Commanding the Command Line

Cybersecurity

Terminal 101 Day 2

Class Objective

By the end of today's class, you will be able to:

- Identify and explain the structure of a terminal command.
- Explain how options modify the default behavior of a terminal command.
- Use the `man` command to list instructions and options for each command
- Use the `find` command to locate files based on search parameters.
- Use the `grep` command to search within the contents of files.
- Use the `wc` command to count words and lines.
- Combine multiple commands in sequence with pipes to accomplish intermediate IT tasks.

Welcome Back to the Terminal

Terminal Review

Commands for navigating a file directory:

`pwd`	
`ls`	
`cd`	
`cd ../`	
`clear`	

Terminal Review

Commands for navigating a file directory:

`pwd`	Display the current working directory.
`ls`	List the directories and files in the current directory.
`cd`	Navigate into a directory.
`cd ../`	Navigate out of a directory.
`clear`	Clear the terminal history on the page.

Terminal Review

Commands for making and removing files and directories:

`mkdir`	
`rmdir`	
`touch`	
`rm`	

Terminal Review

Commands for making and removing files and directories:

`mkdir`	Create a new directory.
`rmdir`	Remove a directory.
`touch`	Create an empty file.
`rm`	Remove a file.

Terminal Review

Commands for moving and copying files:

`mv`	
`cp`	

Terminal Review

Commands for moving and copying files:

`mv`	Move files to a new location.
`cp`	Copy files into a new location.

Terminal Review

Commands for previewing files:

`more`	
`less`	
`head`	
`tail`	

Terminal Review

Commands for previewing files:

`more`	Display a file one page at a time.
`less`	Display a file, with the ability to scroll up and down.
`head`	Preview the top 10 lines of a file.
`tail`	Preview the bottom 10 lines of file.

Terminal Review

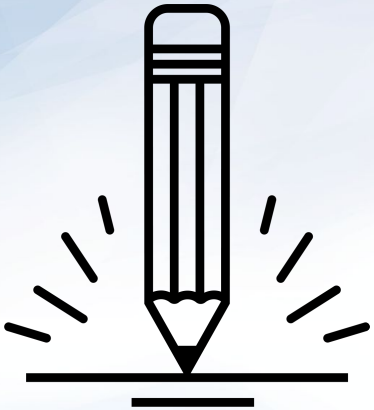
Commands for concatenating and redirecting files:

`cat`	
`>`	
`>>`	

Terminal Review

Commands for concatenating and redirecting files:

`cat`	Concatenate and combine files together.
`>`	Write to a file, overwriting the file if the file name already exists.
`>>`	Write to a file, appending the file if the file name already exists.



Activity: Warm Up

In this activity, you will continue in your role as security analyst at Wonka Corp.

Local authorities found video evidence that Slugworth made a cash delivery to Wonka's back door on October 13th, 2019.

You must gather physical access logs to prove Henry or Ruth opened the back door for the delivery.

Suggested Time:
15 minutes

Time’s Up! Let’s Review.

Command Line Structure

Command Line Structure

So far, we are familiar with the following structure:

```
<command> <argument>
```

Example:

```
touch myfile
```

- The command is **`touch`**.
- The argument is **`myfile`**.

Expanding the Command Line

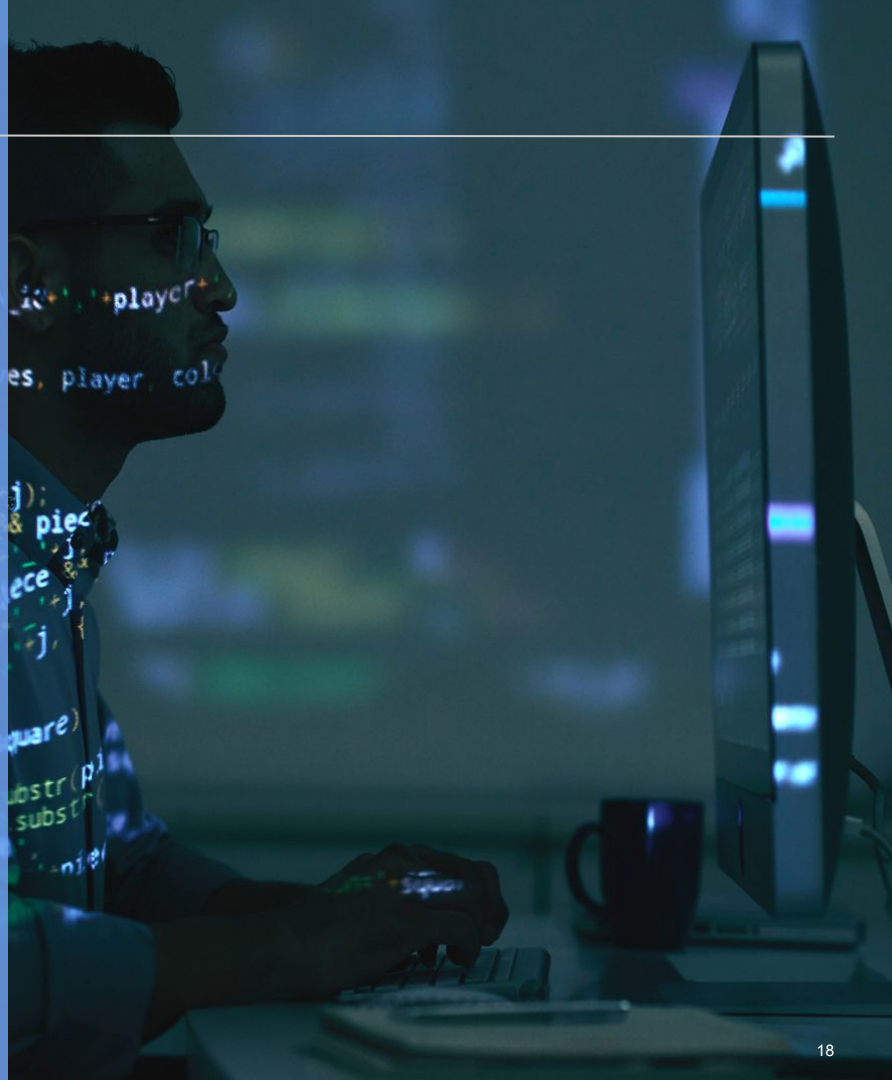
IT professionals often need to run commands with more specific parameters than can be included in the command itself.

