In a specialized module for user authentication

27. Which Apache configuration directive enables group-based authorization?

A. `AuthGroups`

B. `AuthGroupList`

C. `AuthGrouping`

D. `AuthGroupFile`

28. Which of the following commands shows the current status of the Apache server, including number of requests currently being processed and server uptime?

A. `apachectl serverstatus`

B. `apachectl status`

C. `apachectl faststatus`

D. `apachectl stats`

29. Which HTTP status code is returned when TraceEnable has been set to off within Apache?

A. 405

B. 100

C. 302

D. 200

30. Which option to `htpasswd` creates the credentials file and places a new entry into it?

A. `-f`

B. `-b`

C. `-c`

D. `-e`

31. Which Apache server log format sequence is used to log the time taken to service the request in microseconds?

A. `%D`

B. `%T`

C. `%t`

D. `-m`

32. Which of the following configuration lines makes the directory `/home/web/docs` available at the location `/documentation/` on the server?

A. `Connect /documentation /home/web/docs`

B. `Alias /documentation/ /home/web/docs/`

C. `Connect /home/web/docs /documentation`

D. `Alias ~/docs/ /documentation/`

33. Within a valid `<Location>` stanza, which directive in Apache indicates that `mod_perl` will be used for resources in that location?

A. `Handler mod_perl`

B. `SetHandler perl-script`

C. `SetHandler mod_perl`

D. `LoadModule perl-script`

34. Which directive for nginx sets up a pass-through proxy for a given location?

A. `pass-through`

B. `proxy`

C. `proxy_pass`

D. `proxypass`

35. Which configuration directive determines the number of Apache child server processes to initially start?

A. `Servers`

B. `MaxServers`

C. `StartServers`

D. `ServerStarts`

36. Which Apache directive sets the format of a log file, including which elements are recorded in the log file?

A. `LogFile`

B. `Format`

C. `LoggingDirective`

D. `LogFormat`

37. Which option within a `.htaccess` file allows access only to the user `ssuehring`?

A. `Require ssuehring`

B. `RequireUser ssuehring`

C. `Require user ssuehring`

D. `AllowOnly ssuehring`

Chapter 20

File Sharing (Topic 209)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **209.1 Samba Server Configuration**

- Samba 4 documentation
- Samba 4 configuration files
- Samba 4 tools and utilities and daemons
- Mounting CIFS shares on Linux
- Mapping Windows user names to Linux user names
- User-Level, Share-Level and AD security
- The following is a partial list of the used files, terms and utilities:
  - smbd, nmbd, winbindd
  - smbcontrol, smbstatus, testparm, smbpasswd, nmblookup
  - samba-tool
  - net
  - smbclient
  - mount.cifs
  - /etc/samba/
  - /var/log/samba/

✓ 209.2 NFS Server Configuration

- NFS version 3 configuration files
- NFS tools and utilities
- Access restrictions to certain hosts and/or subnets
- Mount options on server and client
- TCP Wrappers
- Awareness of NFSv4
- The following is a partial list of the used files, terms and utilities:
  - /etc/exports
  - exportfs
  - showmount
  - nfsstat
  - /proc/mounts
  - /etc/fstab
  - rpcinfo
  - mountd
  - portmapper

1. Within which directory will you find configuration files related to Samba version 4?
   - **A.** `/etc/samba4`
   - **B.** `/etc/samba`
   - **C.** `/etc/smb`
   - **D.** `/etc/filesharing/samba`
2. Which of the Samba daemons is responsible for responding to NetBIOS name service requests?
   - **A.** `smbd`
   - **B.** `nmbd`
   - **C.** `winbindd`
   - **D.** `samba`
3. You have made a configuration change to `smb.conf` and need to have the config reloaded. Which of the following commands accomplishes this task with the least disruption to users?
   - **A.** `smbcontrol all shutdown`
   - **B.** `smbcontrol smbd reload`
   - **C.** `smbctrl all reload`
   - **D.** `smbcontrol all reload-config`
4. Which of the following files is used to define the filesystems shared by NFS?
   - **A.** `/etc/nfs.cfg`
   - **B.** `/etc/nfs.conf`
   - **C.** `/etc/export.nfs`
   - **D.** `/etc/exports`
5. Which of the following NFS shares allows users from `cwa.example.com` to connect with read-write access to an NFS share at `/srv/vhosts`?
   - **A.** `/srv/vhosts www.example.com(rw)`
   - **B.** `www.example.com (rw) /srv/vhosts`
   - **C.** `/srv/vhosts www.example.com (rw)`
   - **D.** `/srv/vhosts www.example.com`
6. When using the `net` command in an Active Directory environment, which option enables authentication using Kerberos?
   - **A.** `-b`
   - **B.** `-k`
   - **C.** `-l`
   - **D.** `-a`

7. Which option within a Samba configuration enables translation of Windows to Linux usernames?
   - **A.** `usermap`
   - **B.** `usernamemaps`
   - **C.** `userfile`
   - **D.** `username map`

8. When specifying credentials on the command line with the Samba `net` command, which character is used to separate the username from the password?
   - **A.** `/`
   - **B.** `\`
   - **C.** `%`
   - **D.** `!`

9. Which of the following host specifications enables any host within the `example.org` domain to mount an NFS filesystem?
   - **A.** `all=example.org`
   - **B.** `rw=*.example.org`
   - **C.** `*.example.org`
   - **D.** `%.example.org`

10. Which filesystem type for the `mount` command is used for mounting Samba shares?
    - **A.** win
    - **B.** ext4
    - **C.** vfat
    - **D.** cifs

11. Which of the following commands displays the currently mounted CIFS filesystems?
    - **A.** `mount -t smb`
    - **B.** `lssmbd`
    - **C.** `mount -t cifs`
    - **D.** `ls -cifs`

12. To which setting should the security parameter be set within the Samba configuration in order for share-level security to be used?
    - **A.** `sharelevel`
    - **B.** `share-level`
    - **C.** `high`
    - **D.** `share`

13. Which option to `rpcinfo` displays statistics on `rpcbind` operations?

A. `-s`

B. `-m`

C. `-l`

D. `-e`

14. Which of the following commands displays the export list for a given NFS server?

A. `rpcmount`

B. `showmount -e`

C. `mount -shownfs`

D. `mount -listnfs`

15. Which of the following lines in `/etc/fstab` will mount an NFS filesystem shared as `/source` from the host `src.example.com` into a directory called `/srv/source` on the local server?

A. `/source /srv/source -h src.example.com`

B. `src.example.com/source /srv/source`

C. `src.example.com:/source /srv/source nfs`

D. `nfs src.example.com:/source /srv/source`

16. Which option to the `nfsstat` command shows statistics about only NFSv3?

A. `-3`

B. `-o3`

C. `-v3`

D. `-t`

17. Which of the following files shows the currently mounted filesystems?

A. `/etc/mounts`

B. `/proc/mounts`

C. `/proc/mtab`

D. `/etc/fstab`

18. Which of the following blocks access to the `portmap` service from the hosts within `example.com`'s network (`192.168.1.0/24`) when placed in `hosts.deny`?

A. `portmap: 192.168.1.0/24`

B. `portmap: example.com`

C. `portmap: *.example.com`

D. `portmap: ALL/DENY 192.168.1.0/24`

19. Which option to `smbstatus` displays a list of locks?
    - **A.** `-l`
    - **B.** `-L`
    - **C.** `-o`
    - **D.** `-m`

20. Which of the following commands creates a new user in the Samba password database?
    - **A.** `passwd -samba`
    - **B.** `smbpasswd -a`
    - **C.** `smbpass`
    - **D.** `smbuser -c`

21. Which option, defined within a share in the Samba configuration file, specifies whether users browsing for network shares will be able to see the share?
    - **A.** `browsable`
    - **B.** `shareconnect`
    - **C.** `sharepoint`
    - **D.** `browseenable`

22. Which of the `samba-tool` commands is used to verify the local Active Directory database to ensure that it is error free?
    - **A.** `dbverify`
    - **B.** `dblist`
    - **C.** `verifydb`
    - **D.** `dbcheck`

23. Within which section of the Samba configuration file is the log file specified?
    - **A.** `[server]`
    - **B.** `[logging]`
    - **C.** `[global]`
    - **D.** `[debug]`

24. Which of the following commands can be used to verify the syntax of the Samba configuration file?
    - **A.** `testsmb`
    - **B.** `smbtest`
    - **C.** `testparm`
    - **D.** `smbver`

25. Which of the following commands exports all filesystems in `/etc/exports` by reloading the file to do so?
    - **A.** `export -a`
    - **B.** `exportfs -ra`

C. `exportnfs -a`

D. `exportnfs -r`

26. Which option to `smbclient` enables specification of the order in which names are resolved?

A. `-R`

B. `-r`

C. `-d`

D. `-o`

27. Which option to `mountd` logs all successful requests?

A. `-n`

B. `-b`

C. `-l`

D. `-r`

28. Which option within a Samba share configures whether the share will allow read-write access?

A. `read write`

B. `read only`

C. `read/write`

D. `read-write`

29. On which port(s) does `smbd` listen by default?

A. 139

B. 443

C. 139 and 445

D. 161 and 162

30. Which option within `/etc/exports` prevents remote root users from having root privileges on the filesystem shared by the NFS server?

A. `no_root`

B. `deny_root`

C. `root_squash`

D. `disallow_root`

31. Which of the following commands shows the Windows-to-Linux group mappings?

A. `groupmap list`

B. `net groupmap list`

C. `netgroup list`

D. `net list groupmapping`

32. Which option to `rpcinfo` shows the current port mappings?

A. `-p`

B. `-c`

C. `-m`

D. `-f`

33. Which of the following options to the `smbpasswd` command deletes the specified user?

A. `-d`

B. `-x`

C. `-o`

D. `-e`

34. Which of the following commands lists the shares available on a host called `fs.example.com`?

A. `smblist`

B. `smbshares -list`

C. `smbclient -L`

D. `smbshare -L`

35. Which of the following log file directives creates a separate log file for each share?

A. `log file = <share>.log`

B. `log file = %<share>.log`

C. `log file = %S.log`

D. `log file = [share].log`

36. Which of the following commands can be used to test the status of Windows NetBIOS-related name services and browsing?

A. `mblookup`

B. `adlookup`

C. `browserl`

D. `nmblookup`

37. Which of the following commands stops sharing all NFS file shares?

A. `nfs stop -a`

B. `nfs-stopshare`

C. `stopnfs -a`

D. `exportfs -ua`

Chapter 21

Network Client Management (Topic 210)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **210.1 DHCP configuration**

- DHCP configuration files, terms and utilities
- Subnet and dynamically-allocated range setup
- Awareness of DHCPv6 and IPv6 Router Advertisements
- The following is a partial list of the used files, terms and utilities:
  - dhcpd.conf
  - dhcpd.leases
  - DHCP Log messages in syslog or systemd journal
  - arp
  - dhcpd
  - radvd
  - radvd.conf

✓ **210.2 PAM authentication**

- PAM configuration files, terms and utilities
- passwd and shadow passwords
- Use sssd for LDAP authentication
- The following is a partial list of the used files, terms and utilities:
  - /etc/pam.d/
  - pam.conf
  - nsswitch.conf

- pam_unix, pam_cracklib, pam_limits, pam_listfile, pam_sss
- sssd.conf

✓ 210.3 LDAP client usage

- LDAP utilities for data management and queries
- Change user passwords
- Querying the LDAP directory
- The following is a partial list of the used files, terms and utilities:
  - ldapsearch
  - ldappasswd
  - ldapadd
  - ldapdelete

✓ 210.4 Configuring an OpenLDAP server

- OpenLDAP
- Directory based configuration
- Access Control
- Distinguished Names
- Changetype Operations
- Schemas and Whitepages
- Directories
- Object IDs, Attributes and Classes
- The following is a partial list of the used files, terms and utilities:
  - slapd
  - slapd-config
  - LDIF
  - slapadd
  - slapcat
  - slapindex
  - /var/lib/ldap/
  - loglevel

1. Which option within `dhcpd.conf` configures how dynamic DNS updates are done?
   - **A.** `ddns-update-style`
   - **B.** `ddns-updates`
   - **C.** `ddns-server`
   - **D.** `ddns-enable`
2. Which of the following `subnet` definitions for DHCP can be used with private networks with at least 100 addresses?
   - **A.** `subnet 192.168.1.0 netmask 255.255.255.128`
   - **B.** `subnet 192.168.1.0 size 100`
   - **C.** `subnet 192.168.1.0 size 102`
   - **D.** `subnet 192.168.1.0/26`
3. When creating a DHCP reservation, which option within a host stanza is used to indicate the MAC address for the host?
   - **A.** `mac`
   - **B.** `hardware ethernet`
   - **C.** `mac address`
   - **D.** `hw-address`
4. Within which directory are individual configuration files stored for the Pluggable Authentication Module mechanism?
   - **A.** `/etc/pamd`
   - **B.** `/etc/pam`
   - **C.** `/etc/pam.d`
   - **D.** `/etc/pam.conf.d`
5. On which port does the `slapd` LDAP daemon listen for connections?
   - **A.** 389
   - **B.** 3389
   - **C.** 3306
   - **D.** 110
6. Which of the following commands is used to add entries to the OpenLDAP database?
   - **A.** `ldapd`
   - **B.** `adduser`
   - **C.** `addldap`
   - **D.** `ldapadd`

7. On which ports does DHCP traffic communicate?
   - **A.** 50 and 51
   - **B.** 143 and 144
   - **C.** 67 and 68
   - **D.** 530 and 531

8. Which of the following commands can be used to help with recovery of a corrupt OpenLDAP database?
   - **A.** `openldap-recover`
   - **B.** `oreco`
   - **C.** `slapd-recover`
   - **D.** `slapd_db_recover`

9. Which of the following configuration lines sets the domain suffix search order to `example.com` followed by `example.org` within a DHCP configuration?
   - **A.** `open domain-search "example.com", "example.org";`
   - **B.** `option domain-search "example.com, example.org";`
   - **C.** `option domain-search "example.com", "example.org";`
   - **D.** `option domain-suffix "example.com", "example.org";`

10. Within which directory are databases stored for OpenLDAP?
    - **A.** `/var/lib/ldap`
    - **B.** `/var/cache/openldap`
    - **C.** `/var/share/ldap`
    - **D.** `/usr/share/openldap`

11. Which PAM module prevents logins from accounts other than root when the file `/etc/nologin` exists?
    - **A.** `pam_login.so`
    - **B.** `pam_preventlogin.so`
    - **C.** `pam_nologin.so`
    - **D.** `pam_logindef.so`

12. When importing entries into the LDAP database using `ldapadd -f <filename>`, what should the format of the file be?
    - **A.** LDAP
    - **B.** TXT
    - **C.** CSV
    - **D.** LDIF

13. Which PAM module is responsible for normal or standard password authentication?
    - **A.** `pam_auth.so`
    - **B.** `pam_login.so`
    - **C.** `pam_unix.so`
    - **D.** `pam_standardlogin.so`

14. Which option within `radvd.conf` is used to limit the nodes to which advertisements will be sent?
    - **A.** `cnodes`
    - **B.** `clients`
    - **C.** `nodes`
    - **D.** `lnodes`

15. Which debug level for `slapd` is used to provide debugging of configuration file processing?
    - **A.** 1
    - **B.** 64
    - **C.** 8
    - **D.** 0

16. Which option in `dhcpd.conf` specifies the maximum amount of time that a client is allowed to have a DHCP lease?
    - **A.** `max-time`
    - **B.** `max-lease-time`
    - **C.** `lease-max`
    - **D.** `maximum-lease-duration`

17. When viewing DHCP-related messages through syslog or the `systemd` journal, you see the message DHCPDISCOVER followed by a MAC address and an interface. Which of the following best describes the DHCPDISCOVER message being logged?
    - **A.** The server is sending out messages to discover all clients.
    - **B.** The client is sending a message to begin the process of obtaining an IP address.
    - **C.** The server is responding to a message from a client.
    - **D.** The client is responding to an offer from the server.

18. Which of the following lines in `/etc/nsswitch.conf` uses local files followed by LDAP for authentication?
    - **A.** `passwd: files ldap`
    - **B.** `passwd [files ldap]`
    - **C.** `auth: local ldap`
    - **D.** `auth: localfiles ldap`

19. Which PAM module provides a mechanism for checking and enforcing the strength of passwords?

A. `pam_passwdstr.so`

B. `pam_cracklib.so`

C. `pam_libpasswd.so`

D. `pam_strpass.so`

20. You need to specify an alternate configuration file for `sssd`. Which option can be used on the `sssd` command line in order to point to a new configuration file?

A. `-f`

B. `-c`

C. `-a`

D. `-m`

21. On which port does DHCP failover communicate?

A. 67

B. 68

C. 647

D. 389

22. Which option with `dhcpd.conf` defines the default gateway that will be sent with the DHCP lease?

A. `default-gw`

B. `default-gateway`

C. `routers`

D. `default-route`

23. Which command creates an LDIF file from the current LDAP database?

A. `slapdump`

B. `ldapdump`

C. `slapcat`

D. `catldap`

24. Which PAM module is responsible for enforcing limits such as the maximum number of logins and CPU time used?

A. `pam_enforce.so`

B. `pam_limittest.so`

C. `pam_max.so`

D. `pam_limits.so`

25. Which of the following commands is used to re-create indexes based on existing slapd databases?

A. `ldapind`

B. `ldapindex`

C. `slapindex`

D. `indexldap`

26. What will be logged with the loglevel set to 0x10 in a `slapd.conf` configuration file?

A. No debugging

B. Trace debugging

C. Stats logging

D. Packets sent and received

27. When using `slapadd` for a large import, an error occurs at roughly 90 percent completion. Which option to `slapadd` enables specification of a line number from which the import will be restarted?

A. `-l`

B. `-f`

C. `-q`

D. `-j`

28. Which command is recommended for configuration of `slapd` for OpenLDAP versions 2.3 and later?

A. `slapd-conf`

B. `config-slapd`

C. `openldap-config`

D. `slapd-config`

29. When working with an LDIF file to make changes to the LDAP database, which `changetype` is used to create a new database entry?

A. `create`

B. `add`

C. `addmod`

D. `insert`

30. When working with `ldapsearch`, which of the following option sets creates output in LDIFv1 format without comments or versioning information?

A. `-L`

B. `-LLL`

C. `-cal`

D. `-e`

31. On which port does LDAP over SSL listen for connections?

A. 389

B. 443

C. 636

D. 3128

32. Which of the following PAM modules can be used for authorization and authentication scenarios using external files?

A. `pam_authfiles.so`

B. `pam_listfiles.so`

C. `pam_filesauth.so`

D. `pam_fileauth.so`

33. Which option to `ldapmodify` is used to perform a dry run, where no changes are made to the database?

A. `-n`

B. `-d`

C. `-l`

D. `-e`

34. What is the default filter for `ldapsearch` when no filter is provided?

A. `(*)`

B. `(objectClass=*)`

C. `(class=*)`

D. `(list*)`

35. Which PAM module is used for integration with the SSSD system?

A. `pam_sss.so`

B. `pam_sssd.so`

C. `pam_sssd_config.so`

D. `pam_sss_mod.so`

36. Which option within `sssd.conf` sets the URI for the LDAP server?

A. `ldap_server`

B. `ldap_uri`

C. `ldap_connect`

D. `ldap_use`

37. Which of the following configuration lines causes the DHCP server to refuse address requests from clients that are unknown to the server?

A. `unknown-clients: deny;`

B. `deny unknown-clients;`

C. `clients-deny: unknown`

D. `list-clients-deny`

Chapter

22

E-Mail Services (Topic 211)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ **211.1 Using e-mail servers**

- Configuration files for postfix
- Basic TLS configuration for postfix
- Basic knowledge of the SMTP protocol
- Awareness of sendmail and exim
- The following is a partial list of the used files, terms and utilities:
  - Configuration files and commands for postfix
  - /etc/postfix/
  - /var/spool/postfix/
  - sendmail emulation layer commands
  - /etc/aliases
  - mail-related logs in /var/log/

✓ **211.2 Managing E-Mail Delivery**

- Understanding of Sieve functionality, syntax and operators
- Use Sieve to filter and sort mail with respect to sender, recipient(s), headers and size
- Awareness of procmail
- The following is a partial list of the used files, terms and utilities:
  - Conditions and comparison operators
  - keep, fileinto, redirect, reject, discard, stop
  - Dovecot vacation extension

✓ 211.3 Managing Mailbox Access

- Dovecot IMAP and POP3 configuration and administration
- Basic TLS configuration for Dovecot
- Awareness of Courier
- The following is a partial list of the used files, terms and utilities:
  - /etc/dovecot/
  - dovecot.conf
  - doveconf
  - doveadm

1. Which command is used to remove an e-mail from the mail queue with Postfix?
   - **A.** `postsuper -d`
   - **B.** `postmaster`
   - **C.** `postfix -d`
   - **D.** `postdel`
2. Within which directory hierarchy are queue-related messages stored for Postfix?
   - **A.** `/var/mqueue`
   - **B.** `/var/spool/mailq`
   - **C.** `/var/spool/postfix`
   - **D.** `/var/postfix`
3. Which format should the certificate and key be in for a Postfix TLS configuration?
   - **A.** PKCS
   - **B.** PEM
   - **C.** TLS
   - **D.** SSL
4. Which configuration keyword for Sieve is responsible for moving mail into the specified mailbox?
   - **A.** `filein`
   - **B.** `moveinto`
   - **C.** `mailmover`
   - **D.** `fileinto`
5. Within which directory are configuration files stored for the Postfix e-mail server?
   - **A.** `/etc/postfix.d`
   - **B.** `/etc/postfix.conf.d`
   - **C.** `/etc/mail/postfix`
   - **D.** `/etc/postfix`
6. Which of the following files is used as a user-based configuration file for Procmail?
   - **A.** `/home/procmail.conf`
   - **B.** `~/.procmailrc`
   - **C.** `/etc/procmail.conf`
   - **D.** `~/procmail.conf`
7. Which of the following definitions in `/etc/aliases` will deliver mail destined to root to two e-mail addresses, `admin@example.com` and `webmaster@example.com`?
   - **A.** `[root] = admin@example.com, webmaster@example.com`
   - **B.** `root: admin webmaster`
   - **C.** `root: admin, webmaster`
   - **D.** `root: admin@example.com, webmaster@example.com`

8. Which of the following commands displays the mail queue for a Postfix server?
   A. `mailqueue`
   B. `qmail`
   C. `mailq`
   D. `mail-queue`

9. Which of the following commands causes Postfix to process the mail queue immediately?
   A. `postqueue -f`
   B. `mailq -f`
   C. `postqueue -a`
   D. `postmailq -process`

10. Which of the following commands deletes all messages from the mail queue with Postfix?
    A. `postsuper -d mqueue`
    B. `postsuper -d ALL`
    C. `postsuper delete-all`
    D. `postsuper -D`

