Bash basics

Sorting your downloads with Bash

About me

- Programming in some way for 7 years
- Experience with Java, Visual Basic, C, C++, and Bash
- Designed game engines, Minecraft mods, operating systems

What is BASH?

- Shell scripting language
- Default shell for Unix and Linux systems
- Bourne Again SHell
- Used mainly for automation and lower level OS interaction

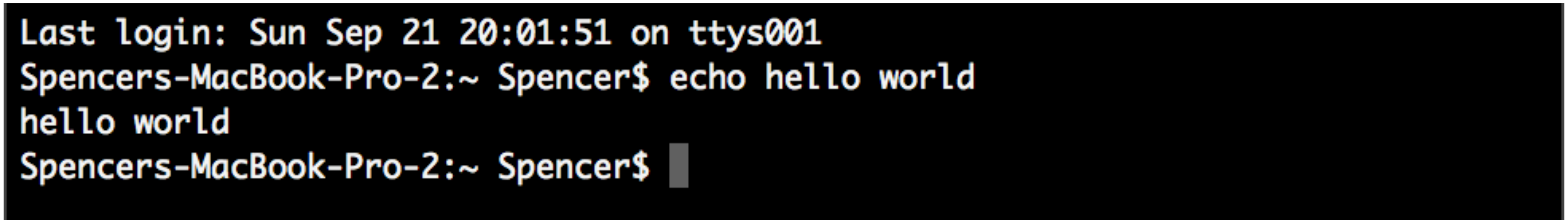
Where is BASH?

- Computers
- Smartphones
- Cars
- mp3 players
- Home appliances

Hello world!

echo - prints out argument passed to it

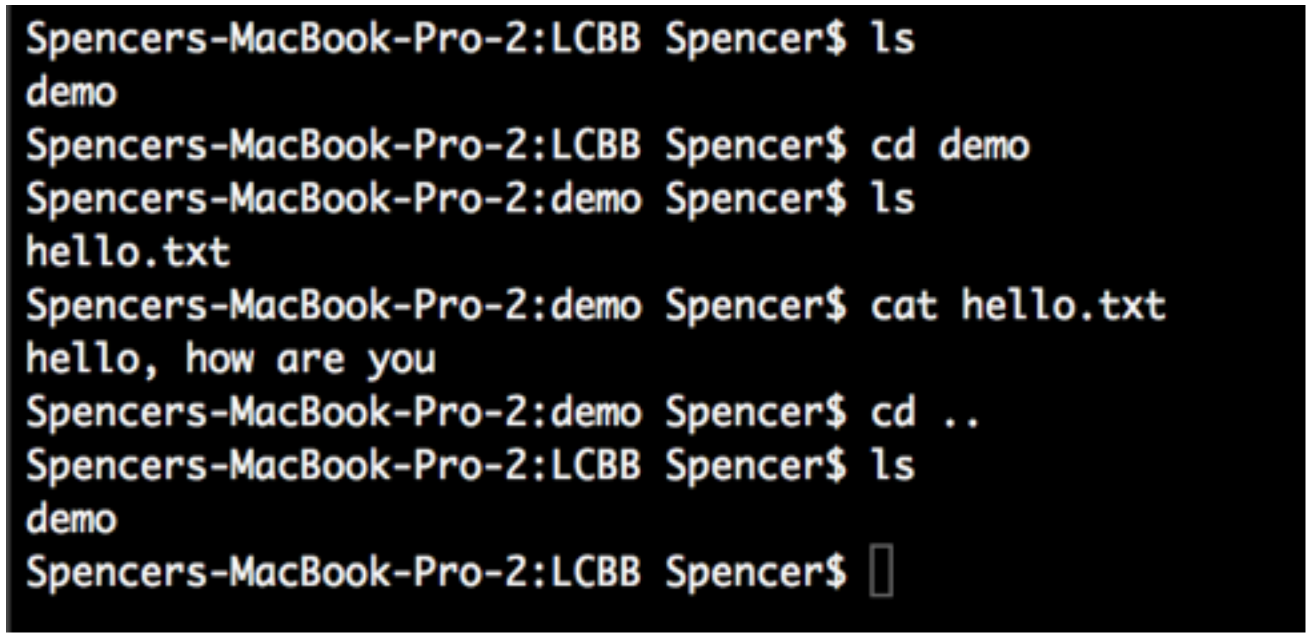
To print “Hello world” enter the command **`echo Hello world`**



```
Last login: Sun Sep 21 20:01:51 on ttys001
Spencers-MacBook-Pro-2:~ Spencer$ echo hello world
hello world
Spencers-MacBook-Pro-2:~ Spencer$ 
```