For example:

- You need to clean up server space.

  You want to list out files by size, so you can delete the largest files first.

  But the default behavior of the `ls` command does not list out the files by size.



Method One

Add an option to modify the command's default behavior.

```
ls -S
```

We can use the command `ls -S` to list files by size.

- By default, `ls` simply lists out the files in the current directory. The `-S` option modifies that behavior to list by size, largest first.
- The syntax for the preceding command:
  - `ls` is the command.
  - `-S` is the option.

Method One

Add an option to modify the command's default behavior.

```
ls -S
```

Keep in mind:

- Options always use a hyphen.
- Options, just like commands, are case sensitive:
  - `-s` provides a different result than `-S`.
  - The lowercase `-s` option prints the size of each file.
- Options have different uses for different commands.
  - `ls -s` will print the size of each file.
  - `cat -s` will suppress repeated empty output lines.

Method Two

Add an option and an argument to modify the default behavior.

```
cat -n logfile1.txt
```

- This command displays the line numbers of `logfile1.txt`.
- By default, the `cat` command concatenates multiple files or displays the contents of a single file.
- Adding the option `-n` modifies the behavior by displaying the line numbers preceding each line.

Method Three

Add options that require their own arguments, called **parameters**.

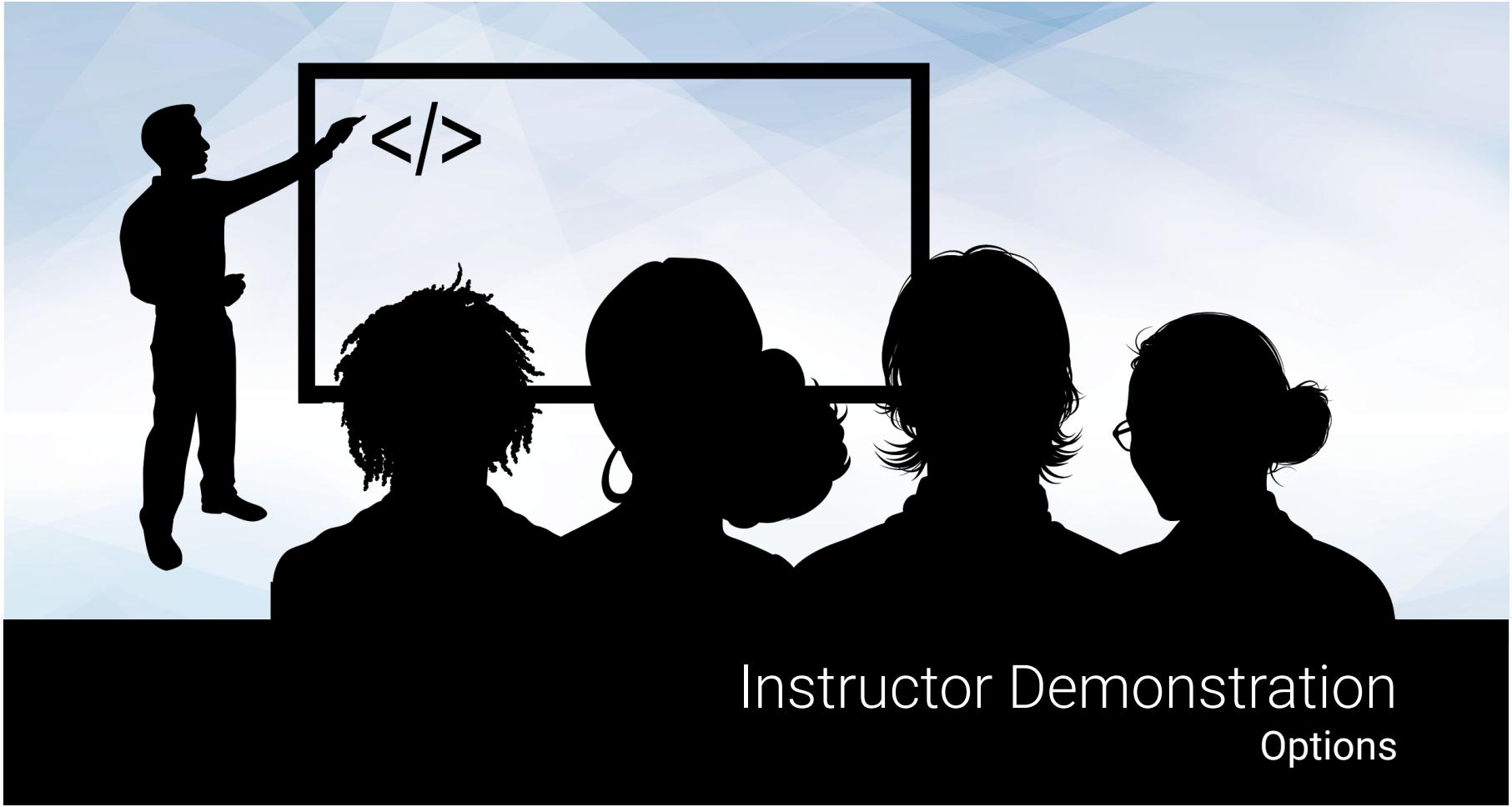
```
head -n 4 logfile.txt
```

- This command previews the first four lines of **`logfile1.txt`**.
- By default, **head** displays the top 10 lines of a file.
- The option **`-n`** changes the number of lines displayed.
  - **`-n`** requires a **parameter** specifying the number of lines.
  - Parameters provide additional details on how to modify a command's default behavior.

Demo Scenario: Options

We are security analysts at ACME Corp. Our manager has tasked us with cleaning up some evidence files, as server space is getting low.

- We need to delete the three largest evidence files, as long as they don't contain the user **`Sheila`**, which will be needed for a future investigation.
- We've been told that the log files are not more than 40 lines.



Instructor Demonstration

Options

Man Pages

Welcome to Man Pages

With the multitude of commands at our disposal, and with each command offering unique options and parameters, navigating the command line can feel overwhelming.

Welcome to Man Pages

IT and security professionals can learn and manage options with a valuable resource known as **manual (man) pages.**

man pages are built-in to the terminal and document the following for each command:

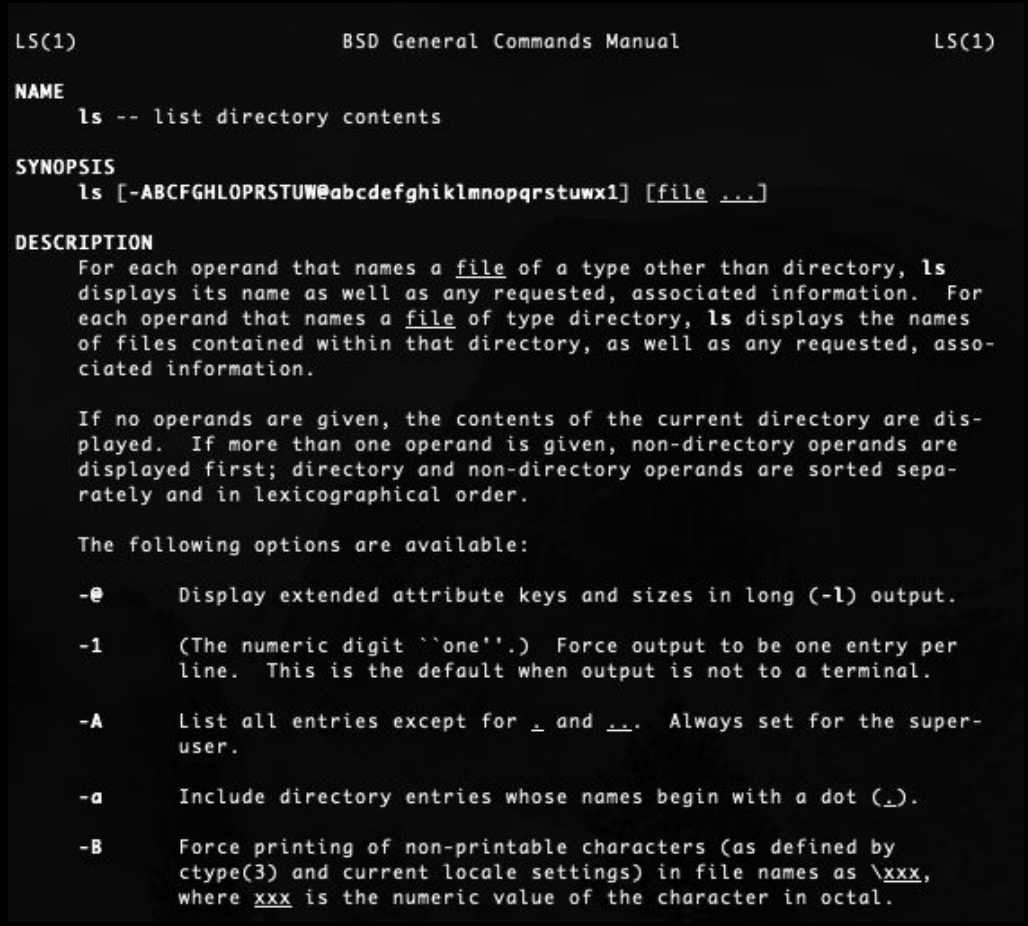
- Name of the command
- Synopsis (includes syntax)
- Description
- Options and option parameters

Access man pages with the following:

```
man <command>
```

For example:

