CSE 390a Lecture 5

Intro to shell scripting

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Lecture summary

- basic script syntax and running scripts
- shell variables and types
- control statements: the for loop

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Shell scripts

- **script**: A short program meant to perform a targeted task.
  - a series of commands combined into one executable file
- **shell script**: A script that is executed by a command-line shell.
  - `bash` (like most shells) has syntax for writing script programs
  - if your script becomes > ~100-150 lines, switch to a real language
- To write a `bash` script (in brief):
  - type one or more commands into a file; save it
  - type a special header in the file to identify it as a script (next slide)
  - enable execute permission on the file
  - run it!

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Basic script syntax

`#!`***interpreter***

- written as the first line of an executable script; causes a file to be treated as a script to be run by the given interpreter
  - (we will use `/bin/bash` as our interpreter)
- Example: A script that removes some files and then lists all files:

```
#!/bin/bash
rm output*.txt
ls -l
```

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Running a shell script

- by making it executable (most common; recommended):

```
chmod u+x myscript.sh
./myscript.sh
```

- by launching a new shell:

```
bash myscript.sh
```

- by running it within the current shell:

```
source myscript.sh
```

  - advantage: any variables defined by the script remain in this shell (seen later)

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echo

command	description
echo	produces its parameter(s) as output (the `println` of shell scripting) `-n` flag to remove newline (`print` vs `println`)

- Example: A script that prints your home directory.

```
#!/bin/bash
echo "This is my amazing script!"
echo "Your home dir is: `pwd`"
```

- *Exercise* : Write a script that when run on attu does the following:
  - clears the screen
  - displays the date/time: Today's date is Tue Apr 26 10:44:18 PDT 2011
  - shows me an ASCII cow welcoming my user name

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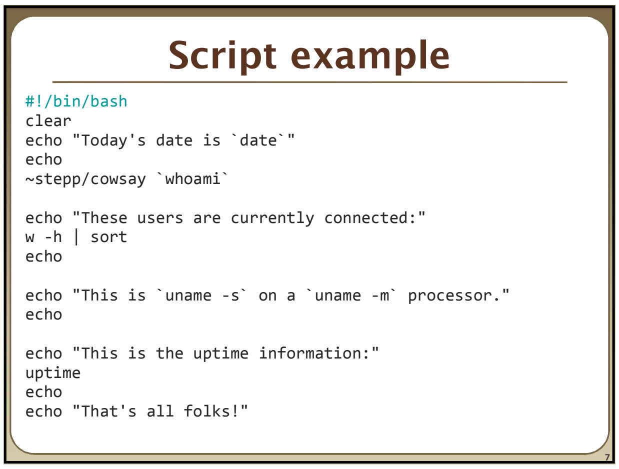


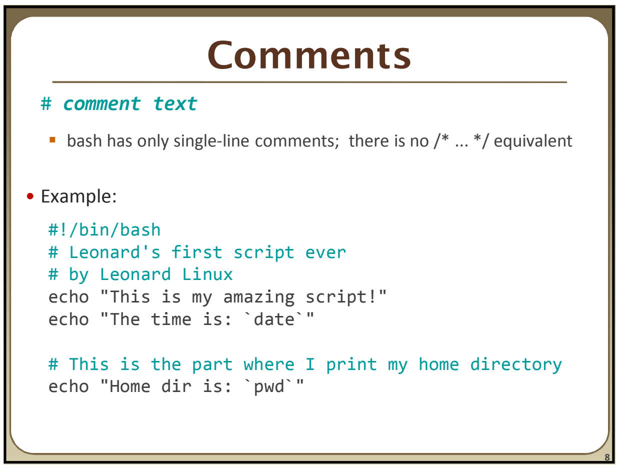
Script example

```
#!/bin/bash
clear
echo "Today's date is `date`"
echo
~stepp/cowsay `whoami`

echo "These users are currently connected:"
w -h | sort
echo

echo "This is `uname -s` on a `uname -m` processor."
echo

echo "This is the uptime information:"
uptime
echo
echo "That's all folks!"
```