Navigating your file system with BASH

- **`cd`** to change current directory
- **`ls`** to list files in current directory
- **`cat`** to read file
- **`mv`** moves files and directories
- **`rm`** deletes files



```
Spencers-MacBook-Pro-2:LCBB Spencer$ ls
demo
Spencers-MacBook-Pro-2:LCBB Spencer$ cd demo
Spencers-MacBook-Pro-2:demo Spencer$ ls
hello.txt
Spencers-MacBook-Pro-2:demo Spencer$ cat hello.txt
hello, how are you
Spencers-MacBook-Pro-2:demo Spencer$ cd ..
Spencers-MacBook-Pro-2:LCBB Spencer$ ls
demo
Spencers-MacBook-Pro-2:LCBB Spencer$ 
```

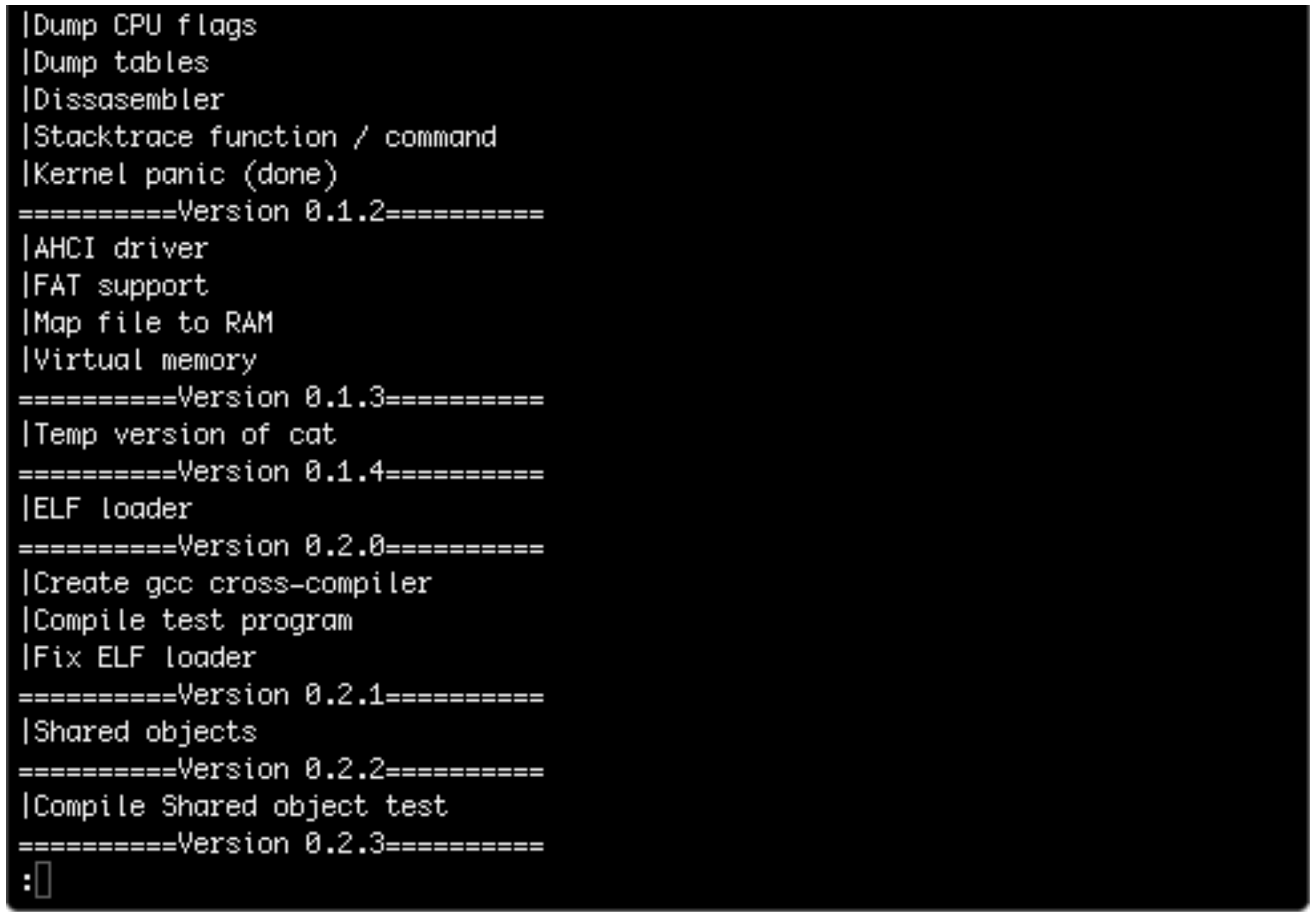
- All part of the POSIX standard commands that exists across most operating systems
- . is the current directory, .. is the directory above the current one