11. Which of the following commands can be executed in order to rebuild the `/etc/aliases` database?
    A. `newaliases`
    B. `realias`
    C. `rebuildaliases`
    D. `realiases`

12. Which Sieve action retains the message in the mailbox?
    A. `remain`
    B. `keep`
    C. `store`
    D. `file`

13. Which of the following commands views the contents of a message that exists in the Postfix queue?
    A. `postshow`
    B. `postless`
    C. `postmore`
    D. `postcat`

14. Which command can be used to view the currently logged-in users for the Dovecot server?
    A. `doveadm list`
    B. `dovecot list`
    C. `dovecot users`
    D. `doveadm who`

15. Which of the following deletes a message that matches on a condition with Sieve?
    A. `delete`
    B. `discard`
    C. `remove`
    D. `kill`

16. Which of the following commands is used to view the pending messages queue on a Postfix server?
    A. `postqueue -p`
    B. `postconf -pending`
    C. `postqueue -f`
    D. `postsuper pending`

17. Which of the following action lines in a Sieve configuration forwards a copy of the message to `admin@example.com` and keeps a copy for further processing?
    A. `redirect "admin@example.com";`
    B. `forward "admin@example.com";`
    C. `redirect :copy "admin@example.com";`
    D. `forward :duplicate "admin@example.com";`

18. Which configuration parameter within the vacation Sieve functionality is used to specify how often a vacation reply should be sent to the same sender?
    A. `:freq`
    B. `:days`
    C. `:often`
    D. `:replyfrequency`

19. Which Postfix-related command is used to provide an overview of the number of messages in the incoming and active queues arranged by age?
    A. `queuelist`
    B. `postq`
    C. `qshape`
    D. `queueshow`

20. Which of the following commands displays the current Dovecot configuration?
    A. `doveconf`
    B. `doveconfig`
    C. `dovecot --list`
    D. `doveadm conf`

21. When working with Sieve, which action is performed implicitly when no other action takes precedence?
    - **A.** `keep`
    - **B.** `discard`
    - **C.** `shred`
    - **D.** `forward`

22. Which configuration parameter for Postfix sets the networks that are allowed to relay through the server?
    - **A.** `relaynet`
    - **B.** `mynetworks`
    - **C.** `networkrelay`
    - **D.** `relnet`

23. Which of the following commands tests authentication for a user of a Dovecot server?
    - **A.** `dovecot -testauth`
    - **B.** `doveadm testauth`
    - **C.** `dovecot auth`
    - **D.** `doveadm auth`

24. Which of the following commands compiles a Sendmail configuration file in its native language to a standard Sendmail configuration file at `/etc/sendmail.cf`?
    - **A.** `makemap sendmail.mc > /etc/sendmail.cf`
    - **B.** `m1 sendmail.mc > /etc/sendmail.cf`
    - **C.** `gcc sendmail.mc > /etc/sendmail.cf`
    - **D.** `m4 sendmail.mc > /etc/sendmail.cf`

25. Which of the following commands views all parameters related to a Postfix configuration?
    - **A.** `postconf -d`
    - **B.** `postmaster -config`
    - **C.** `postfix -c`
    - **D.** `postc -a`

26. Within which file will you find errors related to delivery of mail on a Postfix server?
    - **A.** `/var/log/mail`
    - **B.** `/var/log/postfix.log`
    - **C.** `/var/log/mail.err`
    - **D.** `/var/log/postfix.err`

27. Which option is used to create a listening port stanza within a Dovecot configuration?

A. `inet_port`

B. `inet_listener`

C. `listening_port`

D. `listener`

28. On which port does SMTP operate by default?

A. 25

B. 2525

C. 110

D. 143

29. You need to find the mail queue path on a Postfix server. You're using `postconf -d` to view all parameters. Which configuration parameter contains the mail queue path on a Postfix server?

A. `mqueue`

B. `queue_dir`

C. `mailq_path`

D. `mqueue_path`

30. When testing SMTP communications between a client and a server, you need to begin the conversation. Which of the following lines shows the beginning of an SMTP conversation using Extended Hello syntax from `mail.example.com`?

A. `BEGIN mail.example.com`

B. `SMTP mail.example.com`

C. `HELO mail.example.com`

D. `EHLO mail.example.com`

31. Which of the following keywords defines an alternate condition when the original `if` condition fails in Sieve?

A. `else if`

B. `elsif`

C. `elseif`

D. `alt`

32. Which Sieve test examines an object such as an address to determine if there is a string within it?

A. `:grep`

B. `:contains`

C. `:has`

D. `:lookin`

33. Which configuration option specifies the maximum number of authentication processes that can be active within a Dovecot server?

A. `process_limit`

B. `max_proc`

C. `proc_max`

D. `auth_proc_max`

34. When examining an address in Sieve, which keyword attempts to look at just the domain name portion of the address?

A. `:domainname`

B. `:afterat`

C. `:last`

D. `:domain`

35. On which port does Dovecot listen for SSL/TLS-based IMAP or IMAPS?

A. 143

B. 993

C. 995

D. 110

36. Which of the following files is used as the default configuration file for Exim 4 on a Debian system?

A. `/etc/exim/exim4.conf`

B. `/etc/exim.conf`

C. `/etc/exim.configure`

D. `/etc/exim/configure`

37. Which Postfix configuration option is used with the postscreen server to set the TLS security level?

A. `postscreen_tls`

B. `postscreen_tls_security_level`

C. `postscreen_security_level`

D. `post_tls_sec_level`

Chapter 23

System Security (Topic 212)

THE FOLLOWING LPIC-2 EXAM TOPICS ARE COVERED IN THIS CHAPTER:

✓ 212.1 Configuring a router

- iptables and ip6tables configuration files, tools and utilities
- Tools, commands and utilities to manage routing tables.
- Private address ranges (IPv4) and Unique Local Addresses as well as Link Local Addresses (IPv6)
- Port redirection and IP forwarding
- List and write filtering and rules that accept or block IP packets based on source or destination protocol, port and address
- Save and reload filtering configurations
- The following is a partial list of the used files, terms and utilities:
  - /proc/sys/net/ipv4/
  - /proc/sys/net/ipv6/
  - /etc/services
  - iptables
  - ip6tables

✓ 212.2 Managing FTP servers

- Configuration files, tools and utilities for Pure-FTPd and vsftpd
- Awareness of ProFTPd
- Understanding of passive vs. active FTP connections
- The following is a partial list of the used files, terms and utilities:
  - vsftpd.conf
  - important Pure-FTPd command line options

✓ 212.3 Secure shell (SSH)

- OpenSSH configuration files, tools and utilities
- Login restrictions for the superuser and the normal users
- Managing and using server and client keys to login with and without password
- Usage of multiple connections from multiple hosts to guard against loss of connection to remote host following configuration changes
- The following is a partial list of the used files, terms and utilities:
  - ssh
  - sshd
  - /etc/ssh/sshd_config
  - /etc/ssh/
  - Private and public key files
  - PermitRootLogin, PubKeyAuthentication, AllowUsers, PasswordAuthentication, Protocol

✓ 212.4 Security tasks

- Tools and utilities to scan and test ports on a server
- Locations and organisations that report security alerts as Bugtraq, CERT or other sources
- Tools and utilities to implement an intrusion detection system (IDS)
- Awareness of OpenVAS and Snort
- The following is a partial list of the used files, terms and utilities:
  - telnet
  - nmap
  - fail2ban
  - nc
  - iptables

✓ 212.5 OpenVPN

- OpenVPN
- The following is a partial list of the used files, terms and utilities:
  - /etc/openvpn/
  - openvpn

1. Which of the following options within an OpenSSH server configuration is used to determine whether the root user can log in directly with an ssh client?
   A. `PermitRootLogin`
   B. `AllowRoot`
   C. `RootLogin`
   D. `PermitDirectRootLogin`

2. Which of the following files is used as the primary configuration file for `vsftpd`?
   A. `vsftp.cfg`
   B. `vsftpd.conf`
   C. `vsftpd.cfg`
   D. `vsftp.conf`

3. Which iptables chain is used to create a port redirect?
   A. REDIRECT
   B. PREROUTING
   C. PORTREDIR
   D. ROUTING

4. Which of the following files is the primary server configuration file for OpenSSH?
   A. `/etc/ssh/sshd_config`
   B. `/etc/sshserver.conf`
   C. `/etc/openssh.conf`
   D. `/etc/openssh/sshd.conf`

5. Which of the following commands saves the current set of iptables rules into a file?
   A. `save-iptables`
   B. `iptables-create`
   C. `iptables-save`
   D. `ipt-save`

6. When starting Pure FTPd, which command-line option is used to indicate that host names should not be resolved on client connection?
   A. `-n`
   B. `-H`
   C. `-r`
   D. `-z`

7. Which of the following commands can be used to generate a private and public key pair for authentication with ssh?
   A. `ssh-createkey`
   B. `sshkey`
   C. `ssh-key`
   D. `ssh-keygen`

8. Which of the following commands tests a connection to `mail.example.com` on the standard SMTP port?
   - **A.** `telnet mail.example.com smtp`
   - **B.** `telnet mail.example.com 25`
   - **C.** `telnet mail.example.com`
   - **D.** `smtptest mail.example.com`

9. Which of the following commands lists the current iptables rules while not attempting to resolve host or port names?
   - **A.** `iptables -L`
   - **B.** `iptables -List -no-resolve`
   - **C.** `iptables -a`
   - **D.** `iptables -nL`

10. Which command-line option to Pure FTPd disables anonymous upload?
   - **A.** `-n`
   - **B.** `-a`
   - **C.** `-i`
   - **D.** `-m`

11. Which option within an OpenSSH configuration is used to specify the port on which the daemon will listen?
   - **A.** `Port`
   - **B.** `ListenOn`
   - **C.** `ListenPort`
   - **D.** `PortNum`

12. Which option within an OpenVPN configuration lets a client know that it can reach the network `192.168.5.0/24`?
   - **A.** `client-route 192.168.5.0`
   - **B.** `push "route 192.168.5.0 255.255.255.0"`
   - **C.** `send "route 192.168.5.0/24"`
   - **D.** `client-route "192.168.5.0/24"`

13. Which of the following commands executes a port scan using TCP Connect to the host `192.168.2.3`?
   - **A.** `portscan 192.168.2.3`
   - **B.** `nmap -sT 192.168.2.3`
   - **C.** `maphost 192.168.2.3`
   - **D.** `tcpscan -C 192.168.2.3`

14. Which of the following directories contains configuration files for the fail2ban system?

A. `/etc/fail2ban.cfg`

B. `/etc/fail2ban.d`

C. `/etc/f2b`

D. `/etc/fail2ban`

15. Which option on the client side of an SSH connection is used to specify the private key for authentication?

A. `ssh -i`

B. `ssh -k`

C. `ssh -p`

D. `ssh -l`

16. Which of the following commands saves the current IPv6 iptables configuration?

A. `iptables6-save`

B. `ip6tables-save`

C. `iptables6save`

D. `save-iptables6`

17. Within an OpenSSH configuration, which option disables the use of empty passwords?

A. `DisableEmptyPass`

B. `PermitEmptyPasswords`

C. `EmptyPasswordAuth`

D. `PermitPasswordLength`

18. Which of the following commands sets the default policy for the INPUT chain to discard packets that don't have a specific rule allowing them?

A. `iptables INPUT DROP`

B. `iptables chain INPUT policy DROP`

C. `iptables -P INPUT DROP`

D. `iptables POLICY=DROP CHAIN=INPUT`

19. On which port and protocol does OpenVPN listen?

A. ICMP/1194

B. UDP/1194

C. TCP/1194

D. VPN/1194

20. Which directive in an OpenSSH configuration is used for specifying the version of the SSH protocol to use?

A. `Proto`

B. `Protocol`

C. `ProtoVer`

D. `Version`

21. Which of the following best describes the difference between the `DROP` and `REJECT` targets in iptables?

A. Both `DROP` and `REJECT` do the same thing.

B. `DROP` silently discards packets, while `REJECT` sends back an ICMP acknowledgement.

C. `REJECT` silently discards packets, while `DROP` sends back an ICMP acknowledgement.

D. `DROP` sends back a direct message, and `REJECT` sends a redirect.

22. Which file contains a list of keys that will be accepted for authentication for a given user?

A. `~/ssh/keys`

B. `~/.ssh/pubkeys`

C. `~/.ssh/keyauth`

D. `~/.ssh/authorized_keys`

23. Which of the following partial iptables rules sets up a configuration that limits log entries to three per minute?

A. `-m limit 3 -j LOG`

B. `-m limit --limit 3/minute --limit-burst 3 -j LOG`

C. `-m limit --limit 3`

D. `-m limit --limit-minute 3 --burst 3 -j LOG`

24. Which option to the `ssh` command is used for X11 application forwarding?

A. `-X11`

B. `-A`

C. `-X`

D. `-F`

25. The command `netstat -a` is reporting that port 80 is in use on the server. Which of the following commands can be used to determine what is actually using that port?

A. `listPorts`

B. `portlist -a`

C. `lsof -i`

D. `tcpdump`

26. Which of the following partial `iptables` rules allows incoming ICMP traffic?

A. `-A INPUT -p ICMP -j ACCEPT`

B. `-A IN -P ICMP`

C. `-A INPUT -P ACCEPT-ICMP`

D. `-A IN -P ICMP -j ACCEPT`

27. Which option in an OpenSSH configuration is used to determine whether port forwarding will be enabled?

A. `AllowPortForwarding`

B. `PortForwarding`

C. `ForwardPort`

D. `AllowTcpForwarding`

28. Which of the following partial iptables rules blocks all traffic from `192.168.51.50`?

A. `-A INPUT -p ALL 192.168.51.50 -j ACCEPT`

B. `-A INPUT -p ALL -s 192.168.51.50 -j DROP`

C. `-A INPUT -p ALL -s 192.168.51.50 -j BLOCK`

D. `-A INPUT -p ALL -f 192.168.51.50 -j DISCARD`

29. Which of the following partial iptables rules will allow all hosts to connect to TCP port 2222?

A. `-A INPUT -p TCP -s 0/0 --destination-port 2222 -j ACCEPT`

B. `-A TCP -s ALL -p 2222 -j ACCEPT`

C. `-A INPUT -p TCP -s *.* --destination-port 2222 -j ALLOW`

D. `-A INPUT --destination-port */* -j ACCEPT`

30. Which of the following commands enables forwarding such as would be used for NAT?

A. `echo "1" > /proc/sys/net/ipv4/nat`

B. `echo "1" > /proc/sys/net/ipv4/ip_forward`

C. `iptables --enable-forwarding`

D. `ip-forward --enable`

31. Within the `vsftpd.conf` file, which directive enables IPv6?

A. `ipv6_enable`

B. `ipv6`

C. `ipv6_listen`

D. `listen_ipv6`

32. Which configuration directive for OpenSSH determines whether key-based authentication will be used?

A. `KeyAuth`

B. `PubKeyAuth`

C. `PubkeyAuthentication`

D. `AuthenticationKey`

33. Within a jail configuration for fail2ban, which configuration option sets the name and location of the log file to monitor for failures?

A. `logpath`

B. `monitor`

C. `logfile_mon`

D. `monitor_log`

34. Which command sends a copy of the public key identity to another server for use with SSH?

A. `ssh-key`

B. `ssh-copy-key`

C. `ssh-sendkey`

D. `ssh-copy-id`

35. Which command is used for creation and maintenance of firewall rules for IPv6?

A. `iptables6`

B. `ip6tables`

C. `ipv6tables`

D. `ipfw6`

36. Which of the following OpenVPN configuration entries sends a DHCP option to a client to indicate the DNS server (`192.168.2.1`) to be used by the client?

A. `push "dhcp-option ns 192.168.2.1"`

B. `push "dhcp-nameserver 192.168.2.1"`

C. `push "dhcp-option DNS 192.168.2.1"`

D. `push "dhcp-dns 192.168.2.1"`

37. Which option in `vsftpd.conf` specifies whether users will be able to authenticate to the server?

A. `local_enable`

B. `users_login`

C. `user_login`

D. `local_users`

Chapter

24

Practice Test 1

THE FOLLOWING IS A PRACTICE TEST FOR THE COMPTIA LINUX+ EXAM 103

1. Which filesystem is used to store information about current running processes?
   - **A.** `/environment`
   - **B.** `/proc`
   - **C.** `/etc`
   - **D.** `/dev`
2. What is the default directory for configuration information related to the `modprobe` command?
   - **A.** `/etc/modprobe.conf`
   - **B.** `/etc/modprobe`
   - **C.** `/etc/modprobe.d`
   - **D.** `/var/modprobe`
3. Which of the following wall commands send the message `"Please Log Off"` to users in the operator group?
   - **A.** `wall -g operator "Please Log Off"`
   - **B.** `wall "Please Log Off"`
   - **C.** `wall -operator "Please Log Off"`
   - **D.** `echo "Please Log Off" | group operator`
4. When using `systemctl` to kill a process, what is the default signal sent to a process?
   - **A.** SIGKILL
   - **B.** SIGTERM
   - **C.** SIGINT
   - **D.** SIGCALL
5. Which option to `dmesg` displays the time in local time?
   - **A.** `-rel`
   - **B.** `-e`
   - **C.** `-f`
   - **D.** `-t`
6. Which process ID is typically associated with the init process?
   - **A.** 0
   - **B.** 1
   - **C.** 5
   - **D.** 100

7. You have been troubleshooting a system issue that may be related to the driver in use for a PCI device in the system. Which command and option will display the PCI devices and the drivers being used for those devices?
   - **A.** `lsusb -v`
   - **B.** `ls -pci`
   - **C.** `lspci -k`
   - **D.** `showpci`

8. Which option to the `telinit` command will cause the operation to not send any notice to logged-on users?
   - **A.** `-q`
   - **B.** `-v`
   - **C.** `--no-wall`
   - **D.** `-l`

9. Which file in the `sysfs` filesystem could you view in order to see the MAC address of eth0?
   - **A.** `/sys/class/net/eth0/address`
   - **B.** `/sys/devices/eth0`
   - **C.** `/sysfs/devices/eth0`
   - **D.** `/sys/net/eth0`

10. A newly added SATA disk is not showing up during the boot process. Where can you check to begin troubleshooting this issue?
    - **A.** System logging
    - **B.** Debugfs
    - **C.** Within the `fdisk` utility
    - **D.** Within the computer BIOS

11. Which command can be used to monitor communication taking place with `dbus`?
    - **A.** `dbus-mon`
    - **B.** `dbus -m`
    - **C.** `dbus-monitor`
    - **D.** `dbus-debug`

12. Within a `systemd` environment, which service manages `udev`?
    - **A.** `systemd-udevd.service`
    - **B.** `systemd-udev.service`
    - **C.** `udevd-service`
    - **D.** `systemd.udevd-service`

13. What is the correct syntax to indicate that the system should shut down at 8 p.m.?
    A. `shutdown 20:00`
    B. `shutdown 8pm`
    C. `shutdown +20:00`
    D. `halt 20`

14. Which option to the `systemctl kill` command will change the signal sent to the process to be killed?
    A. `-k`
    B. `-f`
    C. `-s`
    D. `-d`

15. Which `systemd` command and option are equivalent to the `chkconfig --list` command in a SysVinit environment?
    A. `systemctl list-unit-files`
    B. `systemctl list-service`
    C. `systemctl --list`
    D. `systemctl list-unit-files --type=service`

16. Which option to `ldconfig` is used to change the location of the cache to be updated?
    A. `-C`
    B. `-c`
    C. `--f`
    D. `-v`

17. Which of the following commands will remove all files for a package in Debian, including configuration files?
    A. `apt-get remove`
    B. `apt-cache clean`
    C. `dpkg -P`
    D. `apt-get conf-remove`

18. What is the prefix used to denote a Debian source repository in `/etc/apt/sources.list`?
    A. `deb`
    B. `source`
    C. `deb-src`
    D. `debsrc`

19. Which options to rpm will upgrade a package while displaying progress and other additional information about the operation?
    A. `-Iv`
    B. `-Uvh`
    C. `-U`
    D. `-vh`

20. Which option to a `yum install` command will cause `yum` to assume yes and therefore not prompt for verification when performing actions deemed critical?
    A. `-y`
    B. `-f`
    C. `-p`
    D. `-m`

21. When working with a `yum`-based system, you need to create a configuration to ensure that certain packages are not upgraded or installed. Which option can you set in `/etc/yum.conf` to facilitate this behavior?
    A. `exclude`
    B. `noupdate`
    C. `assumeupdate`
    D. `clearupdate`

22. You are having difficulty with shared libraries on the system. Which of the following commands will print the current directories and libraries in the cache?
    A. `ldconfig -C`
    B. `ldd -f`
    C. `ldconfig -p`
    D. `ldd -b`

23. Which option within the `.repo` file in `/etc/yum.repos.d/` is used to set the URL for the repository?
    A. `url`
    B. `repourl`
    C. `httpurl`
    D. `baseurl`

24. Which command and option are used to display basic information about each available package and its dependencies on a Debian system?
    A. `apt-get list`
    B. `apt-cache dump`
    C. `apt-get list-all`
    D. `apt-cache list`

25. When running the `lsblk` command, there is no separate partition listed for `/boot`. From which partition is the system likely booted?

A. There is a `/boot` directory under the / partition.

B. The `/boot` partition is hidden.

C. The system has not yet built the `/boot` partition.

D. The `/boot` partition does not show up with `lsblk`.

26. Within which hierarchy is cached data stored for both `yum` and `apt-style` systems?

A. `/etc`

B. `/var/cache`

C. `/usr/lib`

D. `/tmp`

27. On a BIOS-based system, within which region of the disk is the bootloader typically installed?

A. MBR

B. `/boot`

C. Sector 8192

D. Front

28. Which of the following best describes the contents of the / filesystem within Linux?

A. The / filesystem is the root filesystem and contains temporary files.

B. The / filesystem is the root's home directory.

C. The / filesystem is used for storage of the device and to swap information.

D. The / filesystem is the root filesystem and is the logical root of the hierarchy within Linux.

29. Which of the following commands will send the output of the `grub2-mkconfig` command to the correct location for booting?

A. `grub2-mkconfig --output=/boot/grub2/grub.cfg`

B. `grub2-mkconfig --file=/boot/grub2.menu`

C. `grub2-mkconfig --file=/boot/grub.lst`

D. `grub2-mkconfig --output=/boot/menu.lst`

30. Which command will change into the current user's home directory?

A. `cd !`

B. `cd home`

C. `cd ~`

D. `cd /home`

31. Which of the following commands writes an image called from the current directory named `raspbian.img` to the SD card mounted at `/dev/sdc`?

