Scripting Languages

Module 4

Managing Repetition
with Loops

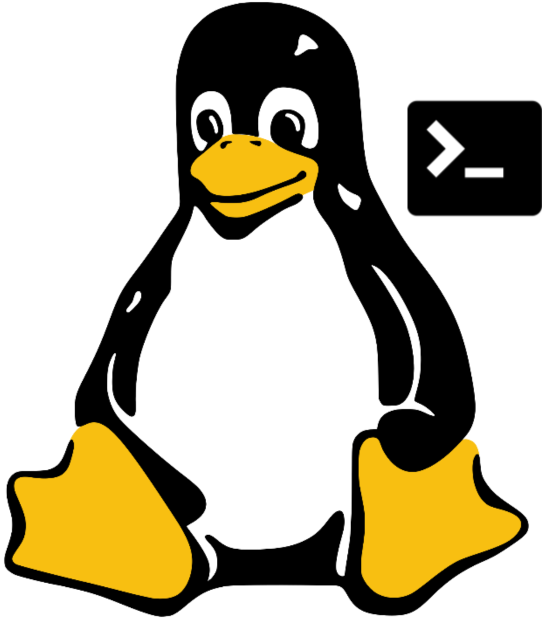
Contents

1. For Loops
2. C-Style Loops
3. While Loops
4. Until Loops
5. Break and Continue
6. Nested Loops
7. Infinite Loops

Learning Objectives

By the end of this Module you should:

- Understand and execute scripts that require iteration
- Write scripts that iterate through content using a range of loop structures



For Loops

for loops

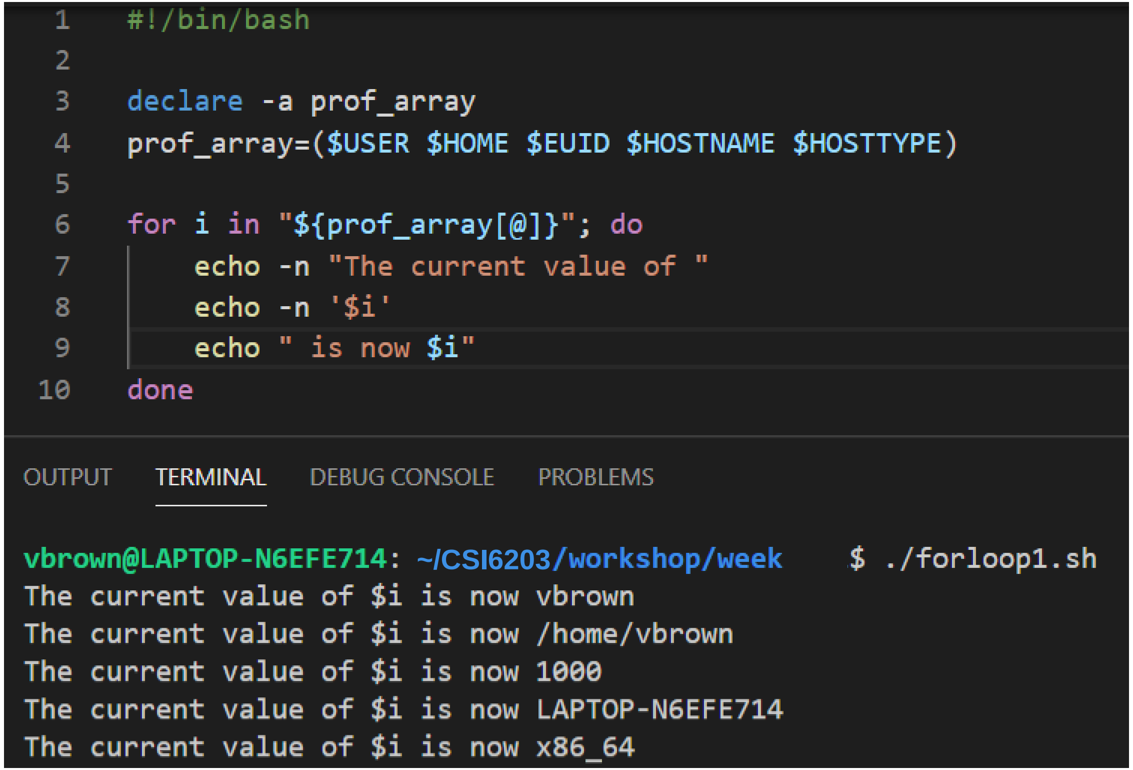
- **for** is a shell keyword used to control iteration
- Iteration allows one or more commands to be executed for each item within a list of items
- These items may be contained within a *variable*, an *array* or an *external file*