Bash shortcuts

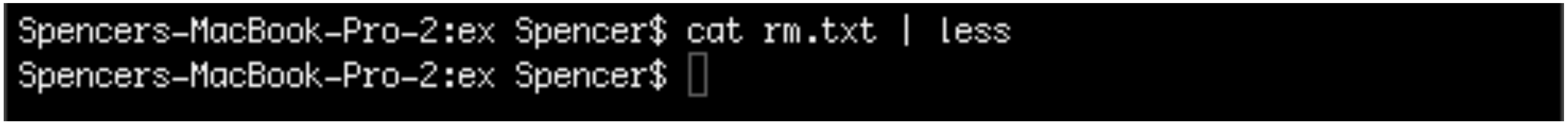
- Hit tab at any point to have bash attempt to autocomplete a command or file name
- Hold control + c during a long process to terminate it
- Use up and down arrow keys to find previously entered commands

Linking it all together

- **`less`** - pagifies input
- pipes - `|`



```
|Dump CPU flags
|Dump tables
|Dissasembler
|Stacktrace function / command
|Kernel panic (done)
==========Version 0.1.2==========
|AHCI driver
|FAT support
|Map file to RAM
|Virtual memory
==========Version 0.1.3==========
|Temp version of cat
==========Version 0.1.4==========
|ELF loader
==========Version 0.2.0==========
|Create gcc cross-compiler
|Compile test program
|Fix ELF loader
==========Version 0.2.1==========
|Shared objects
==========Version 0.2.2==========
|Compile Shared object test
==========Version 0.2.3==========
:
```



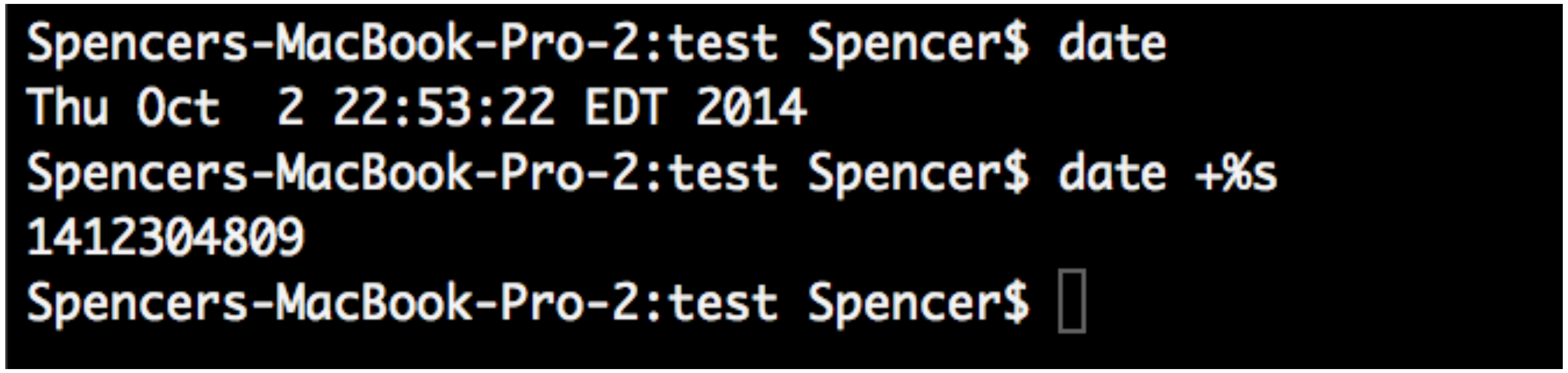
```
Spencers-MacBook-Pro-2:ex Spencer$ cat rm.txt | less
Spencers-MacBook-Pro-2:ex Spencer$ 
```

The epoch

- The epoch is a time (January 1st, 1970) in seconds
- Used as a baseline for times, like 1 CE in our date system.

date

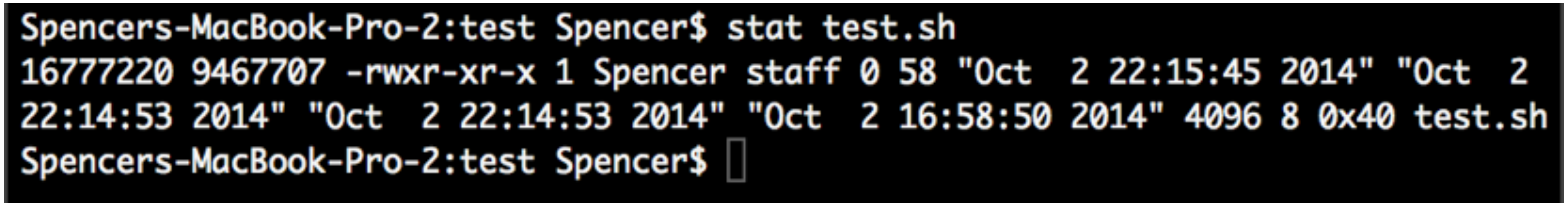
- **`date`** has many ways of representing the current date and time
- Can output date and time in english
- Able to output time since epoch in seconds with **`date +%s`**



```
Spencers-MacBook-Pro-2:test Spencer$ date
Thu Oct  2 22:53:22 EDT 2014
Spencers-MacBook-Pro-2:test Spencer$ date +%s
1412304809
Spencers-MacBook-Pro-2:test Spencer$ 
```