A. `dd if=raspbian.img of=/dev/sdc bs=1M`

B. `imgwrite raspbian.img > /dev/sdc`

C. `imgw raspbian.img | cat /dev/sdc`

D. `dd raspbian.img > /dev/sdc`

32. When troubleshooting a problem, you look through `.bash_history` to determine commands that you've recently executed. However, the file does not contain information from your current session. Which command can you use to view the commands that have been executed during the current session?

A. `cmdhist`

B. `cmds`

C. `pwd`

D. `history`

33. Which option should be sent to `grub-install` if you want to install the boot images within a directory other than `/boot`?

A. `--boot`

B. `--image`

C. `--boot-directory`

D. `--b`

34. Which command should be run in order to make changes take effect for a GRUB2 configuration change?

A. `update-grub`

B. `grub-update`

C. `grub-config`

D. `grub-ins`

35. Which of the following commands will set the environment variable `JAVA_PATH` equal to `/home/user/java2` when using the Bash shell?

A. `invoke JAVA_PATH=/home/user/java2`

B. `export JAVA_PATH=/home/user/java2`

C. `envvar JAVA_PATH=/home/user/java2`

D. `echo JAVA_PATH=/home/user/java2`

36. Which option in the `.bashrc` sets the number of commands to keep in the `.bash_history` file?

A. `HISTLIMIT`

B. `HISTORYFILE`

C. `HISTFILESIZE`

D. `HISTNUM`

37. Which of the following commands will cause `nl` to number all lines, including blank lines, for a file called `code.php`?

A. `nl code.php`

B. `nl -a code.php`

C. `nl -n code.php`

D. `nl -b a code.php`

38. Which command can be used to create an octal representation of a given plaintext file?

A. `oct`

B. `cat`

C. `list`

D. `od`

39. Which command and option can be used to format text with pagination in a double-space format, including page numbers?

A. `pr -d`

B. `pag -db`

C. `cat -pd`

D. `print -d`

40. Of the following options for the `tail` command, which option outputs the last lines beginning at the 30th line from the start of the file rather than the end of the file?

A. `-n +30`

B. `-n 30`

C. `-30`

D. `+30`

41. Which option to the `uniq` command causes the matching to be done in a case-insensitive manner?

A. `-c`

B. `-f`

C. `-i`

D. `-n`

42. Which of the following commands prints the username and real name of all users in `/etc/passwd` in a tab-separated format?

A. `cut -d: -f 1,6 /etc/passwd`

B. `sed 's/://' /etc/passwd`

C. `awk -F: '{print $1,$5}' OFS="\t" /etc/passwd`

D. `cat -o "\t" /etc/passwd`

43. Which option to `cp` will preserve symlinks in a recursive copy?

A. `-f`

B. `-d`

C. `-a`

D. `-b`

44. Which of the following key combinations is a technique for moving to the 23rd line of a file in Vi?

A. 23G

B. /23

C. i23

D. ZZ

45. Which option to the `top` command changes the update interval?

A. `-d`

B. `-t`

C. `-n`

D. `-f`

46. Which of the following commands will display the process id, the real user id, the filesystem access user id, and command for processes on the system?

A. `listproc -uf`

B. `ps -eo pid,euser,fuser,comm`

C. `ps -e pid,user,comm`

D. `ps -fa`

47. Which command can be used to search the contents of all files below your current location for files that contain the characters DB?

A. `grep -r "DB" *`

B. `grep -ri "DB" *`

C. `cat * | less`

D. `cat *.txt | grep DB`

48. Which of the following commands will locate all files that begin with the name `DB`, starting from the current directory?

A. `locate "DB*"`

B. `find ./ -name "DB*"`

C. `whereis "DB*"`

D. `find "DB*"`

49. Which of the following files is the location used to gather information about load average for use in the `uptime` command?

A. `/proc/uptime`

B. `/proc/loadavg`

C. `/proc/load`

D. `/proc/utime`

50. The system contains an NFS mounted filesystem that has become unreachable. Which option should be passed to `umount` in order to force the unmounting of the filesystem?

A. `-nfs`

B. `--fake`

C. `-f`

D. `-n`

51. Which option to `fsck` causes the operation to prompt when attempting a repair action?

A. `-y`

B. `-f`

C. `-r`

D. `-a`

52. Which of the following files is updated dynamically with information about currently mounted filesystems?

A. `/etc/fstab`

B. `/etc/files`

C. `/boot/fstab`

D. `/etc/mtab`

53. Which option to `repquota` causes the output to be printed in a human-readable format?

A. `-h`

B. `-s`

C. `-p`

D. `-f`

54. When running the `df` command, you need to change the scale such that the report shows terabytes instead of bytes. Which option will accomplish this task?

A. `-ST`

B. `-BT`

C. `-j`

D. `-T`

55. What command can be used to create an image of important metadata for an ext3 filesystem?

A. `e2image`

B. `e3image`

C. `dumpe2fs`

D. `dumpe3fs`

56. Which option to `mke2fs` is used to check for bad blocks during filesystem creation?

A. `-a`

B. `-b`

C. `-c`

D. `-d`

57. Which of the following commands changes the ownership of the file `Class.java` to the user `steve` and the group `developers`?

A. `chgrp steve:developers Class.java`

B. `chown steve.developers Class.java`

C. `chown developers.steve Class.java`

D. `chown Class.java steve.developers`

58. Which of the following best describes the difference between HISTSIZE and HISTFILESIZE in Bash?

A. HISTSIZE is the number of overall history entries to keep in the `.bash_history`, while HISTFILESIZE sets the number of commands to keep for the current session.

B. HISTFILESIZE is the number of overall history entries to keep in the `.bash_history`, while HISTSIZE sets the number of commands to keep for the current session.

C. HISTSIZE is the size of root's history, while HISTFILESIZE sets the overall system history.

D. HISTSIZE and HISTFILESIZE are the same.

59. Which configuration option can be set within `/etc/default/grub` to affect the behavior of the system after a failed boot?

A. GRUB_RECOVER

B. GRUB_NOFAIL

C. GRUB_RECORDFAIL_TIMEOUT

D. GRUB_RECOVER_TIMEOUT

60. Which options to `du` will print a summary of information in a human-readable format?

A. `-sh`

B. `-h`

C. `-s`

D. `-su`

61. Which option to the `find` command causes it to follow symbolic links?

A. `-S`

B. `-H`

C. `-P`

D. `-L`

Chapter

25

Practice Test 2

THE FOLLOWING IS A PRACTICE TEST FOR THE COMPTIA LINUX+ EXAM 104

1. To which file should you add an entry in order for a host to be blocked using TCP Wrappers?
   - **A.** `/etc/hosts.deny`
   - **B.** `/etc/tcp.wrappers`
   - **C.** `/etc/wrap.config`
   - **D.** `/etc/tcpwrap.conf`

2. Which of the following best describes the SQL `WHERE` keyword?
   - **A.** `WHERE` can be used with `SELECT`, `INSERT`, `UPDATE`, and `DELETE` operations.
   - **B.** `WHERE` can be used with `SELECT`, `UPDATE`, and `DELETE` operations.
   - **C.** `WHERE` is a standalone statement that enables selection of specific criteria.
   - **D.** `WHERE` is used within `GROUP BY` clauses.

3. Which of the following commands creates an alias for the `ps` command such that the option `auwx` is included when the user types `psa`?
   - **A.** `alias "ps auwx" = "psa"`
   - **B.** `alias psa=ps uawx`
   - **C.** `alias psa="ps auwx"`
   - **D.** `psa="ps auwx"`

4. Which of the following conditionals in a Bash script will test if the variable `DAY` is equal to `SUNDAY`?
   - **A.** `if ($DAY == "SUNDAY")`
   - **B.** `if ($DAY -eq "SUNDAY")`
   - **C.** `if [[ $DAY == "SUNDAY" ]]`
   - **D.** `if [ DAY = "SUNDAY" ]`

5. Which of the following commands is necessary for making a variable defined in your current shell available to child processes?
   - **A.** `export`
   - **B.** `source`
   - **C.** `let`
   - **D.** `def`

6. You are watching another administrator perform some work on a server. As part of that work, the admin uses the following command: `. variables.sh`. Which of the following is the equivalent of `. variables.sh`?
   - **A.** `let variables.sh`
   - **B.** `set variables.sh`
   - **C.** `source variables.sh`
   - **D.** `var variables.sh`

7. Which of the following commands adds `~/code/bin` to the path?
   - **A.** `PATH=~/code/bin:$PATH`
   - **B.** `PATH=/code/bin:$PATH`
   - **C.** `PATH=/home/code/bin:$PATH`
   - **D.** `PATH=PATH:~/code/bin`

8. Which of the following shows a valid Bash function called `sayHello`?
   - **A.** `function sayHello () { echo "hello"; }`
   - **B.** `function sayHello{}`
   - **C.** `function sayHello() { echo Hello }`
   - **D.** `function sayHello() { echo Hello };`

9. Which of the following commands sends an e-mail to root with the subject of `Update` and the content of the file `/etc/hostname`?
   - **A.** `mail root > /etc/hostname`
   - **B.** `mail -s Update root > /etc/hostname`
   - **C.** `mail -s Update root < /etc/hostname`
   - **D.** `mail root -s Update /etc/hostname`

10. Files that should be copied to a user's home directory when their account is created should be placed in which of the following directories?
    - **A.** `/etc/usertemplate`
    - **B.** `/etc/template`
    - **C.** `/etc/skel`
    - **D.** `/etc/userskel`

11. Which of the following is a valid `UPDATE` statement in SQL?
    - **A.** `UPDATE tablename WHERE columnname is 1;`
    - **B.** `UPDATE tablename SET columnname = 1;`
    - **C.** `UPDATE tablename USING columnname AS SOURCE;`
    - **D.** `UPDATE tablename HAVING columnname = 1;`

12. Which of the following commands launches Orca with speech capabilities?
    - **A.** `orca --no-setup --disable main-window`
    - **B.** `orca --screen`
    - **C.** `orca --screen-reader`
    - **D.** `orca --no-setup -s`

13. Which of the following areas within an Ubuntu system contains information and settings for accessibility?
    - **A.** Accessibility
    - **B.** Access and Help
    - **C.** Universal Use
    - **D.** Universal Access

14. Which command can be used to set the delay and repeat rate for a keyboard?
    - **A.** `keyboard`
    - **B.** `kbdrate`
    - **C.** `kbd`
    - **D.** `keyrate`

15. Which of the following locations stores the configuration for LightDM?
    - **A.** `/etc/lightdm/`
    - **B.** `/etc/lightdm.conf`
    - **C.** `/etc/lightdm-conf`
    - **D.** `/etc/lightdm.d`

16. Which variable is used to indicate the screen on which GUI applications will be shown?
    - **A.** `DISPLAY`
    - **B.** `SCREEN`
    - **C.** `LIST`
    - **D.** `XWIN`

17. Which of the following commands displays statistics and information about windows in X windows?
    - **A.** `xinfo`
    - **B.** `xstats`
    - **C.** `xwin`
    - **D.** `xwininfo`

18. Users can be added or removed for access to the X server. Which command facilitates this?
    - **A.** `xauthorization`
    - **B.** `xhost`
    - **C.** `xwin`
    - **D.** `xconnect`

19. Which option to `useradd` sets the number of days between password expiration and when the account is disabled?
    - **A.** `-n`
    - **B.** `-f`

C. `-e`

D. `-g`

20. Which of the following commands displays the current mail aliases known on the server?

A. `getent aliases`

B. `getalias`

C. `listalias`

D. `mail aliases`

21. Which of the following configuration lines in `/etc/hosts.deny` creates a deny-by-default policy where clients will need to be specifically allowed in `/etc/hosts.allow`?

A. `*.*`

B. `All: *`

C. `ALL: ALL`

D. `LOC: ALL`

22. Which of the following describes the result of running the `atq` command as root?

A. The current cron and at jobs for root will be listed.

B. The current at jobs for all users will be listed.

C. The current cron and at jobs for all users will be listed.

D. The last 10 entries in the at log will be shown.

23. Which of the following commands can be used to set the time zone on a Debian system?

A. `tzconfig`

B. `/etc/timeconfig`

C. `timeconfig`

D. `timecfg`

24. Which command option can be used to remove all cron jobs for a given user using the `crontab` command?

A. `-d`

B. `-e`

C. `-r`

D. `-l`

25. Which option to the `crontab` command enables you to work with a different user's cron jobs?

A. `-u`

B. `-m`

C. `-d`

D. `-e`

26. Which of the following commands displays the available character maps?

A. `charmap`

B. `charmap -l`

C. `locale -m`

D. `mapinfo`

27. Within which directory hierarchy will you find information regarding the available time zones on the server?

A. `/usr/zoneinfo`

B. `/usr/share/zoneinfo`

C. `/etc/zoneinfo`

D. `/etc/tz.conf.d`

28. When deleting a user from the server, you need to maintain their home directory rather than deleting it. Which option of the following commands deletes the user `<username>` but preserves their home directory?

A. `userdel <username>`

B. `userdel -r <username>`

C. `userdel -h <username>`

D. `userdel -p <username>`

29. After deleting a group, you need to search the filesystem for files owned by the group using its group ID. Which option to the `find` command will search using the group ID?

A. `-user`

B. `-group`

C. `-groupid`

D. `-gid`

30. Which of the following commands changes the group name from `admins` to `serveradmins`?

A. `groupmod -g admins serveradmins`

B. `groupmod -n serveradmins admins`

C. `groupchg -n serveradmins admins`

D. `groupchg admins -n serveradmins`

31. Which command is used to parse log file entries on a `systemd`-based system?

A. `logger`

B. `journalentry`

C. `jrnctl`

D. `journalctl`

32. The drift file, as specified in `/etc/ntp.conf` on a Red Hat system, is stored in which location by default?

A. `/var/lib/ntp/drift`

B. `/var/ntp/drift`

C. `/usr/share/ntpdrift`

D. `/usr/share/lib/ntpdrift`

33. Which option to the `ntpdate` command configures the version to use, such that an older NTP server could be queried?

A. `-o`

B. `-v`

C. `-e`

D. `-r`

34. Within which directory are `systemd` journals stored by default?

A. `/var/log/systemd`

B. `/var/systemd/journal`

C. `/var/log/journald`

D. `/var/log/journal`

35. Which option to the `logrotate` command specifies the mailer to use?

A. `-o`

B. `-s`

C. `-m`

D. `-v`

36. Which option to `date` changes the output to UTC regardless of the current time zone?

A. `-u`

B. `-t`

C. `-s`

D. `-v`

37. Which of the following commands can be used to delete a print job on a system that uses the lp print system?

A. `lpdel`

B. `rmprint`

C. `rm -print`

D. `lprm`

38. Which character combination sets the body of the message to STDIN when using the `mail` command?

A. `<`

B. `>`

C. `<<<`

D. `|`

39. Which of the following commands deletes a group from a Linux system?

A. `groupdm`

B. `grouprm`

C. `groupdel`

D. `delgroup`

40. Which of the following syslog facilities captures messages from the lp printing facility?

A. `auth`

B. `messages`

C. `lpr`

D. `root`

41. Which of the following subnet masks represents a `/23`?

A. 255.255.255.0

B. 255.255.0.0

C. 255.255.255.255

D. 255.255.254.0

42. An entry in `/etc/nsswitch.conf` indicates `hosts: files dns`. In which order will `/etc/hosts` be queried for a host name lookup?

A. The `/etc/hosts` file will be examined first.

B. The `/etc/hosts` file is not related to host name lookup.

C. The `/etc/hosts` file will be queried second.

D. The `/etc/hosts` file will be queried last.

43. Which port needs to be allowed through the firewall for standard LDAP traffic to be received by the server?

A. TCP port 25

B. TCP port 443

C. TCP port 143

D. TCP port 389

44. Which option to ssh changes the username to use for logging into the server?

A. `-v`

B. `-i`

C. `-l`

D. `-u`

45. Which option to `ping` disables name resolution?

A. `-d`

B. `-D`

C. `-f`

D. `-n`

46. Which of the following commands shows various statistics for a network interface such as packets and bytes received and transmitted along with errors and other such conditions?

A. `ifconfig`

B. `ifstat`

C. `if -s`

D. `ifcond`

47. Which option to `dig` causes it to use IPv6 only for communication?

A. `-ipv6`

B. `-6`

C. `-v6`

D. `-IPv6`

48. What is the limit for domains and characters when using the search option in `/etc/resolv.conf`?

A. Three domains and 128 characters

B. Six domains and 256 characters

C. Twelve domains and 1024 characters

D. Fourteen domains and 1024 characters

49. When using the `host` command, which option displays the SOA record from each of the authoritative DNS name servers for the given domain?

A. `-N`

B. `-n`

C. `-C`

D. `-a`

50. You need to specify an additional localhost address and host name for a server in order to support a specialized network configuration. Which line in `/etc/hosts` sets the host name with a unique IP address in the correct range for localhost?

A. `127.0.1.1 host.example.com host`

B. `192.168.0.1 host.example.com host`

C. `host.example.com 127.0.0.1`

D. `host.example.com 172.16.31.32`

51. Which of the following options to `ifup` tells the command to ignore errors and continue?

A. `--continue`

B. `--C`

C. `--ignore-errors`

D. `-h`

52. Which option to `passwd` can be used to unlock an account that was locked with the `passwd` command?

A. `-S`

B. `-l`

C. `-u`

D. `-w`

53. Which of the following is the correct syntax to connect using `ssh` to `host.example.com` on port 2200?

A. `ssh -l 2200 host.example.com`

B. `ssh host;example.com`

C. `ssh host.example.com:2200`

D. `ssh host:2200 -d example.com`

54. Which of the following scenarios prevents all users from using cron except those specifically allowed?

A. Create an `/etc/cron.allow` with the specified users.

B. Add an entry of `*` to `/etc/cron.deny`.

C. Create `/etc/cron.deny`, and add specified users.

D. Add `deny=users` to `cron.allow`.

55. Which option in `/etc/sudoers` sets the destination address for administrative and security e-mails related to `sudo`?

A. `mail`

B. `mailto`

C. `secmail`

D. `adminmail`

56. Which of the following commands displays a listing of who is logged into the server along with the date and time that they logged in?

A. `whois`

B. `who`

C. `loggedin`

D. `curusers`

57. Which port should be allowed through a firewall for NTP communication?

A. Port 139

B. Port 161

C. Port 123

D. Port 194

58. Which option to `nmap` causes it to scan using UDP?

A. `-sT`

B. `-sS`

C. `-sP`

D. `-sU`

59. Which of the following commands retrieves the ssh host key fingerprint from a server?

A. `ssh-keygen`

B. `ssh-hostkey`

C. `ssh-keyscan`

D. `ssh-key`

60. Which of the following options to `lsof` searches an entire directory tree for open instances of files or directories?

A. `-d`

B. `+D`

C. `-f`

D. `-i`

Chapter

26

Practice Test 3

THE FOLLOWING IS A PRACTICE TEST FOR THE COMPTIA LINUX+ EXAM 201

1. When using `mdadm` in monitor mode, which option sets the polling interval?
   - **A.** `--delay`
   - **B.** `--internal`
   - **C.** `--interval`
   - **D.** `--poll`
2. Which options to `mdadm` will start an array, assuming that there is one RAID device on the server?
   - **A.** `--assemble`
   - **B.** `--start`
   - **C.** `--get`
   - **D.** `--begin`
3. Which of the following commands can be used to set the first partition of the first SATA device to a RAID type?
   - **A.** `sfdisk /dev/sda1 fd`
   - **B.** `sfdisk --id /dev/sda 1 fd`
   - **C.** `sfdisk /dev/sda 1 fd`
   - **D.** `sfdisk /dev/list fd 1`
4. Which of the following is a persistent name that can be used across systems to identify a SCSI device?
   - **A.** iSCSIID
   - **B.** `/dev/sd`
   - **C.** iLUN
   - **D.** WWID
5. Which of the following represents a valid mode for `iscsiadm` for discovering iSCSI targets?
   - **A.** discovery
   - **B.** discover
   - **C.** find
   - **D.** list
6. Which command is used to build the LVM cache file?
   - **A.** `lvmcache`
   - **B.** `lvcache`
   - **C.** `vgscan`
   - **D.** `vgcache`
7. Which of the following commands displays the current hostname as known to the kernel?
   - **A.** `cat /etc/passwd`
   - **B.** `sysctl -n kernel.hostname`

C. `sysctl -n net.host`

D. `less /etc/hosts`

8. Which option within `/etc/ssh/sshd_config` is used to provide the name of a file that will be displayed prior to logging in via ssh?

A. Banner

B. LoginBanner

C. MOTD

D. Message

9. Which option to a configure script is used to set the location to which the resulting compiled code will be installed?

A. `--location`

B. `--dest`

C. `--last`

D. `--prefix`

10. Which options are encompassed when the `-a` option to `rsync` is invoked?

A. `-rlpt`

B. `-rlptgo`

C. `-rpfsxl`

D. `-rlptgoD`

11. When troubleshooting an issue from the console, kernel messages continually print, making it difficult to perform the troubleshooting. Which option to `dmesg` will stop messages from being sent to the console?

A. `-D`

B. `-off`

C. `-E`

D. `-O`

12. Which option to `netstat` displays information regarding multicast group membership?

A. `-m`

B. `-g`

C. `-r`

D. `-a`

13. Which option to the `ip` command displays DNS names rather than merely IP addresses?

A. `-n`

B. `-f`

C. `-r`

D. `-a`

14. Which of the following commands and options enables you to examine timing related to listening sockets?
    A. `ss -o`
    B. `netstat -rn`
    C. `ping -f`
    D. `ls -l`

15. Which of the following `dd` commands writes the contents of `linux.img` to `/dev/sdb1`?
    A. `dd if=linux.img > /dev/sdb1`
    B. `dd of=/dev/sdb1 > linux.img`
    C. `dd if=/dev/sdb1 of=linux.img`
    D. `dd if=linux.img of=/dev/sdb1`

16. Which of the following IP address and subnet mask pairs represents a private network in a /24 size?
    A. `192.168.3.0/255.255.255.128`
    B. `172.16.19.128/255.255.0.0`
    C. `192.168.2.0/255.255.255.0`
    D. `10.168.1.0/0.0.0.255`

17. Which option to `rsync` creates a backup for each destination file transferred?
    A. `-a`
    B. `-b`
    C. `-c`
    D. `-d`

18. Which option to the `tar` command preserves permissions?
    A. `-x`
    B. `-v`
    C. `-z`
    D. `-p`

19. When viewing the results of a `traceroute`, you see `!H`. To what does `!H` refer?
    A. Network unreachable
    B. Host available
    C. Host unreachable
    D. High length

20. Assuming that policy routing has been enabled in the kernel, which option to the `ping` command can be used to mark the outgoing request appropriately in order to indicate that the packet should be processed according to a particular policy?
    A. `-m`
    B. `-a`

C. `-p`

D. `-k`

21. Which environment variable can be used to specify the default device on which the `mt` command will operate?

A. `TAPEDEVICE`

B. `MTDEVICE`

C. `MTTAPE`

D. `TAPE`

22. When creating a backup for a system, which directory should be included so that most configuration files will be backed up?