FOR LOOP BASIC STRUCTURE

```
for i in items_list; do
    command(s) to be executed
    for each item
done
```

for loop example - array

- In a for loop, we read each item in the list from left to right
- If the list is a string of text, the items are separated by spaces by default
- Each value in the list is assigned to the variable on the left one at a time



```bash
#!/bin/bash

declare -a prof_array
prof_array=($USER $HOME $EUID $HOSTNAME $HOSTTYPE)

for i in "${prof_array[@]}"; do
    echo -n "The current value of "
    echo -n '$i'
    echo " is now $i"
done
```

```
vbrown@LAPTOP-N6EFE714: ~/CSI6203/workshop/week    $ ./forloop1.sh
The current value of $i is now vbrown
The current value of $i is now /home/vbrown
The current value of $i is now 1000
The current value of $i is now LAPTOP-N6EFE714
The current value of $i is now x86_64
```

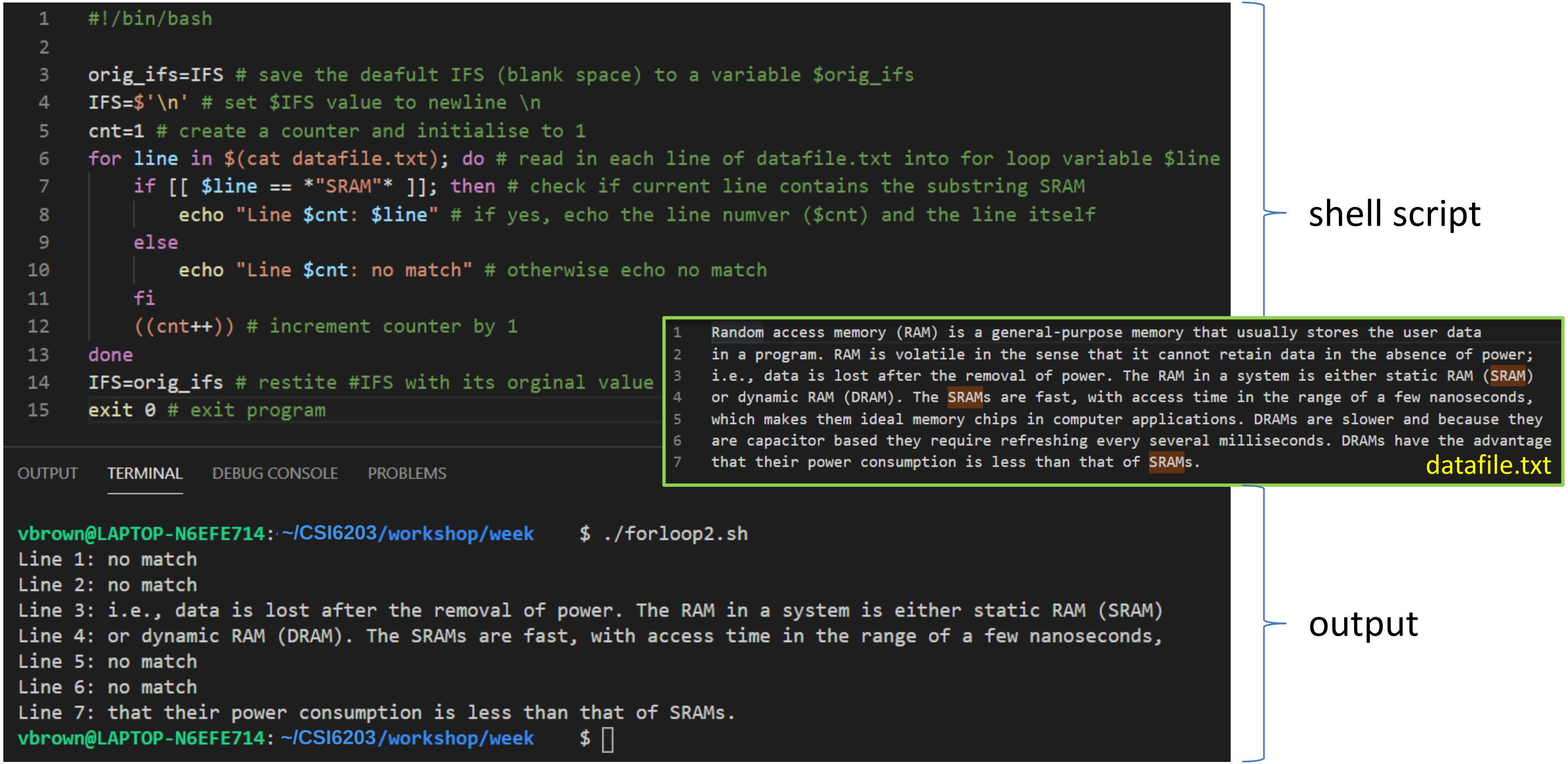
The IFS

- The **Internal Field Separator** (IFS) variable is used by the system to tell where one item in a list ends and the next one starts

- By default, this is a space so that structures such as *for loops* will count through each word in a list

- By setting this to something else, we can make it split each item a list in a different way e.g. newlines (\n)

