

Apple Pro Training Series

macOS Support Essentials 10.13

Supporting and Troubleshooting macOS High Sierra

Arek Dreyer and Adam Karneboge

Lesson files available for download



Certification Exam Preparation for
Apple Certified Support Professional 10.13

Apple Pro Training Series

macOS Support Essentials 10.13

Arek Dreyer and Adam Karneboge



Apple Pro Training Series: macOS Support Essentials 10.13
Arek Dreyer and Adam Karneboge
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IMPORTANT: Some of the exercises contained in this guide can be temporarily disruptive, and some exercises, if performed incorrectly, could result in data loss or damage to system files. As such, it’s recommended that you perform these exercises on a Mac computer that is not critical to your daily productivity.

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*This book is dedicated to my children,
who are the best thing to ever happen to me.*

—Adam Karnebo

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About This Guide

The Apple Pro Training Series *macOS Support Essentials 10.13* guide prepares you for the macOS Support Essentials 10.13 exam. To prepare for the macOS Support Essentials exam, use the guide alone or use the guide in the macOS Support Essentials 10.13 course. Either way, if you pass the macOS Support Essentials 10.13 exam, you're eligible for the Apple Certified Support Professional (ACSP) 10.13 certification.

Audience

Whether you're an experienced system administrator or you just want to dig deeper into macOS, you'll learn what ACSPs do to update, upgrade, reinstall, configure, maintain, diagnose, and troubleshoot macOS High Sierra.

You should be comfortable using a Mac before you read this guide or take the course. If you're not sure about basic Mac use, visit "Get to know your new Mac" at support.apple.com/explore/new-to-mac.

How to Use the Guide

Use the reference sections to get familiar with macOS High Sierra. Then use the exercises to practice what you've learned. After you've completed the guide, you should be able to:

- ▶ Explain how macOS High Sierra works
- ▶ Explain the best practices for updating, upgrading, reinstalling, configuring, and using macOS High Sierra
- ▶ Explain macOS High Sierra troubleshooting and repair procedures
- ▶ Use appropriate tools and techniques in macOS High Sierra to diagnose and resolve issues

Reference Sections

Unless otherwise specified, references to macOS in this guide refer to macOS High Sierra 10.13.0. As Apple updates macOS High Sierra, this guide might also be updated. Updates are delivered to you through the Web Edition, which contains the complete guide, including updates. When you purchase this guide from Peachpit (in any format), you automatically get access to its Web Edition.

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Exercises

For the most part, the exercises in this guide work in the classroom or at home. If you're learning from home, use a Mac that isn't critical to your daily productivity because exercises might disrupt your Mac. To complete the exercises, ensure you have the following:

- ▶ A Mac that meets the requirements to install macOS High Sierra
- ▶ macOS High Sierra (see Exercise 2.2, "Upgrade to macOS High Sierra")
- ▶ A high-speed Internet connection

- ▶ Exercise files (see Exercise 3.5, “Download Participant Materials for Independent Study”)
- ▶ An Apple ID (you don’t need to provide credit card information to get free apps from the App Store)

You don’t have to have these items, but they can be helpful:

- ▶ An iCloud account.
- ▶ An erasable external storage disk with a capacity of at least 12 GB for Exercise 5.2, “Create a macOS Install Disk.”
- ▶ An isolated network or subnet. You can use a small network Wi-Fi router with multiple Ethernet ports—for example, Apple AirPort Extreme (www.apple.com/airport-extreme/).
- ▶ At least two Wi-Fi networks (one should be visible).
- ▶ A second Mac running macOS High Sierra. This Mac can have macOS Server 5.4 or later installed and set up with an exercise-specific configuration.
- ▶ The required Thunderbolt, USB-C or FireWire cable to connect two Mac computers in target disk mode.
- ▶ A Mac with all-flash storage.

Additional Materials

Apple Support

The Apple Support website (<https://support.apple.com>) includes the latest free online Apple Support articles.

Apple Course

Participants use this guide in the macOS Support Essentials 10.13 course. Apple Certified Trainers teach each course and give presentations and demonstrations. Participants practice macOS support with hands-on exercises. The course prepares you for the macOS Support Essentials 10.13 exam.

ACSP 10.13 Certification

An ACSP 10.13 certification verifies that you understand macOS core functionality and can configure key services, troubleshoot, and support users. If you pass the

macOS Support Essentials 10.13 exam, you are eligible for an ACSP 10.13 certification. Apple macOS certifications are for IT professionals who:

- ▶ Want to know how to add a Mac to a Windows or other standards-based network
- ▶ Support macOS users
- ▶ Manage networks of Mac computers; for example, a system administrator at a large organization, a technology specialist who manages computer labs, or a teacher who manages classroom networks
- ▶ Manage complex, multiplatform networks that include Mac computers

Apple certification exams are delivered at Apple Authorized Training Provider locations. Visit <http://locate.apple.com/> to find a location. To learn more about Apple certifications and to find the macOS Support Essentials 10.13 Exam Prep Guide, visit <http://training.apple.com>. To prepare for the macOS Support Essentials 10.13 exam, do the following:

- ▶ Read the reference sections of this guide.
- ▶ Complete the exercises in this guide.
- ▶ Complete the macOS Support Essentials 10.13 course.
- ▶ Gain experience on a Mac running macOS High Sierra.
- ▶ Study the *macOS Support Essentials 10.13 Exam Preparation Guide*.

Lesson 4

Use the Command-Line Interface

Use the command-line interface (CLI) to access additional administrative functionality.

Reference 4.1 Command-Line Basics

The CLI includes these advantages:

- ▶ Additional administrative and troubleshooting options are available from CLI. For example, the following apps have CLI equivalents that include additional options: System Information (`system_profiler`), Installer (`installer`), Software Update (`softwareupdate`), Disk Utility (`diskutil`), and Spotlight (`mdfind`). These are just a few instances, as nearly every administrative function has both a graphical and a command-line tool.
- ▶ From the CLI you have more access to the file system. For example, the Finder hides many files and folders that are visible in the CLI. Also, there are many file-system permissions settings that the Finder doesn't display.
- ▶ You can remotely log in to a Mac computer's CLI using the Secure Shell (SSH) protocol. This remote access allows administrators to make changes at the command line without alerting the user to their work.
- ▶ By using the `sudo` command, any administrator can run commands as the system administrator user, also known as root. This enables great administrative flexibility in the CLI.

GOALS

- ▶ Be able to describe when the command-line interface is useful
- ▶ Explore Terminal

- ▶ If you are comfortable with the CLI syntax, you can apply it to a command-line script. This enables you to automate repetitive tasks.
- ▶ If you combine CLI instructions with Apple Remote Desktop (ARD), you can remotely administer multiple, even thousands of, Mac computers simultaneously. ARD enables you to remotely send the same command to many Mac computers with one click. For more information about Apple Remote Desktop go to <https://www.apple.com/remotedesktop>.

Access the CLI

A shell is the first command that runs when you access the CLI. It displays the CLI. You can access the CLI several ways:

- ▶ You can use Terminal. It's in /Applications/Utilities/Terminal. Terminal is a customizable interface. It includes a tabbed interface for multiple command-line sessions, multiple split panes for viewing history, support for full-screen mode, and Touch Bar shortcuts.

```

ladmin — -bash — 84x12
~ — less ◀ man rm ... ..tail -f /var/log/system.log ... ~ — -bash +
Last login: Fri Oct 27 14:10:40 on ttys001
[Johnnys-MacBook-Pro:~ ladmin$ ls -l
total 0
drwx-----+ 14 ladmin  staff   448 Oct 27 14:08 Desktop
drwx-----+  4 ladmin  staff   128 Oct 27 11:27 Documents
drwx-----+  5 ladmin  staff   160 Oct 27 11:20 Downloads
drwx-----@ 56 ladmin  staff  1792 Oct 27 13:25 Library
drwx-----+  3 ladmin  staff   96 Oct 27 10:21 Movies
drwx-----+  3 ladmin  staff   96 Oct 27 10:21 Music
drwx-----+  3 ladmin  staff   96 Oct 27 10:21 Pictures
drwxr-xr-x+  4 ladmin  staff   128 Oct 27 10:21 Public
[Johnnys-MacBook-Pro:~ ladmin$ ls -lea
total 40
drwxr-xr-x+ 15 ladmin  staff   480 Oct 27 11:14 .
0: group:everyone deny delete
drwx-----@ 56 ladmin  staff  1792 Oct 27 13:25 Library
0: group:everyone deny delete
drwx-----+  3 ladmin  staff   96 Oct 27 10:21 Movies
0: group:everyone deny delete
drwx-----+  3 ladmin  staff   96 Oct 27 10:21 Music
0: group:everyone deny delete
drwx-----+  3 ladmin  staff   96 Oct 27 10:21 Pictures
0: group:everyone deny delete
drwxr-xr-x+  4 ladmin  staff   128 Oct 27 10:21 Public
0: group:everyone deny delete
[Johnnys-MacBook-Pro:~ ladmin$

```

- ▶ At startup, press and hold Command-S to start a Mac in single-user mode. This mode starts the minimum system required to provide you with a command-line prompt so that you can enter commands to repair a Mac that can't fully start up. Read more about single-user mode in **Lesson 28, "Troubleshoot Startup and System Issues."**