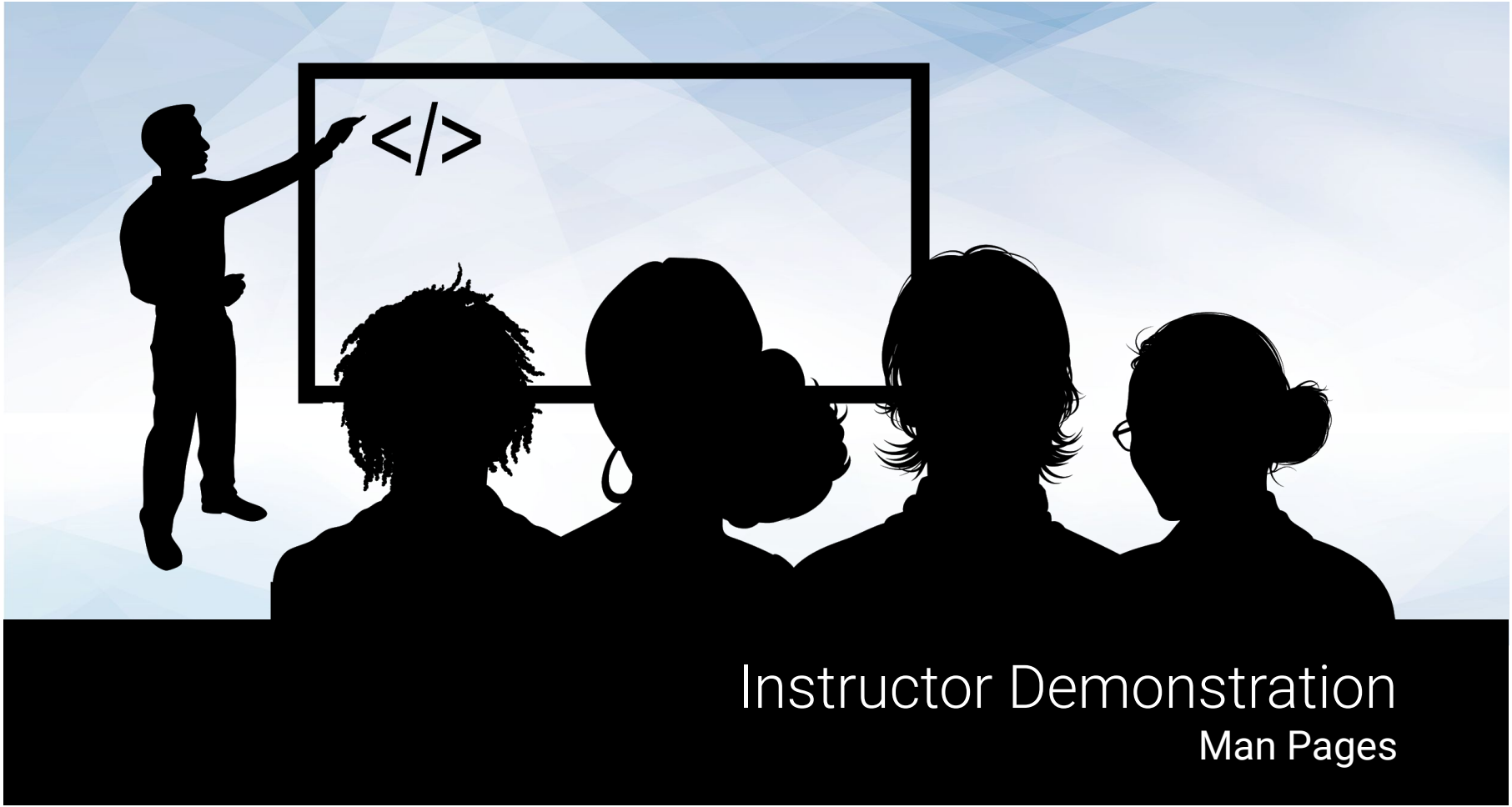
```
man ls
```



Demo Scenario: Man Pages

In this demo, we are a security analyst at ACME Corp. Your manager has tasked you with counting the number of logins on a server on the day of October 13, 2019.

- They told us to use the command **`wc`** to count the logins on the server login file.
- We have not used the **`wc`** command before and need to use a man page to learn how it works.

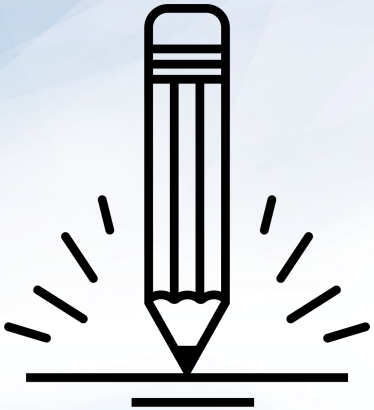


Instructor Demonstration

Man Pages

Demo Review: Man Pages

- In this demo, we are a security analyst at ACME Corp. Our manager has tasked you with counting the number of logins on a server on the day of October 13, 2019.
- They told us to use the command **`wc`** to count the logins on the server login file.
- Since we have not used the wc command before, we need to use a man page to learn how it works.



Activity: Learning New Commands

You continue in the role of security analyst at Wonka Corp.

There has been a network attack on Wonka's websites and management needs your help determining which website was the main target.

To determine which website was the main target, you will count the IP addresses in log files provided by your manager.

Suggested Time:
18 Minutes

Time’s Up! Let’s Review.

The `find` Command

find

We have previously navigated in and out of multiple directories to find files or directories. This isn't always the best practice.

- For example, you might be tasked with finding access logs on a server that you're not familiar with.

  Security professionals are often not provided the exact location of a file, so you may have to navigate through hundreds of directories to find the access logs.

Introducing the `find` Command

The **`find`** command searches for files and directories with one command.

By default, **`find`** will search through the current directory and the subdirectories within that current directory.

However, **`find`** does not review the contents within a file, only the file name or directory name.

`find` Syntax

```
find -type f
```

- This command finds **all** files in our current directory and its subdirectories.
- We use the option **`-type`** and the required parameter **`f`** to indicate that we are searching for files.