A. `/var`

B. `/opt`

C. `/etc`

D. `/bin`

23. When working with a `patch` file, which option can be used to have the patching process ignore whitespace?

A. `-w`

B. `-i`

C. `-e`

D. `-p`

24. When working in ping mode, which option to `iscsiadm` sets the delay between two ping requests?

A. `-a`

B. `-e`

C. `-i`

D. `-o`

25. Which option to `hdparm` checks the current power mode for a drive?

A. `-a`

B. `-C`

C. `-d`

D. `-f`

26. Which file contains information on swap spaces and devices?

A. `/proc/swapspace`

B. `/proc/swap`

C. `/etc/swap`

D. `/proc/swaps`

27. Which `systemd` target will boot into rescue mode?

A. `init`

B. `rescue`

C. `recovery`

D. `recover`

28. Which option to `fsck` will report statistics such as CPU time used on completion of the `fsck` operation?

A. `-s`

B. `-r`

C. `-l`

D. `-f`

29. Which `make` target for the kernel is used to answer `no` to every question when creating a config file?

A. `allconfig`

B. `config`

C. `allnoconfig`

D. `menunoconfig`

30. Which of the following files provides information on memory utilization including free memory, buffers, cache usage, and several additional items?

A. `/proc/cpuinfo`

B. `/proc/memtime`

C. `/proc/memuse`

D. `/proc/meminfo`

31. Which option to the `modinfo` command can be used to determine the options that a given module accepts?

A. `-o`

B. `-p`

C. `-e`

D. `-f`

32. Which option to `lspci` displays the kernel driver (module) being used for a given device along with modules capable of being used for the device?

A. `-d`

B. `-j`

C. `-k`

D. `-f`

33. After updating source files related to udev, which command should be used in order to update the hardware database index?

A. `udevadm update`

B. `udev update`

C. `udevhw update`

D. `udevadm hwdb -u`

34. You need to look for files that are overriding each other when loading with `systemd`. Which of the following commands can help to show the files that are overridden with `systemd`?

A. `systemd-delta`

B. `systemd-override`

C. `systemd --override`

D. `systemctl --override`

35. Which of the following commands installs the GRUB bootloader on the second SCSI disk?

A. `grub-load /dev/sda`

B. `grub-install /dev/sdb`

C. `grub-load /dev/sdb`

D. `grub-install /dev/sdb2`

36. Which of the following commands can be used to list the UUID for each appropriate device in the computer?

A. `uuid`

B. `ubid`

C. `diskid`

D. `blkid`

37. When using the `dm-crypt` command, which type of encryption is used by default?

A. Plain

B. SHA-256

C. LUKS

D. Loop

38. You are creating an El Torito bootable CD with `mkisofs`. Which option is necessary to specify the boot image file?

A. `-el`

B. `-b`

C. `--torito-boot`

D. `--tor`

39. You are running `fstrim` on all filesystems. The exit code is 64. To what does an exit code of 64 refer with the `fstrim` command?

A. Success

B. All disks failed

C. Some disks failed

D. General failure

40. Which of the following is the correct option and format for adding an Ethernet and IP ARP entry, where `<address>` is the IP address and `<hardware address>` is the MAC address?

A. `arp -d <address>`

B. `arp -c <address> <hardware address>`

C. `arp -a <hardware address> <address>`

D. `arp -s <address> <hardware address>`

41. Which of the following options to the `iwlist` command displays information on the available transmit power for a given interface?

A. `power`

B. `txpower`

C. `rcpower`

D. `transmitpower`

42. Which scan mode for `nmap` provides an Xmas scan?

A. `-sT`

B. `-sS`

C. `-sP`

D. `-sX`

43. Which option to `tcpdump` sets the snapshot length of packets to capture?

A. `-s`

B. `-l`

C. `-d`

D. `-c`

44. Which option to `journalctl` displays the output in reverse, with newest entries first?

A. `-n`

B. `-r`

C. `-f`

D. `-b`

45. Which of the following is the default location of the LVM cache?

A. `/etc/lvm/cache`

B. `/etc/lvm/.cache`

C. `/etc/lvmcache`

D. `/home/lvm/.cache`

46. On which port does the `ping` command operate for ICMP echo requests?

A. 53

B. 1337

C. 33433

D. No port is used for ICMP.

47. Which `systemd` target can be used as an alternative to rescue mode when recovery is not possible in rescue mode?

A. `emerg`

B. `recover`

C. `control-recover`

D. `emergency`

48. When performing an `rsync` across devices, you receive errors that file ownership cannot be preserved, likely due to missing users or groups on the destination system. Which option should be removed from the `rsync` options in order not to preserve user and group ownership?

A. `-go`

B. `-o`

C. `-no-ownership`

D. `-remove-owners`

49. Which option to `ping` enables the bypass of the routing tables?

A. `-q`

B. `-r`

C. `-b`

D. `-A`

50. On which port and protocol is the first probe sent with `traceroute`?

A. UDP/33434

B. UDP/1337

C. ICMP

D. IGMP

51. When working with tape devices, which of the following device names typically indicates the first non-rewinding SCSI tape device on the system?

A. `/dev/st0`

B. `/dev/tape0`

C. `/dev/nst0`

D. `/dev/tape/st0`

52. When choosing directories to back up, which directory hierarchy should be included in order to ensure that mail files, such as user spool files containing mail, are backed up?

A. `/var`

B. `/mail`

C. `/etc`

D. `/usr`

53. Which option to the `patch` command makes a backup of files?

A. `-d`

B. `-b`

C. `-s`

D. `-c`

54. Which option to `hdparm` displays information such as the size in sectors and the starting offset for the drive?

A. `-e`

B. `-w`

C. `-h`

D. `-g`

55. When booting into rescue mode with `systemd`, a message is sent to all logged-in users informing them of the impending reboot. Which option to `systemctl` can be used to prevent this message from displaying?

A. `--suppress`

B. `--no-wall`

C. `--quiet-mesg`

D. `--no-mesg`

56. When checking an ext4 filesystem with `fsck`, which option can be used to display progress indicators?

A. `-p`

B. `-f`

C. `-C`

D. `-d`

57. Which target for the kernel is used to provide a minimal kernel config?

A. `minconfig`

B. `min`

C. `tinyconfig`

D. `configsmall`

58. Which of the following files contains the udev hardware database?

A. `/etc/udev/hwdb.cfg`

B. `/etc/udev.d/hwdb.txt`

C. `/etc/udev/hwdb.db`

D. `/etc/udev/hwdb.bin`

59. Which option to `systemd-delta` can be used to display differences among files in the instance where files are overridden?

A. `--show-diff`

B. `--diff`

C. `-s`

D. `-d`

60. Which option to the `mount` command mounts a partition using its UUID?

A. `-u`

B. `-U`

C. `-t`

D. `-i`

Chapter

27

Practice Test 4

THE FOLLOWING IS A PRACTICE TEST FOR THE COMPTIA LINUX+ EXAM 202

1. Which option within a BIND zone configuration stanza for a master zone is used to specify whether or not slave servers should be notified when there is a change to the zone?
   - **A.** `slave-notify`
   - **B.** `notify-slave`
   - **C.** `notify`
   - **D.** `a-notify`
2. Which option to `dnssec-keygen` enables specification of the key size to use?
   - **A.** `-b`
   - **B.** `-f`
   - **C.** `-e`
   - **D.** `-a`
3. Which option to `named-checkzone` suppresses output except for the exit code?
   - **A.** `-s`
   - **B.** `-q`
   - **C.** `-p`
   - **D.** `-f`
4. When creating a zone file, a record contains the following: www IN A 192.168.1.1. To what does the IN refer in the record?
   - **A.** Internal
   - **B.** Internet
   - **C.** Inner
   - **D.** IN Priority
5. On which port does `rndc` listen by default?
   - **A.** 53
   - **B.** 1053
   - **C.** 953
   - **D.** 530
6. Which type of DNS record indicates the Start of Authority?
   - **A.** A
   - **B.** IN
   - **C.** SOA
   - **D.** NS
7. Which option to the `dig` command sets the server to which the query will be sent to `192.168.3.2`?
   - **A.** `@192.168.3.2`
   - **B.** `server=192.168.3.2`

C. `server=non-default`

D. `--query-dest=192.168.3.2`

8. Which configuration directive for BIND sets the forwarders to which queries will be sent?

A. `forward-dest`

B. `forward-ip`

C. `forwarding`

D. `forwarders`

9. Which BIND configuration directive sets the IP address from which queries will be sent?

A. `query-source`

B. `query-ip`

C. `query-origination`

D. `source-ip`

10. Which option to `named-checkzone` enables a dump of the zone in canonical format?

A. `-D`

B. `-d`

C. `-c`

D. `-o`

11. When using `named-checkconf`, which option should be used if BIND is operating in a chroot environment?

A. `-c`

B. `-t`

C. `-f`

D. `-r`

12. Which option to `htpasswd` specifies password encryption using bcrypt?

A. `-B`

B. `-b`

C. `-m`

D. `-C`

13. Which configuration option for Apache changes how the version information is returned by the server for server-generated documents?

A. `Version`

B. `ServerVersion`

C. `ServerTokens`

D. `VersionToken`

14. Which of the following is the primary configuration file for an Apache2 server?
    A. `apache2.conf`
    B. `apache.conf`
    C. `http.cfg`
    D. `httpd.conf`

15. Which directive in a Squid configuration enables the setting of the port on which Squid will listen for connections?
    A. `tcp_port`
    B. `http_port`
    C. `listen_host`
    D. `ip_listener`

16. Which Apache directive sets the location of the public key for an SSL-based virtual host?
    A. `SSLCertificateKeyFile`
    B. `SSLCertificateFile`
    C. `SSLCertificatePublicKey`
    D. `SSLCertFile`

17. Which SSL-related directive sets the available list of cryptographic ciphers available on an Apache server?
    A. `SSLCipherList`
    B. `SSLCiphers`
    C. `SSLCipherSuite`
    D. `SSLCryptoList`

18. When using an `AuthGroupFile` with Apache, which of the following is the correct format for a group called `AdminGroup` with members `steve` and `tim`?
    A. `Group: steve, tim`
    B. `Group: steve tim`
    C. `AdminGroup: steve tim`
    D. `AdminGroup: steve, tim`

19. Which Apache web server log file format sequence is used to log the number of bytes in the response, including HTTP headers?
    A. `%b`
    B. `%B`
    C. `-b`
    D. `-B`

20. Which argument to the `ca.pl` helper script can be used to create a new certificate authority hierarchy?

A. `-ca`

B. `-genca`

C. `-newca`

D. `-canew`

21. You are looking for files related to the SSL configuration on the server. After looking in `/etc/ssl`, within which other directory might the files reside?

A. `/etc/sslconfig`

B. `/usr/share/ssl`

C. `/etc/pki`

D. `/etc/private`

22. On which port does the `nmbd` Samba daemon listen on?

A. 139

B. 445

C. 143

D. 137

23. Which message type can be used by `smbcontrol` to facilitate a new browse master election by `nmbd`?

A. `force-election`

B. `new-election`

C. `send-election`

D. `notify-election`

24. Which mode of the Samba `net` command is used to work with Active Directory?

A. `rpc`

B. `ads`

C. `ad`

D. `actived`

25. Which of the following configuration options for NFS facilitates the use of an NIS netgroup called `admins` within a host definition for an export?

A. `-admins`

B. `group=admins`

C. `@admins`

D. `admin=rw`

26. Which of the following formats is correct for specifying a username of `Steve` and a password of `Boo` for a Samba `mount` command?

A. `-o username=Steve,password=Boo`

B. `-username Steve -password Boo`

C. `-credentials=Steve,Boo`

D. `--credentials=Steve,Boo`

27. To which level should security be set within a Samba configuration in order for Active Directory security to be used?

A. `ads`

B. `ad`

C. `domain`

D. `controlDomain`

28. Which of the following options to the `showmount` command displays both host and directory information for mounted directories?

A. `-a`

B. `-b`

C. `-c`

D. `-d`

29. Which of the following commands lists the current Samba shares?

A. `smbstats`

B. `smbstatus -S`

C. `smbshares`

D. `smbd -shares`

30. You need to create a new user for Samba. However, you executed the command `smbpasswd -a` and subsequently found out that the specified user already exists. What will be the result of running `smbpasswd -a` on an existing user?

A. The user information will be overwritten with new information.

B. The password will be changed.

C. An error will occur.

D. A duplicate entry will be created.

31. The Samba configuration for your Linux server does not use the standard port for SMB shares. Which option to the `smbclient` command enables setting the port?

A. `-a`

B. `-p`

C. `-b`

D. `-d`

32. Which option within a host stanza in `dhcpd.conf` is used to specify the reserved IP address for a DHCP reservation?

A. `ip-address`

B. `address`

C. `ethernet address`

D. `fixed-address`

33. Which of the following describes a primary difference between `slapadd` and `ldapadd`?

A. The `ldapadd` command is used when the server is running, whereas `slapadd` works with the database while the server is offline.

B. The `ldapadd` command is used to add entries to the local database, whereas `slapadd` is used to add entries to a remote database.

C. The `ldapadd` command has been deprecated in favor of `slapadd`.

D. The `ldapadd` command is used for OpenLDAP, whereas `slapadd` is used for Active Directory.

34. When `radvd` starts, it will exit if a given interface does not exist. Which interface option changes this behavior?

A. `StartAlways`

B. `StartIfMissing`

C. `IgnoreIfMissing`

D. `MissingOK`

35. Which option in `dhcpd.conf` sets the default time for the DHCP lease for a given pool?

A. `lease-duration`

B. `default-lease-time`

C. `default-time`

D. `lease-time`

36. Which of the following configuration lines in `/etc/nsswitch.conf` provides group membership information from local files and then LDAP?

A. `groupmembers: files ldap`

B. `groups: files ldap`

C. `group: files ldap`

D. `group [files ldap]`

37. The `sssd.conf` file is divided into sections. Which section of `sssd.conf` specifies overall or general parameters for the daemon?

A. `[general]`

B. `[service]`

C. `[sssd]`

D. `[main]`

38. Within which file is the configuration related to the `pam_limits.so` module stored?

A. `limits.conf`

B. `pam_limits.conf`

C. `pamlimit.conf`

D. `limitproc.cfg`

39. Which option to `slapcat` specifies the file to which the output will be written?

A. `-f`

B. `-l`

C. `-o`

D. `-d`

40. Which changetype in an LDIF file is used to indicate that an entry should be changed?

A. `change`

B. `modify`

C. `mod`

D. `update`

41. Within which objectClass does the LDAP attribute `mail` reside?

A. `inetOrgPerson`

B. `mailOrg`

C. `orgMail`

D. `organization`

42. Which of the following operators is used to test whether a value is greater than another value with Sieve?

A. `>`

B. `greater-than`

C. `ge`

D. `gt`

43. Within which directory are configuration files for Dovecot stored?

A. `/usr/dovecot`

B. `/etc/dovecot`

C. `/etc/dovecot.conf.d`

D. `/etc/dove.cfg.d`

44. Which of the following is the `sendmail` command to print the mail queue?

A. `sendmail -q`

B. `sendmail -bp`

C. `sendmail -bq`

D. `sendmail -mailq`

45. Which of the following commands deletes all of the messages in the Postfix deferred queue?

A. `postsuper -d DEFERRED`

B. `postqueue -d DEF`

C. `postsuper -d ALL deferred`

D. `postqueue -d ALL`

46. Which of the following options can be used with `postcat` to display only the body of the message?

A. `-m`

B. `-e`

C. `-h`

D. `-b`

47. Which of the following Sieve tests will match on a message that is greater than 500 KB?

A. `if message > 500`

B. `if size :over 500K`

C. `if messagesize > 500K`

D. `if size :morethan 500`

48. Which of the following commands produces a password appropriate for use with Dovecot?

A. `dovepass`

B. `doveadm pw`

C. `dovepasswd`

D. `doveadm pass`

49. Which configuration parameter in a Postfix configuration sets the limit on an individual message?

A. `message_size_limit`

B. `message_max`

C. `message_size`

D. `max_message_size`

50. Which of the following `address-part` structures is used to indicate the entire e-mail address with Sieve?

A. `:email`

B. `:address`

C. `:all`

D. `:full`

51. When testing the SMTP protocol using a tool like Telnet, which of the following lines specifies the destination address as part of the SMTP conversation?

A. `RCPT TO`

B. `MAILTO`

C. `DEST`

D. `TO`

52. Which of the following `iptables` targets is used to create a port redirection?

A. `PORTDIR`

B. `PORTREDIR`

C. `REDIR`

D. `REDIRECT`

53. Which Pure-FTPd directive is used to limit bandwidth for authenticated users?

A. `-T`

B. `-B`

C. `-b`

D. `-t`

54. Which of the following commands connects to `www.example.com` on the standard HTTP port?

A. `nc www.example.com`

B. `nc www.example.com 80`

C. `nc www.example.com:80`

D. `nc www.example.com:http`

55. Which of the following commands clears `iptables` rules for a given chain?

A. `iptables -P`

B. `iptables -C`

C. `iptables -F`

D. `iptables -N`

56. Which OpenSSH configuration directive is used to specify the users who will be allowed to log in using SSH?

A. `AllowUsers`

B. `PermitUsers`

C. `UsersAllowed`

D. `AllowedUsers`

57. Which of the following commands prevents packets from going out on an interface different from the interface on which the packet was received?

A. `iptables --no-redirect`

B. `echo "1" > /proc/sys/net/ipv4/conf/all/rp_filter`

C. `echo "1" > /proc/sys/net/ipv4/conf/all/redirect_filter`

D. `echo "1" > /proc/sys/net/ipv4/conf/all/pf`

58. Which of the following commands creates a local port-forwarding scenario where connections to port 8080 will be sent to `www.example.com` on port 80 through the server at `ssh.example.com`?

A. `ssh -forward 80:www.example.com:8080 ssh.example.com`

B. `ssh -p 8080:www.example.com:80 ssh.example.com`

C. `ssh ssh.example.com -F 8080`

D. `ssh -L 8080:www.example.com:80 ssh.example.com`

59. When using `netstat -a`, which file is consulted for port-number-to-name translation?

A. `/etc/portnum`

B. `/etc/services`

C. `/etc/portnames`

D. `/proc/sys/net/ipv4/ports`

60. Which option within a LOG target for `iptables` sets a string that will be prepended to log entries?

A. `--log-prefix`

B. `--prepend`

C. `--log-prepend`

D. `--log-str`

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/irq` 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 buffer. On many Linux distributions, this log is also saved to `/var/log/dmesg`. The other options shown for this question are not valid commands.

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. 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. 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. 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. 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. 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` hiearchy.

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. 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. 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. 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. 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. 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. 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. D. The `/proc/bus/usb` directory contains information about USB devices. The other directories are not valid for this purpose.

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. 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. A. The `ls` command from within the `grub >` prompt will show the available partitions in a format such as `(hd0,1)`.

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. 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. 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. A. The `initctl reload` command causes Upstart to reread its configuration files.

32. B. The `--list` option will show all services on a system along with their status for each runlevel.

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. 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. 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. B. The `umount` command is used to unmount drives within a running system. The other commands do not exist.

37. D. The ESP is typically mounted at `/boot/efi`.

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. 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. B. From these options, only B will shut down the system immediately. Answer A will cancel a shutdown.

41. C. The `ExecStart` option indicates the command to be executed on startup of a `systemd` service.

42. D. The `systemctl get-default` command will show the default target. The other commands and options are not valid.

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. C. The `/proc` filesystem contains information about currently running processes and additional information about the kernel and current boot of the system.

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. A. SCSI supports 7 to 15 devices per bus, depending on the type of SCSI.

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. 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 `rmmod`.

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

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. 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. 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. 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. 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. 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. 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. 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. 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. A. rpm2cpio sends its output to STDOUT by default, and therefore that output needs to be redirected to a file in most cases.

11. B. 0x82 is Linux swap while 0x83 is Linux. NTFS is 0x07 and FAT32 is 0.0c.

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. 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. 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. 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. 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. B. The `export` command is used to set environment variables in Bash. The other commands are not valid for this purpose.

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. 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. 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. 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. 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. 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. 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. 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. D. The `ldd` command will list the libraries on which the command's argument depends.

27. B. Swap space is used when there is insufficient RAM on a system.

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. 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. 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. 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. B. The `pvcreate` command initializes a physical partition for future use as a logical volume with LVM.

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. 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. C. The `lvcreate` command is used to create logical volumes with LVM. The `pvcreate` command initializes physical volumes prior to creating logical volumes. The command in the other two options for this question do not exist.

36. A. Physical volumes are initialized first, followed by volume group creation, and then logical volume creation.

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

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

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

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

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

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

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

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. 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. C. Both `head` and `tail` print 10 lines of output by default.

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. 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. 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. 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. A. The timestamp of the file will change when `touch` is run on a file that already exists.

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. 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. 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. 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. 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. 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. 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. 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. 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. B. While the `ps auwx` 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. A. The `xz` command can compress and decompress files in a variety of formats, one of which is `lzma`.

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. 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. D. The `pwd` command prints the current working directory. The `cd` command changes directory.

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. A. Preceding the command with `!` will search history and execute the specified command. For example, `!vi` will start your last vi session.

47. C. The `killall` command is used to terminate processes using their name.

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. 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. A. The `chgrp` command can be used to change group ownership of a file. The order is `chgrp <groupname> <target>`.

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. 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. 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. 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. B. The `tune2fs` command can be used for this purpose but should be used with care because it can result in data corruption.

8. B. The addition of journaling in ext3 increased filesystem reliability and performance.

9. C. The `-S` option displays output in a format such as `u=rwx,g=rx,o=rx`. The other options listed in this problem do not exist.

10. B. The `-s` option to `ln` creates a symbolic link or symlink.

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. 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. 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. 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. 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. 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. A. The `tune2fs` command displays a lot of information about filesystems including the number of times that the filesystem has been mounted.

18. A. The `-g` option displays progress of the dump. The other options listed do not exist.

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. A. The `du` command will report on disk usage in a recursive manner, unlike the other commands shown here.

21. C. The `/etc/fstab` file is used to store information about the filesystems to mount within the system.

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. 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. 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. C. The `022 umask` value will translate into 644 permissions on a new non-executable file.

26. B. The `l` 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. B. The `repquota` command is used for this purpose, and the `-a` option will display information for all filesystems.

28. C. The `updatedb` command will update the database used by the `locate` command.

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. B. The `-R` option will perform the change ownership in a recursive manner.

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. 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. D. The `xfs_info` command is equivalent to `xfs_growfs -n`.

34. B. The `mkfs.btrfs` command is used to create btrfs filesystems and does not require the drive to be partitioned.

35. C. The `usrquota` option will enable user-level quotas on the given mount point. This is typically set within `/etc/fstab`.

