Lab #5

Loops, Conditionals, and Parameters

BINF 2111, Fall 2023

Terminology

Conditional

A programming element that tells the computer to execute certain actions, provided certain conditions are met

Loop

A programming element that repeats a portion of code a set number of times until the desired process is complete

Parameter

A special kind of variable used in a function or program to refer to one of the pieces of data provided as input (sometimes called **input variables**)

Iterate

The repetition of a section of code within a computer program for a number of instances or until status is encountered

Commands To Know

Commands are case sensitive!!

Command
Options
RegEx
Input (like a file or folder)

Command	Meaning	Usage
diff	Find the differences between two files	`diff [file1] [file2]`
sed	Stream editor. Diverse command that can manipulate text/files.	`sed [options] '[regex]' [file]`

if	Conditional statement to compare two data points	`if [[ condition ]]; then`
		`  commands`
		`fi`

for	Loop statement to look through a group of elements and run a command on each of those elements, one at a time	`for i in group; do`
		`  commands`
		`done`

Command Breakdown - diff

- **diff:** finds the differences between two files
  - Useful Options
    - -i Case insensitive, ignore capitalizations
  - Usage
    - `diff file1.txt file2.txt`
  - Understanding Output
    - Line numbers corresponding to the first file
    - A special symbol
      - a: add
      - c: change
      - d: delete
    - Line numbers corresponding to the second file

Command Breakdown - diff

- Understanding Output
  - Lines preceded by a < are lines from the first file.
  - Lines preceded by > are lines from the second file.
  - The three dashes separate the lines of file1 and file2

- 2d1: line 2 in file1 needs to be deleted to match line 1 in file2

- 6c5: line 6 in file1 needs to be changed to match line 5 in file2

```
(base) madelinebellanger@Madelines-MacBook-Air Lab5 % cat file1.txt
hello
how are you

testing
this is a line
    _
this is lab 5%
(base) madelinebellanger@Madelines-MacBook-Air Lab5 % cat file2.txt
hello

testing
this is a line

this is lab 5%
(base) madelinebellanger@Madelines-MacBook-Air Lab5 % diff file1.txt file2.txt
2d1
< how are you
6c5
<     _
---
>
```

Command Breakdown - sed

- **sed**: stream editor. Diverse command that can manipulate text/files
  - Mac users need to use gsed
  - Printing specific lines
    - Print line three only
      - `sed -n '3p' file.txt`
    - Print lines four and six
      - `sed -n '4p;6p' file.txt`
    - Print lines 2 through 5
      - `sed -n '2,5p' file.txt`

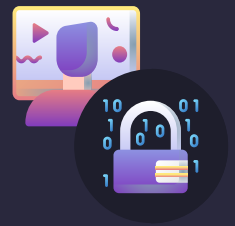
Conditionals - If Statements

- Used to evaluate if a statement/condition is true or false

```
if [[ condition ]]; then
    commands
fi
```

- Useful Conditions

Useful Conditions	Meaning
[[number1 -gt number2]]	Is number1 > number2?
[[number1 -lt number2]]	Is number1 < number2?
[[number1 -ge number2]]	Is number1 ≥ number2?
[[number1 -le number2]]	Is number1 ≤ number2?
[[-z string1]]	Is string1 empty?
[[-n string1]]	Is string1 not empty?
!	Opposite (usually not)



If Statements - Multiple Evaluations

- Test if statement 1 and statement 2 are both true
  - Use &&
- Test if statement 1 or statement 2 is true
  - Use ||
- Do something else if the statement is false
  - Use else
- Test if statement 2 is true when statement 1 is false
  - Use elif

```
# Test if num1 < num2 AND num2 ≥ num3 using &&
if [[ $num1 -lt $num2 && $num2 -ge $num3 ]]; then
    echo "Number 1 is less than number 2 AND number 2 is greater than number 3"
fi
```

```
# Test if num1 < num2 or num2 = num3 using ||
if [[ $num1 -le $num2 || $num2 -eq $num3 ]]; then
    echo "Number 1 is less than number 2 OR number 2 is equal to number 3"
fi
```

```
# Test if num1 < num2
if [[ $num1 -lt $num2 ]]; then
    echo "Number 1 is less than number 2"
else
    echo "Number 1 is NOT less than number 2"
fi
```

```
# Test if num1 ≥ num2. If not, test if num1 ≤ num2
if [[ $num1 -ge $num2 ]]; then
    echo "Number 1 is greater than or equal to number 2"
elif [[ $num1 -le $num2 ]]; then
    echo "Number 1 is less than or equal to number 2"
fi
```