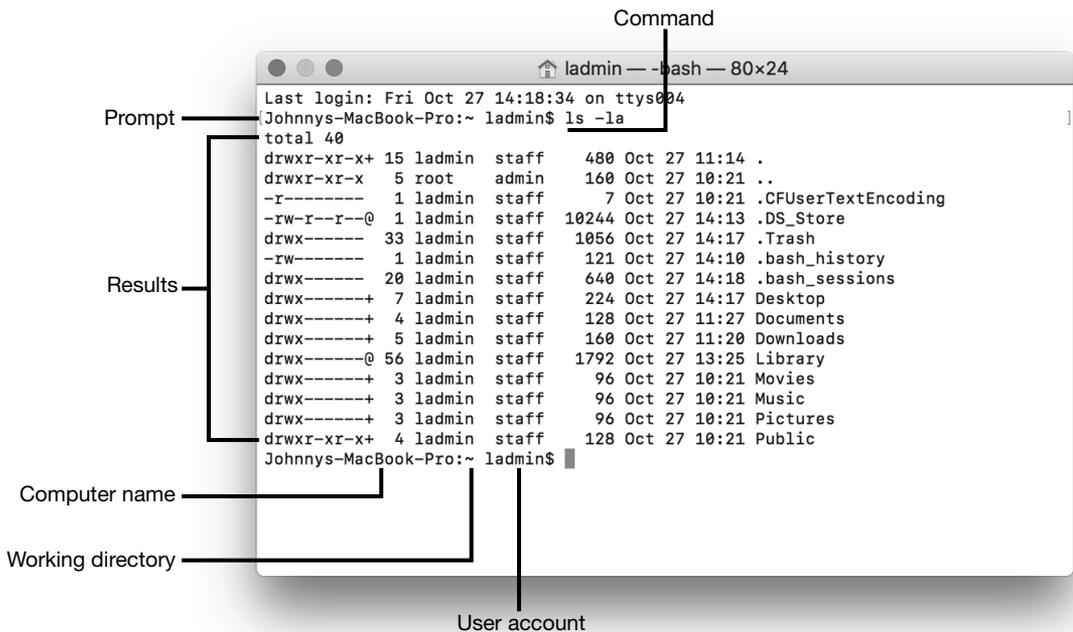
- ▶ SSH remote login enables you to securely log in from a remote computer to access your Mac computer's command line. SSH is a common standard, so you can use any operating system that supports SSH to remotely log in to your Mac.

Work in the Command Line

The first thing you'll see at the command line is the prompt. The prompt indicates that you can enter a command. By default, the prompt shows you the name of the Mac you're using, followed by where you are in the file system, followed by your current user account name, and ending with a \$. The \$ at the end of the prompt indicates that you're using the standard Bash shell. Where you are in the computer's file system is called the working directory, and it changes as you navigate through the file system.

At the prompt you enter your command string, often more than one word, and press Return to initiate or execute the command. An executing command will take over the Terminal window with a text interface, show the results of the command and return to the prompt, or perform some work and return to the prompt when complete. Many commands display results only if a problem occurs. Read what the command returns to make sure it doesn't indicate a problem.

Some commands take time to execute and may not give a progress indication. If you don't see a new prompt, generally assume your last command is still running.



Command String

The command string includes a few parts:



1—Command Name	In this example the “ls” command displays a list of a folder’s contents
2—Command Options	Options add conditions, limits, or other modifiers to the command
3—Arguments	This is the recipient of the action, often specified as a file or folder path
4—Extras	Redirected output, or other commands, as needed... In this example a text file is created from the list output

- ▶ **Command name (1)**—Some commands just need you to enter their name to execute.
- ▶ **Command options (2)**—After a command name, you might specify options (or flags) that change a command’s default behavior. Options aren’t required and can be different for every command. Options start with one or two dashes to distinguish them from arguments. Many commands can include several single-letter options after a single dash. For example, `ls -lA` is the same as `ls -l -A`.
- ▶ **Arguments (3)**—After the command and its options, you typically specify an argument (or parameter), which is the item you want the command to modify. An argument is needed only if the command requires an item to act upon.
- ▶ **Extras (4)**—Extras aren’t necessary, but they can enhance the capabilities of a command. For example, you could add items that redirect the command output, include other commands, or generate a document.

Command-Line Example

Here is an example in which the user Joan works on a Mac called MyMac and her working directory is Documents. She deletes an app called Junk inside the /Applications folder. Joan presses Return after she enters her command.

```
MyMac:Documents joan$ rm -R /Applications/Junk.app
```

```
MyMac:Documents joan$
```

In this example the command was entered and executed properly, and macOS returns to a new prompt. This is an example of a command that returns information only if it didn't execute properly. The Mac will usually let you know if you entered something incorrectly by returning an error message or help text. macOS won't prevent or warn you from entering a destructive command, such as accidentally deleting your home folder. Always double-check your typing.

Use Manual (man) Pages

When you want to learn more about a command, you enter `man` followed by the name of the command. Manual (man) pages include detailed information about commands and references to other commands. After you open a man page, use navigation shortcuts to move through it:

- ▶ Use the Up Arrow and Down Arrow keys to scroll.
- ▶ Use the Space bar to move down one screen at a time.
- ▶ Enter a slash (/) and a keyword to search through a man page.
- ▶ Exit the man page by pressing Q.

If you don't know the name of the command you're looking for, enter `man -k` and a keyword to search the database. For example, you enter `man -k owner` to return a short list of commands used for changing file and folder ownership, including the command `chown`.

Enter the `apropos` command and a search term like `network`, and commands that are related to `network` are displayed.

Reference 4.2 CLI Navigation

The command line is case-sensitive and requires that you use full filenames with file-name extensions. For example, the CLI won't locate the "itunes" app, but it will locate the "iTunes.app" app.

A path represents a file or folder's location in the file system. For instance, Disk Utility's file system path is `/Applications/Utilities/Disk Utility.app`. In the CLI, you use the path-name to navigate through the file system and to identify the location of items.

There are two types of file-system pathnames:

- ▶ **Absolute** pathnames are full descriptions of an item location, starting from the root (or beginning) of the system (startup) volume. An absolute path begins with a forward slash (/) to indicate the beginning of the file system. An example of the absolute path to the user Joan’s Drop Box folder is `/Users/joan/Public/Drop Box`, which means: Start from the startup volume; go to the Users folder, then to the joan subfolder, and then to the Public subfolder; and select the item named Drop Box.
- ▶ **Relative** paths are partial descriptions of an item location. They’re based on where you’re currently working in the file system. When you first open Terminal, your session starts at your home folder. The relative path from your home folder to your Drop Box is `Public/Drop Box`. This means: From where you are now, go into the Public subfolder, and select the item named Drop Box.

Navigate with Commands

You use three commands to navigate the file system: `pwd`, `ls`, and `cd`. Short for “print working directory,” `pwd` reports the absolute path of your current working location:

```
MyMac:~ joan$ pwd
/Users/joan
```

Short for “list,” `ls` lists the folder contents of your current working location. Enter a pathname following the `ls` command to list the contents of the specified item. The `ls` command has additional options for listing file and folder information that are covered throughout this lesson.

Short for “change directory,” `cd` is the command you use to navigate. Enter a pathname following the `cd` command to change your current working location to the specified folder. Entering `cd` without specifying a path returns you to your home folder.

Use Special Characters

You can use special characters at the prompt or in pathnames to save time and to be able to use special characters in filenames and pathnames.

Enter a space between command items to separate the items. If you don’t want the space character to separate items, use the backslash (\) before a space character.

```
MyMac:~ joan$ cd Public/Drop\ Box
MyMac:Drop Box joan$ pwd
/Users/joan/Public/Drop Box
```

Another way to enter filenames and paths with spaces is to surround filenames and paths with quotation marks:

```
MyMac:~ joan$ cd "Public/Drop Box"
MyMac:Drop Box joan$ pwd
/Users/joan/Public/Drop Box
```

You can drag and drop items from the Finder to Terminal. When you do this, Terminal enters an item's absolute path with the appropriate backslash characters before spaces in names. Use the Tab key completion feature that's built into the command line to automatically complete filenames and pathnames.

Other special characters include !, \$, &, *, ;, |, \, parentheses, quotes, and brackets. The Finder drag-and-drop and Tab key completion parse these characters. In the CLI you can enter a backslash before any special character to treat that special character as regular text rather than as a special character.

Use double periods (..) to indicate a parent folder. For example, if you are in your home folder at `/Users/username`, enter `cd ..` to navigate to the `/Users` folder.

Use the tilde (~) to indicate the current user home folder in a pathname. For example, say the current user's Drop Box is in `~/Public/`. Use the tilde to specify another user's home folder. For example, `~jill/Public` specifies Jill's Public folder.

Use Tab Key Completion

Use Tab key completion to automatically complete filenames, pathnames, and command names. Tab key completion prevents you from making typos and verifies that the item you're entering exists.

Here's an example of Tab key completion. Start from your home folder by entering `cd`, then `P`, and then press the Tab key. The Terminal window will flash quickly and you may hear an audible alert, letting you know there is more than one choice for items that begin with "P" in your home folder. Press the Tab key again, and the Mac will display your two choices, Pictures and Public. Now, enter `u` after the initial `P`, and then press the Tab key again, and the Mac will automatically finish `Public/` for you. Finally, enter `D` and press the Tab key one last time, and the computer will finish the path with `Public/Drop\ Box/`.

When completing a folder name, Tab key completion puts a forward slash (/) at the end. It assumes that you want to continue the path. Most commands ignore the trailing slash, but a few behave differently if it's there. You should delete the / at the end of a path.