Change IFS value



shell script

```bash
#!/bin/bash

orig_ifs=IFS # save the deafult IFS (blank space) to a variable $orig_ifs
IFS=$'\n' # set $IFS value to newline \n
cnt=1 # create a counter and initialise to 1
for line in $(cat datafile.txt); do # read in each line of datafile.txt into for loop variable $line
    if [[ $line == *"SRAM"* ]]; then # check if current line contains the substring SRAM
        echo "Line $cnt: $line" # if yes, echo the line numver ($cnt) and the line itself
    else
        echo "Line $cnt: no match" # otherwise echo no match
    fi
    ((cnt++)) # increment counter by 1
done
IFS=orig_ifs # restite #IFS with its orginal value
exit 0 # exit program
```

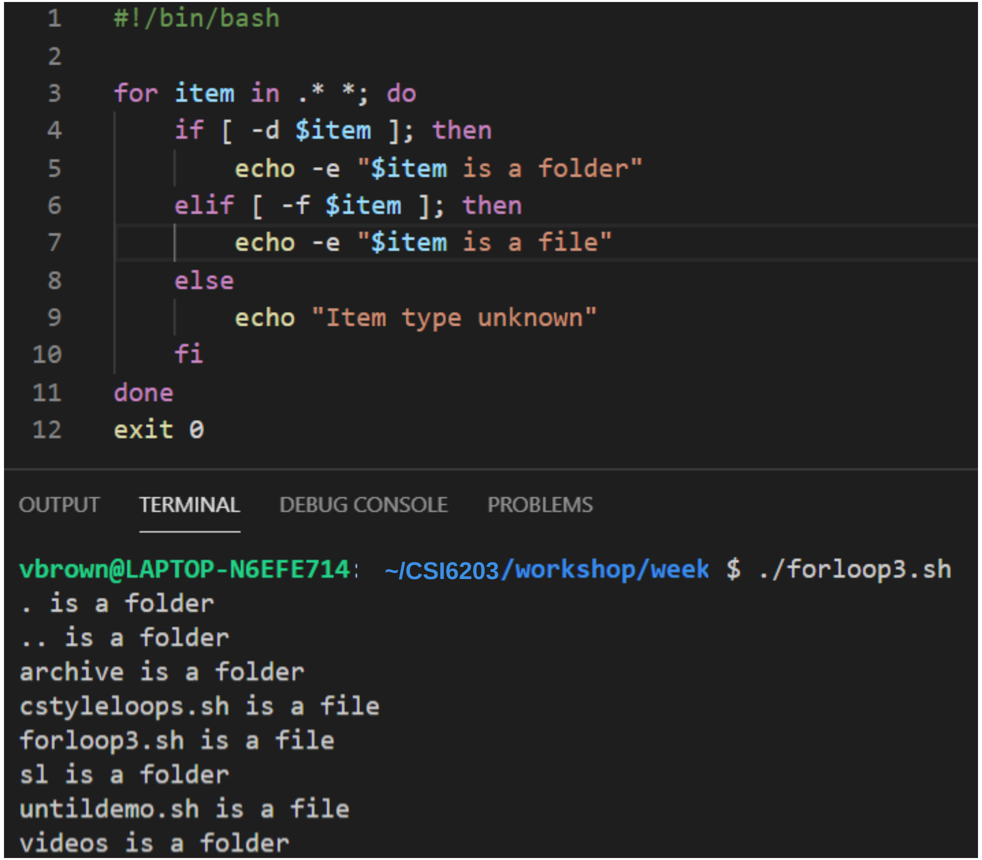
datafile.txt

```
Random access memory (RAM) is a general-purpose memory that usually stores the user data
in a program. RAM is volatile in the sense that it cannot retain data in the absence of power;
i.e., data is lost after the removal of power. The RAM in a system is either static RAM (SRAM)
or dynamic RAM (DRAM). The SRAMs are fast, with access time in the range of a few nanoseconds,
which makes them ideal memory chips in computer applications. DRAMs are slower and because they
are capacitor based they require refreshing every several milliseconds. DRAMs have the advantage
that their power consumption is less than that of SRAMs.
```

output

```
vbrown@LAPTOP-N6EFE714:~/CSI6203/workshop/week    $ ./forloop2.sh
Line 1: no match
Line 2: no match
Line 3: i.e., data is lost after the removal of power. The RAM in a system is either static RAM (SRAM)
Line 4: or dynamic RAM (DRAM). The SRAMs are fast, with access time in the range of a few nanoseconds,
Line 5: no match
Line 6: no match
Line 7: that their power consumption is less than that of SRAMs.
vbrown@LAPTOP-N6EFE714:~/CSI6203/workshop/week    $ 
```

for loops with files directories



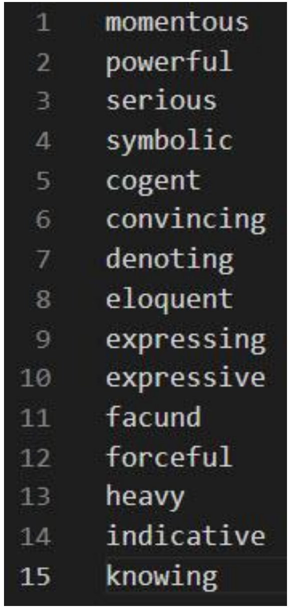
```bash
#!/bin/bash

for item in .* *; do
    if [ -d $item ]; then
        echo -e "$item is a folder"
    elif [ -f $item ]; then
        echo -e "$item is a file"
    else
        echo "Item type unknown"
    fi
done
exit 0
```

```
vbrown@LAPTOP-N6EFE714: ~/CSI6203/workshop/week $ ./forloop3.sh
. is a folder
.. is a folder
archive is a folder
cstyleloops.sh is a file
forloop3.sh is a file
sl is a folder
untildemo.sh is a file
videos is a folder
```