`find` Syntax

```
find -type f -name log.txt
```

- This example will find a **specific** file.
- We use the option `-name` to search for an exact match of the specified parameter, `log.txt`.

`find` Syntax

```
find -type f -iname log.txt
```

- To find a specific file with case insensitivity, we change the **`-name`** option to **`-iname`.**
- This example will find the files called **`log.txt`** (lowercase) or **`LOG.TXT`** (uppercase) in our current directory and its subdirectories.

`find` Syntax

```
find -type f -iname *.txt
```

- This example uses a symbol known as a **wildcard** to search for all files ending with `.txt`.
- The `*` wildcard symbol indicates that any file ending with `.txt` will be displayed, regardless of what comes before `.txt`. Using wildcards with `find` is called a **wildcard search**.
- With the addition of `-iname`, this example finds all files that end with `.txt` or `.TXT` in your current directory and its subdirectories.

`find` Syntax

```
find /root/desktop -type f -iname log.txt
```

- In the final example, we're using **`find`** to search for a file located in *another* directory. Specifically, we're looking for the case insensitive **`log.txt`** in the **`/root/desktop`** directory.
- We place the desired directory after the **`find`** command and before the the **`-type`** option.

Syntax for Finding Directories

We find directories with the same syntax, but add `-d` as the **`type`** parameter.

```
find -type d
```

```
find -type d -name logs
```

```
find -type d -iname logs
```

```
find -type d -iname *1013
```

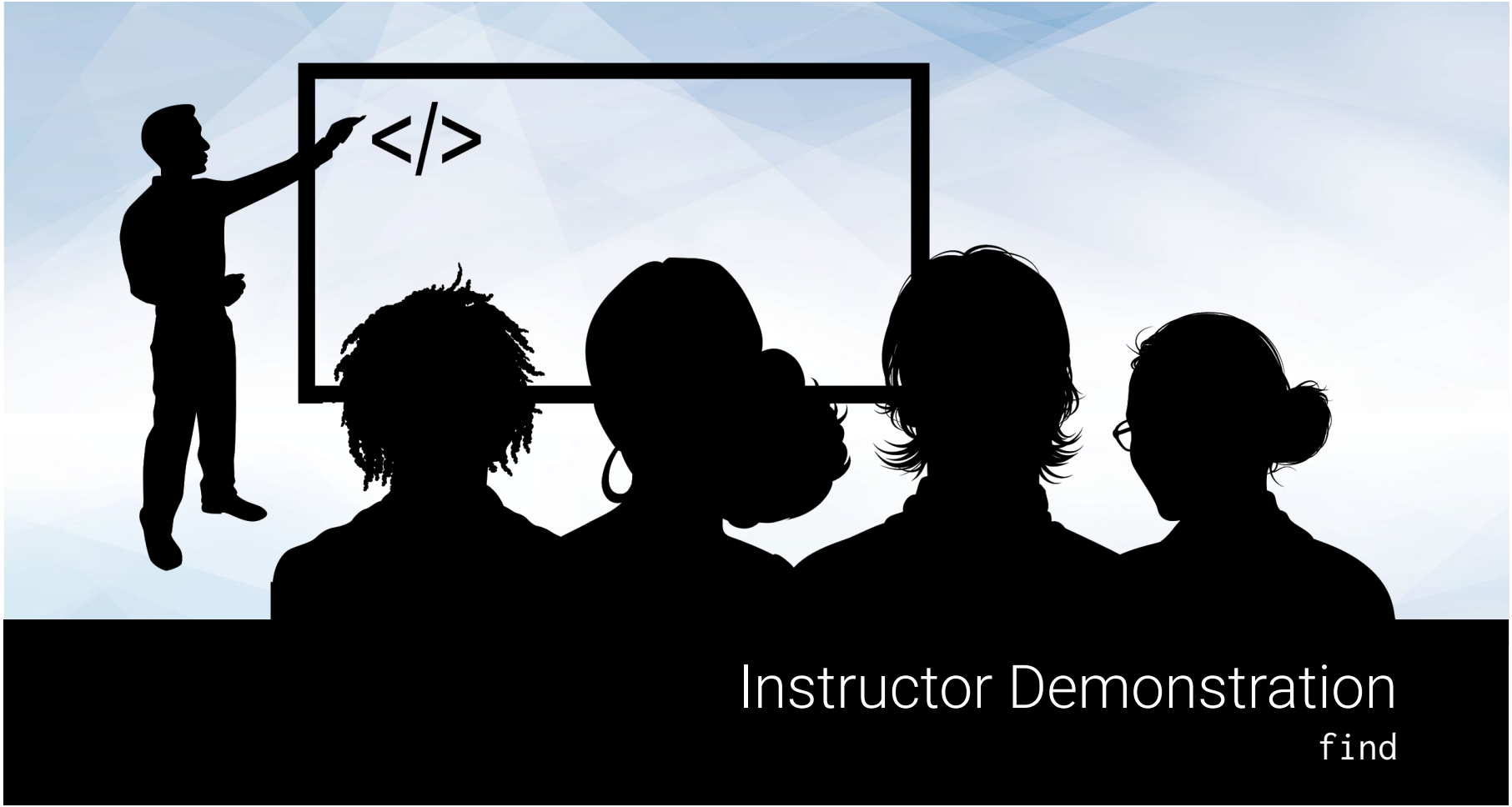
```
find /root/desktop -type d -iname logs
```

`find` Demo Setup

In the next demonstration, we'll use the following scenario:

- Your manager at ACME has tasked you with finding logs for a certain type of web server called **Apache**, for the date of **October 13th**.
- They told you that the directory should be named **`apache`** and the log files should have the date noted as **`1013`** in their file names.
- Since there are many directories, you will use the **`find`** command to complete these tasks.