Tab key completion reads only into folders you have permission to access. You might run into issues trying to use this feature for items that are readable only by a root user.

View Invisible Items

The CLI and the Finder hide many files and folders from view. The hidden items are often macOS support items. In the Finder, these items are set with a hidden file flag. The CLI ignores the hidden file flag and shows most hidden items. If you enter the `ls` command, you won't see filenames that begin with a period. To see hidden items in long format at the command line, add the `-a` option to the `-l` option when you enter the `ls` command:

```
MyMac:~ joan$ ls -la
total 16
drwxr-xr-x+ 14 ladmin staff 448 Oct 26 01:06 .
drwxr-xr-x  5 root  admin 160 Oct 26 00:54 ..
-r-----  1 ladmin staff  7 Oct 26 00:54 .CFUserTextEncoding
drwx----- 5 ladmin staff 160 Oct 26 01:06 .Trash
-rw-----  1 ladmin staff 139 Oct 26 01:06 .bash_history
drwx----- 6 ladmin staff 192 Oct 26 11:29 .bash_sessions
drwx-----+ 4 ladmin staff 128 Oct 26 01:06 Desktop
drwx-----+ 3 ladmin staff  96 Oct 26 00:54 Documents
drwx-----+ 3 ladmin staff  96 Oct 26 00:54 Downloads
drwx-----@ 54 ladmin staff 1728 Oct 26 09:17 Library
drwx-----+ 3 ladmin staff  96 Oct 26 00:54 Movies
drwx-----+ 3 ladmin staff  96 Oct 26 00:54 Music
drwx-----+ 3 ladmin staff  96 Oct 26 00:54 Pictures
drwxr-xr-x+ 4 ladmin staff 128 Oct 26 00:54 Public
```

Any item with a period at the beginning of its name is hidden by default in the CLI and the Finder. These items are created and used by macOS. Leave them alone.

Navigate to Other Volumes

In the CLI, the system volume is also known as the root volume, and it's identified by a lone forward slash. Other nonroot volumes appear as part of the main file system in the Volumes folder.

Use Marks and Bookmarks

Add marks and bookmarks as you work; then use them to quickly navigate through lengthy Terminal output.

Select a line in Terminal, then choose Edit > Marks > Mark to add a mark. By default, Mark > Automatically Mark Prompt Lines is selected, so each prompt line sets a mark. Then you can choose Edit > Select Between Marks, or choose Edit > Navigate > Jump to Previous Mark, or just press Command-Up Arrow.

Choose Edit > Marks > Mark as Bookmark to add a bookmark. Then choose Edit > Bookmarks to see a list of bookmarks. Choose a bookmark to jump to that bookmark.

Reference 4.3 Manipulate Files in the CLI

When you manage and edit files in the CLI, you have more options—and more chances to make mistakes.

File Examination Commands

Use the `cat`, `less`, `file`, and `find` commands to locate and examine files. Read the man pages for these commands to find out more about them.

Short for concatenate, the `cat` command displays a file sequentially to Terminal. The syntax is `cat`, followed by the path to the item you want to view. Use the `cat` command to append to text files using the `>>` redirect operator. In the following example, Joan uses the `cat` command to view the content of two text files in her Desktop folder, `TextDocOne.txt` and `TextDocTwo.txt`. Then she uses the `cat` command with the `>>` redirect operator to append the second text file to the end of the first text file.

```
MyMac:~ joan$ cat Desktop/TextDocOne.txt
```

```
This is the content of the first plain text document.
```

```
MyMac:~ joan$ cat Desktop/TextDocTwo.txt
```

```
This is the content of the second plain text document.
```

```
MyMac:~ joan$ cat Desktop/TextDocTwo.txt >> Desktop/TextDocOne.txt
```

```
MyMac:~ joan$ cat Desktop/TextDocOne.txt
```

```
This is the content of the first plain text document.
```

```
This is the content of the second plain text document.
```

Use the `less` command to view long text files. It enables you to browse and search the text. Enter `less`, followed by the path to the item you want to view. The `less` interface is the same interface you use to view man pages, so the navigation shortcuts are the same.

The `file` command determines a file type based on its content. This is useful for identifying files that don't have a filename extension. The syntax is `file` followed by the path to the file you're trying to identify. In the following example, Joan uses the `file` command to locate the file type of two documents in her Desktop folder: `PictureDocument` and `TextDocument`:

```
MyMac:~ joan$ ls Desktop/
PictureDocument.tiff TextDocument.txt

MyMac:~ joan$ file Desktop/PictureDocument.tiff
Desktop/PictureDocument.tiff: TIFF image data, big-endian

MyMac:~ joan$ file Desktop/TextDocument.txt
Desktop/TextDocument.txt: ASCII English text
```

Use the `find` command to locate items based on search criteria. The `find` command doesn't use Spotlight, but it does enable you to set search criteria and use filename wildcards. (Filename wildcards are covered in the next section.) The syntax is `find`, followed by the beginning path of the search, then an option defining your search criteria, and then the search criteria within quotation marks. In the following example, Joan uses the `find` command to locate picture files in her home folder by searching only for files with names that end in `.tiff`:

```
MyMac:~ joan$ find /Users/joan -name "*.tiff"
/Users/joan/Desktop/PictureDocument.tiff
/Users/joan/Pictures/FamilyPict.tiff
/Users/joan/Pictures/MyPhoto.tiff
```

When you use the `find` command to start a search at the root of the system drive, you should also use the `-x` option to avoid searching the `/Volumes` folder.

To use Spotlight from the command line, enter the `mdfind` command. The syntax is `mdfind` followed by your search criteria.

Use Wildcard Characters

You can use wildcard characters to define pathname and search criteria. Here are three of the most common wildcards:

- ▶ Use the asterisk (*) wildcard to match any string of characters. For instance, entering * matches all files, and entering *.tiff matches all files that end in .tiff.
- ▶ Use the question mark (?) wildcard to match a single character. For example, entering b?ok matches book but not brook.
- ▶ Use square brackets ([]) to define a range of characters. For example, [Dd]ocument locates items named Document or document, and doc[1-9] matches files named doc#, where # is a number between 1 and 9.

You can combine filename wildcards. Consider a collection of five files with the names ReadMe.rtf, ReadMe.txt, read.rtf, read.txt, and It's All About Me.rtf. Using wildcards to specify these files:

- ▶ *.rtf matches ReadMe.rtf, read.rtf, and It's All About Me.rtf
- ▶ ????.* matches read.rtf and read.txt
- ▶ [Rr]*.rtf matches ReadMe.rtf and read.rtf
- ▶ [A-Z].* matches ReadMe.rtf, ReadMe.txt, and It's All About Me.rtf

Use Recursive Commands

When you direct a command to execute a task on an item, it touches only the item you specify. If the item you specify is a folder, the command won't navigate inside the folder to execute the command on the enclosed items. If you want a command to execute on a folder and its contents, you must tell the command to run recursively. Recursive means "Execute the task on every item inside every folder starting from the path I specify." Many commands accept -r or -R as the option to indicate that you want the command to run recursively.

In the following example, Joan lists the contents of her Public folder normally, and then recursively using the -R option. When she lists the contents of the Public folder recursively, macOS lists the contents of the Drop Box and Drop Folder:

```
MyMac:~ joan$ ls Public
Drop Box PublicFile1 PublicFile2 PublicFile3
MyMac:~ joan$ ls -R Public
```

```
Drop Box PublicFile1 PublicFile2 PublicFile3
```

```
Public/Drop Box:
```

```
Drop Folder DroppedFile1 DroppedFile2
```

```
Public/Drop Box/Drop Folder:
```

```
DropFolderFile1 DropFolderFile2
```

Modify Files and Folders

The `mkdir`, `touch`, `cp`, `mv`, `rm`, `rmdir`, `vi`, and `nano` commands enable you to modify files and folders.

Short for “make directory,” `mkdir` is used to create folders. The syntax is `mkdir`, followed by the paths of the folders you want to create. The `-p` option tells `mkdir` to create intermediate folders if they don’t already exist in the paths you specify. In the following example, Joan uses the `mkdir` command with the `-p` option to create a folder called `Private` with two folders inside it called `Stocks` and `Bonds`:

```
MyMac:~ joan$ mkdir -p Private/Stocks Private/Bonds
```

Use the `touch` command to update the modification date of a specified item. The `touch` command creates an empty file if it doesn’t exist.

Use the `cp` (copy) command to copy items from one place to another. The syntax is `cp`, followed by the path to the original item, ending with the destination path for the copy. If you specify a destination folder but no filename, `cp` makes a copy of the file with the same name as the original. If you specify a destination filename but not a destination folder, `cp` makes a copy in your current working folder. Unlike the Finder, the `cp` command won’t warn you if your copy replaces an existing file. It deletes the existing file and replaces it with the copy you told it to create.

Use the `mv` (move) command to move items from one place to another. The syntax is `mv`, followed by the path to the original item, ending with the new destination path for the item. The `mv` command uses the same destination rules as the `cp` command.

Use the `rm` (remove) command to permanently delete items. There is no Trash in the CLI. The `rm` command removes items forever. The syntax is `rm`, followed by the paths of the items you wish to delete.

Use `rmdir` (remove directory) to permanently delete folders. The `rmdir` command removes folders forever. The syntax is `rmdir`, followed by the paths of the folders you want to delete. The `rmdir` command can remove a folder only if it’s empty. You can use the `rm` command with the recursive option, `-R`, to remove a folder and all its contents.