- For loops are also often used to iterate through the contents of files and directories
- If the **-d** test evaluates to true, then echo that the item is a *folder*
- If the **-f** test evaluates to true, then echo that the item is a *file*
- If neither the -d or the -f test evaluate true, echo that the item is of an indeterminate type

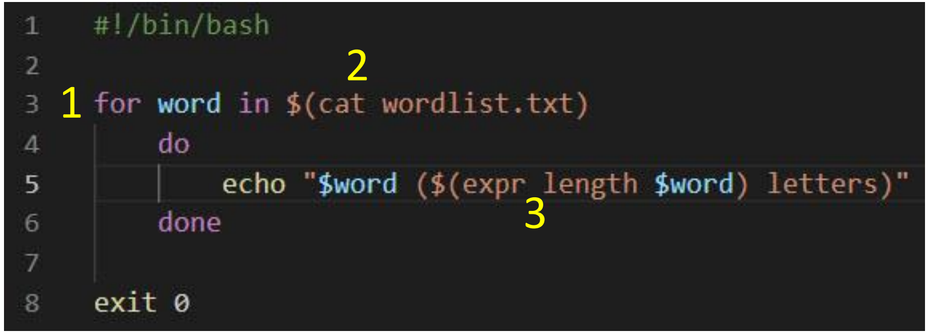
for loop to process values in a file

wordlist.txt



```
momentous
powerful
serious
symbolic
cogent
convincing
denoting
eloquent
expressing
expressive
facund
forceful
heavy
indicative
knowing
```

bash script

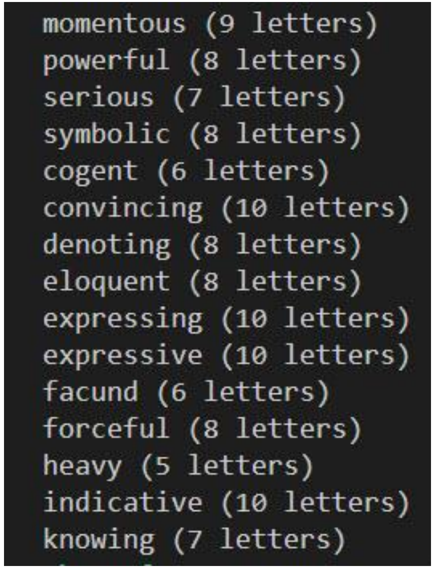


```bash
#!/bin/bash

for word in $(cat wordlist.txt)
    do
        echo "$word ($(expr length $word) letters)"
    done

exit 0
```

script output



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facund (6 letters)
forceful (8 letters)
heavy (5 letters)
indicative (10 letters)
knowing (7 letters)
```

1. A for loop is used to cycle through each string value in a text file

2. Command substitution is used to capture the string values in the file that the for loop to process

3. For each string value in the file, *expr length* is used to determine the number of characters in each string and print to terminal

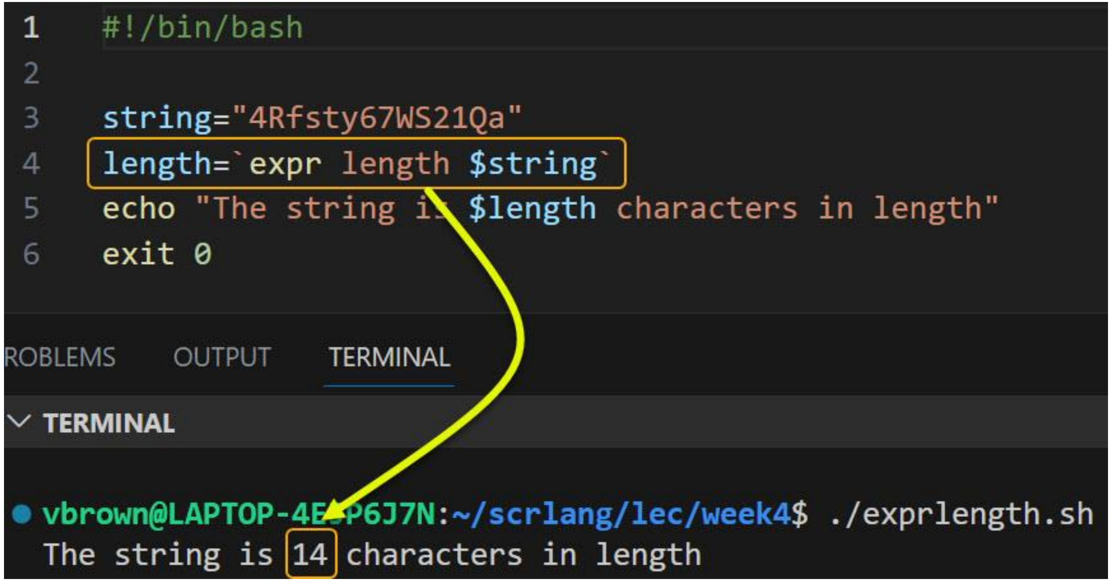
Functions associated with expr

- In addition to integer-based mathematical calculations, the **`expr`** command also supports a number of useful string-based functions including:
  - **`length`**
  - **`substring`**
  - **`index`**

expr length

- **`expr length`** is used to determine the number of characters in given string
- The syntax required is **`expr length $string`**

EXAMPLE:



```
#!/bin/bash

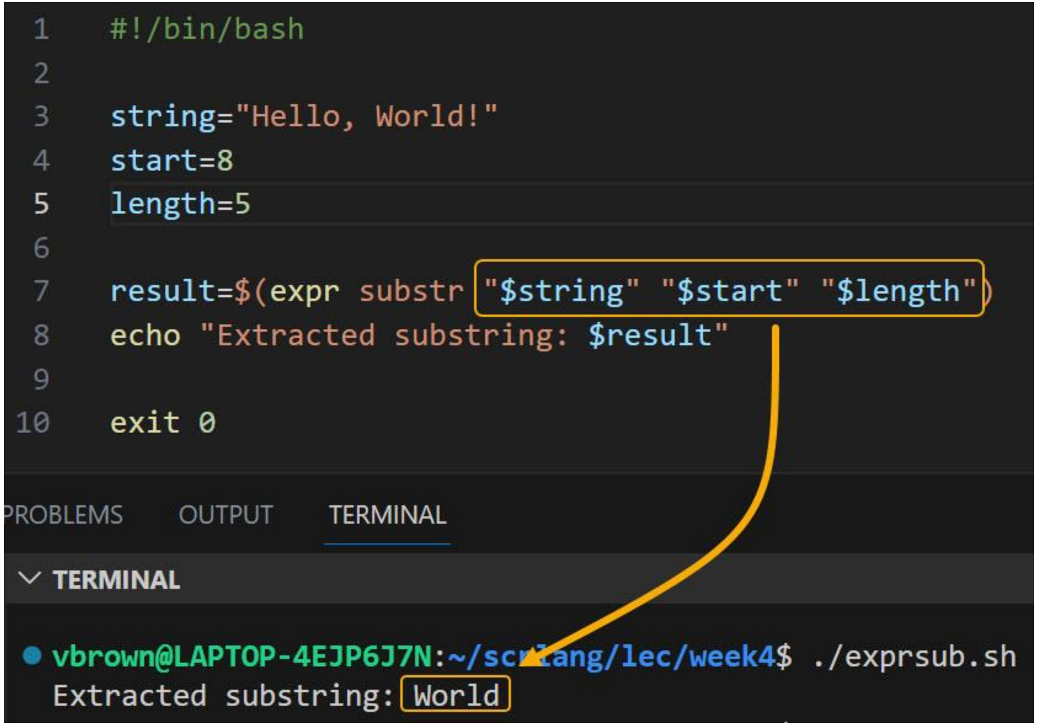
string="4Rfsty67WS21Qa"
length=`expr length $string`
echo "The string is $length characters in length"
exit 0
```