Comments

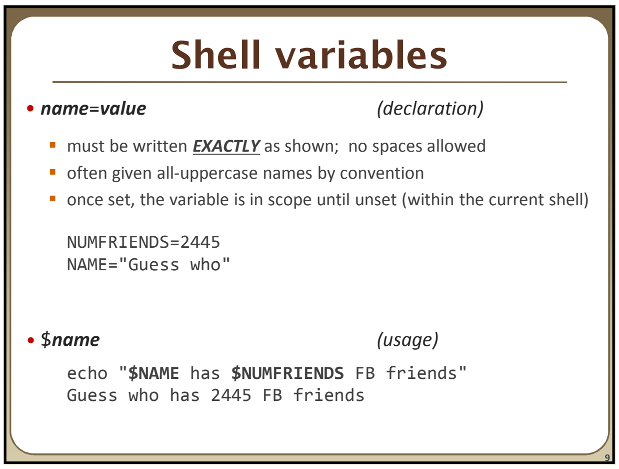
`# comment text`

- bash has only single-line comments; there is no /* ... */ equivalent

- Example:

```
#!/bin/bash
# Leonard's first script ever
# by Leonard Linux
echo "This is my amazing script!"
echo "The time is: `date`"

# This is the part where I print my home directory
echo "Home dir is: `pwd`"
```



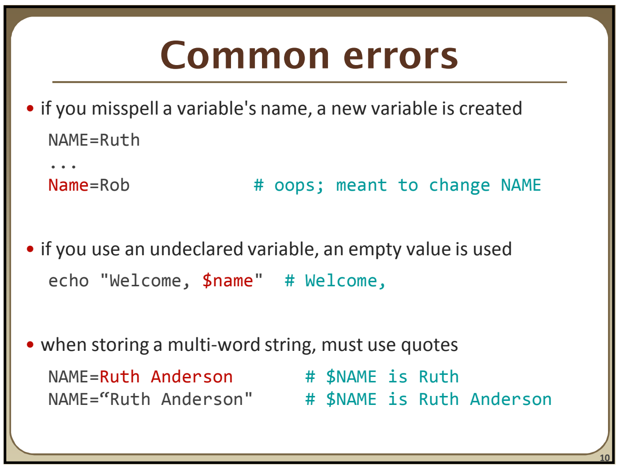
Shell variables

- ***name=value*** *(declaration)*
  - must be written ***EXACTLY*** as shown; no spaces allowed
  - often given all-uppercase names by convention
  - once set, the variable is in scope until unset (within the current shell)

```
NUMFRIENDS=2445
NAME="Guess who"
```

- ***$name*** *(usage)*

```
echo "$NAME has $NUMFRIENDS FB friends"
Guess who has 2445 FB friends
```



Common errors

- if you misspell a variable's name, a new variable is created

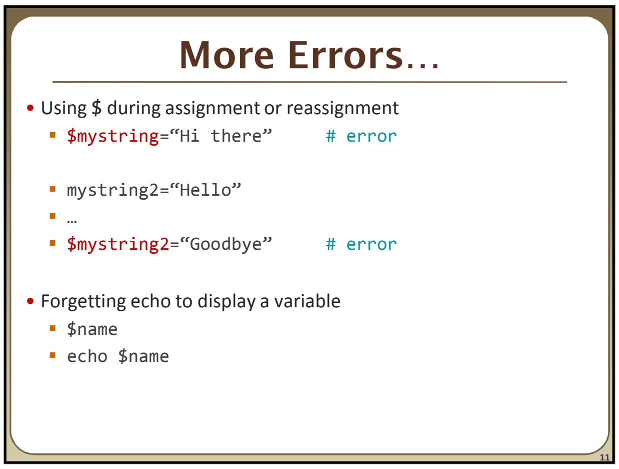
```
NAME=Ruth
...
Name=Rob              # oops; meant to change NAME
```

- if you use an undeclared variable, an empty value is used

```
echo "Welcome, $name"  # Welcome,
```