stat

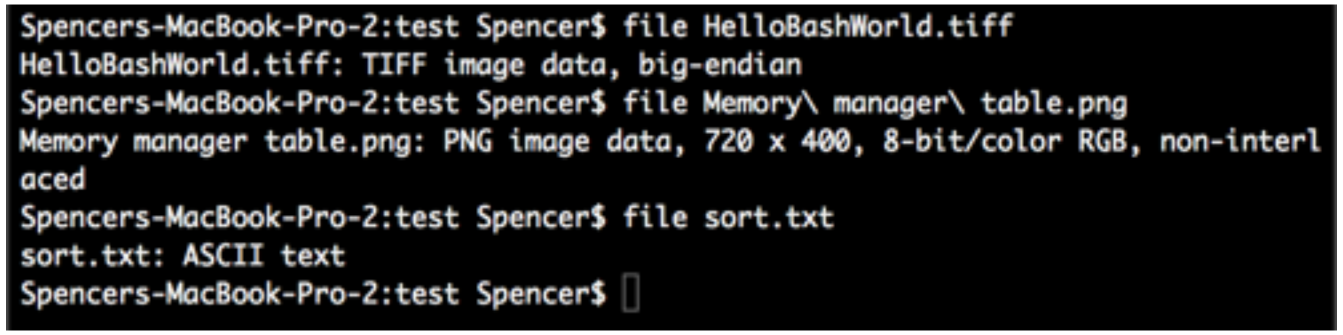
- Gives information about file
- Can output access time since epoch, access date and time in english, permissions, the creator
- **`stat -f%c`** will output the number of seconds since the epoch that the file was accessed



```
Spencers-MacBook-Pro-2:test Spencer$ stat test.sh
16777220 9467707 -rwxr-xr-x 1 Spencer staff 0 58 "Oct  2 22:15:45 2014" "Oct  2
22:14:53 2014" "Oct  2 22:14:53 2014" "Oct  2 16:58:50 2014" 4096 8 0x40 test.sh
Spencers-MacBook-Pro-2:test Spencer$ 
```

File

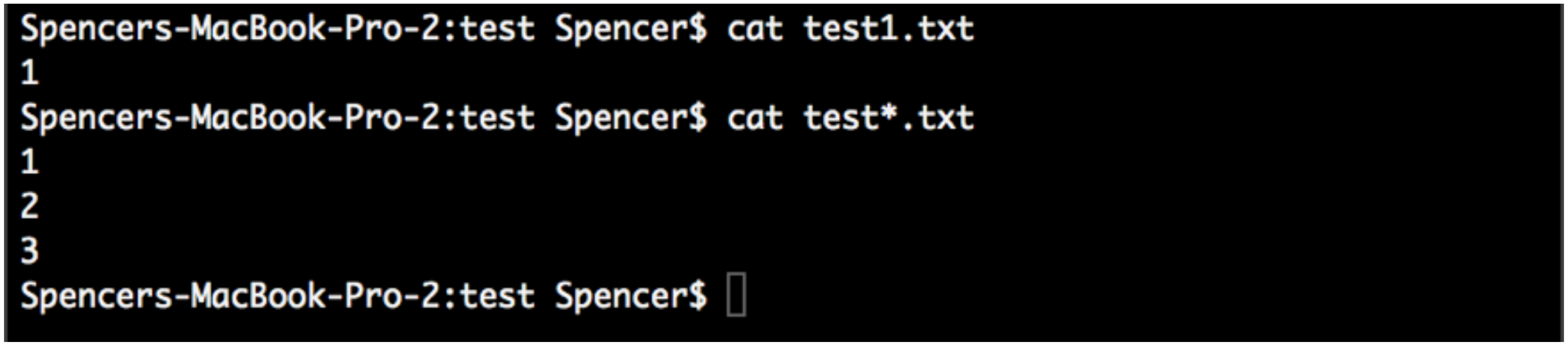
- Outputs information about a given file
- Capable of determining the resolution and color depth of images
- Identifies audio files and their corresponding metadata
- Able to identify archives
- Determines type by looking at the contents of the file
- Use file on “Space” to find out what type of file it is.



```
Spencers-MacBook-Pro-2:test Spencer$ file HelloBashWorld.tiff
HelloBashWorld.tiff: TIFF image data, big-endian
Spencers-MacBook-Pro-2:test Spencer$ file Memory\ manager\ table.png
Memory manager table.png: PNG image data, 720 x 400, 8-bit/color RGB, non-interl
aced
Spencers-MacBook-Pro-2:test Spencer$ file sort.txt
sort.txt: ASCII text
Spencers-MacBook-Pro-2:test Spencer$ 
```