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. A. The `tune2fs` command is used for this purpose, and the `-c` option sets the mount count for the specified partition.

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. C. The VFAT filesystem is known as `vfat` to the `mount` command, and the other elements of the `mount` command are standard.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. C. The double-ampersand sequence executes commands only if the previous command within the command line exited cleanly.

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. 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. 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. 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. C. The `elif` keyword is used to create an alternative execution path within a shell script. The other constructs such as `else if` and `elsif` are used in other languages.

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. 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. 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. 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. 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. 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. 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. A. The `UPDATE` statement uses the `SET` keyword to indicate the column or columns to change. The `WHERE` clause is optional.

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. C. The `--norc` 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. A. The greeter is configured through `/etc/lightdm/lightdm.conf` using the `greeter-session` option. The other answers provided here are not valid.

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. A. Frequency options are one of Hz, k, kHz, M, or MHz, thereby making uHz an unavailable option.

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. 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. 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. C. The Shift key can be used to enable and disable sticky keys within GNOME and other operating systems for accessibility purposes.

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. 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. 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. 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. 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. 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. 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. D. The `xdpyinfo` command displays various elements about the current display(s) along with information about X itself.

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. 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. C. Kernel versions beginning with 2.6.26 include native support for Braille displays in Linux.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. D. With an on-screen keyboard, users can utilize a pointer such as a mouse to select keys on the keyboard.

35. C. Bounce keys cause the interface not to react when keys are accidentally pressed in succession or held down.

36. B. The Alt+Ctr+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. 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. 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. 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. 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. 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. 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. C. The `VideoRam` option, which can be expressed in bytes, configures the amount of RAM available to the video card.

44. A. The `ColorDepth` option sets the color depth for a given monitor display. A typical value might be 24 for this option.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. C. The `--list` option shows the available character sets on the system. The other options given for this question do not exist.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. C. The `LC_MONETARY` variable is used by certain programs to determine the localization for currency.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. A. The `-q` option causes sendmail to attempt to deliver messages from the queue. Add the `-v` option to display verbose output.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. A. The syntax is database: databasename with additional databasenames separated by spaces, as shown in the correct option for this question.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. The `tracepath` command provides the maximum transmission unit (MTU) of the hops, where possible. Both `traceroute` and `tracepath` can be used internally or externally, and both provide IPv6 capabilities. Certain options with the `traceroute` 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. 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. 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. 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. 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. 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` always having the same IP address, or the solutions require additional maintenance to constantly add new IP addresses if `www.example.com`'s IP address changes.

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

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 `xfer` type, and option B is just a normal query for the domain sent to the specified server.

Chapter 10: Security (Domain 110)

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. A. The correct format is `YYYY-MM-DD` for the `usermod` command.

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. 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. 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. 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. 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. 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. 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. 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. 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 `chguser` command.

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. C. The `maxlogins` parameter is used to control the number of simultaneous logins for a given account.

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. 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. 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. 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. A. The `--gen-key` subcommand is used for the purpose described. The other options shown do not exist.

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. 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. 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. 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. 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. 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. 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. 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. 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. B. The file `pubring.gpg`, found in `~/.gnupg`, contains the public keyring.

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. 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. 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. 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. 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. 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. 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. 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. C. The `iotop` 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. 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. 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. 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. 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. 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. 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 `pstree` command is used to show a tree-like structure of processes.

11. A. The `ps` command provides information on processor and memory usage for individual processes. You can use this information to predict capacity.

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. 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. 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. C. The `pstree` command displays current processes in a tree-like structure, with parent processes connected to child processes. The `pstree` command makes it easy to see processes in a grouped format to check for potential high resource usage.

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. 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. 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. C. The `-p` option to `pstree` shows process IDs along with the standard `pstree` output. The `-a` option displays command-line arguments for commands. There is no `-i` or `-b` option.

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. 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. 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. D. The steal column shows the percentage of time that was spent waiting due to the hypervisor stealing cycles for another virtual processor.

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. A. Load average with the `uptime` command is displayed in 1-, 5-, and 15-minute increments.

26. B. The `/proc/swaps` file can be used to gather information quickly, especially within a script, on swap space.

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. 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. 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. C. The `-i` option is needed for this case, and the format for the port is preceded by a colon.

31. C. The `-m` option causes the disk-related statistics to use megabytes as the scale rather than the default kilobytes.

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

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

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

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

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. 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. 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. 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. B. The `modprobe` command examines dependencies for a given module and loads both the dependencies and the requested module.

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. B. The `uname` command is used for this purpose, and the `-r` option displays the kernel version number.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. Variables and values placed in `/etc/sysctl.conf` will take effect on boot. The other files listed are not valid.

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. B. The `--show-depends` option displays the dependencies for a given module. The other options are not valid for the `modprobe` command.

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. B. The `/proc/sys/kernel` hierarchy contains vital configuration information for a kernel. These settings can be changed on a running system.

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. B. The `/etc/systemd/system` directory is the recommended location to store unit files for `systemd`. The other locations are not valid.

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. 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. 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. 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. 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. B. The `fsck` command is used to diagnose and repair hard drive problems in Linux. The `defrag` command is not available in Linux.

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. A. The `--install` option is used followed by the partition to which `extlinux` will be installed for boot.

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. 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. D. The `-n` option changes the boot order for the next boot only and boots from the specified partition. The `-b` along with `-B` modifies and then deletes the option. The `-o` option sets the boot order. The `-c` option creates a boot number.

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. 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. 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. 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. 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. 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. 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. 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. 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. A. The bootloader is mounted into `/boot/efi`. The other directories do not exist.

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. 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. 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. 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. 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. 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. 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. 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. 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. C. The runlevel defined as `initdefault` is the default runlevel for the system. The other options shown do not exist.

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. 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. 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. 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. 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. 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. 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. B. The file `/etc/auto.master` contains the configuration for `autofs`. The other files listed as options are not valid for this scenario.

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. 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. B. The `mkswap` command is used to format a swap partition. The other commands are not valid.

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. 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. 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. 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. 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. B. The `xfs_info` command, which is functionally equivalent to `xfs_grow -n`, displays information about an XFS-formatted filesystem.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. The `btrfs subvolume create` command creates a btrfs subvolume. The other commands are not valid.

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. 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. 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. 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. A. The `Where=` directive specifies the location for the final mounted filesystem.

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. 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. 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. A. The `snapshot` subcommand of `btrfs subvolume` creates a snapshot. The other commands shown are not valid.

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. 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. 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. D. A partition type 0xFD 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. 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. 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. C. The `pvdisplay` command shows information about a given physical volume. You can use `pvdisplay` 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. C. The `/dev/mapper` directory contains information about multipath devices such as logical volumes. The other directories are not valid.

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. 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. 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. B. The MAILADDR option sets the destination address for mail about RAID events that are noted by `mdadm` when in monitor mode.

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. D. A partition type of 0xFD 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. 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. 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. 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. 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. B. The `snapshot` option creates a snapshot of a logical volume. The other options shown are not valid.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. A. The `-s` option creates an ARP table entry. The `-d` option removes an entry. The `-c` and `--add` options do not exist.

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. D. The `-t` option shows TCP connections, while `-a` shows active sockets. The `-n` option disables name resolution.

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 `lsof` command allows for negation with the caret `^` character. Therefore, listing all files except `bind` requires the syntax shown.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. Only alphanumerics, minus/dash, and dot are valid for hosts in `/etc/hosts`.

31. B. Options within `/etc/resolv.conf` are preceded with the `options` keyword followed by one or more options such as `debug`.

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. D. The `systemctl` command is used for this purpose. Adding the `-u` option specifies the unit for which journal entries are desired.

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. C. The `/etc/sysconfig/network-scripts` directory contains configuration information for a Red Hat system. The other directories shown do not exist.

36. B. The `traceroute6` command is used for tracing IPv6 routes. The other commands do not exist.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. The `gunzip` command is used to uncompress files that have been compressed using gzip compression.

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. 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. D. Tape devices are found within `/dev/st*`, thereby making `st0` the first device.

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. 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. 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. 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. 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. 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. C. Executing the `configure` script from the current directory typically means prefacing the script name with `./`, as shown in the correct option.

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. 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. 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. A. The `uname` command displays information about the kernel, processor type, and other relevant components that might be helpful when compiling software.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. The `-q` option suppresses all warnings. The `-v` option is verbose, while `-L` displays the license. The `-r` option is recursive.

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. 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. A. The file `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. 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. 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. 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. 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. A. The lowest priority number wins for MX records, thereby making 0 the highest priority MX record for the domain.

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. 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. 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. 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. B. The `listen-on` directive sets the IP address or addresses on which the daemon will operate. The other directives are not valid.

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. A. The `dnssec-signzone` command is used to sign DNS zones when using DNSSEC. The other commands do not exist.

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. C. The correct format for a `CNAME` requires a trailing dot, which represents the only difference between answers C and D.

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. 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. 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. 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. C. TTL, or time to live, values are provided in seconds by default, thereby making 28,800 equal to eight hours.

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. C. TXT records are used to create resource records in support of SPF. MX is used for SMTP servers.

23. B. The mail exchanger is defined as Priority MX Hostname in the format shown.

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. 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. 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. A. The `rndc` command can be used for this purpose and, when given the `reload` subcommand, will reload the zones for the server.

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. D. POP3 servers do not have a specific type in DNS. The MX type indicates mail exchanger, or SMTP server.

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. A. The correct format is `named-checkzone <zone> <zonefile>`. No other options are required.

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. B. The `version none;` directive within a BIND configuration file tells BIND not to return version information. The other directives are not valid.

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. 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. A. The `pdns-server` package is available on Debian and `pdns` on Red Hat. Red Hat will require installation from EPEL.

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. B. The `<VirtualHost>` directive begins a stanza that facilitates serving websites using virtual servers. The other directives are not valid for Apache.

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. 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. 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. 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. C. The `ServerName` directive provides the hostname for the virtual server. The other directives are not used.

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. 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. 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. 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. 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. A. The `SSLCACertificateFile` directive enables specification of a single PEM file containing CA certificates for client authentication.

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. D. The `LoadModule` directive is used for this purpose and accepts the name of the module followed by its filename.

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. 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. 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. 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. 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. 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. B. Squid listens on port 3128 by default. The other ports listed are valid but are not the default port for Squid.

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. 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. 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. C. The `AccessFileName` directive can be used to set the access filename to something other than `.htaccess`.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. C. The `[global]` section of the Samba configuration file enables setting of the log file. The other sections shown are not valid.

24. C. The `testparm` command can be used to verify the syntax within Samba configuration files. The other commands shown are not valid.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. D. The `nmblookup` command can be used to test NetBIOS-related services on a network.

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. 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. A. The `subnet` keyword is used for this purpose as well as a `netmask` parameter. The `netmask` shown will provide 126 usable addresses.

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. 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. 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. D. The `ldapadd` command is used to add entries into the OpenLDAP database.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. The `pam_cracklib.so` module enforces password strength options. The other files listed are not valid PAM modules.

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. 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. C. The `routers` 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. C. The `slapcat` command dumps the slapd database in LDIF format. The other commands are not valid.

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. C. The `slapindex` command generates indexes based on slapd databases. The other commands are not valid.

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. 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. 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`. The other commands are not valid.

29. B. The `changetype add` creates a new entry in the LDAP database. The other `changetypes` are not valid.

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. 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. 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. 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. B. The filter `(objectClass=*)` is used when there is no filter provided for `ldapsearch`. The other filters shown are not valid with `ldapsearch`.

35. A. The `pam_sss.so` module is used for integration of SSSD into the PAM authentication system. The other modules are not valid.

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 `sssd.conf`.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. The `keep` action causes the message to be preserved in the mailbox. The other verbs shown are not valid Sieve actions.

13. D. The `postcat` command shows the contents of a message from the Postfix queue. The other commands shown are not valid.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. A. The `process_limit` option specifies the maximum login processes for a Dovecot server. The parameter is set on a per-service basis.

34. D. The `:domain` keyword matches on just the domain portion of an address in Sieve. The other keywords shown are not valid.

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

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. 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. 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. 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 `smtptest` command, and specifying the port by name or not specifying the port will not work.

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. 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. 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. 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. 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. D. The `/etc/fail2ban` directory contains configuration files related to fail2ban. The other directories shown are not valid.

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. 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. 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. 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. B. OpenVPN listens on UDP port 1194 by default. The other combinations are not the valid OpenVPN configuration.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. D. The `listen_ipv6` directive is used to indicate that IPv6 will be enabled for `vsftpd`. The other directives shown are not valid.

32. C. The `PubkeyAuthentication` directive determines whether key-based authentication can be used with the server. The other directives shown are not valid.

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. 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. 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. 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. 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. 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. 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. 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. B. The SIGTERM signal is the default signal sent with the `systemctl kill` command.

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. 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. 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. 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. 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 eth0 name.

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. 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. A. The `udevd` service is called `systemd-udevd.service` within a `systemd` environment.

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. 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. 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. 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. 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. 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. 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. A. The `-y` or `--assumeyes` 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. 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. 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. 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. 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. 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. 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. A. The Master Boot Record (MBR) is the typical location for the bootloader to be stored on a BIOS-based system.

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. A. The `--output` option configures the location for output of the command instead of STDOUT.

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. 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. 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. 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. 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. 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. C. The `HISTFILESIZE` option configures the number of commands to keep in the history file. The other variables are not valid within Bash.

37. D. The `-b` option configures the body numbering format for `nl`, 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 `nl` command, and the `-n` option configures the numbering format and would require an additional argument in order to be valid.

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. 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. 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 Nth line within the file.

41. C. The `-i` option causes the unique test to be done while ignoring the case of the element to be matched.

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. 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. 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. 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. B. The `ps -e` command is used to display all processes, while the `-o` option configures the columns to display.

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

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

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

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

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

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

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. The syntax at a minimum sees the `UPDATE` keyword, followed by the table name, and then followed by the `SET` keyword.

12. A. The command shown launches speech output for Orca. The other commands contain options that are invalid and thus will not work.

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. B. The `kbdrate` command is used for the purpose described and can help with accessibility. The other commands shown are not valid.

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. A. The `DISPLAY` variable controls the destination and screen for displaying GUI applications. Setting this variable facilitates forwarding of X applications over ssh.

17. D. The `xwininfo` command is used to gather information about windows. The other commands shown are not valid.

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. 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. 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. 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. B. The current at jobs for all users are shown when `atq` is executed as superuser.

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. 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. 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. 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. B. `Timezone` information is found within the `/usr/share/zoneinfo` hierarchy. The other directories listed do not typically exist by default.

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. 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. 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. 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. 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. A. The `-o` option, followed by either `1` or `2`, enables `ntpdate` compatibility with older NTP servers. The default, when no `-o` option is specified, is version 3. The `-v` option tells `ntpdate` to be verbose, while the `-e` option sets the authentication timeout.

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. 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. 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. 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. 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. 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. C. The `lpr` 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. 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. A. The `/etc/hosts` file will be examined first, and then a DNS query will be sent based on the configuration shown.

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. 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. 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. 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. B. The `-6` option causes `dig` to use IPv6 for communication.

48. B. The current limit is six domains and 256 total characters for the search option in `/etc/resolv.conf`.

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. 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. 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. 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. 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. 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. B. The `mailto` configuration option sets the destination for e-mails related to `sudo`. The other options listed are not valid for `sudo`.

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. 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. 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. 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. 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. 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. A. The `--assemble` option starts an array that has been previously stopped. The other options are not valid.

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

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

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

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

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. B. The `-p` option shows the parameters for a given module. The other options are not valid for the `modinfo` command.

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. 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. 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. 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. D. The `blkid` command displays the UUID and other relevant information for appropriate devices. The other commands shown are not valid.

37. C. LUKS encryption is the default mode for the `dm-crypt` command. Other modes include plain, loopaes, and tcrypt.

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. 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. 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. 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. 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. A. The `-s` option sets the snapshot length, or snaplen, 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. 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. 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. D. There is no port for ICMP. The protocol itself does not use ports.

47. D. The `emergency` target can be used in situations where rescue mode cannot recover the system. The other targets are not valid.

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. 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. A. The `traceroute` 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. 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. 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. 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. 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. B. The `--no-wall` option suppresses the warning from being sent to logged-in users. The other options are not valid.

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. C. The `tinyconfig` target provides the smallest possible kernel config. The other targets are not valid for the kernel.

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. 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. 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. 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. 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. 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. B. The class of record for most BIND zones is IN, meaning an Internet class. The other options are not valid classes.

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. 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. 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. 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. 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. A. The `-D` option dumps the zone file in canonical format. The other options are not valid for this purpose.

11. B. The `-t` option, followed by the directory, tells `named-checkconf` to read included files relative to the specified directory.

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. 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. 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. 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. 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. 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. C. The format is `GroupName: name1 name2 name3`, thereby making option C the correct answer.

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. 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. 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. 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. A. The `force-election` message type, sent to `nmbd`, forces a browse master election. The other message types are not valid with `smbcontrol`.

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. 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. 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. 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. 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. 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. B. If a user already exists when `smbpasswd` receives the `-a` option, the user's password is simply changed to the new password.

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. 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. 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. 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. 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. 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. C. The `[sssd]` section defines general parameters for use with the SSSD system. Sections are noted with brackets, as in the answer shown.

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. 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. B. The `modify` changetype specifies that an entry will be changed. The other changetypes are not valid.

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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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`.

Index

A

abuse accounts for email, 92
AccelerationProfile option, 67
access control lists (ACLs) in Squid, 194, 196
access_log file, 196
AccessFileName directive, 196–197
accessibility
  AccessX options, 71
  Ubuntu, 246
AccessX utility, 71
accounts
  expiration, 76, 115
  information on, 111
  locking, 117
  unlocking, 252
acl configuration directive, 194
ACLs (access control lists) in Squid, 194, 196
Active Directory security, 272
@admins option, 271
ads mode for net command, 271
advertisements, node limits on, 211
alerts monitoring, 123
alias command, 55, 244
Alias directive, 198
aliased commands, removing, 57
aliases
  commands, 244
  email, 88, 247
:all address-part structure, 275
ALL: option in /etc/hosts.deny, 113
allnoconfig make target, 260
Allow directive in CUPS printing system, 89
allow-guest option, 66
allow-query directive, 185
allow-recursion option, 189
AllowTcpForwarding directive, 229
AllowUsers directive, 276
Alt+Ctrl+F1 keys in LightDM, 70
Alt+Super+S keys for screen readers, 69
altered files, checking for, 19
ampersands (&) for conditional execution, 56
anacron command, 77, 81
anonymous uploads in Pure FTPd, 226
ANY query type, 187
AOE (ATA over Ethernet) commands, 160
Apache
  access filenames, 196–197
  authentication directives, 193, 195, 197
  AuthGroupFile, 270
  authorization, 196–197
  CA certificates, 194
  child server processes, 198
  cryptographic ciphers, 270
  document directories, 195
  file display, 195
  log files, 36, 196, 198
  module enabling, 195
  process IDs, 33
  server status, 197
  service time logs, 197
  SSL configuration, 194
  SSL private keys, 196, 270
  TraceEnable, 197
  version, 194
  version information, 269
  <VirtualHost> directive, 193
  web server log file format sequence, 270
Apache2 server configuration files, 270
apachectl configtest command, 193
apachectl status command, 197
Appearance section in GNOME, 68
applications forwarding, 228
apt-cache dump command, 235
apt-get update command, 20
apt-get upgrade command, 17
apt-style system caches, 236
aptitude tools, 21
architecture, printing information on, 30
archives, 177, 179
ARP
  disabling, 171
  entry format, 262
arp -d command, 168
arp -s command, 169, 262
ARRAY command, 59
assistive technologies
  bounce keys, 70
  Emacspeak program, 72
  on-screen keyboards, 70
asterisks (*)
  case statements, 61
  hosts, 202
  moving files, 37
  regular expressions, 35
at command, 77–78
at symbols (@) in dig command, 268–269
ATA over Ethernet (AOE) commands, 160
atq command, 78, 247
atrm command, 79

authentication
Apache directives, 197
Dovecot server, 220, 222
external files, 214
Kerberos, 201
keys, 117, 228
LDAP, 211
OpenSSH, 230
PAM modules, 210
pop-up windows, 195
rndc, 190
SSH, 112, 227
vsftpd.conf, 230
AuthGroupFile directive, 197, 270
AuthName directive, 195
authorization
Apache, 196–197
external files, 214
authorized_keys file, 112, 228
AuthUserFile directive, 193
auto interfaces, 101
autofs automounter, 151
autologin-user option, 70–71
automatic logins in LightDM, 70–71
available character sets, displaying, 77
awk command, 238

B

B key for kernel options, 9
%b sequence for HTTP headers, 270
background tasks, displaying, 36
backups
configuration files, 259
mail files, 264
patch command, 264
tape destination, 178
transferred files, 258
Bacula Director configuration files, 182
bad blocks
checking for, 241
displaying, 49, 152
bandwidth in Pure-FTPd, 276
Banner option, 257
baseurl option, 235
Bash
command history, 35, 37, 241
command-line parameters, 55
conditionals, 55, 57, 244
configuration files, 55
environment settings, 30, 61, 237
file commands, 54
functions, 245
initialization files, 59
output redirects, 30, 34–35
sourcing files, 57
.bash_history file, 237
.bash_login file, 55
.bash_profile file, 55, 59
.bashrc file, 237
Basic authentication, 195
bcfg command, 145
bcrypt encryption, 269
/bin/false shell, 78
BIND
allow-query directive, 185
chroot environment, 269
configuration files, 185, 187
forward only directive, 187
forwarders, 269
home directory, 186
IP addresses, 186, 269
mount, 188–189
name servers, 186
recursive lookups, 189
reloading, 185
server restarts, 190
version, 190
zone transfers, 189
zones, 186, 188, 268
BIOS
drive detection, 233
first disk identification, 10
hard disks not detected, 8
blackhole option, 187
blacklist information in modules, 136
blank modes in xorg.conf, 69
BlankTime option, 69
blkid command, 48, 152, 261
blocks
bad, 49, 241
displaying, 123
size, 154, 178
/boot partition
/dev/sda1, 143
extlinux, 143
size, 20
/boot/efi partition, 10, 145
boot process
boot images, 237, 261
configuration, 145
GUIs, 65
messages, 9
order, 50, 143
partitions, 236
rescue mode, 260
root partition mounting, 10
bootloaders
CD-ROMs, 144
GRUB, 261
grubx64.efi, 147
MBRs, 236
UEFI, 144
bounce keys, 70
Braille display, 67
broadcast messages, 179
browsable option in Samba, 204
browse master election, 271
btrfs filesystem
copy-on-write feature, 152
subvolumes, 155–156
btrfs subvolume create command, 155
btrfs subvolume snapshot command, 156
bypassing routing tables, 263
bzImage compression, 133
bzip2 -c command, 182
bzip2 compression, 133