Use the `vi` (visual) command to edit files in the CLI. `vi` is one of several built-in text editors in the CLI. Enter `vi` and the pathname to a file to edit it. macOS High Sierra redirects `vi` to a newer version, `vim`. For basic functions you probably won't notice the difference. Like the `less` command, `vi` takes over the Terminal window with the contents of the text file. When you first open `vi`, it's in command mode and you must type predefined characters to tell `vi` which operation you want to complete. Use the arrow keys to browse a file in command mode. Enter the letter `a` to begin editing the text. In command mode, `vi` inserts new text wherever the cursor is. Use the arrow keys to move the cursor keys. Press the `Esc` (Escape) key to reenter `vi` command mode. After you're in command mode, enter `ZZ` to save changes and quit `vi`.

The text editor `nano` features a list of commonly used keyboard shortcut commands at the bottom of the screen.

Reference 4.4

Manage macOS from the CLI

In this section, you look at commands that enable you to access items normally restricted by file-system permissions.

Use the `su` (substitute user identity or super user) command to switch to another user account. Enter `su` followed by the short name of the user you want to switch to and enter the account password. The password won't display. The command prompt changes, indicating that you have the access privileges of a different user. Enter `who -m` to verify your currently logged-in identity. You remain logged in as the substitute user until you quit Terminal or enter the `exit` command. In the following example, Joan uses the `su` command to change her shell to Johnny's account, and then she will exit back to her account:

```
MyMac:~ joan$ who -m
joan ttys001 Aug 20 14:06
MyMac:~ joan$ su johnny
Password:
bash-3.2$ who -m
johnny ttys001 Aug 20 14:06
bash-3.2$ exit
exit
MyMac:~ joan$ who -m
joan ttys001 Aug 20 14:06
```

Use sudo

Precede a command with `sudo` (substitute user do) to tell macOS to run the command using root account access. You must have an administrator user account to use `sudo`. `sudo` works even when the root user account is disabled in the graphical interface. Be careful with `sudo` and limit access to it.

System Integrity Protection (SIP) prevents changes to parts of macOS, even for the root user. Read **Reference 15.2, “System Integrity Protection,”** for more information about the specific resources that are protected.

If, as an administrator user, you need to execute more than one command with root account access, you can temporarily switch the entire command-line shell to have root level access. Enter `sudo -i` and your password to switch the shell to root access. You remain logged in as the root user until you quit Terminal or enter the `exit` command.

Reference 4.5

Command-Line Tips and Tricks

Here are some command-line tips that help you customize your experience and save time:

- ▶ Control-click a command and choose Open man Page to read more about that command.



- ▶ If your Mac has a Touch Bar, type a command and press the button for that command in the Touch Bar to view the man page. The figure shows the Touch Bar displaying a button for the defaults command man page.



- ▶ Use Tab key completion when you enter file paths.
- ▶ Drag and drop files and folders from the Finder to Terminal to automatically enter their locations at the command line.
- ▶ Type `open .` (“open” followed by a space, followed by a period) at the prompt to open your current command-line location in the Finder.

- ▶ Explore Terminal preferences (from the menu bar, choose Terminal > Preferences or press Command-Comma) to customize the look and feel of your command line.
- ▶ To cancel a command or clear your current command entry, use Control-C.
- ▶ You can edit commands before submitting. The Left and Right Arrow keys and the Delete key work as you would expect.
- ▶ At the command prompt, use the Up Arrow and Down Arrow keys to view and reuse your command history. This includes editing old commands before rerunning them. Enter the `history` command to see your recent command history.
- ▶ To clear the Terminal screen, enter the `clear` command or press Control-L.
- ▶ To move the cursor to the beginning of the current line, press Control-A.
- ▶ To move the cursor to the end of the current line, press Control-E.
- ▶ To move the cursor forward one word, press Esc-F.
- ▶ To move the cursor back one word of the line, press Esc-B.
- ▶ To move the cursor to a location in a command string, Option-click where you'd like the cursor to be.
- ▶ Use the inspector to view and manage running processes, and edit window titles and background colors. To open the inspector, press Command-I. To send a command to a process, select it, click the action pop-up menu, then choose a command from the Signal Process Group.

For more information about Terminal, read Terminal Help at support.apple.com/guide/terminal/welcome.

Exercise 4.1

Command-Line Navigation

▶ Prerequisites

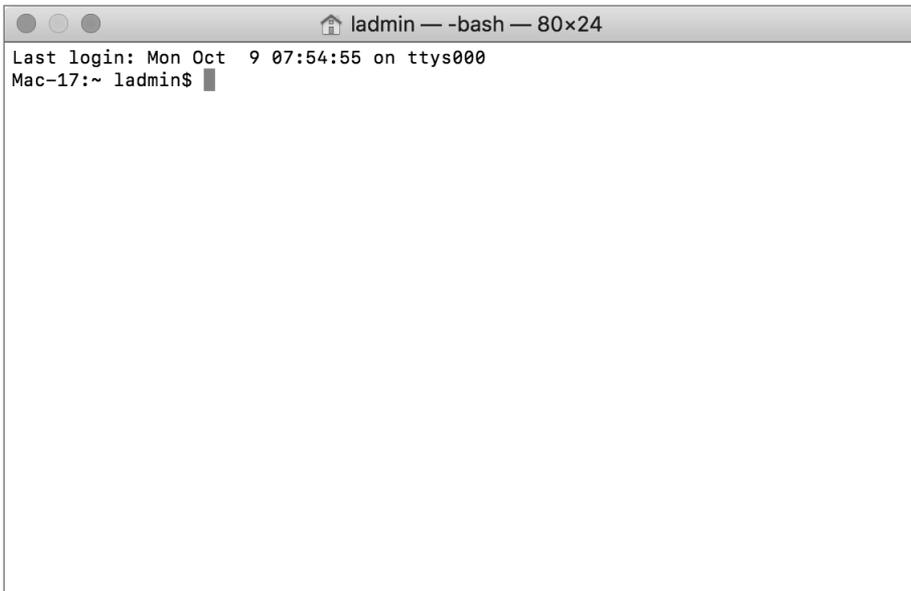
- ▶ You must have created the Local Administrator account (**Exercise 3.1, “Configure a New Mac for Exercises,”** or **Exercise 3.2, “Configure an Existing Mac for Exercises”**).

In this exercise, you use commands to navigate the file system, to view items that aren't visible from the Finder, and to access the manual (man) pages that tell you more about commands.

View Your Home Folder

- 1 If necessary, log in as Local Administrator.
- 2 Click Launchpad in the Dock.
- 3 In the Search field at the top of the screen, enter Terminal.
- 4 Click Terminal.

A new Terminal window opens.



```
ladmin — -bash — 80x24
Last login: Mon Oct 9 07:54:55 on ttys000
Mac-17:~ ladmin$
```

The second line you see includes your computer and user name followed by a prompt—for example:

```
Mac-17:~ ladmin$
```

In this example, Mac-17 is the name of the Mac you logged in to. The colon separates the computer name from the path to your current working directory. The path is ~ (the tilde [~] is shorthand for your home folder). After the space, you see the name of the logged-in user. The \$ is the prompt.

- 5 At the prompt, type `ls` and press Return.

You will see output that looks something like this, followed by another prompt:

```
Desktop    Downloads    Movies    Pictures
Documents  Library    Music    Public
```

- 6 Switch to the Finder. If you don't see a Finder window that's open, go to File > New Finder Window or press Command-N.
- 7 Select `admin`'s home folder in the Finder sidebar and compare the contents of the home folder in the Finder and Terminal.

With the exception of the Library folder, what you see in Terminal is the same as in the Finder. (User Library folders are hidden in the Finder by default; see **Reference 14.1, "Examine Hidden Items."**)

- 8 Switch back to Terminal and type `ls -A` (lowercase `ls` followed by space, a hyphen, and an uppercase `A`) at the prompt.

In general, the command-line environment is case-sensitive. For example, `ls -a` isn't the same as `ls -A`.

You will see some extra files in the list that begin with a period. Files beginning with a period are hidden in directory listings unless you ask for them by entering `ls -A`. The Finder doesn't show files beginning with a period (sometimes called dot-files).

Examine and Change Your Current Working Directory

Think of your current working directory as the place you are in the file system. When you open a new Terminal window, your default working directory is your home folder. Use the `cd` command to change your current working directory.

- 1 At the prompt, type `pwd`.

The period (`.`) ends the sentence and isn't part of the command, so don't type it. This guide tells you if a trailing `.` is part of the command. Also, press Return at the end of each step, unless otherwise instructed.

You will see:

```
/Users/admin
```

This is where Local Administrator's home folder exists in the file system. It's the folder you're "in" in this Terminal window.

- 2** At the prompt, type `cd Library`.

This changes your current working directory to the Library folder inside your home folder.

This command uses a relative path. A relative path means “Start in my current working directory.”

Your prompt changes to something like this:

```
Mac-17:Library ladmin$
```

The path component of the prompt indicates the folder you are in, not the entire path.

The `cd` command changed your working directory without providing feedback. A command that completes and doesn't need to provide feedback will exit silently. If you get an error message, you should investigate its cause before continuing.

- 3** At the prompt, type `pwd`. Terminal displays:

```
/Users/ladmin/Library
```

You changed to the Library folder that was inside your previous working directory.