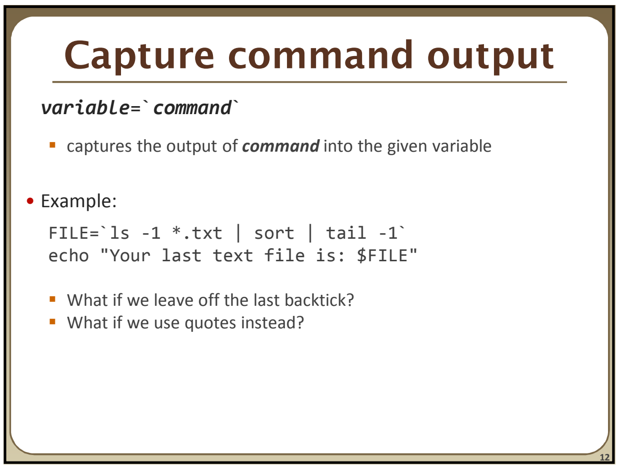
- when storing a multi-word string, must use quotes

```
NAME=Ruth Anderson       # $NAME is Ruth
NAME="Ruth Anderson"     # $NAME is Ruth Anderson
```



More Errors…

- Using $ during assignment or reassignment
  - `$mystring="Hi there"      # error`
  - `mystring2="Hello"`
  - …
  - `$mystring2="Goodbye"      # error`
- Forgetting echo to display a variable
  - `$name`
  - `echo $name`



Capture command output

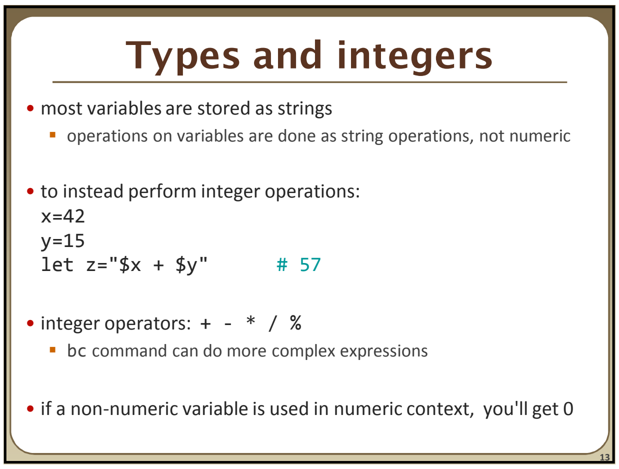
variable=`command`

- captures the output of ***command*** into the given variable

- Example:

```
FILE=`ls -1 *.txt | sort | tail -1`
echo "Your last text file is: $FILE"
```

  - What if we leave off the last backtick?
  - What if we use quotes instead?

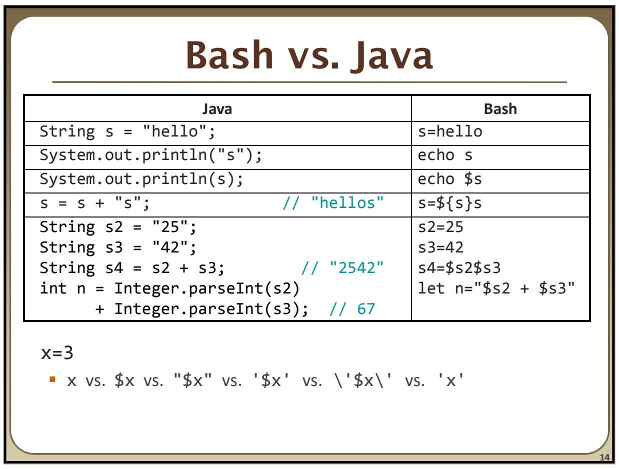


Types and integers

- most variables are stored as strings
  - operations on variables are done as string operations, not numeric
- to instead perform integer operations:

```
x=42
y=15
let z="$x + $y"       # 57
```

- integer operators: `+ - * / %`
  - bc command can do more complex expressions
- if a non-numeric variable is used in numeric context, you'll get 0