C

CA certificates, 194
caches
directories, 235
hosts, 115

libraries, 16, 235
location, 234
LVM, 256, 263
packages, 20–21
yum and apt-style, 236
Cacti tools, 124
case statements
default case, 61
ending, 60
cat command, 32
cat /etc/passwd file, 31
cat /proc/interrupts command, 5
cd ~ command, 236
CD-ROMs, bootloader for, 144
Certificate Signing Requests (CSRs), 195
certificates
certificate authorities, 271
TLS configuration, 217
chage -d command, 81
chage -E command, 76, 115
chage -l command, 111
change dates for passwords, 81
changetype add command, 213
character maps, 248
character multibyte representation, 78
character sets, 77
chgrp command, 48
chgrp -R command, 50
chgrp users command, 43
child server processes in Apache, 198
chkconfig --list command
boot files, 144–145
services and runlevels, 10
systemd equivalent, 234
chmod command
permissions, 57
sticky bits, 45
chown command, 241
chown -R command, 47
chroot environment
BIND, 188–189
home directory, 186
named-checkconf, 269
CIDR notation for subnet masks, 101, 103
cifs filesystems, 202
clean target, 133, 178
clearing iptables rules, 276
clients option for node limits, 211
clock
setting, 91–92
working with, 89
CNAME records, 187
ColorDepth option, 72
columns in tables, 55
command-line parameters in Bash, 55
commands
aliases, 244
exclamation points, 37
executed at logout, 54
history, 35, 237
information on, 44
piping and redirection, 59
reading and executing, 54
scheduling, 77, 80
scripts, 57
comments, 117
communication, monitoring, 233
compiled code location, 257
completed print jobs, displaying, 92–93
compression
bzip2, 133
log files, 94
source code, 174
computers, turning off, 180
conditional execution, 56–57
configuration files
Apache2 server, 270
autofs automounter, 151
backups, 259
Bacula Director, 182
BIND, 185, 187
CUPS, 88
debugging, 211
Dovecot, 274
Exim 4, 222
fail2ban, 227
FCoE, 164
greeters, 65
iscsid daemon, 162
ISOLINUX, 145
LightDM, 71, 246
log files, 91
modprobe command, 232
network interface, 173
OpenLDAP, 213
OpenSSH, 225
order, 55
overriding, 144
PAM modules, 209, 274
PHP, 195
Postfix, 217
priority, 144
Procmail, 217
RAID devices, 159
reloading, 9
Samba, 201, 204
Sendmail, 220
SSL, 271
sssd, 212
syslog-ng, 94
updating, 16
verifying, 193
vsftpd, 225
./configure command, 180
configure script
description, 178
--help option, 182
connections for USB, 11–12
connectivity tests
networks, 170
SMTP, 226
:contains keyword, 221
conversations in SMTP, 221
copy-on-write filesystems, 152
copying
directories, 32
files, 77, 245
symlinks, 238
corrupted filesystems, 50
cp -i command, 32
cp -R command, 32
CPU
I/O wait time, 125
performance, 125
time information, 260
time limits, 113, 212
usage, 128

credentials
  files, 197
  htaccess scenarios, 193
  prompts, 117
  Samba, 272
cron jobs
  execution, 76
  removing, 247
  scheduling, 77
  system-wide files, 79
  users, 76, 78, 82, 247
  users denied to use, 81, 252
crontab -l command, 82
crontab -r command, 247
crontab -u command, 247
cryptographic ciphers, 270
cryptsetup command, 151
CSRs (Certificate Signing Requests), 195
CUPS printing system
  access control, 89
  completed print jobs, 92
  configuration files, 88
  ports, 91, 95
  restarting, 95
curly braces ({}) for variables, 61
currency-related localization, 83
current directory, printing, 37
current logins, 112, 123
current partitions, 9
custom log files, 94
cut command, 33

D

%D log format sequence, 197
databases
  hardware, 261, 265
  hosts, 103
  LDAP, 210, 213
  locate, 47
  OpenLDAP, 210
  sendmail changes, 94
  slapcat, 213
  sorting, 57
date command, 61
date -s command, 95
date -u command, 249
date +%s command, 77
dates
  environment variable, 78
  expiring accounts, 113
  logged-in users, 253
  obtaining, 61
  password change, 115
  seconds format, 77
  settings, 89, 95
  UTC, 249
:days keyword for vacation replies, 219
dbcheck command, 204
dbus-monitor command, 233
dd command, 32, 236–237
dd bsl= command, 178
dd if= command, 258
ddns-update-style option, 209
deactivating swap space, 155
deb-pkg option, 134
deb-src prefix, 234
debugfs -c command, 50
debugfs -w command, 153
debugging
  configuration files, 211
  enabling, 172–173
  slapd levels, 211
declaring read-only variables, 61
decompressing files, 36
default-lease-time option, 273
default.target unit, 147
default=0 option, 18
defaults
  case statements, 61
  CUPS ports, 91
  delimiters, 33
  DHCP gateways, 212
  dual-boot partitions, 18
  /etc/fstab, 154
  gateways, 100, 104
  mt, 259
  operating systems, 19, 22
  process priority, 35
  routes, 100
  runlevels, 147
  shell prompt, 54
  targets, 11
  virtual host directory, 195
delay rate for keyboards, 246
delays in ping requests, 259
DELETE FROM statement, 55
deleting. *See* removing
delimiters, 33
deny-by-default policy, 247
deny unknown-clients line, 214
dependencies
  checking, 178
  downloading, 23
  libraries, 20
  modules, 5, 8, 134–135, 137
  packages, 18, 235
deplist option, 18
depmod command, 134
depositories in yum, 19
DESC command, 55
/dev/disk/by-id directory, 159
/dev/disk/by-path file, 160
/dev/fd0 device, 5
/dev/mapper directory, 162
/dev/nst0 device, 264
/dev/nvme*, 160
/dev/sda1 disks, 23, 143
/dev/sdX identifier, 5
/dev/st0 device, 179
DEVICE configuration line, 159
devices
  boot order, 50
  displaying, 7
  filters, 164
  IP addresses, 104
  UUIDs, 261
df command, 124
df -BT command, 240
df -i command, 43
DHCP
  address requests, 214
  domain suffix search order, 210
  failover, 212
  leases, 211–212
  messages, 211
  OpenVPN, 230
  ports, 210, 212

reservations, 209, 273
subnets, 209
system log, 172
dhcpd.conf file
dynamic DNS updates, 209
IP addresses, 273
leases, 211–212, 273
DHCPDISCOVER message, 211
dig command
axfr type, 186
mail servers, 101
per-user default settings, 188
server queries, 102
server setting, 268–269
dig -6 command, 251
dig soa command, 105
.digrc file, 188
directories
aliases, 198
caches, 235
copying, 32
creating, 32
finding, 31
large files, 46
mounted, 272
open instances, 253
printing, 37
removing, 31
Disable option for modules, 66
disable option for services, 113
disabling
ARP, 171
booting into GUIs, 65
file display, 195
name resolution, 251
services, 117
discard action in Sieve, 220
discard keyword, 219
discovery mode in iscsiadm, 256
disks and disk drives
bootloaders, 236
content, 50
detecting, 233
error checking, 143
journal log space, 90
not detected, 8
power mode, 259
preparation order, 43
user usage, 123
utilization, 124
writing data to, 153
display, information on, 67
DISPLAY environment variable, 65, 246
Display Power Management Signaling (DPMS), 72
djbdns prerequisites, 187
dkms (Dynamic Kernel Module Support), 133
dm-crypt command, 261
dm-crypt volumes, 151
dmesg command
description, 6
kernel ring buffer, 137
USB disks, 11
dmesg -c command, 173
dmesg -D command, 257
dmesg -e command, 232
DNS
dynamic updates, 209
names display, 257
overriding lookups, 106
POP3 server records, 189
server address, 103
SOA records, 268
SPF queries, 106
DNS zones
reloading, 189
signing, 186
dnssec-keygen command, 190
dnssec-keygen -a command, 185
dnssec-keygen -b command, 268
dnssec-signzone command, 186
do keyword, 61
documentation
accessing, 30
kernel, 135
levels, 35
DocumentRoot directive, 195
domain names
servers, 102
Sieve, 222
domain security level, 272
domains, non-existent, 106
done keyword, 61
DontZoom option, 68
dots (.)
regular expressions, 35
source command equivalence, 244
doveadm auth command, 220
doveadm pw command, 275
doveadm who command, 218
doveconf command, 219
Dovecot
authentication, 220, 222
configuration files, 274
passwords, 275
ports, 221–222
downloading
dependencies, 23
RPM packages, 18
dpkg -i command, 23
dpkg -P command, 234
dpkg-reconfigure command, 21, 82
dpkg -s command, 22
DPMS (Display Power Management Signaling), 72
dracut command, 136
drift file location, 90, 249
driftfile option, 90
drivers
filesystems, 147
kernel, 135, 260
loading, 142
lsmod command, 12
NVMe, 161
PCI devices, 233
drives. *See* disks and disk drives
DROP targets for iptables, 228
du command, 46
du -sh command, 241
dual-boot systems, 18
dump file size, 155
dumpe2fs -b command, 49, 152
dynamic DNS updates, 209
Dynamic Kernel Module Support (dkms), 133

E

e key in GRUB, 146
E key in kernel options, 9
e test for file existence, 58
e2image command, 240
echo command
  packet control, 277
  packet forwarding, 229
  variable contents, 56
ECHO_REQUEST packets, 170
EFI
  bootloader, 145
  system partitions, 10
EFI System Partition (ESP), 142
efibootmgr -n command, 143
egrep commands, 35
EHLO command, 221
elif keyword, 57
elsif keyword, 221
Emacspeak program, 72
email
  abuse accounts, 92
  aliases, 88, 247
  authentication, 220
  backups, 264
  configuration files, 217
  contents, 218
  deleting, 218–219
  delivery errors, 220
  destinations, 252
  displaying, 219
  /etc/aliases file, 90, 217–218
  forwarding, 219
  message overview, 219
  paths, 221
  queues, 217–219
  relay networks, 220
  retaining, 218
  sending, 245
  Sieve addresses, 275
  vacation replies, 219
emergency target, 263
empty passwords in OpenSSH, 227
enabling
  debugging, 172–173
  IPv6 addresses, 229
  quotas, 50
encryption
  LUKS, 261
  passwords, 269
ending processes, 34
env command, 30
env -u command, 54
environment settings, 30
environment variables
  date and time formats, 78
  inactivity logouts, 60
  newly spawned windows, 65
  removing, 54
  settings, 18, 237
equality, testing variables for, 244
esac statements, 60
ESP (EFI System Partition), 142
/etc/access database, 94
/etc/aliases file
  abuse accounts, 92
  email, 90, 217
  rebuilding, 218
/etc/anacrontab file, 81
/etc/apt/sources.list file, 20, 234
/etc/auto.master file, 151
/etc/bacula/bacula-dir.conf file, 182
/etc/bash.bash_logout file, 54
/etc/cron.allow file, 76, 252
/etc/cron.daily directory, 80
/etc/cron.deny file, 81
/etc/crontab file, 79
/etc/cups directory, 88
/etc/default/grub file
  default operating systems, 19, 22
  failed boot behavior, 241
  settings, 18
/etc directory, 259
/etc/dovecot directory, 274
/etc/exim/exim4.conf file, 222
/etc/exports file, 201, 204–205
/etc/fcoe directory, 164
/etc/fstab file
  defaults, 154
  device order, 50
  filesystem formats, 154
  filesystem information, 46
  format, 48
  NFS filesystems, 203
/etc/gshadow file, 83
/etc/hostname file, 173
/etc/hosts file
  configuration lines, 104
  hostnames, 172
  IP addresses, 252
  lookup order, 250
  overriding DNS lookups, 106
/etc/hosts.allow file
  deny-by-default policy, 247
  wildcards, 173
/etc/hosts.deny file, 113
  deny-by-default policy, 247
  TCP Wrappers, 244
/etc/hotplug/usb directory, 5
/etc/inetd.conf file, 117
/etc/init.d directory
  runlevels, 147
  startup and shutdown scripts, 6, 144
/etc/inittab file
  changes, 7
  runlevels, 118, 142, 147
/etc/issue file, 179
/etc/issue.net file, 180
/etc/lib directory, 20
/etc/lightdm directory, 246
/etc/lightdm/lightdm.conf.d directory, 71
/etc/lightdm/lightdm.conf file, 65
/etc/localtime file, 76
/etc/login.defs file, 79
/etc/logrotate.conf file, 90
/etc/logrotate.d directory, 91
/etc/lvm/.cache file, 263
/etc/mdadm.conf file, 159, 163
/etc/modprobe.d directory
  blacklist information, 136
  configuration information, 232
/etc/motd file, 179

/etc/mtab file
  filesystem information, 46
  mount command, 155
  mounted filesystems, 151, 240
/etc/network directory, 172
/etc/nologin file, 111, 210
/etc/nsswitch.conf file
  authentication, 211
  group membership information, 273
  host name lookup, 250
  local files, 102
  users, 79
/etc/ntp.conf file, 90, 249
/etc/pam.d directory, 209
/etc/passwd file
  chroot user, 186
  directories listing, 31
  user information, 76, 238
/etc/pki directory, 271
/etc/postfix directory, 217
/etc/rc.d directory
  links, 118
  runlevels, 147
/etc/resolv.conf file
  debugging setting, 172–173
  DNS servers, 103
  search option, 105
/etc/samba directory, 201
/etc/security/limits.conf file, 112, 115
/etc/sendmail.cf file, 220
/etc/services file
  port-number-to-name translation, 277
  ports, 103
/etc/shadow file
  information in, 81
  password change date, 115
/etc/skel directory, 58, 77, 245
/etc/ssh_known_hosts file, 115
/etc/ssh/sshd_config file, 225, 257
/etc/sshd_config file, 116
/etc/sudoers file
  editing, 114
  email destinations, 252
  groups, 116
  password prompts, 113
/etc/sysconfig/network-scripts directory, 173
/etc/sysctl.conf file, 137
/etc/syslog-ng/syslog-ng.conf file, 94
/etc/systemd/system directory, 142
/etc/udev directory, 5
/etc/udev/hwdb.bin file, 265
/etc/udev/rules.d directory, 135
/etc/updatedb.conf file, 44
/etc/X11/xorg.conf file, 65
/etc/xinetd.d directory, 113
/etc/yum.conf file
  changes, 22
  kernel updates, 22
  package changes, 235
/etc/yum.repos.d directory, 19, 235
events in udev, 134
exclamation points (!) for commands, 37
exclude option, 22, 235
exec command, 56
ExecStart option, 11
executables location, 43
executing commands, 54
Exim 4 configuration files, 222
existence of files, 58, 61
expiration
  accounts, 76, 115
  passwords, 246–247
export command, 18, 237, 244
export DISPLAY command, 71
export lists for NFS servers, 203
exportfs -ra command, 204–205
exportfs -ua command, 206
exporting
  filesystems, 204–205
  variables, 18, 237, 244
ext2 filesystem, 44
ext3 filesystem, 44
ext4 filesystem, 264
external files security, 214
extlinux --install command, 143

F

fail2ban system
  configuration files, 227
  log files, 230
FAT filesystems
  ESP, 142
  formatting, 156
  SYSLINUX bootloader, 142
FCoE (Fibre Channel over Ethernet), 164
fdisk command, 43
fg command, 33
FHS (Filesystem Hierarchy Standard) source code, 178
fi construct, 55
Fibre Channel, 162
Fibre Channel over Ethernet (FCoE), 164
file command, 32
fileinto keyword, 217
files
  boot images, 261
  copying, 77, 245
  creating, 50
  decompressing, 36
  existence, 58, 61
  gpg, 118
  group ownership, 43
  hard links, 43
  inode numbers, 50
  listing, 31
  moving, 37
  open instances, 253
  opening, 170
  output to, 19
  overriding, 261
  overwriting, 32
  ownership, 83, 241, 263
  patched backups, 181
  permissions, 47
  removing, 179, 234
  runlevels, 144–145
  searching for, 36, 111, 118, 239
  searching for contents, 239
  size, 126

sorting, 37
sticky bits, 45
timestamp, 31
types, 32
uncompressing, 178, 180
user information, 76
Filesystem Hierarchy Standard (FHS) source code, 178
filesystems
checking, 49
copy-on-write, 152
corrupted, 50
creating, 48, 151
drivers, 147
errors, 155
/etc/fstab, 154
exporting, 204–205
formatting, 156
information on, 46
ISO, 151
journals, 44, 156
location, 155
mounted, 151
mounting, 45, 49
quotas, 50
read-only, 46, 152, 156
read-write mode, 153
shared, 201
times mounted, 45
unmounting, 240
unused blocks, 153, 160
filters
devices, 164
ldapsearch, 214
traffic, 123
find command
directories, 31
file ownership, 83
files, 36, 111, 118, 239
find -gid command, 248
find -inum command, 50
find -L command, 241
find -type command, 36
finding
directories, 31
group IDs, 248
open ports, 116
scripts, 80
fingerprints, host key, 253
firewalls
IPv6 rules, 230
LDAP traffic, 250
NTP traffic, 253
ports, 100
SMTP traffic, 94
SNMP traffic, 102
first disk, identifying, 10
flash USB disks, removing, 10
flood pings, 170
floppy disk devices, 5
FontPath directive, 70
fonts
paths, 70
storage, 67
fonts.scale file definition, 72
for loops, 61
for VAR in construct, 58
foreground processing, 33
formats
dates and time, 77
log files, 198
passwords, 272
formatting
FAT filesystem, 156
swap partitions, 45
forward only directive, 187
forwarded packets, 128
forwarders directive, 269
forwarding
applications, 228
email, 219
packets, 229
ports, 116, 229, 277
X11, 116
ForwardX11 option, 70
free command, 33, 124
frequency options for monitors, 65
fsck command, 143
fsck -a command, 49
fsck -C command, 264
fsck -f command, 154
fsck option in /etc/fstab, 50
fsck -r command, 146, 240, 260
fsck -y command, 43
fstrim command, 160, 262
functions
Bash, 245
in .bash_profile, 59
scripts, 57
fuser command, 111

G

gateways
default, 100, 104
DHCP, 212
gdisk c command, 49
gdmsetup program, 68
geometry, XFS filesystem, 152
gestures, mouse, 69
getent command, 79, 103
getent aliases command, 247
gethostname function, 172
GIDs, UIDs relationship, 82
[global] section for Samba, 204
Gnome
high-contrast theme, 68
on-screen keyboard, 68
screen readers, 66, 69
sticky keys, 66
GnuPG key pairs, 116
GOK
Menus option, 71
mouse keys, 69
gok command, 68
gpg
migrated files, 118
public keyrings, 118
gpg --gen-key command, 116
gpg send-key command, 114
.gpg-v21-migrated file, 118
graphics cards, 65
greater than signs (>) for redirecting output, 34–35
greeter-show-manual-login option, 68
greeters, 65
grep -i command, 172
grep -r command, 239
group: files ldap option, 102
group IDs, 79, 248
group ownership
changing, 50
files, 43

groupdel command, 83, 250
groupmod command, 78
groupmod -n command, 248
groups
  Apache authorization, 197
  AuthGroupFile, 270
  deleting, 83, 250
  displaying, 83
  /etc/sudoers, 116
  membership information, 273
  multicast group membership, 257
  passwords, 83
  permissions, 48
  printing, 94
  renaming, 78, 248
  users, 82
  Windows-to-Linux mappings, 205
GRUB bootloader
  displaying, 6
  images, 146
  installing, 21, 261
  MBR, 143
  parameters, 146
  root partitions, 8
  single-user mode, 6
GRUB 2 bootloader, 19
GRUB_DEFAULT option, 19, 22
grub-install command, 21, 143, 261
grub-install --boot-directory command, 146, 237
grub-mkconfig command, 22
grub-mkconfig -o command, 19
GRUB_RECORDFAIL_TIMEOUT option, 241
grub2-mkconfig command, 236
grubx64.efi bootloader, 147
gt operator in Sieve, 274
guest logins in LightDM, 66
GUI applications, 246
gunzip command, 178
gzip -q command, 182
.gz files, 178

H

halt command, 11
hard disks. *See* disks and disk drives
hard links, 43
hardware clock
  setting, 91–92
  working with, 89
hardware database
  udev, 265
  updating, 261
hardware ethernet directive, 209
hardware querying, 66
hdparm command, 161
hdparm -C command, 259
hdparm -g command, 264
head command, 31
head -n command, 34
hidden files, listing, 31
Hint zone type, 189
HISTFILESIZE option, 237, 241
history command, 35, 237
HISTSIZE option, 241
hmac-md5 algorithm, 190
home directory
  changing, 236
  chroot user, 186
  creating, 80
  preserving, 248
  root users, 17
host -a command, 187
host -C command, 251
host key fingerprints, 253
host -t ns command, 100
hostname command
  domain names, 102
  gethostname function, 172
hostnames
  displaying, 256–257
  IP addresses, 252
  Pure FTPd, 225
  setting, 173
  valid characters, 172
hosts
  blocking, 244
  caches, 115
  database enumeration, 103
  displaying, 272
  MAC addresses, 209
  mounting, 202
  name lookup, 250
  non-existent, 106
  unreachable, 258
hotplug devices
  scripts, 5
  USB, 10
htaccess credentials, 193
.htaccess file
  changing name of, 196–197
  Require directive, 198
htop command
  open files, 126
  processes, 125
htop -d command, 128
htop -p command, 124
htpasswd command, 193
htpasswd -B command, 269
htpasswd -c command, 197
HTTP
  headers, 270
  ports, 276
  status code in TraceEnable, 197
http_access directive, 196
http_port directive, 270
httpd.conf file, 270
hwclock command, 89
hwclock --systohc --utc command, 92
hwclock -w command, 91