- 4** Type `ls` to view what files and folders are in this Library folder.

- 5** At the prompt, type `cd /Library`. Note the `/` that precedes Library this time.

- 6** At the prompt, type `pwd`. You will see output like this:

```
/Library
```

This is a different folder.

A path that starts with a leading `/` is an absolute path. It means “Start at the root folder and navigate from there.” A path that doesn't start with a leading `/` is a relative path. It means “Start in your current working directory and navigate from there.”

- 7** Enter `ls` to view the files and folders that are in this Library folder.

There is some overlap in the item names in this Library and the one in ladmin's home folder, but the names aren't entirely the same.

- 8** At the prompt, type `cd` and a space character. Don't press the Return key.

Terminal enables you to drag and drop items from the Finder to Terminal and have the path to the items appear in the command line.

In this part of the exercise, you use the Finder to locate a folder you want to use as your working directory in Terminal.

- 9 Switch to the Finder.

When you don't know exactly what you are looking for, it's sometimes faster and easier to find a file or folder in the Finder.

- 10 Open a new Finder window if necessary.
- 11 Click Macintosh HD in the sidebar.
- 12 Open the Users folder.
- 13 Drag and drop the Shared folder to Terminal.

Terminal fills in the path (`/Users/Shared`). Macintosh HD doesn't appear in the path that Terminal fills in.

The Finder shows you volume names to make locating a particular volume easier. Terminal doesn't show volume names in the same way.

- 14 Switch to Terminal and press Return.
- 15 Type `pwd` at the prompt.

You are in the Shared folder.

Read About `ls` in the Man Pages

In Terminal, you can read the details about commands using the `man` command.

- 1 Open Terminal.
- 2 At the prompt, type `man ls`.

This opens the man page for the `ls` command.

Each man page is divided into various parts. The number in parentheses on the top line indicates in which section of the manual this command is documented. In this case, `ls` is documented in section 1, which is for general use commands. Next you see the name of the command and a very terse summary of what the command does: "list directory contents." The synopsis is supposed to be a formal representation of how to use the command. Anything contained in square brackets is optional. The synopsis isn't always completely accurate. For example, a few options for `ls` are mutually exclusive of each other, but this synopsis does not indicate that. Generally speaking, options or switches (which change the behavior of a command) immediately follow the command, and arguments (which tell the command what to operate on) follow

options or switches. The description, which describes the various uses of the command, follows the synopsis.

- 3 Press the Q key to quit viewing the man page for `ls`.
- 4 At the prompt, type `man less`.
The `less` option enables you to view one man page at a time.
- 5 Use the Space bar to read through the man pages one page at a time.
- 6 After you're comfortable with the `less` option, read the `ls` man page.
- 7 At the prompt, enter `man man`.
- 8 Read about the `man` command.

You can also Control-click, or on a MacBook Pro with Touch Bar, tap the icon for a man page to open it.

Exercise 4.2

Manage Files and Folders with Commands

► Prerequisites

- You must have created the Local Administrator account (**Exercise 3.1, “Configure a New Mac for Exercises,”** or **Exercise 3.2, “Configure an Existing Mac for Exercises”**).

In this exercise, you learn to copy, move, rename, and delete files and folders with commands.

Create Files

- 1 If you aren't logged in as Local Administrator, log in now.
- 2 Open TextEdit.

TextEdit is in your Dock if you performed **Exercise 3.4, “Download Participant Materials for Classroom Use.”** If it isn't in your Dock, you can find it in `/Applications`.

- 3 In the TextEdit menu bar, choose Format > Make Plain Text, or press Command-Shift-T.
- 4 Add the following names to the yet Untitled (default) TextEdit document:

MacBook

MacBook Air

MacBook Pro

iMac

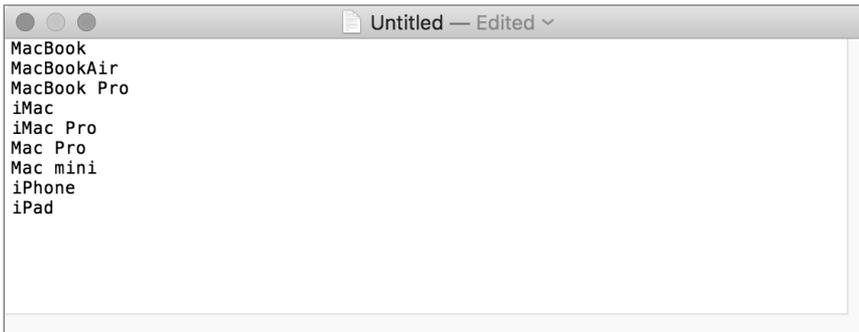
iMac Pro

Mac Pro

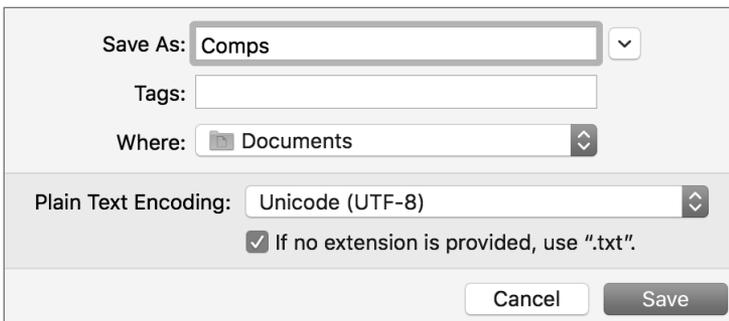
Mac mini

iPhone

iPad



- 5 From the Text Edit menu bar, choose File > Save and name the document Comps. Leave the document in the Documents folder.



- 6 Close the Comps.txt document window.
- 7 Open a new document in TextEdit and change the format to Plain Text.
- 8 Save and name the new document Empty. Leave the document in the Documents folder.
- 9 Quit TextEdit.

Copy and Move Files and Create a Folder

- 1 Switch to or open Terminal.
- 2 Enter `cd` to change to the Documents folder.
- 3 Enter `ls` to view the files in the Documents folder.

When you save a plain text file from TextEdit, the program adds the filename extension “.txt” to it.

- 4 Enter `cp` to make a copy of Comps.txt and rename it MacModels.txt.

```
Mac-17:Documents ladmin$ cp Comps.txt MacModels.txt
```

Many commands that take a source and a destination list the source first.

- 5 Enter `less` to view both files.

MacModels.txt is an exact copy of Comps.txt.

```
Mac-17:Documents ladmin$ less MacModels.txt
```

```
Mac-17:Documents ladmin$ less Comps.txt
```

Create a Folder and Copy a File to It

- 1 Create a new folder in the Documents folder:

```
Mac-17:Documents ladmin$ mkdir AppleInfo
```

Because AppleInfo is a relative path, the folder is created in the Documents folder.

- 2 Enter `cp` to copy MacModels.txt into AppleInfo (don't forget to try Tab key completion):

```
Mac-17:Documents ladmin$ cp MacModels.txt AppleInfo
```

- 3 Enter `ls` to view the contents of `AppleInfo`:

```
Mac-17:Documents ladmin$ ls AppleInfo
```

Fix a Naming Error

The text list in `MacModels.txt` includes a couple of items that are not technically Mac computers. Let's rename the file and clean up the extra copies.

- 1 Remove the `Comps.txt` file from the `Documents` folder and the `MacModels.txt` file from the `AppleInfo` folder:

```
Mac-17:Documents ladmin$ rm Comps.txt AppleInfo/MacModels.txt
```

You entered the command once to delete both files. The command line doesn't have an undo function. Any change you make is permanent.

- 2 Move the `MacModels.txt` file into the `AppleInfo` folder using the `mv` command:

```
Mac-17:Documents ladmin$ mv MacModels.txt AppleInfo
```

- 3 Enter `cd` to change your working directory to `AppleInfo`.

- 4 Enter `mv` to rename the `MacModels.txt` file to `AppleHardware.txt`.

```
Mac-17:AppleInfo ladmin$ mv MacModels.txt AppleHardware.txt
```

You can move and rename a file with just `mv`:

```
$ mv MacModels.txt AppleInfo/AppleHardware.txt
```

Remove a Folder

- 1 Change your working directory back to the `Documents` folder. You can do so in one of three ways:

- ▶ Use the absolute path `/Users/ladmin/Documents`.
- ▶ Use the home folder shortcut `~/Documents`.
- ▶ Use the relative path `(..)`.

The `..` notation refers to the parent directory of the current directory. So, because your current working directory is `/Users/ladmin/Documents/AppleInfo`, `..` refers to `/Users/ladmin/Documents`.

Occasionally, you see the `..` notation in the middle of a path instead of at the beginning—for example, `/Users/ladmin/Documents/../Desktop`. It still has the same meaning, so in this example, it refers to Local Administrator's Desktop folder.

Similarly, a single `.` refers to the current directory or location in the path.

Each directory actually contains a reference to both itself and its parent. These are visible if you use `ls -a` (note the lowercase `a` instead of the uppercase `A` you used previously).

- 2 Move the `AppleHardware.txt` file to `Documents` and rename it `AppleHardwareInfo.txt`.

Don't press the Return key until you enter `AppleHardwareInfo.txt`.

```
Mac-17:Documents ladmin$ mv AppleInfo/AppleHardware.txt AppleHardwareInfo.txt
```

The path `AppleHardwareInfo.txt` is relative to your current working directory, so this step moves `AppleInfo/AppleHardware.txt` to the current working directory (`Documents`) and renames it `AppleHardwareInfo.txt`.