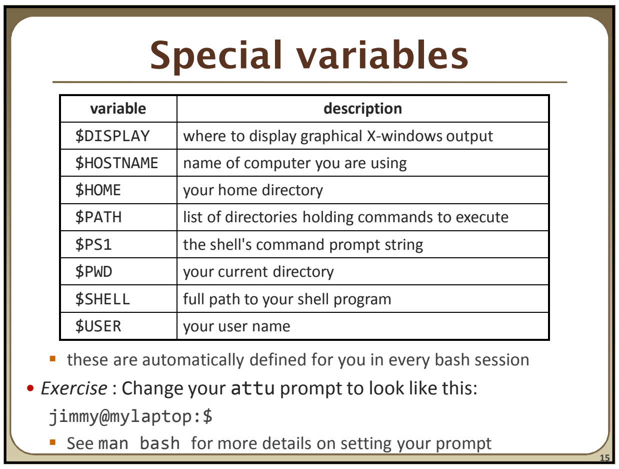
Bash vs. Java

Java	Bash
`String s = "hello";`	`s=hello`
`System.out.println("s");`	`echo s`
`System.out.println(s);`	`echo $s`
`s = s + "s";            // "hellos"`	`s=${s}s`

`String s2 = "25";`
`String s3 = "42";`
`String s4 = s2 + s3;     // "2542"`
`int n = Integer.parseInt(s2)`
`      + Integer.parseInt(s3);  // 67`
	`s2=25`
	`s3=42`
	`s4=$s2$s3`
	`let n="$s2 + $s3"`

```
x=3
```

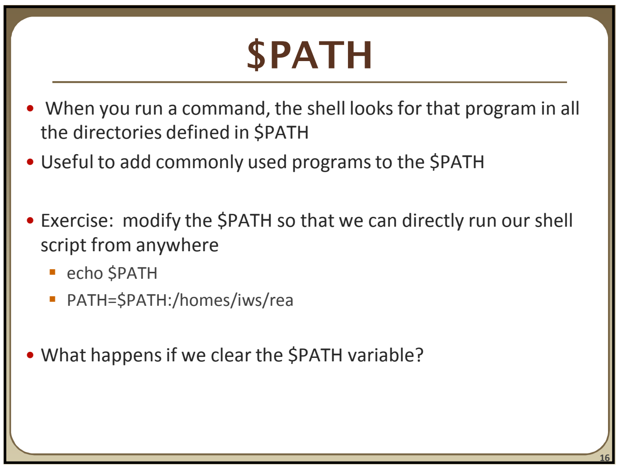
- `x` vs. `$x` vs. `"$x"` vs. `'$x'` vs. `\'$x\'` vs. `'x'`



Special variables

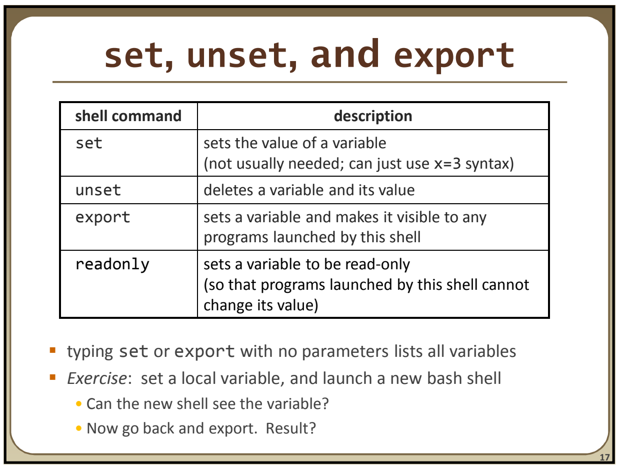
variable	description
`$DISPLAY`	where to display graphical X-windows output
`$HOSTNAME`	name of computer you are using
`$HOME`	your home directory
`$PATH`	list of directories holding commands to execute
`$PS1`	the shell's command prompt string
`$PWD`	your current directory
`$SHELL`	full path to your shell program
`$USER`	your user name