For Loops

- Loop statement to look through a group of elements and run a command on each of those elements, one at a time

```
for i in group; do
    commands
done
```

- Common Uses
  - Looping through files that end in .txt

```
# Loop through all the text files (end in .txt) in the current directory, find the line count for each file
for file in *.txt; do
    wc -l $file
done
```

  - Looping through a range of numbers

```
# Loop through numbers 1 through 10, add them all up, print the sum
for i in {1..10}; do
    ((sum+=$i))
    echo "The sum of all the numbers thus far: $sum"
done
```

Parameters Within Scripts

- Each parameter is specified by a dollar sign and the parameter number
  - $1, $2, $3, etc.
- Can be set equal to variables or used as a variable itself

```
param1=$1       # the first parameter used when running the program
param2=$2       # the second parameter used when running the program
```

```
echo "These parameters are not set to variables within the code: "
echo "These are a couple more parameters: $3, $4"

# Parameters can be used the same as any other variable
if [[ ${#param1} -ge ${#3} ]]; then
    echo "Parameter 1 is longer than parameter 3"
fi
```

Running Scripts with Parameters

- When using parameters, they are set when the script is called:
  - `bash script.sh parameter1 parameter2 parameter3 parameter4`

- If the following command was ran:
  `bash script.sh hello how are you`
  - Parameter 1 (`$1`/`param1`) would be set to `hello`
  - Parameter 2 (`$2`/`param2`) would be set to `how`
  - Parameter 3 (`$3`) would be set to `are`
  - Parameter 4 (`$4`) would be set to `you`

```
(base) madelinebellanger@Madelines-MacBook-Air Lab5 % bash parameters.sh hello how are you
These parameters are set to variables within the code:
This is the first parameter: hello
This is the second parameter: how

These parameters are not set to variables within the code:
These are a couple more parameters: are, you
Parameter 1 is longer than parameter 3
```

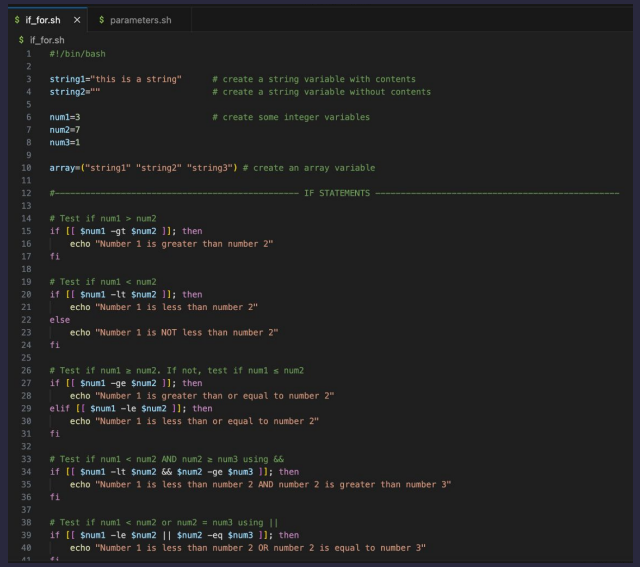
Pseudocode

- Outline of code written in plain language, so that anyone can understand it
- Usually written as comments, deleted after code is written