I

ICMP
  blocked traffic, 107
  iptables rules, 229
  IPv6 requests, 171
  packet generation, 101
  ports, 104
  traceroute requests, 172
iconv --list command, 77
id command, 83
id_rsa file, 114
IDE device parameters, 161
Identifier option, 72

if statement
  fi construct, 55
  Sieve, 275
ifconfig command
  IP addresses, 104
  IPv6 addresses, 106
  MAC addresses, 168
  network interfaces, 251
ifconfig -a command, 100
ifconfig -arp command, 171
ifconfig mtu command, 169
ifup -a command, 101
ifup --ignore-errors command, 252
IgnoreIfMissing option, 273
images
  creating, 240
  GRUB, 146
  location, 237
  partitions, 32
  writing, 236–237
IMAP ports, 222
IMAPS ports, 222
indexes
  slapcat databases, 213
  valid, 194
INET family, 168
inet_listener directive, 221
inetOrgPerson objectClass, 274
info severity level, 89
informational messages, 89
init command
  process IDs, 232
  rebooting, 6
init scripts management, 146
initctl reload command, 9
initdefault runlevel, 147
initialization files, skipping, 59
initializing partitions, 20–21
initramfs filesystem, 147
initrd command, 142
inner joins, 58
inode numbers, 50
inodes usage, 43
INPUT chains
  blocking traffic, 229
  host connections, 229
  ICMP traffic, 229
  policies, 227
INSERT INTO statement, 59
insert mode in vi editor, 35
insmod command, 135
install make target, 181
install option in yum, 17
installing
  GRUB, 21, 261
  modules, 134–135
  packages, 17, 21, 23
  PowerDNS authoritative nameserver, 190
interactive mode for NTP servers, 90
interfaces
  auto, 101
  configuration files, 173
  information on, 100, 171, 251
  tcpdump, 170
interpreter location, 54
iostat command, 126
iostat -m command, 127
iostat -p command, 123
iotop command, 123
IP addresses
  ARP tables, 169
  BIND, 186, 269
  devices, 104
  host names, 252
  IPv4 vs. IPv6, 104
  name-based virtual hosting, 194
  open ports, 111
  private, 100, 107, 258
  reserved, 273
ip command, 168
ip -6 addr command, 171
ip monitor command, 102
ip -o command, 169
ip -r command, 257
ip route change command, 106
ip route change default command, 104
ip route flush cache command, 106
ip6tables command, 230
ip6tables-save command, 227
iptables
  DROP and REJECT targets, 228
  IPv6, 227
  log limits, 228
  LOG target, 277
  port redirects, 225, 276
iptables -nL command, 226
iptables -P command, 227
iptables rules
  blocking traffic, 229
  clearing, 276
  host connections, 229
  ICMP traffic, 229
  listing, 226
  saving, 225
iptables-save command, 225
iptraf tool, 123, 125
IPv6 addresses
  dig, 251
  enabling, 229
  firewall rules, 230
  ICMP requests, 171
  information on, 171
  vs. IPv4, 104
  localhosts, 101
  ping command, 105
  route traces, 173
  traceroute command, 102
IPv6 iptables, 227
IRQ assignments, 5
iSCSI
  administering, 159
  targets, 161, 256
iscsiadm command
  description, 159
  discovery mode, 256
  ping request delays, 259
iscsid.conf file, 162
iscsid daemon
  configuration files, 162
  targets, 161
ISO filesystem, 151
ISOLINUX bootloader
  CD-ROMs, 144
  configuration files, 145
isolinux.cfg file, 145
iw dev command, 168
iwconfig command, 168
iwlist scan command, 169
iwlist txpower command, 262

J

jail configuration, 230
jobs
  cron. *See* cron jobs
  deleting, 79
  executing, 76
  information, 81
  scheduled, 78
jobs command, 36
joins, inner, 58
journalctl command
  disk space used, 90
  log files, 88, 248
journalctl -f command, 92
journalctl -r command, 262
journald.conf file, 93
journals
  disk space used, 90
  displaying, 173
  filesystems, 44, 156
  systemd, 249

K

kbdrate command, 246
keep action for mailboxes, 218
Kerberos authentication, 201
kern facility, 88
kernel
  Braille display, 67
  dkms, 133
  documentation, 135
  drivers, 135, 260
  final configuration location, 133
  information on, 137
  loaded modules, 8
  messages, 88
  minimal configuration, 265
  options, 9
  parameters, 164
  printing information on, 30
  SAN modules, 44
  source code compression, 174
  source directory, 132
  symbols, 137
  unzipping, 132
  updates, 22
  upgrades, 132
  version, 22, 135, 180
kernel ring buffer
  messages, 137
  viewing, 6
key pairs
  GnuPG, 116
  ssh, 225
keyboard models, configuring, 67
keyboards
  delay and repeat rate, 246
  on-screen, 68, 70
keys
  algorithms, 185
  authentication, 117, 228
  OpenSSH, 230
  PBKDF2, 154
  RSA, 117
  size, 268
  SSH, 227
  SSL, 193
  TLS configuration, 217
kill command, 185
kill -9 command, 34
kill -HUP command, 35
killall command, 37
killing processes, 37, 232, 234
klogd -f command, 91
kmag program, 68

L

l key for htop, 126
LANG=C option, 80
large files, directories for, 46
last command, 117
last -f command, 112
layout options for servers, 72
LC_ALL variable, 80
LC_MONETARY variable, 83
LC_TIME variable, 78
LDAP
  databases, 213
  firewalls, 250
  mail attribute, 274
  server URIs, 214
LDAP Data Interchange Format (LDIF)
  changetype, 274
  creating, 212
  databases, 210
  ldapsearch with, 213
LDAP over SSL, 106, 214
ldap_uri option, 214
ldapadd command, 273
ldapadd -f command, 210
ldapmodify -n command, 214
ldapsearch command, 214
ldapsearch -L command, 213
ldconfig command, 16
ldconfig -C command, 234
ldconfig -p command, 235
ldd command, 20
LDIF. *See* LDAP Data Interchange Format (LDIF)
leading slash removal for paths, 177
leases in DHCP, 211–212, 273
less than signs (<) for STDIN messages, 250
/lib/systemd/system folder, 7
libraries
  caches, 235
  dependencies, 20
LightDM
  automatic logins, 70–71
  configuration files, 71, 246
  guest logins, 66
  reverting to terminals, 70
lightdm.conf file, 68
limits.conf file, 274
line numbers, prepending, 36
linear acceleration, 67
lines, numbering, 237
links
  /etc/rc.d/*, 118
  files, 43
  shared libraries, 16
  wireless devices, 168

list-unit-files command, 234
listen_ipv6 directive, 229
listen-on directive, 186
listening ports and sockets
  Dovecot, 221
  timing, 258
ln -s command, 44
ln -sf command, 81
load average
  determining, 34
  information on, 239
  performance, 128
  uptime command, 126
loaded modules
  displaying, 133, 136–137
  listing, 8
loaded services, 9
loading
  drivers, 142
  modules, 5
LoadModule line, 195
local_enable directive, 230
local# facility, 94
local files for group information, 102
local time, displaying, 232
local time zone, 76
locale -m command, 248
locale translations, bypassing, 80
locale variables, reconfiguring, 80
localhosts in IPv6, 101
localization, currency-related, 83
locate command, 47
locking accounts, 117
locking out logins, 80
locks, displaying, 204
log files
  compression, 94
  configuration files, 91
  custom, 94
  displaying, 88, 92
  entry limits, 228
  fail2ban, 230
  formats, 198
  mail option, 90
  messages, 91
  minus signs, 95
  monitoring, 36
  parsing, 248
  rotation, 93
  Samba, 204
  server requests, 196
  service time, 197
  shares, 206
  size, 93
  syslog, 95
  systemd-journald, 88
  zeroing, 156
--log-prefix option, 277
LOG target, 277
LogFormat directive, 198
logged-in users, displaying, 218, 253
logger command, 95
logical unit numbers (LUNs), 160
logical volume manager (LVM)
  caches, 256, 263
  logical volumes, 21, 163
  partitions, 20–21
  physical volumes, 159
  volume searches, 23
logical volumes
  available, 164
  creating, 21, 163
  displaying, 163
  information on, 162
  snapshots, 164
login environment, obtaining, 118
login window options, 68
logins
  alternate files, 112
  automatic, 70–71
  current, 112, 123
  guest, 66
  interactive, 78
  last command, 117
  limits, 212
  locking out, 80
  messages, 179–180
  preventing, 111, 210
  root users, 225
  simultaneous, 115
loglevels for packet information, 213
logouts
  commands executed at, 54
  for inactivity, 60
logpath directive, 230
logrotate configuration file, 94
logrotate -m command, 249
lpr command
  message capture, 250
  print queues, 91
lprm command, 249
lpstat -W completed command, 93
ls command, 9
ls -la command, 7
ls -latr command, 31
lsblk command, 236
lsmod command
  device drivers, 12
  loaded modules, 133, 136
lsmod --show-depends command, 8
lsof command, 111, 126
lsof +D command, 253
lsof -i command, 127, 228
lsof -u command, 170
lspci command, 164
lspci -k command
  options for, 260
  PCI devices, 135, 233
lspci -nn command, 7
lsusb command, 5
lsusb -t command, 12, 134
-lt operator for while loops, 58
LUKS
  encryption, 261
  key derivation, 154
LUNs (logical unit numbers), 160
lvchange -a command, 164
lvcreate command, 21, 163
lvcreate snapshot command, 164
LVM. *See* logical volume manager (LVM)
lvm.conf file, 164
lvmdiskscan command, 23

M

m4 sendmail.mc file, 220
MAC addresses
  ARP tables, 169
  changing, 168
  displaying, 233
  hosts, 209
  removing, 168
magnification functionality in kmag, 68
mail attribute in LDAP, 274
mail backups, 264
mail option for log files, 90
mail queues
  Postfix servers, 90, 92–93
  printing, 274–275
  printing information on, 91
  qmail servers, 89
mail -s command, 245
mail servers
  partitions, 16
  querying, 101
MAILADDR option, 163
mailboxes in Sieve, 217–219
mailers, specifying, 249
mailq command, 90, 218
mailq_path parameter, 221
mailstats command, 95
mailto setting, 252
make oldconfig command, 132
make targets
  allnoconfig, 260
  clean, 133, 178
  deb-pkg, 134
  extraneous files, 178
  install, 181
  menuconfig, 132
  modules_install, 136
Makefile file
  dependencies, 178
  description, 177
makemap command, 94
man command, 30
man 2 command, 35
mapping ports, 206
master boot records (MBRs)
  bootloaders, 236
  description, 145
  GRUB in, 143
master zones, testing, 190
max-lease-time directive, 211
maximum transmission unit (MTU), 169
maxlogins option, 115
MBRs (master boot records)
  bootloaders, 236
  description, 145
  GRUB in, 143
mdadm --assemble command, 256
mdadm --create command, 162
mdadm --delay command, 256
mdadm --monitor command, 162
/media mount point, 46
memory
  information on, 260
  processes, 124
  sockets, 169
  usage, 33, 124, 128
  user limits, 113
  video cards, 71
menu.lst file, 19
menuconfig make target, 132
Menus option for GOK, 71
message_size_limit parameter, 275
messages
  broadcasts, 179
  deleting, 92
  DHCP, 211
  displaying, 179, 275
  kernel, 88
  kernel ring buffer, 137
  log files, 91
  logins, 179–180
  netlink, 102
  sending, 8
  sendmail, 92
  syslog level, 89
  wall, 232
migrated files in gpg, 118
minus signs (-) for log files, 95
mkdir -p command, 32
mke2fs -c command, 241
mke2fs -t command, 151
mkfontscale command, 72
mkfs.btrfs command, 48
mkinitrd command, 132
mkisofs command, 151
mkisofs -b command, 261
mkswap command, 45, 151
mod_auth_basic module, 193
mod_authn_file module, 193
mod_authz_host module, 196
modified files, finding, 36
modify changetype, 274
modinfo command
  module dependencies, 135
  NVMe drivers, 161
modinfo -p command, 260
modprobe command
  configuration files, 232
  description, 5
  module dependencies, 8, 134
modprobe -r command, 136
modprobe --show-depends command, 137
Module section in xorg.conf, 66
modules
  blacklist information, 136
  dependencies, 8, 134–135, 137
  installing, 135
  loaded, 133, 136–137
  loading, 5
  options for, 260
  PAM. *See* Pluggable Authentication Modules (PAMs)
  removing, 12, 136
modules_install option make target, 136
monitoring
  alerts, 123
  communication, 233
  logs, 36
  process IDs, 124
  processes, 33
  SMART, 154
monitors
  frequency options, 65
  resolution, 66
  Screen section, 65
  vertical refresh rate, 67
mount command, 11
mount -a command, 45

mount -- bind command, 188–189
mount -f command, 152
mount -n command, 155
mount -o ro command, 156
mount points for removable media, 46
mount -t command, 49
mount -t cifs command, 202
mount -U command, 265
mountd -l command, 205
mounted directories, displaying, 272
mounted filesystems
  displaying, 203
  information on, 240
  listing, 151
mounting
  filesystems, 45, 49
  hosts, 202
  NFS filesystems, 203
  partitions, 265
  root partition, 10
  Samba shares, 202
  USB devices, 11, 49
mouse
  gestures, 69
  keys for, 69
Mouse button, 69
moving files, 37
mt command, 259
mt rewind command, 182
mtr command, 172
MTU (maximum transmission unit), 169
multi-user targets, 147
multibyte representation of characters, 78
multicast group membership, 257
multipath -l command, 160
multipathd -k command, 163
mv * command, 37
mv -i command, 32
MX records, 185, 188
mynetworks parameter, 220
MySQL
  DELETE statement, 55
  INSERT statement, 59
  ORDER BY statement, 57

N

Nagios package, 123
name-based virtual hosting, 194
name resolution
  disabling, 251
  DNS. *See* DNS
  nmap, 170
  smbclient, 205
name servers in BIND, 186
name services
  NetBIOS requests, 201
  status, 206
named-checkconf command, 187
named-checkconf -t command, 269
named-checkconf -z command, 190
named-checkzone command, 185, 189
named-checkzone -D command, 269
named-checkzone -q command, 268
named-compilezone command, 185
named.conf file, 185, 190
names
  groups, 78, 248
  partitions, 49
  users, 83
  virtual servers, 193
nameservers
  querying, 100
  recursive, 187
nc -l -p command, 104
net command, 271
net groupmap list command, 205
net -k command, 201
net % command, 202
NetBIOS name service requests, 201
netcat command, 170
netlink messages, 102
netmasks, 103
netstat -a command, 103, 124–125, 228
netstat -g command, 257
netstat -i command, 171
netstat -p command, 112
netstat -rn command, 100
netstat -s command, 128
netstat -ta command, 170
network connectivity tests, 170
network interfaces
  configuration files, 173
  information on, 251
newaliases command, 88, 218
-newca argument, 271
newlines, removing, 169
NFS filesystem
  host mounting, 202
  mounting, 203
  netgroups, 271
  server export lists, 203
  share allowances, 201
  shared filesystems, 201
nfsstat -3 command, 203
NFSv3 filesystem, 203
nginx
  index files, 194
  pass-through proxies, 198
nice command, 35
nl command, 36
nl -b a command, 237
nmap command, 111
nmap -P0 command, 115
nmap -R command, 170
nmap -s command, 116
nmap -sT command, 226
nmap -sU command, 253
nmap -sX command, 262
nmbd daemon
  browse master election, 271
  NetBIOS name service requests, 201
  ports, 271
nmblookup command, 206
nocompress option, 94
node limits for advertisements, 211
noexec option, 16
non- Linux kernel root partitions, 16

non-swap partitions, 22
NOPASSWD option, 113
--norc option, 59
notify directive, 268
ntop command, 127
NTP
  clients, 88
  communication with firewalls, 253
NTP servers
  compatibility, 249
  interactive mode, 90
ntpd -g command, 93
ntpdate command, 89
ntpdate -o command, 249
ntpq command, 89–90
number of lines
  head and tail, 34
  printing, 30–31
number signs (#) for comments, 117
numbering lines, 237
numeric codes, displaying, 7
NVMe
  devices in PCI subsystem, 164
  drivers, 161
  drives, 160
nvme module, 161
NXDOMAIN, 106

O

octal representation in plain-text files, 238
od command, 238
on-screen keyboards
  description, 70
  GNOME, 68
$1 command-line parameter, 55
open files, displaying, 126
open instances, searching for, 253
open ports
  connections, 127
  displaying, 111
  finding, 116
  scanning for, 111
opening files, 170
OpenLDAP
  configuration files, 213
  databases, 210
OpenSSH
  allowed users, 276
  configuration files, 225
  empty passwords, 227
  key-based authentication, 230
  port forwarding, 229
  ports, 226
  root user logins, 225
  SSH version, 228
openssl genrsa command, 193
openssl req command, 195
OpenVPN
  DHCP, 230
  ports, 227
  push directive, 226
operating systems, default, 19, 22
option domain-search option, 210
options debug line in /etc/resolv.conf, 172–173
Options -Indexes directive, 195
Orca
  screen reader, 66
  speech capabilities, 245
orca --no-setup command, 245
ORDER BY clause in SELECT statement, 57
out-of-memory conditions, 33
output
  to files, 19
  redirects, 30
  to stdout, 32
overriding DNS lookups, 106
overriding files, 144, 261
overwriting files, prompts for, 32
ownership
  changing, 47
  files, 83, 241, 263
  group, 43

P

-p option, 59
packages
  cache searches, 21
  cache updates, 20
  dependencies, 18, 235
  file removal from, 234
  information on, 22
  installing, 17, 21, 23
  repositories, 20, 234
  searching for, 19
  terminal-based interface tools, 21
  upgrading, 235
packets
  controlling, 277
  forwarded, 128
  forwarding, 229
  loglevels, 213
Page Not Found error, 196
paginating text, 238
PAM. *See* Pluggable Authentication Modules (PAMs)
pam_cracklib.so module, 212
pam_limits.so module, 212, 274
pam_listfiles.so module, 214
pam_nologin.so module, 210
pam_sss.so module, 214
pam_unix.so module, 211
PARANOID wildcard, 173
parentheses ()
  case statements, 61
  script commands, 57
parsing log files, 248
parted command, 49
partitions
  bad blocks, 152
  boot, 236
  changing, 49
  creating, 43
  execution prevented, 16
  images, 32
  initializing, 20–21
  Linux swap, 17
  mail servers, 16
  mounting, 265

non-swap, 22
RAID arrays, 159, 163, 256
renaming, 49
swap, 151
UUIDs, 48, 152
pass-through proxies, 198
passwd -a -S command, 81
passwd: files ldap line, 211
passwd -u command, 252
Password-based Key Derivation Function 2 (PBKDF2), 154
passwords
change dates, 81, 115
changing, 272
Dovecot, 275
empty, 227
encryption, 269
/etc/shadow, 81
expiration, 246–247
formats, 272
groups, 83
PAM modules, 211
prompts, 113
Samba, 202, 204
strength, 212
tar, 258
patch -b command, 181, 264
patch -i command, 259
patch -p1 command, 177
paths
adding to, 245
email, 221
fonts, 70
leading slash removal, 177
LUNs, 160
removing, 44
PCI devices
drivers, 233
NVMe, 164
pdns-server package, 190
PEM files
CA certificates, 194
TLS configuration, 217
per-user default settings in dig, 188
percent signs (%) for groups, 116
performance
CPUs, 125
load average, 128
performance-related graphing tools, 124
permissions
chmod, 57
files, 47
groups, 48
POSIX format, 44
SUID bit, 56
symlinks, 47
PermitEmptyPasswords directive, 227
PermitRootLogin directive, 225
persistent names for SCSI devices, 256
pgrep command, 33
PHP configuration files, 195
php.ini file, 195
php7_module, 195
ping command
delays, 259
ports, 263
ping -c command, 105
ping -f command, 170
ping -I command, 101
ping -m command, 258–259
ping -n command, 251
ping -r command, 263
ping6 command, 105, 171
piping commands, 59
plain-text files, octal representation for, 238
Pluggable Authentication Modules (PAMs)
configuration files, 209, 274
external files, 214
login limits, 212
login prevention, 210
password authentication, 211
password strength, 212
SSSD system integration, 214
polling interval in mdadm, 256
pool.ntp.org address, 88
pop-up windows in authentication, 195
POP3 servers, 189
port-number-to-name translation, 277
Port option in OpenSSH, 226
portmap service, access to, 203
ports
adding, 103
CUPS, 91, 95
DHCP, 210, 212
Dovecot, 221–222
firewalls, 100
forwarding, 116, 229, 277
HTTP, 276
ICMP, 104
LDAP, 250
LDAP over SSL, 106, 214
mappings, 206
nmbd daemon, 271
NTP traffic, 253
open, 111, 116, 127
OpenSSH, 226
OpenVPN, 227
ping, 263
process IDs, 112
redirects, 225, 276
remote hosts, 116
rndc, 268
rsyslogd, 93
Samba, 272
Secure Shell communication, 104
slapd daemon, 209
smbd, 205
SMTP, 94, 221
SNMP, 102
Squid, 196, 270
TCP Connect scans, 226
traceroute, 263
usage, 228
zone transfer requests, 186
position of windows, 69
POSIX format for permissions, 44
postcat command, 218
postcat -b command, 275
postconf -d command, 220
Postfix
configuration files, 217
delivery errors, 220
mail queues, 90, 92–93

message limits, 275
parameters, 220
queues, 217–219, 275
relays, 220
TLS configuration, 217
TLS security level, 222
postqueue -f command, 93, 218
postqueue -p command, 219
postrotate option, 93
postscreen_tls_security_level option, 222
postsuper -d command, 92, 217
postsuper -d ALL command, 218
postsuper -d ALL deferred command, 275
power mode for drives, 259
PowerDNS authoritative nameserver, 190
pr -d command, 238
--prefix option for compiled code, 257
prepending line numbers, 36
PREROUTING chain, 225
primary partitions, maximum, 16
printing
CUPS printing system, 88
current directory, 37
deleting print jobs, 249
du options, 241
groups, 94
kernel information, 30
mail queue information, 91
mail queues, 274–275
number of lines, 30–31
numbers, 56
paginated text, 238
print queues, 91
quotas, 240
priority
configuration files, 144
MX records, 185, 188
processes, 35
private IP addresses, 100, 107, 258
private keys
SSH, 114, 225, 227
SSL, 193, 196
/proc/bus/usb directory, 8
/proc filesystem
description, 12
running process information, 232
/proc/kallsyms file, 137
/proc/loadavg file, 239
/proc/mdstat file, 161
/proc/meminfo file, 260
/proc/mounts file, 152, 203
/proc/swaps file, 127, 259
/proc/sys directory, 135
/proc/sys/kernel directory, 137
/proc/sys/net/ipv4/ip_forward file, 229
process IDs
displaying, 112, 125
gathering, 33
init process, 232
monitoring, 124
sockets, 171
process_limit option, 222
processes
default priority, 35
displaying, 125
ending, 34
information on, 239
killing, 37, 232, 234
memory, 124
monitoring, 33
open, 111
restarting, 35
sleep mode, 127
tools, 125
user limits, 112
Procmail configuration files, 217
.procmailrc file, 217
.profile file
login order, 55
time zones, 79
programs indicated for execution, 11
progress indicators, 45, 264
prompts
credentials, 117
fsck, 240
overwriting files, 32
passwords, 113
Protocol directive, 228
proxy_pass directive, 198
PRUNEPATHS option, 44
ps command
description, 124
RSS column, 126
ps -e command, 239
ps -w command, 127
PS1 environment variable, 54
pstree command, 125
pstree -p command, 125
PubkeyAuthentication directive, 230
public keyrings in gpg, 118
public keys
location, 270
SSH, 112, 225, 230
pubring.gpg file, 118
Pure FTPd
anonymous uploads, 226
bandwidth, 276
host names, 225
push directive in OpenVPN, 226, 230
pvcreate command, 20–21
pvdisplay command, 159
pvscan command, 163
pwd command, 37
pxelinux.0 file, 145
PXELINUX bootloader, 145