- these are automatically defined for you in every bash session
- *Exercise* : Change your `attu` prompt to look like this:
  `jimmy@mylaptop:$`
  - See `man bash` for more details on setting your prompt



$PATH

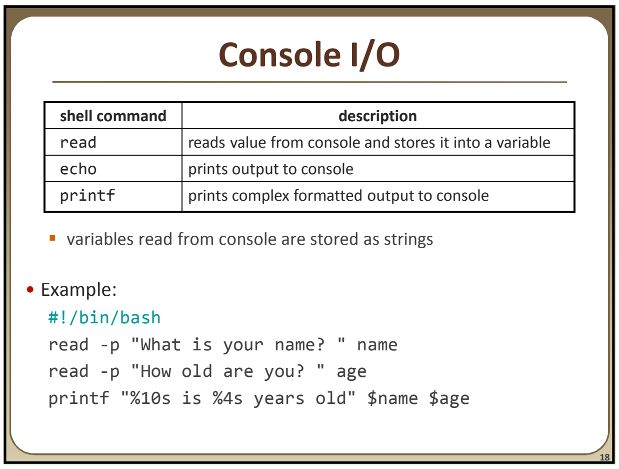
- When you run a command, the shell looks for that program in all the directories defined in $PATH
- Useful to add commonly used programs to the $PATH
- Exercise: modify the $PATH so that we can directly run our shell script from anywhere
  - echo $PATH
  - PATH=$PATH:/homes/iws/rea
- What happens if we clear the $PATH variable?



set, unset, and export

shell command	description
`set`	sets the value of a variable (not usually needed; can just use x=3 syntax)
`unset`	deletes a variable and its value
`export`	sets a variable and makes it visible to any programs launched by this shell
`readonly`	sets a variable to be read-only (so that programs launched by this shell cannot change its value)

- typing `set` or `export` with no parameters lists all variables
- *Exercise*: set a local variable, and launch a new bash shell
  - Can the new shell see the variable?
  - Now go back and export. Result?

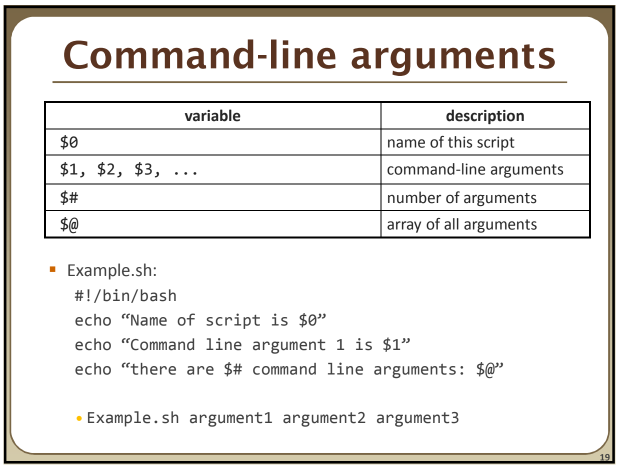


Console I/O

shell command	description
`read`	reads value from console and stores it into a variable
`echo`	prints output to console
`printf`	prints complex formatted output to console

- variables read from console are stored as strings
- Example:

```
#!/bin/bash
read -p "What is your name? " name
read -p "How old are you? " age
printf "%10s is %4s years old" $name $age
```



Command-line arguments

variable	description
`$0`	name of this script
`$1, $2, $3, ...`	command-line arguments
`$#`	number of arguments
`$@`	array of all arguments

- Example.sh:

```
#!/bin/bash
echo “Name of script is $0”
echo “Command line argument 1 is $1”
echo “there are $# command line arguments: $@”
```