Wildcards

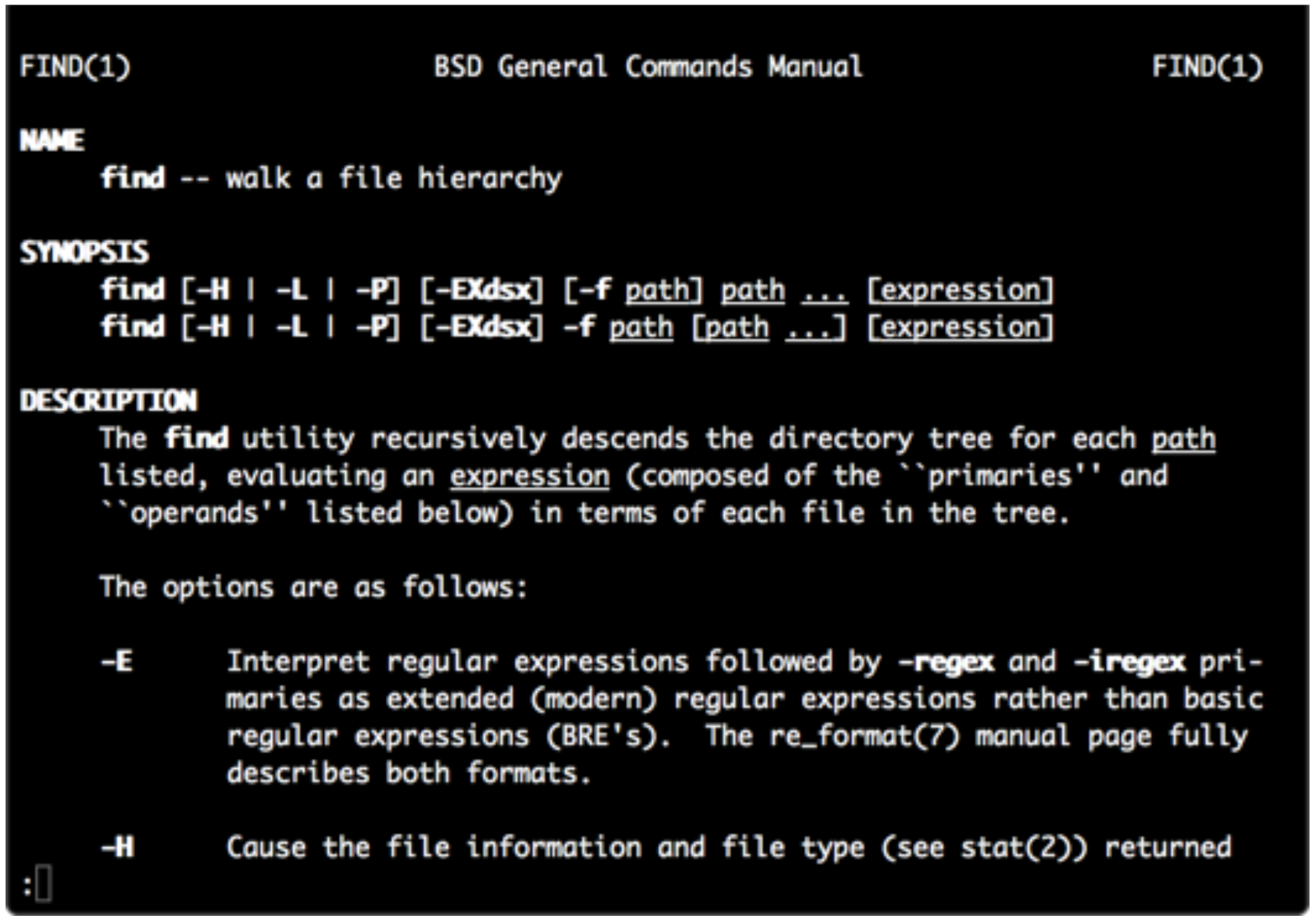
- Usually “*”
- A wildcard signifies that anything can go there
- * can represent anything, and file* represents “file” with any suffix



```
Spencers-MacBook-Pro-2:test Spencer$ cat test1.txt
1
Spencers-MacBook-Pro-2:test Spencer$ cat test*.txt
1
2
3
Spencers-MacBook-Pro-2:test Spencer$ 
```