- 3 Enter `rmdir` to remove the `AppleInfo` directory:

```
Mac-17:Documents ladmin$ rmdir AppleInfo
```

`rmdir` succeeds because `AppleInfo` is empty. `rmdir` removes only folders that are empty. Enter `rm -r` to remove a folder that contains files:

```
Mac-17:Documents ladmin$ rm -r AppleInfo
```

Create and Edit a Text File

macOS includes several command-line text editors. In this exercise, you use the nano editor to create and edit a file.

- 1 Enter `nano` to create a new file named `fruit.txt`:

```
Mac-17:Documents ladmin$ nano fruit.txt
```

```
GNU nano 2.0.6 File: fruit.txt

[ New File ]
^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell
```

- 2 Enter the following words in the file on separate lines. Press Return at the end of each line.

apple

pineapple

grapefruit

pear

banana

blueberry

strawberry

- 3 Press and hold the Control key and press and release X (Control-X) to quit nano.
You'll see "Save modified buffer (ANSWERING 'No' WILL DESTROY CHANGES)?"
- 4 Enter Y.
You'll see "File Name to Write: fruit.txt."
- 5 Press Return.
nano saves your file and exits, returning you to the prompt.
- 6 Quit Terminal.

Lesson 5

Use macOS Recovery

One of the most useful macOS features for troubleshooting is macOS Recovery. You can use macOS Recovery to reinstall macOS and also access administration and troubleshooting utilities. macOS Recovery is on the primary system disk. This gives you easy access to recovery utilities without the need for additional media.

In this lesson, you learn how to access macOS Recovery. You also explore the utilities available from macOS Recovery. Finally, you learn how to create an external macOS install disk that you can use when local macOS Recovery isn't available.

Reference 5.1

Start Up from macOS Recovery

Mac computers running macOS High Sierra include a hidden macOS Recovery system on the local system disk. This built-in recovery system doesn't appear in Disk Utility or in the Finder when a Mac is running macOS.

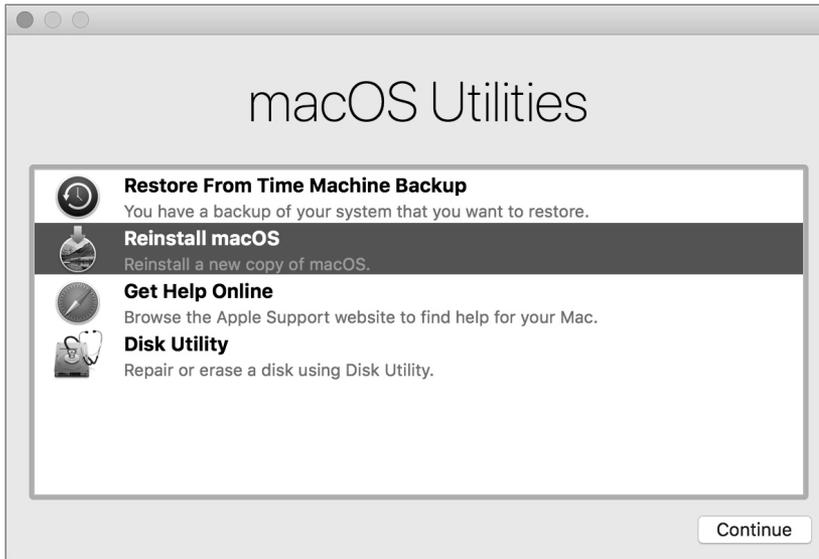
Start macOS Recovery from the Built-In Recovery System

To start up from macOS Recovery, restart or turn on your Mac, and then immediately press and hold Command-R. Release the keys when you see the Apple logo.

After macOS Recovery fully starts, the macOS Utilities window appears. From there you can install or upgrade macOS and choose from a variety of maintenance apps.

GOALS

- ▶ Access macOS Recovery utilities
- ▶ Reinstall macOS from macOS Recovery
- ▶ Create an external macOS Recovery disk



If macOS Recovery doesn't start or isn't installed on the local system disk, you have some alternatives for accessing it.

Start macOS Recovery from a Time Machine Disk

The Time Machine backup service automatically creates a hidden recovery system on local backup disks. To access macOS Recovery, connect the Time Machine backup disk to your Mac, and then start up or restart while you press and hold the Option key. This opens the Mac computer's Startup Manager, where you can use the arrow and Return keys or the mouse or trackpad to select the Time Machine backup disk. **Lesson 17, "Manage Time Machine,"** covers this topic in greater detail.

Start macOS Recovery over the Internet

If the local built-in recovery system is missing, some Mac computers automatically attempt to access macOS Recovery over the Internet. This applies to Mac computers released in mid-2010 or later with available firmware updates installed.

macOS Recovery installs different versions of macOS depending on the key combination you use while starting up. Turn on or restart your Mac, and then immediately press and hold one of these combinations:

- ▶ **Command-R**—Install the latest macOS that was installed on your Mac, without upgrading to a later version.

- ▶ Option-Command-R—Upgrade to the latest macOS that is compatible with your Mac. If you haven't already updated to macOS Sierra 10.12.4 or later, Option-Command-R installs the macOS that came with your Mac, or the version closest to it that is still available.
- ▶ Shift-Option-Command-R—Install the macOS that came with your Mac, or the version closest to it that is still available. If you haven't already updated to macOS Sierra 10.12.4 or later, Shift-Option-Command-R is not available.

If successful, this process re-creates the local built-in recovery system. Read Apple Support article HT204904, “How to install macOS,” for more information about the differences in the key combinations.

Read Apple Support article HT201314, “About macOS Recovery” for more details about macOS Recovery.



Reference 5.2 macOS Recovery Utilities

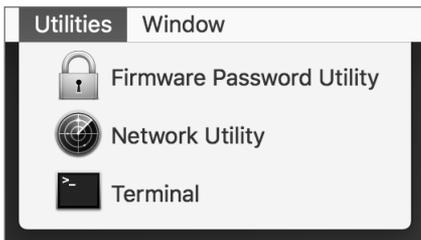
When you start up from macOS Recovery, you can access several administration and maintenance utilities.

When you start up from macOS Recovery, Ethernet and Wi-Fi networks are available if they provide Dynamic Host Configuration Protocol (DHCP) services to automatically configure network settings. macOS automatically enables Ethernet if you connect your Mac to the network with an Ethernet cable. If you don't connect your Mac to the network with an Ethernet cable, macOS should automatically connect to a Wi-Fi network. If it doesn't, select one from the Wi-Fi menu.

From the macOS Utilities window in macOS Recovery, you can access the following functions:

- ▶ Restore From Time Machine Backup—Use this option to restore a full Mac Time Machine backup from either a network or a locally connected external storage device. Read **Lesson 17** for more information.
- ▶ Install macOS or Reinstall macOS—Use this option to open the macOS Installer.
- ▶ Get Help Online—This option opens Safari, which takes you to the Apple Support website.
- ▶ Disk Utility—Use Disk Utility to manage disks, add, and manage volumes, and manage Redundant Array of Independent Disks (RAID) sets. It's useful when you start up a Mac from macOS Recovery because you can use it to manage a system disk that you can't manage when you use it as a startup disk. You can also use Disk Utility to prepare a disk for a new macOS installation or to repair a disk that fails installation. Read **Lesson 11, “Manage File Systems and Storage,”** for more information.
- ▶ Startup Disk (by clicking the close button, quitting, or choosing Startup Disk from the Apple menu)—If you attempt to quit the macOS Utilities window, you see a prompt to start the Startup Disk utility. From this utility you can select the default macOS startup disk. You can override the default startup using the startup modes discussed in **Lesson 28, “Troubleshoot Startup and System Issues.”**

macOS Recovery has a few extra features in the Utilities menu at the top of the screen:



- ▶ Firmware Password Utility—This utility enables you to secure a Mac computer’s startup process by disabling alternate startup modes without a password. You can disable or enable this feature and define the required password. Learn more about firmware passwords in **Lesson 10, “Manage Password Changes.”**
- ▶ Network Utility—This is the main network and Internet troubleshooting utility in macOS. Use it in macOS Recovery to troubleshoot network issues that could prevent the download of macOS installation assets. Network Utility is further discussed in **Lesson 23, “Troubleshoot Network Issues.”**
- ▶ Terminal—This is your primary interface to the UNIX command-line environment of macOS. The most useful command you can enter from here is `resetpassword`, followed by pressing the Return key.

The `resetpassword` command enables you to reset the password of any local user account, including the root user’s, on a selected system disk. You can run `resetpassword` only from macOS Recovery. Find out more about the Reset Password assistant in **Lesson 10**.

NOTE ▶ macOS Recovery utilities can be used to compromise Mac security. Any Mac with a default startup disk that can be overridden during startup isn’t secure. Use the Firmware Password Utility to help protect your Mac computers. Read Lesson 10 for more information.

Reference 5.3

Create a macOS Recovery Disk

Sometimes a Mac doesn’t have a local built-in recovery system. For example, if you replace the internal disk with a new blank disk, nothing is on the new disk. Also, Mac computers on RAID sets and disks with nonstandard Boot Camp partitioning won’t have a local built-in recovery system.

macOS High Sierra includes a command-line tool, named `createinstallmedia`, in the Install macOS High Sierra app that converts a standard disk into a macOS Recovery disk. This tool copies a macOS Recovery system and the macOS installation assets to an external storage device. To use `createinstallmedia`, you must have an external storage device with at least 8 GB. Exercise 5.2, “Create a macOS Install Disk,” outlines the steps to create this disk type.