  - `Example.sh argument1 argument2 argument3`

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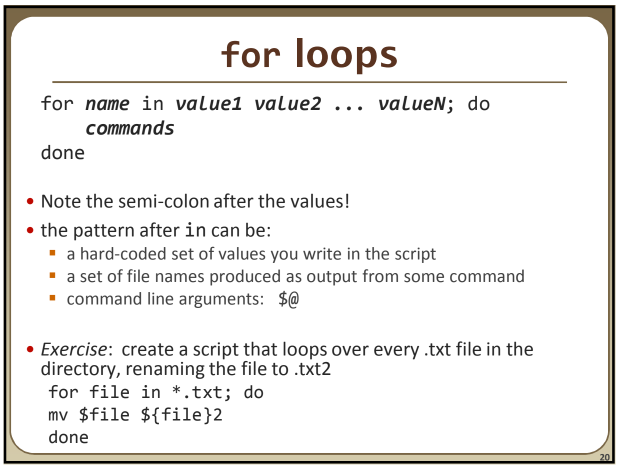

for loops

```
for name in value1 value2 ... valueN; do
    commands
done
```

- Note the semi-colon after the values!
- the pattern after `in` can be:
  - a hard-coded set of values you write in the script
  - a set of file names produced as output from some command
  - command line arguments: `$@`
- *Exercise*: create a script that loops over every .txt file in the directory, renaming the file to .txt2

```
for file in *.txt; do
mv $file ${file}2
done
```

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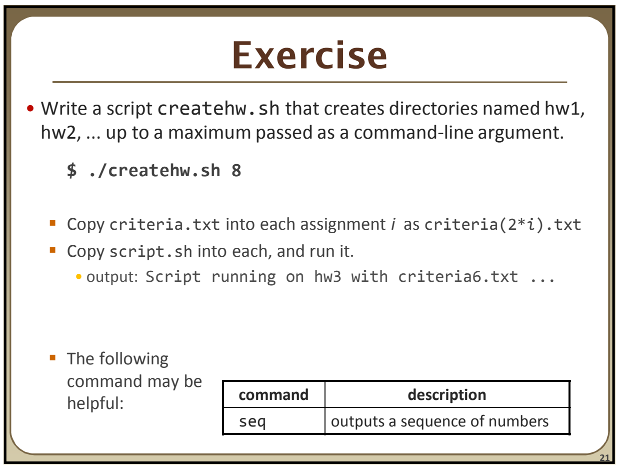

Exercise

- Write a script `createhw.sh` that creates directories named hw1, hw2, ... up to a maximum passed as a command-line argument.

```
$ ./createhw.sh 8
```

  - Copy `criteria.txt` into each assignment *i* as `criteria(2*i).txt`
  - Copy `script.sh` into each, and run it.
    - output: `Script running on hw3 with criteria6.txt ...`
  - The following command may be helpful:

command	description
`seq`	outputs a sequence of numbers

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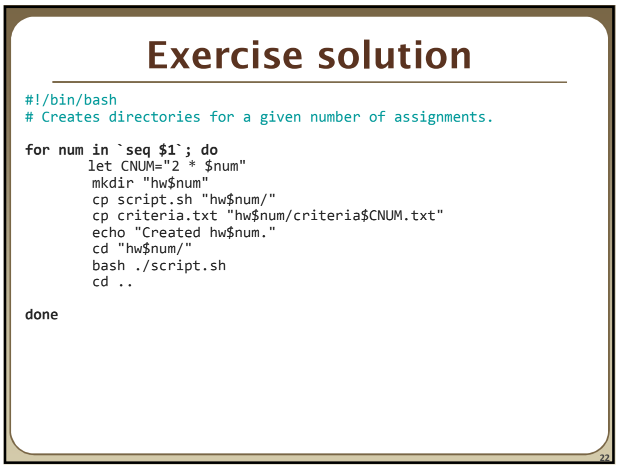

Exercise solution

```
#!/bin/bash
# Creates directories for a given number of assignments.

for num in `seq $1`; do
       let CNUM="2 * $num"
        mkdir "hw$num"
        cp script.sh "hw$num/"
        cp criteria.txt "hw$num/criteria$CNUM.txt"
        echo "Created hw$num."
        cd "hw$num/"
        bash ./script.sh
        cd ..

done
```

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