Man pages

- Man is a manual built into many unix and linux systems
- Can be used to find syntax and usage of Bash / POSIX commands and functions, as well as other programs that add man pages
- Type in **`man file`** to get the manual entry for the **`file`** command
- Down and up arrows to scroll, Q key exits the man page



```
FIND(1)                  BSD General Commands Manual                 FIND(1)

NAME
     find -- walk a file hierarchy

SYNOPSIS
     find [-H | -L | -P] [-EXdsx] [-f path] path ... [expression]
     find [-H | -L | -P] [-EXdsx] -f path [path ...] [expression]

DESCRIPTION
     The find utility recursively descends the directory tree for each path
     listed, evaluating an expression (composed of the ``primaries'' and
     ``operands'' listed below) in terms of each file in the tree.

     The options are as follows:

     -E      Interpret regular expressions followed by -regex and -iregex pri-
             maries as extended (modern) regular expressions rather than basic
             regular expressions (BRE's).  The re_format(7) manual page fully
             describes both formats.

     -H      Cause the file information and file type (see stat(2)) returned
:
```

Writing a script

- Enter all commands in order in a text document
- Shell script files usually end with .sh
- Start shell script with **`bash myScript.sh`** or **`./myScript.sh`**

Variables

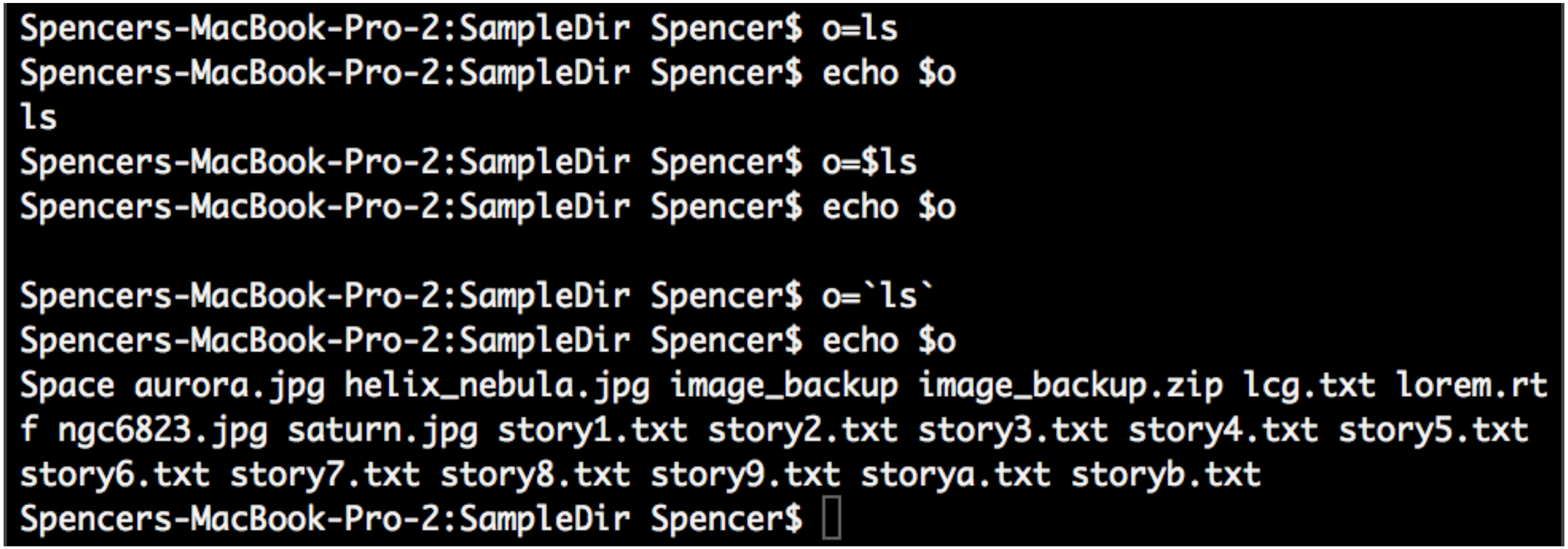
- set variable with **`someVar=something`**
- get variable with **`$someVar`**
- set variable to user input with **`read someVar`**
- **`echo $someVar`** prints the value of someVar

Experiment

Set a variable to the output of ls, and print out the value of that variable

What’s wrong?