```
vbrown@LAPTOP-4E[illegible]P6J7N:~/scrlang/lec/week4$ ./exprlength.sh
 The string is 14 characters in length
```

expr substring

- **`expr substring`** is used to extract a substring from a given string
- The syntax required is **`expr substr $string $start $length`**

EXAMPLE:



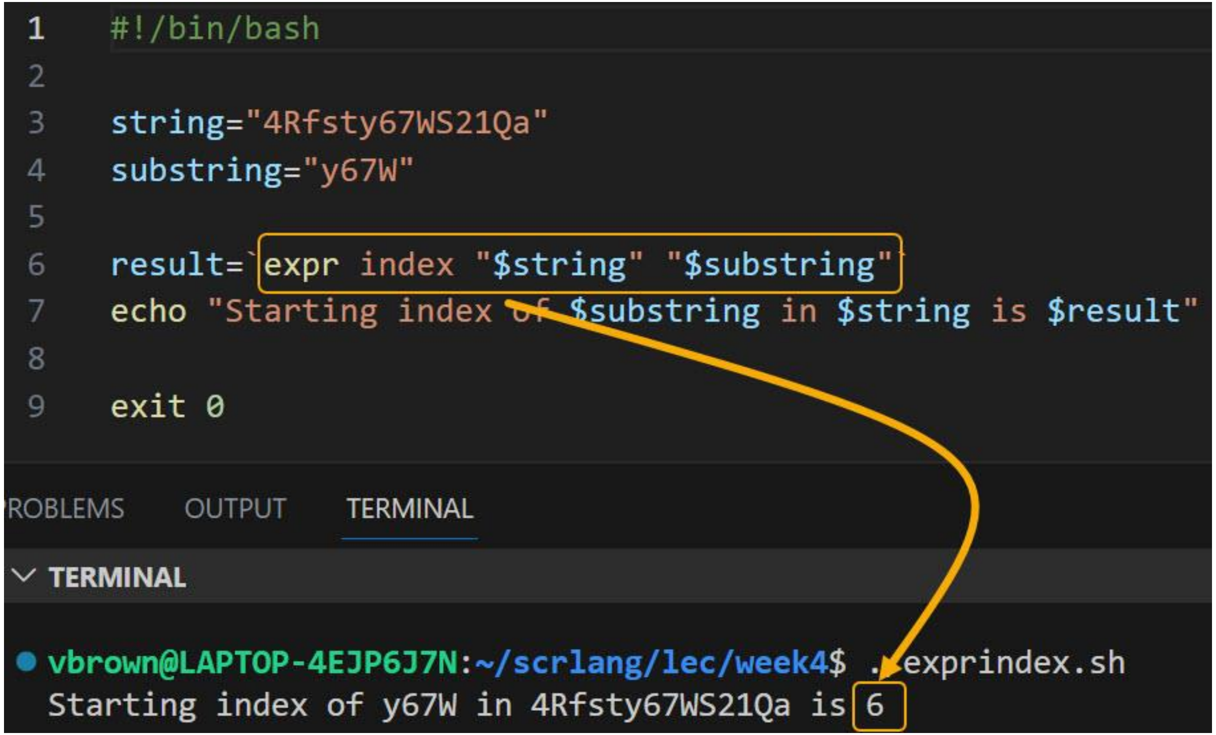
```bash
#!/bin/bash

string="Hello, World!"
start=8
length=5

result=$(expr substr "$string" "$start" "$length")
echo "Extracted substring: $result"

exit 0
```

```
vbrown@LAPTOP-4EJP6J7N:~/scrlang/lec/week4$ ./exprsub.sh
Extracted substring: World
```

expr index

- **`expr index`** finds the starting index of a substring within the string
- The syntax required is **`expr index $string $substring`**

EXAMPLE:



```bash
#!/bin/bash

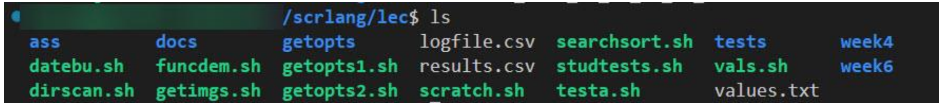
string="4Rfsty67WS21Qa"
substring="y67W"

result=`expr index "$string" "$substring"`
echo "Starting index of $substring in $string is $result"