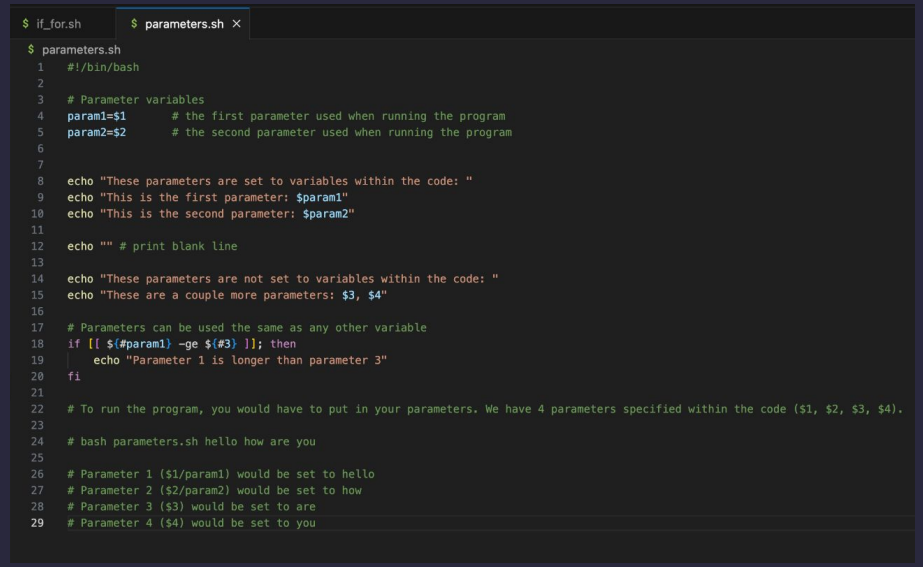
```
# Prompt: Print out numbers 1 - 10, distinguishing between odd and even numbers.

# The actual code                                   The pseduocode

for num in {1..10}; do                              #for loop through 1..10
    if [[ $(( $num%2 )) -eq 0 ]]; then              #   if num is even
        echo "$num is even"                         #       print "$num is even"
    else                                            #   else
        echo "$num is odd"                          #       print "$num is odd"
    fi                                              #   end if
done                                                #end for
```

Helpful Hint!

- Use the if_for.sh and parameters.sh scripts as examples
  - Found in /data/Lab5 on Canvas and /data on GitHub



```
$ if_for.sh
#!/bin/bash

string1="this is a string"      # create a string variable with contents
string2=""                      # create a string variable without contents

num1=3                          # create some integer variables
num2=7
num3=1

array=("string1" "string2" "string3") # create an array variable

#---------------------------------------------- IF STATEMENTS ----------------------------------------------

# Test if num1 > num2
if [[ $num1 -gt $num2 ]]; then
    echo "Number 1 is greater than number 2"
fi

# Test if num1 < num2
if [[ $num1 -lt $num2 ]]; then
    echo "Number 1 is less than number 2"
else
    echo "Number 1 is NOT less than number 2"
fi

# Test if num1 ≥ num2. If not, test if num1 ≤ num2
if [[ $num1 -ge $num2 ]]; then
    echo "Number 1 is greater than or equal to number 2"
elif [[ $num1 -le $num2 ]]; then
    echo "Number 1 is less than or equal to number 2"
fi

# Test if num1 < num2 AND num2 ≥ num3 using &&
if [[ $num1 -lt $num2 && $num2 -ge $num3 ]]; then
    echo "Number 1 is less than number 2 AND number 2 is greater than number 3"
fi

# Test if num1 < num2 or num2 = num3 using ||
if [[ $num1 -le $num2 || $num2 -eq $num3 ]]; then
    echo "Number 1 is less than number 2 OR number 2 is equal to number 3"
fi
```



```
$ parameters.sh
#!/bin/bash

# Parameter variables
param1=$1       # the first parameter used when running the program
param2=$2       # the second parameter used when running the program


echo "These parameters are set to variables within the code: "
echo "This is the first parameter: $param1"
echo "This is the second parameter: $param2"

echo "" # print blank line

echo "These parameters are not set to variables within the code: "
echo "These are a couple more parameters: $3, $4"

# Parameters can be used the same as any other variable
if [[ ${#param1} -ge ${#3} ]]; then
    echo "Parameter 1 is longer than parameter 3"
fi

# To run the program, you would have to put in your parameters. We have 4 parameters specified within the code ($1, $2, $3, $4).

# bash parameters.sh hello how are you

# Parameter 1 ($1/param1) would be set to hello
# Parameter 2 ($2/param2) would be set to how
# Parameter 3 ($3) would be set to are
# Parameter 4 ($4) would be set to you
```