When setting a variable to the output of a program, you must wrap it in ``



```
Spencers-MacBook-Pro-2:SampleDir Spencer$ o=ls
Spencers-MacBook-Pro-2:SampleDir Spencer$ echo $o
ls
Spencers-MacBook-Pro-2:SampleDir Spencer$ o=$ls
Spencers-MacBook-Pro-2:SampleDir Spencer$ echo $o

Spencers-MacBook-Pro-2:SampleDir Spencer$ o=`ls`
Spencers-MacBook-Pro-2:SampleDir Spencer$ echo $o
Space aurora.jpg helix_nebula.jpg image_backup image_backup.zip lcg.txt lorem.rt
f ngc6823.jpg saturn.jpg story1.txt story2.txt story3.txt story4.txt story5.txt
story6.txt story7.txt story8.txt story9.txt storya.txt storyb.txt
Spencers-MacBook-Pro-2:SampleDir Spencer$ 
```

Find

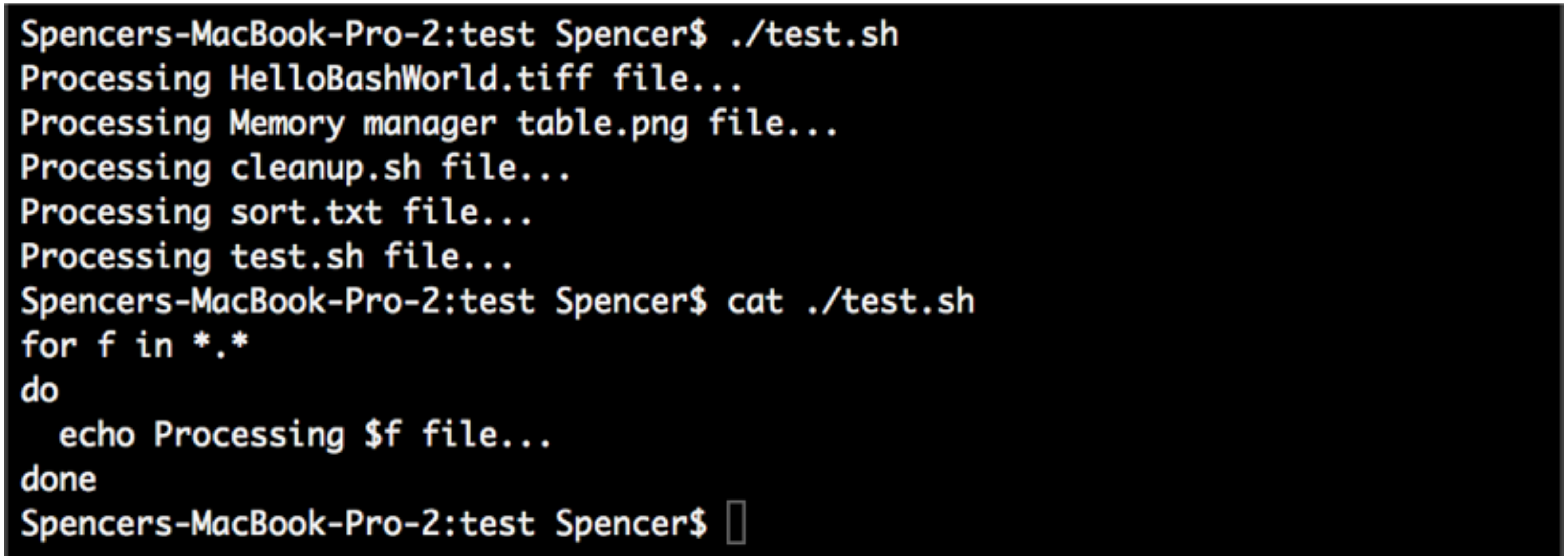
- Used to search for files
- Can find files modified or accessed before or after a time
- Can apply an operation to said files with **`-exec`**
- **`-maxdepth`** and **`-mindepth`** will specify how many folders find will look in
- **`-type`** can specify whether to find files, folders or other file system objects
- **`-name`** to specify the name to look for

Exercise

- Use man pages to identify how to remove the file name in the output of **`file`**
- Do not use other commands to remove parts of the output of **`file`**

Looping

- Iterate over sets with **`for`**
- Can be used to iterate over files in a directory, or even just count



```
Spencers-MacBook-Pro-2:test Spencer$ ./test.sh
Processing HelloBashWorld.tiff file...
Processing Memory manager table.png file...
Processing cleanup.sh file...
Processing sort.txt file...
Processing test.sh file...
Spencers-MacBook-Pro-2:test Spencer$ cat ./test.sh
for f in *.*
do
  echo Processing $f file...
done
Spencers-MacBook-Pro-2:test Spencer$ 
```

Comparing

- **`==`** is true if the left and right sides are equal (**`$a == $b`**)
- **`!=`** is true if the left and right sides are not equal (**`$n != 4`**)
- **`=~`** will compare the left side to items on the right side separated by |'s (**`$a =~ A*|B|$n`**)