Exercise 5.1

Use macOS Recovery

► Prerequisite

- Your Mac must have a hidden macOS Recovery volume. This volume is created and updated by the macOS High Sierra upgrade or installation process.

In this exercise, you start up your Mac in macOS Recovery. You also review the included utilities and how macOS Recovery can reinstall macOS.

NOTE ► You won't perform an installation, but you'll get an opportunity to look at the steps leading up to the installation.

Start Up Using macOS Recovery

To access the installer and other utilities in macOS Recovery, start up from macOS Recovery.

- 1 If your Mac is on, shut it down by choosing Shut Down from the Apple menu.
- 2 Press the power button on your Mac, press and hold Command-R until the Apple logo appears on the screen, and then release the keys.

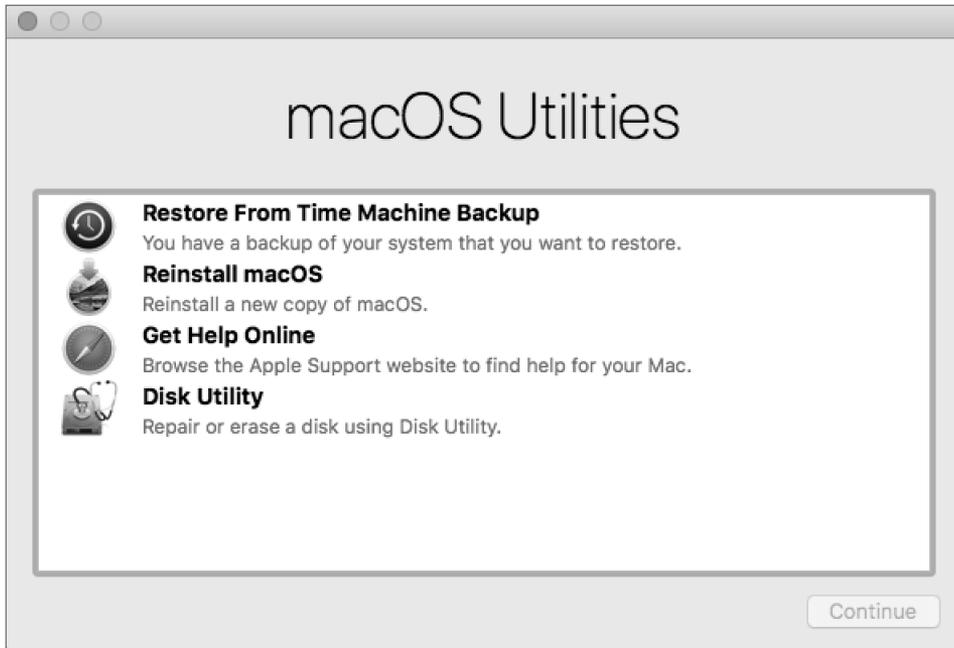
When you press and hold Command-R during startup, the Mac attempts to start up using a recovery partition on the hard disk.

If macOS Recovery isn't available, Mac computers with newer firmware can start up from an Apple server over the Internet and get access to the macOS Recovery utilities.

If your Mac starts up to the Login Window or Setup Assistant instead of macOS Recovery, you may not have held Command-R long enough. If this happens, click the Shut Down button (at the Login Window) or press Command-Q (at the Setup Assistant) and try again.

- 3 If a language selection screen appears, select your preferred language and click the right-arrow button.

- 4 After macOS Recovery starts up, you see macOS Utilities. This window is the primary interface for macOS Recovery.



Examine the macOS Recovery Utilities

While using macOS Recovery, you have access to utilities for recovering, repairing, and reinstalling macOS. In this part of the exercise, you get to know some of these utilities.

View macOS Recovery Help

Use Safari to view the built-in instructions for macOS Recovery and to browse the web.

- 1 Select Get Help Online, and then click Continue.

Safari opens and displays a document with information about how to use macOS Recovery.

- 2 Read the document.

This document is stored in macOS Recovery, but as long as you have an Internet connection, use Safari to view online documentation such as Apple Support articles.

- 3 If a dialog indicates that Safari wants to use the login keychain, leave the Password field blank and click OK.
- 4 Click in the “Search or enter website name” field, enter `apple.com`, and press Return.



Safari displays the Apple website.

- 5 If Safari displays a message saying “You are not connected to the Internet,” join a wireless network using the Wi-Fi icon near the right side of the menu bar.
- 6 Near the top right of the page, click the Support link (<https://www.apple.com/support>).

You are taken to the Apple Support site. If you were experiencing a problem with your Mac, look for solutions and information. You use Apple Support resources later in this guide.

- 7 From the menu bar, choose Safari > Quit Safari (or press Command-Q) to return to the macOS Utilities screen.

When you close Safari, you don’t quit Safari. To quit a Mac app, choose *Quit App Name* from the app menu (the menu next to the Apple menu, named for the current app). Or you can use Command-Q.

Examine Disk Utility

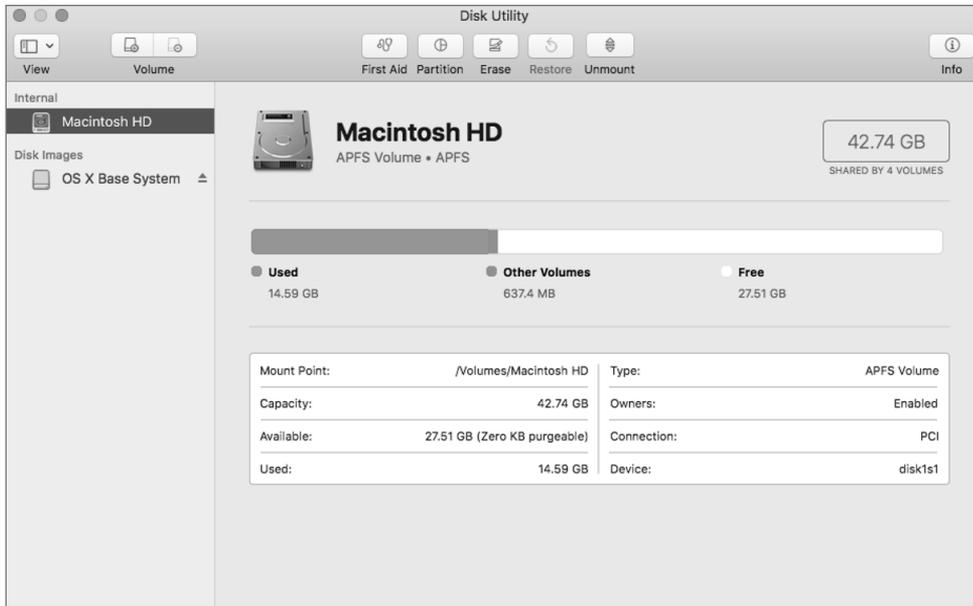
Disk Utility enables you to repair, image, reformat, or repartition your Mac disk.

NOTE ► If your Mac startup disk is protected by FileVault, you must unlock the disk. You can use a local user password to unlock the disk.

- 1 Select Disk Utility, and then click Continue.

In the device list on the left, you see your startup disk and a Base System disk image. If you are in the Show All Devices view, you see the primary entry for each disk device and an indented list of volumes on each device.

- 2 Select the entry for your startup volume. Typically, it is named Macintosh HD.



View the buttons in the Disk Utility toolbar. These buttons represent functions that are discussed in detail in **Lesson 11**.

With Disk Utility you can use First Aid to verify or repair the startup volume file structure or erase the volume before you reinstall macOS High Sierra.

- 3 Quit Disk Utility by going to the menu bar and choosing Disk Utility > Quit Disk Utility or by pressing Command-Q.

You are returned to the macOS Utilities window.

Examine Time Machine Restoration

If you backed up your Mac with Time Machine, macOS Recovery can do a full system restoration from that backup. **Reference 17.2, "Configure Time Machine,"** covers setting up Time Machine.

- 1 Select Restore From Time Machine Backup, and click Continue.

The Restore from Time Machine screen appears, with notes on the restoration. This restoration interface erases current content and replaces it from the backup.

- 2 Click Continue.

The Select a Backup Source screen appears. If you configured a Time Machine backup target, it would be available here as a source for restoring macOS.

- 3 Click Go Back to return to the Restore from Time Machine screen.
- 4 Click Go Back again to return to the macOS Utilities screen.

Examine the macOS Installer

Here you examine reinstallation, but you don't perform a reinstall. When you complete these steps, you experience the reinstallation, but you don't have to wait while macOS is copied to your Mac.

- 1 Select Reinstall macOS, and click Continue.

The Installer app opens.

- 2 Click Continue.
- 3 Read the license agreement, and click Agree.
- 4 In the license confirmation dialog, click Agree to indicate you have read and agree to the terms of the software license agreement.

The installer displays a list of volumes where you could install or reinstall macOS.

NOTE ► Don't click the Install button. If you do, the installer reinstalls macOS.

- 5 Quit the installer.

Verify Your Startup Disk and Restart

The Startup Disk utility enables you to select the volume from which to start up. If you encounter problems with your internal disk during, connect a second disk, with macOS installed, and use Startup Disk to configure your Mac to start up from the new disk.

