

# **CS 241: Systems Programming**

## **Lecture 7. Shell Scripting 2**

Fall 2019

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# Script positional parameters

```
$ ./script arg1 ... argn # or bash script arg1 ... argn
```

## Special variables

- ▶  `$#`  — Number of arguments
- ▶  `$0`  — Name used to call the shell script (`./script` or `script`)
- ▶  `$1, $2, ..., $9`  — First nine arguments
- ▶  `${n}`  — *n*th argument (braces needed for  $n > 9$ )
- ▶  `"$@"`  — all arguments; expands to each argument quoted
- ▶  `"$*"`  — all arguments; expands to a single quoted string

# Two special builtin commands

`set --`

- ▶ Can set positional parameters (and \$#)

```
set -- arg1 arg2 ... argn
```

`shift`

`shift n`

- ▶ Discard first  $n$  parameters and rename the remaining starting at \$1
- ▶ If  $n$  is omitted, it's the same as `shift 1`
- ▶ Updates \$#

# Iterate over parameters

```
while [[ $# -gt 0 ]]; do
    arg="$1"
    # whatever you want to do with ${arg}
    shift
done
```

# Functions

```
#!/bin/bash
```

```
num_args() {
```

```
    echo "foo called with $# arguments"
```

```
    if [[ $# -gt 0 ]]; then
```

```
        echo "foo's first argument: $1"
```

```
    fi
```

```
}
```

```
echo "Script $0 invoked with $# arguments"
```

```
if [[ $# -gt 0 ]]; then
```

```
    echo "$0's first argument: $1"
```

```
fi
```

```
num_args 'extra' "$@" 'args'
```

local creates a local variable.

What does this script print out?

- A. A
- B. B
- C. C
- D. The empty string
- E. Nothing, it's a syntax error

```
#!/bin/bash

foo() {
    x="$1"
}

bar() {
    local x="$1"
}

x=A
foo B
bar C
echo "${x}"
```

local creates a local variable.

What does this script print out?

A. A

B. B

C. C

D. D

E. Nothing, it's a syntax error

```
#!/bin/bash
```

```
foo() {  
    x="$1"  
}
```

```
bar() {  
    local x="$1"  
    foo "$2"  
}
```

```
x=A
```

```
foo B
```

```
bar C D
```

```
echo "${x}"
```

# Lists — sequence of commands

Pipeline: `cmd1 | cmd2 | ... | cmdn`

- ▶ Exit value is exit value of last command in the pipeline
- ▶ Exit value can be negated by `! cmd1 | ... | cmdn`

## Lists

- ▶ `pipeline1 ; pipeline2 ; ... ; pipelinen`  
can replace `;` with newline
- ▶ `pipeline1 && pipeline2`  
`pipeline2` runs if and only if `pipeline1` returns 0
- ▶ `pipeline1 || pipeline2`  
`pipeline2` runs if and only if `pipeline1` doesn't return 0
- ▶ `pipeline &`  
runs `pipeline` in the background



When writing a script, we often want to change directories with `cd`. If the directory doesn't exist, the script should exit with an error.

Which construct should we use?

A. `cd "${dir}" && exit 0`

B. `cd "${dir}" || exit 0`

C. `cd "${dir}" && exit 1`

D. `cd "${dir}" || exit 1`

E. `cd "${dir}" && exit 2`

# Arrays

Assign values at numeric indices

- `arr[0]=foo`
- `arr[1]=bar`

Assign multiple values at once

- `arr=(foo bar)`
- `txt_files=(*.txt) # pathname expansion/globbing`

Append (multiple values) to an array

- `arr+=(qux asdf)`

# Arrays

## Access an element

- ▶ `${arr[0]}`
- ▶ `${arr[1]}`
- ▶ `n=42`  
`${arr[n]}`

## Access all elements

- ▶ `"${arr[@]}"` # expands to each element quoted by itself
- ▶ `"${arr[*]}"` # expands to one quoted word containing all elements

## Array length

- ▶ `${#arr[@]}`

If `arr` is the two element array  
`arr=('foo bar' baz)`  
how should we print each element of `arr`?

A. `for elem in ${arr}; do`  
    `echo "${elem}"`  
`done`

D. `for elem in "${arr[@]}"; do`  
    `echo "${elem}"`  
`done`

B. `for elem in "${arr}"; do`  
    `echo "${elem}"`  
`done`

E. `for (( n=0 ; n < ${#arr[@]}; n+=1 )); do`  
    `echo "${arr[n]}"`  
`done`

C. `for elem in "${arr[*]}"; do`  
    `echo "${elem}"`  
`done`

# In-class exercise

<https://checkoway.net/teaching/cs241/2019-fall/exercises/Lecture-07.html>

Grab a laptop and a partner and try to get as much of that done as you can!