Suggested Time: 15 Minutes



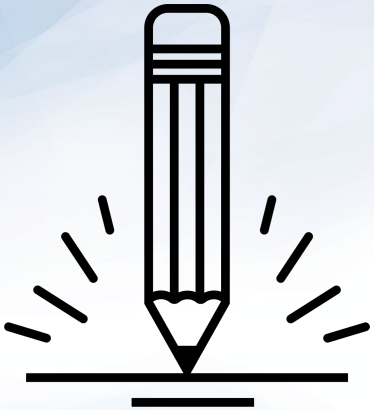
Instructor Demonstration

`find`

Demo Review: `find`ing your Way

The previous demo covered the following concepts:

- **`find`**: Command-line command used to locate a file or a directory.
- **`type f`**: An option used to find files.
- **`type d`**: An option used to find directories.
- **`name:`** Additional option used to find specific file of directory names.
- **`iname`**: Additional option used to find case-insensitive names.



Activity: `find`ing Your Way

Your manager at Wonka Corp has tasked you with searching through the **PeanutButtery.net** server's files and file directories to uncover secret recipes they believe are hidden in the file system.

Suggested Time:
18 Minutes

Time’s Up! Let’s Review.

Countdown timer

15:00

(with alarm)

grep

Limitations of `find`

The **`find`** command only searches for the names of files, *not* the contents within.

However, security professionals are often tasked with searching for specific data inside a file.

- For example, you might be asked to check if a specific user logged in on a specific day.

  You would first find the access log file for that day and then need to verify if that user appeared in the log file.

grep

We've used preview commands such as **head**, **more**, **tail** and **less** to display the contents of a file. But these commands are limiting.

- Large files take a lot of time to scan for data.
- If you have more than one file to scan, it can take a lot of time to preview all of them.
- Manually previewing and scanning files invites human error.

`grep`

We can use **`grep`** to search a file or multiple files for a specific data point.

01

`grep` (*global regular expression print*) is a command to search for data inside of files.

02

`grep` by default returns the entire line that the desired data is found in.

03

`grep` by default will only search for data in the current directory, not subdirectories.

grep Syntax

```
<grep data_point File_to_search_inside>
```

- In this example, we are using **grep** to find a specific data point within a single file.

grep Syntax

```
grep bob log1.txt
```

- In this example, we are using **grep** to find the lines in which user **bob** is mentioned in the file **log1.txt**.
- The syntax is:
    a. **grep** is the command being run.
    b. **bob** is the specific data point being searched for.
    c. **log1.txt** is the file being searched for the data point.
- This command will display all the lines where the data point **bob** was found inside of the file **log1.txt**.
- If no matches of **bob** are found in the file, nothing will be returned.

grep Syntax

```
grep bob *.txt
```

- In this example, we are using **grep** to find a specific data point within *multiple* files.
- We are using **grep** to find where **bob** exists within in all **.txt** files.
    a. **bob** is the specific data point being searched for.
    b. ***.txt** is the wildcard. ***** indicates that it will search through all files that end with **.txt**.
- The command will display all the **.txt** files where the value of **bob** was found, followed by the lines where it was found.

grep Syntax

```
grep -i bob *.txt
```

Can anyone tell us what this command does?

`grep` Syntax

```
grep -i bob *.txt
```

- This **`grep`** command is used to find a *case-insensitive* specific data point.
- Specifically, this command finds the lines where the user **bob** or **BOB** exists within all **`.txt`** files.

grep Syntax

```
grep -il bob *.txt
```

- This example uses **`grep`** to indicate that it should display the *name* of the file that contains the specified data point.
- Specifically, this command outputs the file names of **`.txt`** files containing the user **bob** or **BOB**. It will only display the *names* of the files containing these users.

Note: **`-il`** are two separate options.