Q

qmail servers, 89
qshape command, 219
query-source directive, 269
question marks (?) in vi editor, 37
queues
deleting messages, 275
Postfix, 90, 92–93, 217–219
print, 91
printing, 274–275
qmail servers, 89
sockets, 124–125
quotacheck -c command, 50
quotacheck -u command, 46

quotaon command, 50
quotas
  checking, 46
  enabling, 48, 50
  printing, 240
  usage, 47

R

-r option for read-only variables, 61
-r test for file existence, 61
radvd command, 273
radvd.conf file, 211
RAID arrays and devices
  anomalies, 162
  configuration files, 159
  configuration information, 161
  creating, 162
  partitions, 159, 163, 256
  starting, 256
  troubleshooting, 162
  volume groups, 161
RAM disks
  creating, 136
  initial, 132
RCPT TO in SMTP, 276
read command for user input, 56
read-only filesystems, 46, 152, 156
read-only RAID drives, 162
read-only root partitions, 19
read only shares, 205
read-only variables
  declaring, 61
  displaying, 59
read-write mode for filesystems, 153
read-write shares, 205
reading commands, 54
readonly command, 59
rebooting
  init, 6
  scheduling, 182
reconfiguring locale variables, 80
recursive BIND lookups, 189
recursive nameservers
  query refusals, 187
  zone types, 189
REDIRECT target, 276
redirection
  commands, 59
  output, 30
  port, 225
  stdout and stderr, 34–35
RedirectMatch directives, 196
refresh rate for monitors, 67
regular expressions, 35
reject routes, 169
REJECT targets for iptables, 228
reloading
  configuration files, 9
  DNS zones, 189
remote hosts ports, 116
remote root users, 205
remote server commands, 114
removable media mount points, 46
removing
  aliased command, 57
  cron jobs, 247
  directories, 31
  environment variables, 54
  files from hosts, 179
  files from packages, 234
  flash USB disks, 10
  groups, 83, 250
  jobs, 79
  MAC addresses, 168
  mail messages, 218–219
  modules, 12, 136
  paths, 44
  print jobs, 249
  queue messages, 92, 275
  table data, 55
  tar files, 177
  users, 77, 206, 248
renaming
  groups, 78, 248
  partitions, 49
  users, 83
repeat rate for keyboards, 246
repositories for packages, 20, 234
repquota -a command, 47
repquota -s command, 240
Require directive, 198
rescue mode in booting, 260
rescue target, 145, 260
reservations in DHCP, 209
reserved IP addresses, 273
Resident Set Size column, 126
resolution of monitors, 66
--resolve option for yumdownloader, 23
restarting
  BIND servers, 190
  processes, 35
restores, block size in, 154
retry value in BIND zone files, 188
rewinding tapes, 182
rm -rf command, 31
rmmod command, 136
rmmod -w command, 12
rndc command
  authentication, 190
  BIND servers, 186
  ports, 268
rndc reconfig command, 190
rndc reload command, 189
ro option, 19
/root directory, 17
root partitions
  GRUB configuration, 8
  mounting, 10
  non-Linux kernels, 16
  read-only, 19
root_squash option, 205
root users
  home directory, 17
  logins, 225
root= option, 8
rootnoverify option, 16
route add command, 103, 105
route del command, 169
route dev command, 171
route -n command, 168
routers option for DHCP gateways, 212
routes
  adding, 103
  default, 100
  reject, 169
  UG flag, 107

routing tables, bypassing, 263
rpcbind operations, 203
rpcinfo -m command, 203
rpcinfo -p command, 206
rpm -ivh command, 18
RPM packages,
downloading, 18
rpm -q kernel command, 22
rpm -Uvh command, 235
rpm -V command, 19
rpm2cpio output, 17
RSA keys, 117
rsync -a command, 177, 257
rsync -b command, 258
rsync --delete command, 179
rsync -e command, 182
rsync -go command, 263
rsync --modify-window
command, 181
rsync --size-only command,
181
rsyslogd ports, 93
rules
iptables. *See* iptables rules
udev, 135
Runlevel 1 in single-user
mode, 6
runlevel command, 7
runlevels
defaults, 147
displaying, 7, 10
/etc/inittab, 142
/etc/rc.d, 147
files, 144–145
single-user mode, 118
switching, 146
running processes, 12, 232
running tasks, displaying, 36

S

Samba
configuration files, 201,
204
credentials, 272
log files, 204
NetBIOS name service
requests, 201
passwords, 204, 272
ports, 271–272
read-write shares, 205
security level, 272
security parameters, 202
shares mounting, 202
Windows to Linux
usernames, 202
samba-tool commands, 204
SANs (storage area
networks), 44
sar command
average utilization since
last restart, 128
statistics gathered since
last restart, 127
sar -u command, 125
SATA (Serial ATA) devices
identifiers, 5
parameters, 161
saving vi editor files, 34
scanning for wireless
networks, 169
scheduled jobs, displaying,
78
scheduling
commands, 77, 80
jobs, 77
screen command, 34
screen readers
activating, 69
Gnome, 66
Screen section in /etc/X11/
xorg.conf, 65
screens for GUI applications,
246
scripts
commands, 57
/etc/network, 172
executing, 56
finding, 80
hotplug devices, 5
services, 144
SysVinit, 6
update-rc.d utility, 146
SCSI devices
IDs, 160
persistent names, 256
tapes, 179
values, 164
scsi_id command, 160
sdparm command, 164
search option
/etc/resolv.conf, 105
yum, 21
searches
file contents, 239
files, 36, 111, 118, 239
open instances, 253
package caches, 21
package information, 22
packages, 19
vi editor, 37
volumes, 23
SeatDefaults section, 68
seconds format for dates and
times, 77
sector size, 264
Secure Shell (SSL)
configuration, 194, 271
name-based virtual
hosting, 194
ports, 104
private keys, 193, 196
security
Active Directory, 272
Samba parameters, 202
sed g command, 30
SELECT * FROM statement,
54
SELECT GROUP BY
statement, 60
SELECT ORDER BY
statement, 57
Self-Monitoring, Analysis,
and Reporting
Technology (SMART)
compatible hard drives,
153
monitoring, 154
sending
email, 245
messages, 8
sendmail
access database changes,
94
configuration files, 220
statistics, 95
sendmail -bp command, 91,
274–275
sendmail -q command, 92

seq command, 56
Serial ATA (SATA) devices
  identifiers, 5
  parameters, 161
server-generated document version, 269
Server Name Indication (SNI) technology, 194
ServerName directive, 193
servers
  creating, 104
  domain names, 102
  layout options, 72
  log file requests, 196
  NTP client addresses, 88
  site-specific data, 45
  status, 197
ServerSignature Off directive, 194
ServerTokens directive, 269
services
  disabling, 117
  displaying, 10
  loaded, 9
  preventing, 113
  scripts, 144
  starting and stopping, 118
  stopping on boot, 115
set -C command, 30
SetHandler directive, 198
sfdisk --id command, 256
shared filesystems, 201
shared library links and cache, updating, 16
shares
  displaying, 206
  listing, 272
  log files, 206
  Samba, 202
sharing, stopping, 206
shebang line in shell scripts, 54
shell prompt setting, 54
Shift key
  GRUB menu, 6
  sticky keys, 66
Shift+F keys for top, 124
shim.efi file, 144, 147
showmount -a command, 272
showmount -e command, 203
shutdown
  initiating, 11
  system, 234
  SysVinit scripts, 6
shutdown command, 234
shutdown -r command, 182
Sieve
  conditions, 221
  deleting messages, 219
  discard action, 220
  domain names, 222
  email addresses, 275
  forwarding messages, 219
  gt operator, 274
  if statement, 275
  mailboxes, 217–219
  object examination, 221
  vacation replies, 219
SIGTERM signal, 232
simultaneous logins, 115
single-user mode
  GRUB configuration, 6
  placing system in, 9, 143
  runlevels, 6, 118
site-specific server data, 45
size
  blocks, 178
  /boot partitions, 20
  dump files, 155
  keys, 268
  log files, 93
  open files, 126
  restore blocks, 154
  sectors, 264
  swap space, 156
  windows, 69
  zImage image, 132
slapadd command, 273
slapadd -j command, 213
slapcat command
  databases, 213
  LDIF files, 212
slapcat -l command, 274
slapd command
  debug levels, 211
  index recreation, 213
  ports, 209
slapd.conf file, 213
slapd-config file, 213
slapd_db_recover command, 210
slapindex command, 213
/ (slash) filesystem, 236
slave servers, 268
sleep mode for processes, 127
SMART (Self-Monitoring, Analysis, and Reporting Technology)
  compatible hard drives, 153
  monitoring, 154
smartctl command, 154
smartd daemon, 153
smbclient -L command, 206
smbclient -p command, 272
smbclient -R command, 205
smbcontrol force-election command, 271
smbcontrol smbd reload command, 201
smbd ports, 205
smbpasswd -a command, 204, 272
smbpasswd -x command, 206
smbstatus -L command, 204
smbstatus -S command, 272
SMTP
  connectivity tests, 226
  conversations, 221
  destinations, 276
  firewalls, 94
  ports, 221
snapshots
  btrfs subvolumes, 156
  length, 262
  logical volumes, 164
SNI (Server Name Indication) technology, 194
SNMP traffic and firewalls, 102
SOA (start of authority) records
  description, 268
  displaying, 105, 251
sockets
  displaying, 103, 170
  memory, 169
  process IDs, 171
  queues, 124–125
  timing, 258

software updates, 17
sort command, 37
sorting
  database data, 57
  files, 37
  top, 124
source code
  compression, 174
  kernel, 132
  location, 178
source command
  description, 54
  dot equivalence, 244
speech capabilities in Orca, 245
SPF records
  DNS queries, 106
  TXT, 188
splitting subnets, 101
SQL statements
  GROUP BY clause, 60
  inner joins, 58
  SELECT * FROM, 54
  UPDATE, 58, 245
  WHERE keyword, 244
square brackets ([]) in while loops, 60
Squid
  access control lists, 194
  ACLs, 196
  ports, 196, 270
/srv directory, 45
ss command, 169
ss -o command, 258
ss -p command, 171
SSH
  connections, 252
  host key fingerprints, 253
  key pairs, 225
  private keys, 114, 227
  public keys, 230
  public/private key pairs, 112
  remote server commands, 114
  synchronization, 182
  version, 228
  X session connections, 70
ssh-add command, 114
ssh-agent, 114
ssh-copy-id command, 230
ssh -i command, 117, 227
ssh-keygen command, 112, 117, 225
ssh -L command, 116, 277
ssh -l command, 251
ssh -p command, 116
ssh -X command, 228
SSL. *See* Secure Shell (SSL)
SSLCACertificateFile directive, 194
SSLCertificateFile directive, 270
SSLCertificateKeyFile directive, 196
SSLCipherSuite directive, 270
SSLEngine option, 194
sssd -c command, 212
sssd.conf file, 214, 273
[sssd] section, 273
SSSD system integration, 214
start of authority (SOA) records
  description, 268
  displaying, 105, 251
starting services, 118
StartServers directive, 198
startup scripts in SysVinit, 6
startx command, 69
STDERR, 34–35
STDIN, 250
STDOUT, 17, 32, 34–35
steal column in iostat output, 126
sticky bits in files, 45
sticky keys in Gnome, 66
stopping services, 115, 118
storage area networks (SANs), 44
su - command, 118
su -c command, 114
subnet masks
  example, 250
  private networks, 258
subnets
  DHCP, 209
  splitting, 101
subvolumes in btrfs filesystem, 155
sudo -n command, 117
sudo -u command, 113
SUID bit, 56
swap partitions
  creating, 151
  description, 17
  formatting, 45
swap space
  activating, 153
  deactivating, 155
  information on, 259
  /proc/swaps information on, 127
  purpose, 20
  size, 156
  usage, 124
swapoff command, 155
swapon command, 153
swapon --show command, 156
switching runlevels, 146
symbols, kernel, 137
symlinks
  copying, 238
  creating, 44
  directory for, 159
  example, 7
  following, 241
  permissions, 47
sync command, 153
synchronization
  skew setting, 93
  SSH, 182
/sys/class/fc_host directory, 162
/sys/class/net/eth0/address file, 233
sysctl command
  directory with names and values, 135
  variables, 137
sysctl -a command, 134
sysctl -n command, 256–257
sysctl -w command, 164
sysfs filesystem, 233
SYSLINUX bootloader, 142
syslog
  configuration, 95
  custom log files, 94
  DHCP activity, 172
  informational messages, 89
  logging to, 95
  print messages, 250

syslog-ng, 94
system, shutting down, 234
system users, creating, 82
systemctl command, 232
systemctl daemon-reload command, 142
systemctl disable command, 115
systemctl enable command, 11
systemctl get-default command, 11, 146
systemctl isolate command, 9, 146
systemctl kill -s command, 234
systemctl list-units command, 7
systemctl --no-wall command, 264
systemctl poweroff command, 180
systemctl restart cups.service command, 95
systemctl set-default command, 65, 147
systemctl status command, 9
systemctl -u command, 173
systemd
  emergency target, 263
  journals, 88, 249
  programs to execute, 11
  rescue mode target, 260
  service configurations, 142
  systemctl list-units, 7
  unit configuration files, 7
  unit files, 142, 144
systemd-delta command, 144, 261
systemd-delta -diff command, 265
systemd-journald command, 88
systemd-udevd.service, 233
SystemMaxFileSize option, 93
systool utility, 137
SysVinit
  runlevels, 6
  startup and shutdown scripts, 6

T

tables
  columns, 55
  deleting data in, 55
tabs as delimiters, 33
tail command
  default number of lines, 31
  logs, 36
tail -n command, 34, 238
TAPE environment variable, 259
tapes
  backup destination, 178
  non-rewinding, 264
  rewinding, 182
  SCSI devices, 179
tapetype directive, 178
tar -c command, 177
tar --exclude command, 179
tar files
  creating, 177
  removing, 177
tar -J command, 181
tar -p command, 258
tar --remove-files command, 177
tar -xvf command, 180
tar -z command, 180
tar -zxf command, 33
TCP Connect port scans, 226
TCP protocol
  socket display, 170
  three-way handshakes, 107
TCP SYN packets
  open ports, 116
  traceroute, 101
TCP Wrappers, 244
tcpdump -D command, 170
tcpdump -s command, 262
tee command, 32
telinit command, 7, 143
telinit 3 command, 71
telinit --no-wall command, 233
telnet command, 226
terminal-based package management tools, 21
terminals, starting, 34
test built-in arguments, 60
testparm command, 204
text
  octal representation, 238
  paginating, 238
/tftpboot directory, 145
three-way handshakes, 107
time
  displaying, 232
  environment variable, 78
  logged-in users, 253
  seconds format, 77
  setting, 95
time zones
  changing, 82
  displaying, 79
  information on, 248
  local, 76
  regional files, 76
  setting, 79, 81, 247
timestamps, 31
timing of listening sockets, 258
tinyconfig target, 265
TLS
  certificates, 217
  security level, 222
TMOUT environment variable, 60
top command
  availability, 126
  processes, 33
  sort order, 124
top -d command, 239
touch command
  login prevention, 111
  timestamps, 31
TraceEnable option, 197
tracepath command, 105
traceroute command
  host unreachable, 258
  ports, 263
  vs. tracepath, 105
traceroute -6 command, 102
traceroute -I command, 172
traceroute -T command, 101
traceroute6 command, 173
traffic filters, 123
transferred files, backups for, 258

TTL values
changes, 190
time units, 188
tune2fs command, 44
tune2fs -c command, 49, 151
tune2fs -E command, 161
tune2fs -e command, 155
tune2fs -h command, 45
tune2fs -j command, 156
TXT resource records, 188
type command, 47
TZ environment variable, 79
tzconfig command, 247
tzselect command, 79

U

Ubuntu system accessibility information, 246
udev
configuration files, 5
hardware database, 265
rules, 135
service managing, 233
udevadm hwdb -u command, 261
udevadm monitor command, 134
UDP, scanning with, 253
$UDPServerRun option, 93
UG flag for routes, 107
UIDs
displaying, 83
GID relationship, 82
list of, 81
ulimit -a command, 113
umask command, 47
umask -S command, 44
umount command, 10
umount -f command, 240
umount -r command, 46
umount -t command, 153
unalias command, 57
uname -a command, 30, 180
uname -r command, 135
uncompressing files, 178, 180
uniq -i command, 238
Universal Access section, 246
unlocking accounts, 252
unmounting filesystems, 240
unused blocks, 160
unzipping
kernel, 132
zipped files, 33
update-grub command, 16, 237
update-rc.d command, 118, 146
UPDATE statement, 245
UPDATE SET statement, 58
updatedb command, 47
updating
configuration files, 16
dynamic DNS, 209
hardware database index, 261
kernel, 22
package caches, 20
shared library links and cache, 16
software, 17
upgrading
kernel, 132
packages, 235
uploads, anonymous, 226
uptime command
description, 34
on load average, 239
load average output, 126
URIs for LDAP servers, 214
USB devices
connection points, 11
connections, 12
hotplug devices, 10
information on, 134
listing, 5
mounting, 11, 49
storage location, 8
user input, 56
user quotas
checking, 46
enabling, 48
useradd -f command, 246–247
useradd -G command, 82
useradd -m command, 80
useradd -r command, 82
userdel command, 248
userdel -r command, 77
usermod -aG command, 94
usermod -c command, 83
usermod -e command, 113
usermod -L command, 80, 117
username map command, 201
usernames
changing, 251
displaying, 68
formats, 272
information on, 81
listing, 31
Samba, 202
Windows to Linux translation, 201
users
cron jobs, 76, 78, 81–82, 247
deleting, 77, 206, 248
disk usage, 123
groups, 82
home directory, 236
information on, 76, 79, 113, 238
list of, 79
logged-in, 218
OpenSSH, 276
process limits, 112
renaming, 83
X server, 246
#!/usr/bin/env bash setting, 54
/usr directory, 17
/usr/lib/systemd/user directory, 144
/usr/share/fonts directory, 67
/usr/share/zoneinfo file, 76, 248
/usr/src directory, 178
/usr/src/linux/.config file, 133
/usr/src/linux directory, 132
/usr/src/linux/Documentation directory, 135
usrquota option, 48
UTC dates, 249
UTF-8 encodings, 78
UUIDs
displaying, 152
listing, 261
partitions, 48, 265

V

vacation replies for email, 219
/var directory
  backups, 264
  mail servers, 16
/var/cache directory, 236
/var/lib/ldap directory, 210
/var/lib/ntp/drift file, 249
/var/log/dmesg file, 9
/var/log/journal directory, 249
/var/log/mail.err file, 220
/var/log/wtmp log, 117
/var/named directory, 186
/var/spool/cron/crontabs directory, 78
/var/spool/postfix directory, 217
variables
  change effects, 137
  curly braces, 61
  displaying, 56
  equality tests, 244
  exporting, 244
  read-only, 61
  user input, 56
verbose output in rpm, 18
verifying
  configuration files, 187, 193
  filesystems, 153
version
  Apache, 194
  BIND, 190
  kernel, 22, 135, 180
  server-generated documents, 269
  SSH, 228
version none directive, 190
vertical bars (|) sequence for alternate commands, 57
vertical refresh rate for monitors, 67
VertRefresh option, 67
vgcreate command, 161
vgscan command, 163–164, 256
vi editor
  insert mode, 35
  moving lines in, 239
  saving work, 34
  searching with, 37
vi -o command, 35
vi:wq command, 34
video card RAM, 71
video modes, changing, 68
VideoRam option, 71
virtual hosts
  default directory, 195
  name-based, 194
virtual servers, 193
<VirtualHost> directive, 193
visual impairments, Emacspeak program for, 72
visudo command, 114
vmstat command
  CPU wait time, 125
  description, 123
  memory and CPU usage, 128
  sleep mode, 127
volumes
  information on, 159
  RAID arrays, 161
  searching for, 23
vsftpd.conf file, 225
  authentication, 230
  IPv6 enabling, 229

W

w command, 112, 123
wa statistic, 125
wall command, 8, 179
wall -g command, 232
wc -l command, 30
Welcome section for greeters, 65
Where= directive, 155
WHERE keyword in SQL, 244
whereis command, 44
which command, 43
while loops
  -lt operator, 58
  square brackets, 60
whitespace in patch files, 259
whois command, 253
wide format displays, 127
wildcards
  hosts, 173, 202
  regular expressions, 35
window information for X session, 69
Windows-to-Linux group mappings, 205
Windows to Linux username translation, 201
wireless devices
  links, 168
  settings, 168
wireless networks, scanning for, 169
World Wide Identifiers (WWIDs)
  SCSI devices, 256
  symlinks, 159
World Wide Names (WWNs), 162

X

X programs, displaying, 71
X server
  connecting to, 70
  starting, 69
  users, 246
X sessions
  ssh connections, 70
  window information, 69, 246
X11 forwarding, 116, 228
X11Forwarding option, 116
xdpyinfo command, 67
XFree86 -configure command, 66
xfs_check -f command, 153
XFS filesystem geometry, 152
xfs_growfs -n command, 48
xfs_info command, 48, 152
xfs_metadump -g command, 45
xfs_repair -L command, 156
xfsdump -z command, 155
xfsrestore -b command, 154

xhost command, 246
xhost +cwa command, 70
XkbModel option, 67
Xmas scans, 262
xorg.conf file
  blank modes, 69
  fonts, 70
  Module section, 66
  video modes, 68
xrandr -s command, 66
xwininfo command, 69, 246
xz command
  kernel source code, 177
  lzma files, 36
  with tar, 181
xz -d command, 132
xz --decompress --stdout command, 181

Y

yum command, 17–18
yum install -y command, 235
yum systems
  caches, 21, 236
  depositories, 19
yumdownloader command
  dependencies, 23
  RPM packages, 18

Z

zImage image size, 132
zipped files, 33
zone files
  BIND, 186, 268
  creating, 268
  retry value, 188
zone transfers
  BIND, 189
  ports, 186
  requests, 107
  testing, 186
zone types in recursive nameservers, 189

Comprehensive Online Learning Environment

Register on Sybex.com to gain access to the comprehensive online interactive learning environment and test bank to help you study for your CompTIA Linux+ and LPIC certifications.

The online test bank includes:

- **Practice Test Questions** to reinforce what you learned
- **Bonus Practice Exams** to test your knowledge of the material

Go to `http://www.wiley.com/go/sybextestprep` to register and gain access to this comprehensive study tool package.

SYBEX®
A Wiley Brand

WILEY END USER LICENSE AGREEMENT

Go to www.wiley.com/go/eula to access Wiley’s ebook EULA.