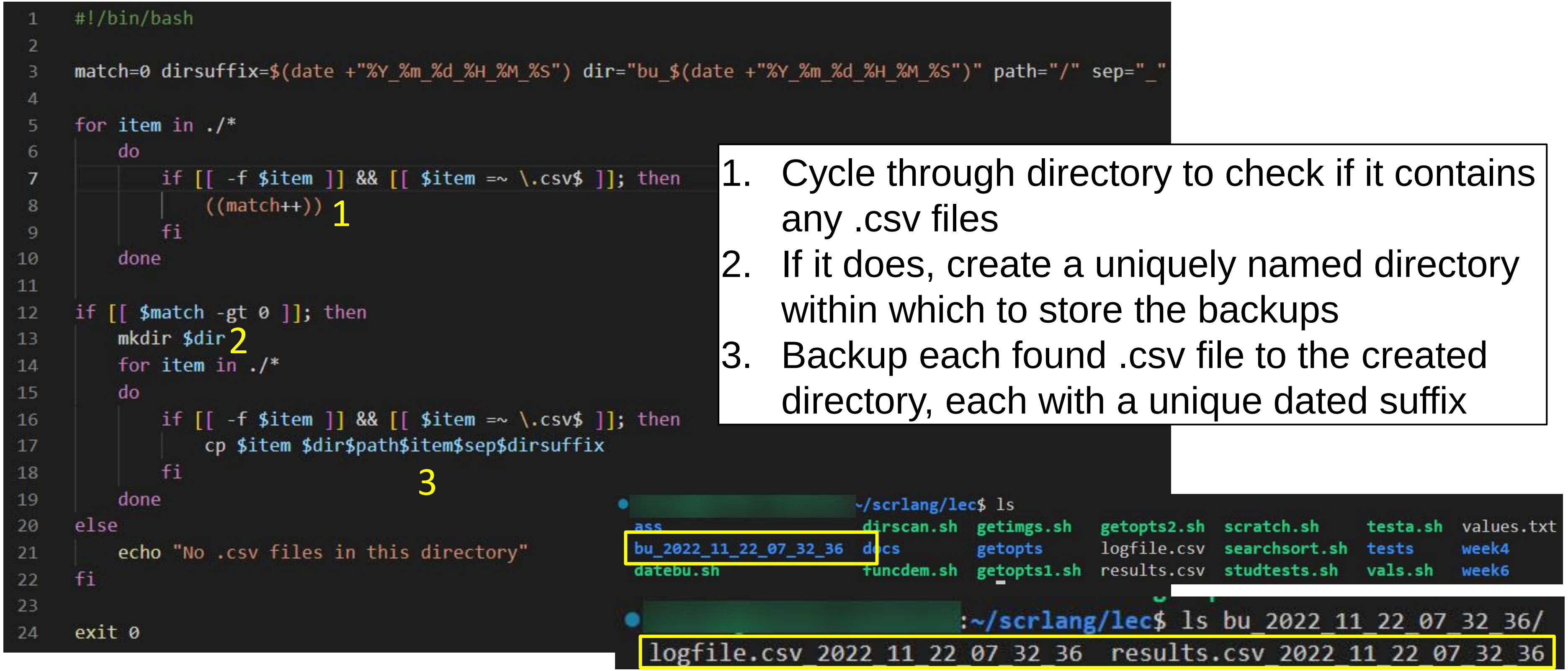
exit 0
```

```
vbrown@LAPTOP-4EJP6J7N:~/scrlang/lec/week4$ ./exprindex.sh
Starting index of y67W in 4Rfsty67WS21Qa is 6
```

for loop to process file in a directory



```
[redacted]/scrlang/lec$ ls
ass         docs        getopts      logfile.csv  searchsort.sh  tests       week4
datebu.sh   funcdem.sh  getopts1.sh  results.csv  studtests.sh   vals.sh     week6
dirscan.sh  getimgs.sh  getopts2.sh  scratch.sh   testa.sh       values.txt
```



```
#!/bin/bash

match=0 dirsuffix=$(date +"%Y_%m_%d_%H_%M_%S") dir="bu_$(date +"%Y_%m_%d_%H_%M_%S")" path="/" sep="_"

for item in ./*
    do
        if [[ -f $item ]] && [[ $item =~ \.csv$ ]]; then
            ((match++))
        fi
    done

if [[ $match -gt 0 ]]; then
    mkdir $dir
    for item in ./*
    do
        if [[ -f $item ]] && [[ $item =~ \.csv$ ]]; then
            cp $item $dir$path$item$sep$dirsuffix
        fi
    done
else
    echo "No .csv files in this directory"
fi

exit 0
```

1. Cycle through directory to check if it contains any .csv files
2. If it does, create a uniquely named directory within which to store the backups
3. Backup each found .csv file to the created directory, each with a unique dated suffix

```
[redacted]~/scrlang/lec$ ls
ass                     dirscan.sh  getimgs.sh   getopts2.sh  scratch.sh     testa.sh  values.txt
bu_2022_11_22_07_32_36  docs        getopts      logfile.csv  searchsort.sh  tests     week4
datebu.sh               funcdem.sh  getopts1.sh  results.csv  studtests.sh   vals.sh   week6
```

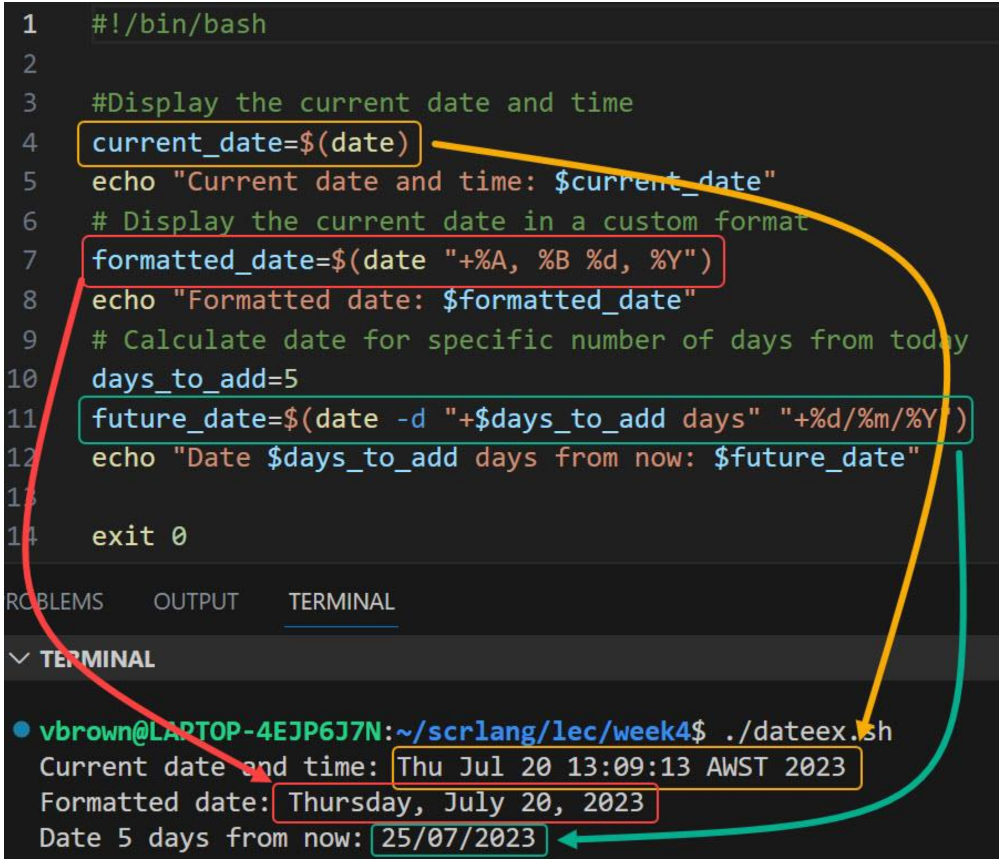
```
[redacted]:~/scrlang/lec$ ls bu_2022_11_22_07_32_36/
logfile.csv_2022_11_22_07_32_36  results.csv_2022_11_22_07_32_36
```

date command

- The date command is used to display or manipulate the current date and time
- It is a versatile utility that can be used to retrieve the system's current date and time or format it according to specific patterns
- The basic syntax required is