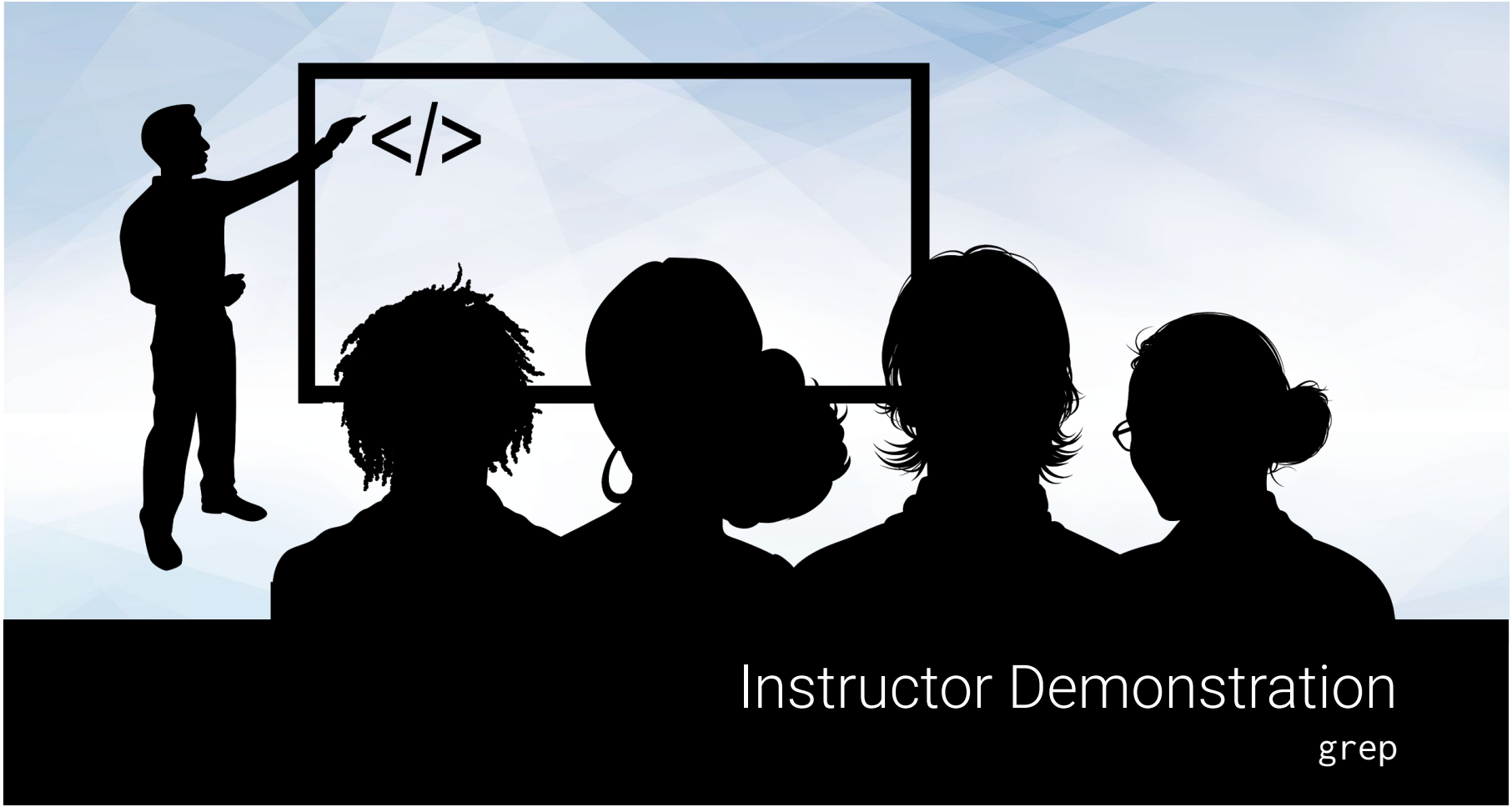
- **`i`** is an option for **`grep`** indicating case insensitivity.
- **`l`** is an additional option indicating to only return the file name.
- **`i`** and **`l`** use a single hyphen.

`grep` Demo Setup

In the next demonstration, we'll use the following scenario:

- Your manager has now asked for your help with a security investigation into an illegal money transfer that took place on May 17.
- The suspect, Sally Stealer, stated that she has never logged in to the company's banking website and that she definitely did not transfer any money on **`0517`**.
- You must use the **`grep`** command to search the application logs to see if Sally Stealer logged in on that day and, if so, when she transferred funds.

Suggested Time: 15 Minutes



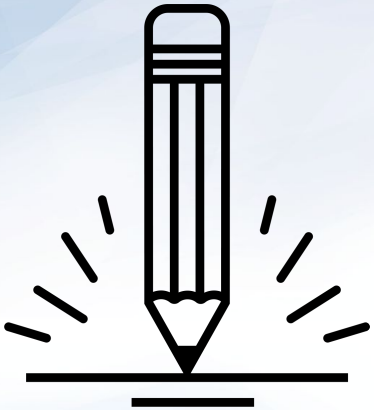
Instructor Demonstration

`grep`

Demo Review: `grep`

The previous demo covered the following concepts:

- **`grep`** is a command-line command to find a data point *inside* of a file.
- The basic syntax is: **`<grep data_point File_to_search_inside>`**
- **`grep`** by default will return the *whole line* on which it finds the data point.
- The **`i`** option will search for the data point with case insensitivity.
- The **`l`** option will return the file names of the file containing the data point.



Activity: `grep`

Slugworth recently made a large purchase of guavaberries. You manager suspects Slugworth is trying to reproduce some of Wonka's secret recipes that use guavaberries.

Your task is to determine which of the secret recipes contain guavaberries in their ingredient list.

Suggested Time:
15 Minutes

Time’s Up! Let’s Review.

Piping

So Far...

We've covered many commands line tools commonly used by IT and security professionals:

- **`find`** to search for file names or directories.
- **`grep`** to search for data points inside of files.
- **`wc`** to count lines or words inside of files.

Combining Commands

It’s common practice to combine commands in order to complete certain tasks.

For example: A security analyst might be tasked with determining if a user exists in a log file, and how many times that user appears.

- We can use the `grep` command to see if a user appears, by redirecting the results into an output file.
- We can use the `wc -l` command to determine how many times the user appears in the file by counting the results of the output file.

Pipes

We can use pipes to combine commands in a single line.