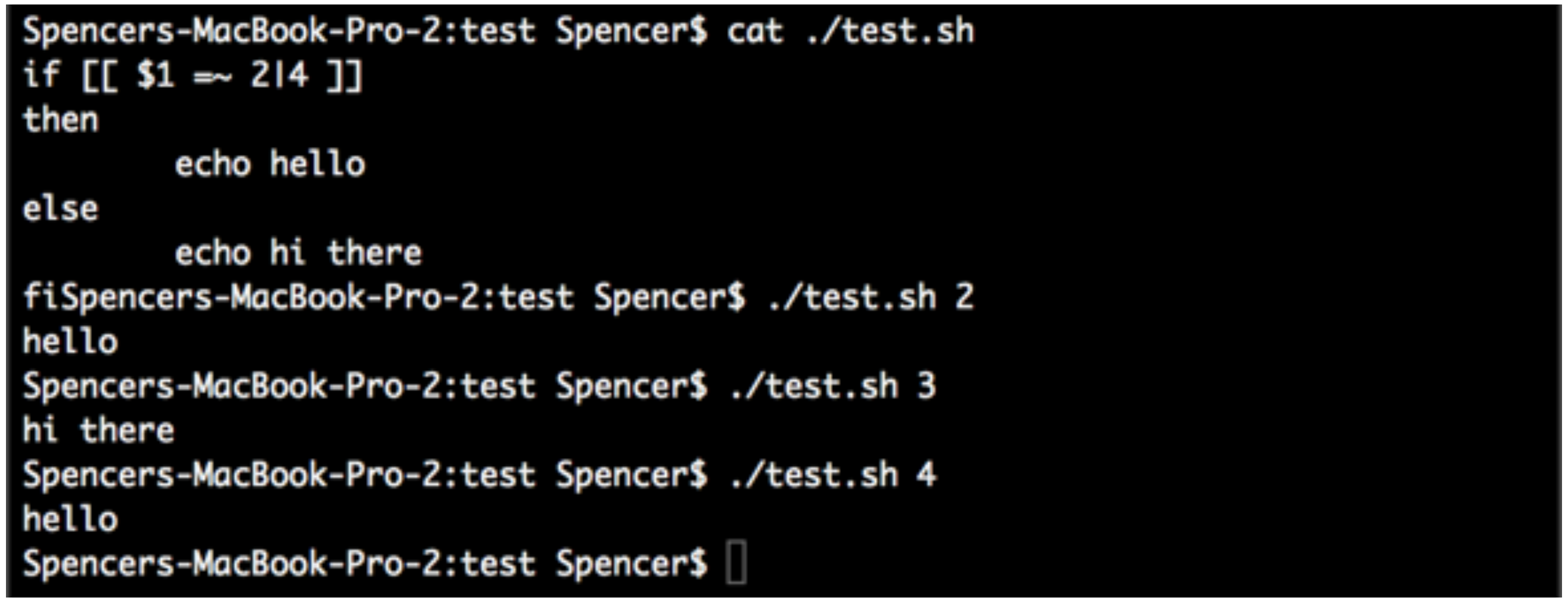
ifs

- Syntax is:
```
if [[ $a == $b ]]
then
  echo hello
fi
```

- will echo hello if a equals b

- Else syntax is:
```
if [[ $a == $b ]]
then
  echo true
else
  echo false
fi
```

- Can use any comparator inside of brackets



```
Spencers-MacBook-Pro-2:test Spencer$ cat ./test.sh
if [[ $1 =~ 2|4 ]]
then
        echo hello
else
        echo hi there
fiSpencers-MacBook-Pro-2:test Spencer$ ./test.sh 2
hello
Spencers-MacBook-Pro-2:test Spencer$ ./test.sh 3
hi there
Spencers-MacBook-Pro-2:test Spencer$ ./test.sh 4
hello
Spencers-MacBook-Pro-2:test Spencer$ 
```

What have we learned?

- File system navigation
- Control flow
- File analysis
- Searching the file system
- Variables
- Man pages

Let’s write some code!

```
#! env bash

mkdir images
mkdir archives
mkdir documents
mkdir unidentified

for f in *.*
do
     t=$(file -b $f)
     if [[ $t =~ PNG*|TIFF*|JPEG* ]]
     then
          mv $f images/$f
     fi

     if [[ $t =~ Zip*|TAR* ]]
     then
          if [[ $f =~ *.docx|*.doc|*.pptx|*.ppt ]]
          then
               mv $f documents/$f
          else
               mv $f archives/$f
          fi
     fi
     if [ $t == UTF-8 ]
     then
          mv $f documents/$f
     fi
done

find ./ -atime +1w -type f -maxdepth 1 -name "*" -exec mv {} unidentified/{}
\;
```