- 1 From the Apple menu, choose Startup Disk.

Startup Disk lists all available startup volumes. The options might include Network Startup or one or more NetBoot images, depending on what Startup Disk finds on your network.

- 2 Verify that your normal startup volume (typically named Macintosh HD) is selected. If necessary, select it.



- 3 Click Restart.
- 4 In the confirmation dialog, click Restart.

You could also restart without using the Startup Disk utility by choosing Restart from the Apple menu.

Exercise 5.2

Create a macOS Install Disk

► Prerequisites

- You need an erasable external disk with a capacity of at least 12 GB.
- You must have created the Local Administrator account (**Exercise 3.1, “Configure a New Mac for Exercises,”** or **Exercise 3.2, “Configure an Existing Mac for Exercises”**).

In this exercise, you create a macOS install disk, which includes the macOS Recovery environment and tools and installation assets. When you create a macOS install disk this way, you can reinstall macOS without downloading the installer app from the App Store. Record the version of the macOS installer that you use. If you need to, you can get an updated installer from the App Store.

Get a Copy of the Install macOS High Sierra App

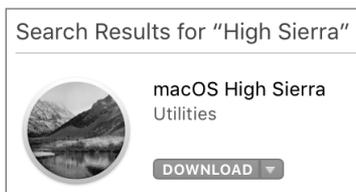
If you upgraded to High Sierra following the instructions in **Exercise 2.2, “Upgrade to macOS High Sierra,”** and saved a copy of the installer app, use it and skip this section.

If you perform these exercises as part of a class, the facilitator probably gave you a copy in the StudentMaterials/Lesson5 folder. Otherwise, you can download the installer using the following steps:

- 1 Log in as Local Administrator (password: `ladminpw`, or whatever you chose when you created the account).
- 2 From the Apple menu, choose App Store. For more about the App Store, see **Lesson 18, “Install Apps.”**
- 3 In the search field of the App Store window, enter **High Sierra** and press Return.



- 4 Find macOS High Sierra in the search results, and click the **DOWNLOAD** or **GET** button under its name.



- 5 If a confirmation dialog appears, click Continue.

- 6 If a dialog appears asking you to sign in, either sign in to an Apple ID account or create a new Apple ID. See **Reference 18.1, “The App Store,”** and **Exercise 18.1, “Install an App from the App Store”**), for more information about using Apple IDs in the App Store.

When the installer app finishes downloading, it opens.

- 7 Quit both Install macOS High Sierra and the App Store.

Reformat the External Disk

Most new external disks come preformatted with the Master Boot Record (MBR) partition scheme. To allow a Mac to start up from MBR, reformat the disk with the GUID partition map (GPT) scheme. For more information about disk formats, see **Lesson 11**.

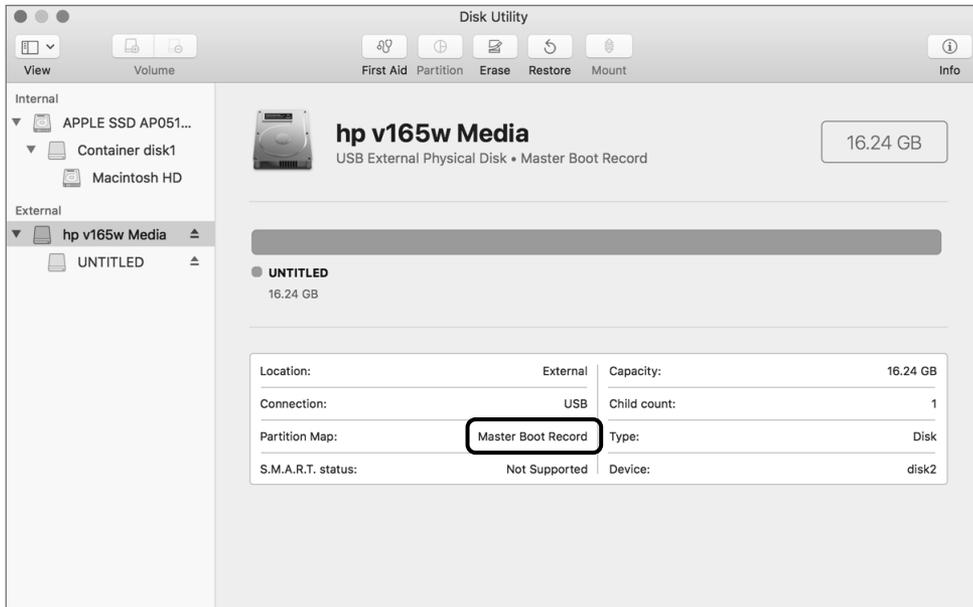
NOTE ► This operation erases all content on the external disk. Don't perform this exercise with a disk that contains important content.

- 1 Open Disk Utility. It's in /Applications/Utilities.
- 2 Connect the external disk to your Mac.
- 3 If you are prompted for a password to unlock the disk, click Cancel.
You don't need to unlock the disk to erase it.
- 4 In the toolbar, choose View > Show All Devices.



- 5 Select the external disk device entry in the Disk Utility sidebar. Select the device entry, not the volume entry indented beneath it.

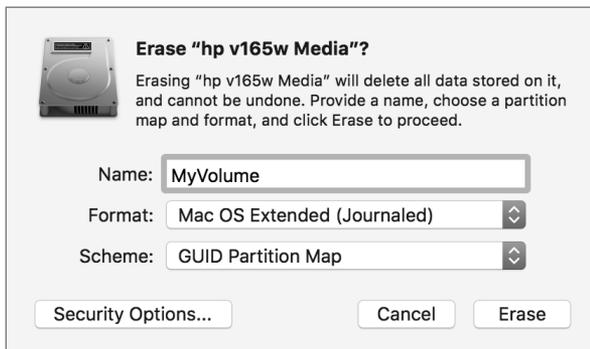
- 6 Check the partition map listed at the bottom of the window.



- 7 You might not know the partition scheme that's currently on the disk, or the disk could include the GPT scheme. In either case, erase the disk.

You can partition the disk and use part of it for the installer volume. See **Reference 11.4, "Manage File Systems,"** for more information about partitioning.

- 8 Click the Erase button in the toolbar.
- 9 Give the disk a descriptive name, choose Mac OS Extended (Journaled) from the Format pop-up menu, and choose GUID Partition Map from the Scheme pop-up menu.



- 10 Click the Erase button.
- 11 When the process finishes, click Done to dismiss the erase dialog.
- 12 Verify that the Partition Map entry is GUID Partition Map.

Location:	External	Capacity:	16.24 GB
Connection:	USB	Child count:	2
Partition Map:	GUID Partition Map	Type:	Disk
S.M.A.R.T. status:	Not Supported	Device:	disk2

- 13 Quit Disk Utility.

Create a macOS Install Disk

- 1 Open Terminal.
- 2 Switch to the Finder, and navigate to the Install macOS High Sierra app and do one of the following:
 - ▶ If you perform this exercise in a class and the facilitator provides a copy of the installer apps, open the Lesson5 folder in StudentMaterials.
 - ▶ If you downloaded the installer app from the App Store, open the Applications folder.
- 3 Control-click the Install macOS High Sierra app, and choose Show Package Contents from the shortcut menu that appears.

Read **Reference 14.2, “Examine Packages”** for more information.

- 4 In the installer package, open the Contents folder, and open the Resources folder.
- 5 Drag the createinstallmedia file from the Finder into Terminal.
This inserts the full path to createinstallmedia in Terminal.
- 6 Switch back to Terminal, and press Return.

This executes the createinstallmedia tool as a command-line program. It prints a usage summary and explains how to use the tool.

- 7 Enter `sudo` followed by a space to start another command, but don't press Return until step 11.
- 8 Drag `createinstallmedia` from the Finder to Terminal again.
- 9 In Terminal, enter `--volume` (enter two hyphens before volume) followed by a space.
- 10 Drag the MyVolume (or whatever you named it) volume icon from the desktop to Terminal.

At this point, the command should look something like this:



```

ladmin — -bash — 80x24
Last login: Tue Oct 24 14:06:20 on ttys000
Mac-17:~ ladmin$ sudo /Applications/Install\ macOS\ High\ Sierra.app/Contents/Re
sources/createinstallmedia --volume /Volumes/MyVolume █

```

- 11 Switch to Terminal, and press Return.

This operation requires admin access.

- 12 Enter the Local Administrator account password (`ladminpw`, or whatever you chose when you created the account; nothing displays as you type), and press Return.

This operation erases the disk, so you are prompted to confirm the operation.

- 13 Verify that the volume name (listed after `/Volumes/`) is the one you intend to use, enter `Y`, and press Return.

- 14 Wait while the install disk is prepared. This may take several minutes, depending on the type and speed of the external disk you use.

When the process finishes, Terminal displays several lines, ending with “Copy complete.” followed by “Done.”

- 15 Quit Terminal.

Test the macOS High Sierra Install Disk

Test the installer disk, but don't reinstall macOS.

- 1 Go to the Apple menu and choose Restart; then click Restart in the confirmation dialog to restart your Mac.

- 2 Press and hold the Option key until you see a row of icons.
- 3 Click the install disk icon.
- 4 Click the arrow that appears under the icon.

The Mac starts up in the installer environment, which is like the recovery environment. Explore it, but don't reinstall macOS.

- 5 When you finish exploring the installer environment, go to the Apple menu and choose Restart to restart your Mac.

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