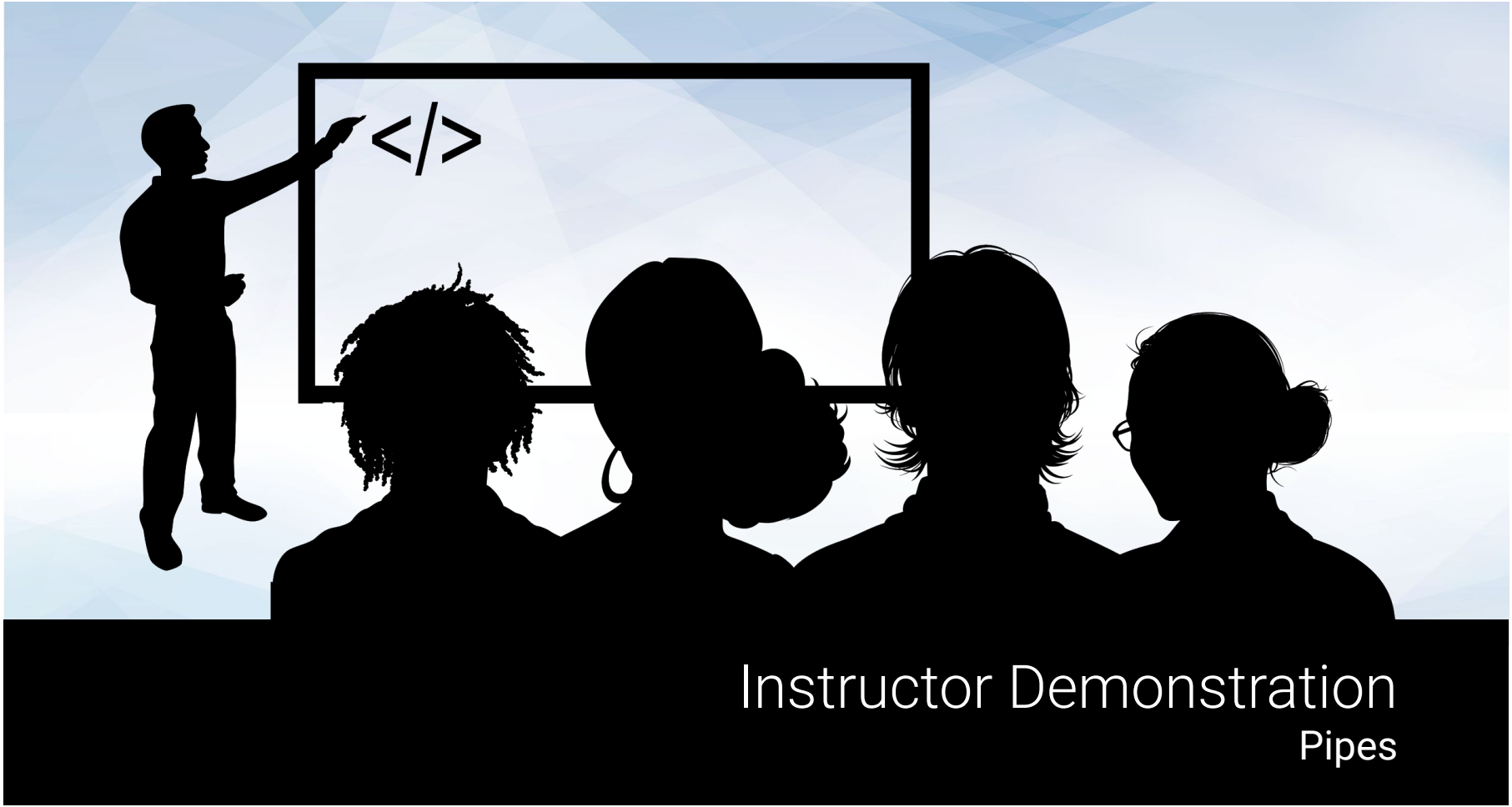
- Pipes redirect the output of one command to another, to complete additional tasks.
- A pipe is designated with the following symbol: |
- Multiple pipes can be used in a single command.
- Pipes are unidirectional, meaning processing of data flows from left to right.

Pipes Demo Setup

In the next demonstration, we'll use the following scenario:

- Our manager at ACME Corp has tasked us with continuing the previous investigation against Sally Stealer. They believe she may have transferred other large amounts of money.
- Our manager created a single file, **`largetransfers.txt`**, containing all transfers over one million dollars.
- We must count how many of those transfers belong to Sally Stealer.

Suggested Time: 15 Minutes



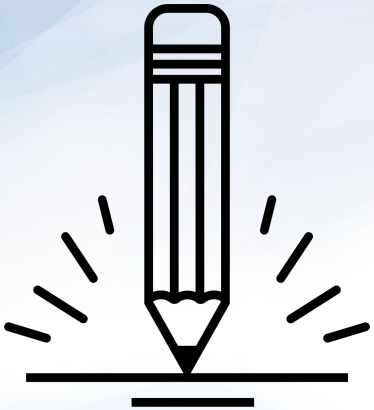
Instructor Demonstration

Pipes

Demo Review: Pipes

In the previous demo, we covered the following concepts:

- A pipe is used to take the output of one command and redirect it to another, in order to complete an additional task on the output.
- A pipe is designated with the following symbol : |
- Multiple pipes can be used in a single command.
- Pipes are unidirectional, meaning the processing of the data flows from left to right through the pipeline.



Activity: Gathering Evidence

Wonka Corp believes they have enough evidence to send to the authorities to charge Slugworth with a cyber crime.

Your task is to gather several points of evidence from your file systems to provide to the authorities to prove Slugworth is stealing data.

Suggested Time:
15 Minutes

Time’s Up! Let’s Review.

Which command do we use to access information about a specific command?

```
man
```

Which command do we use to find a file or directory?

```
find
```

Which command do we use to find a specific data point in a file?

```
grep
```

How do we combine commands?

```
pipes
```