```
date [OPTION]... [+FORMAT]
```

EXAMPLES

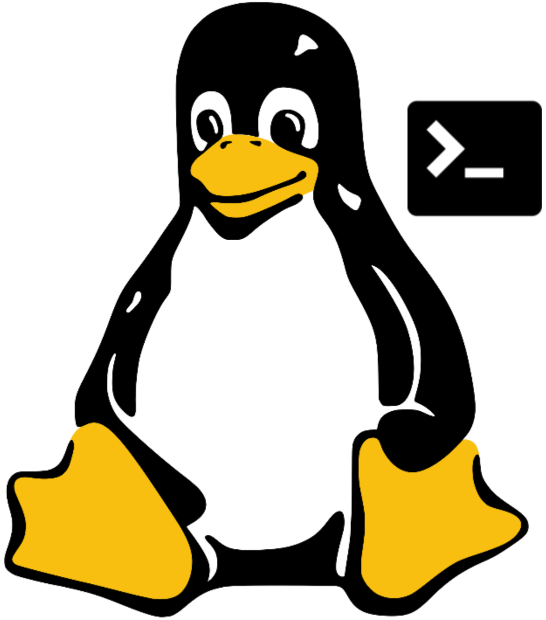


```
#!/bin/bash

#Display the current date and time
current_date=$(date)
echo "Current date and time: $current_date"
# Display the current date in a custom format
formatted_date=$(date "+%A, %B %d, %Y")
echo "Formatted date: $formatted_date"
# Calculate date for specific number of days from today
days_to_add=5
future_date=$(date -d "+$days_to_add days" "+%d/%m/%Y")
echo "Date $days_to_add days from now: $future_date"

exit 0
```

```
vbrown@LAPTOP-4EJP6J7N:~/scrlang/lec/week4$ ./dateex.sh
Current date and time: Thu Jul 20 13:09:13 AWST 2023
Formatted date: Thursday, July 20, 2023
Date 5 days from now: 25/07/2023
```

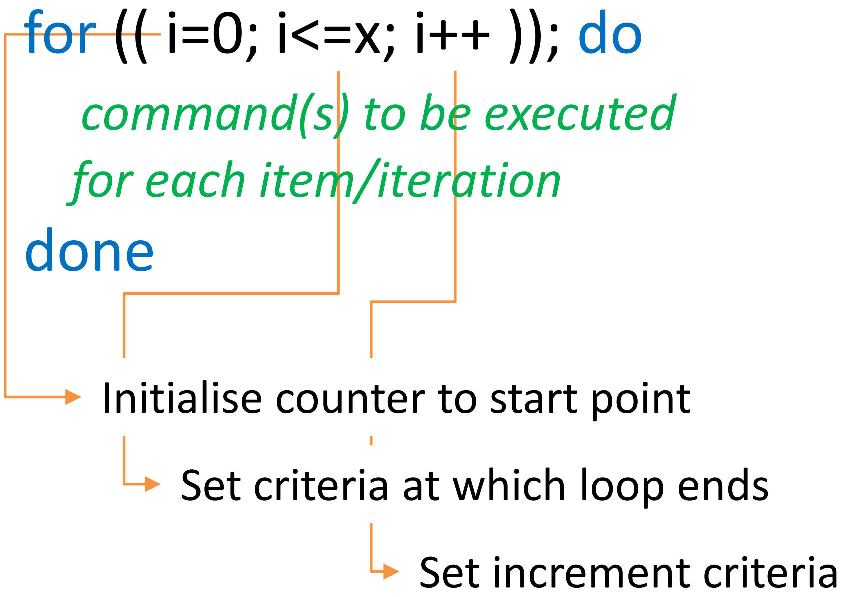


C-Style Loops

C-style for loops

- Bash also supports C-style for loops that count a specified number of times
- The *C-style for loop* sets an *initial value*, a *guard* and an *increment* within the loop
- This is very similar to for loops in other programming languages such as java, C# and C++

FOR C-STYLE LOOP BASIC STRUCTURE



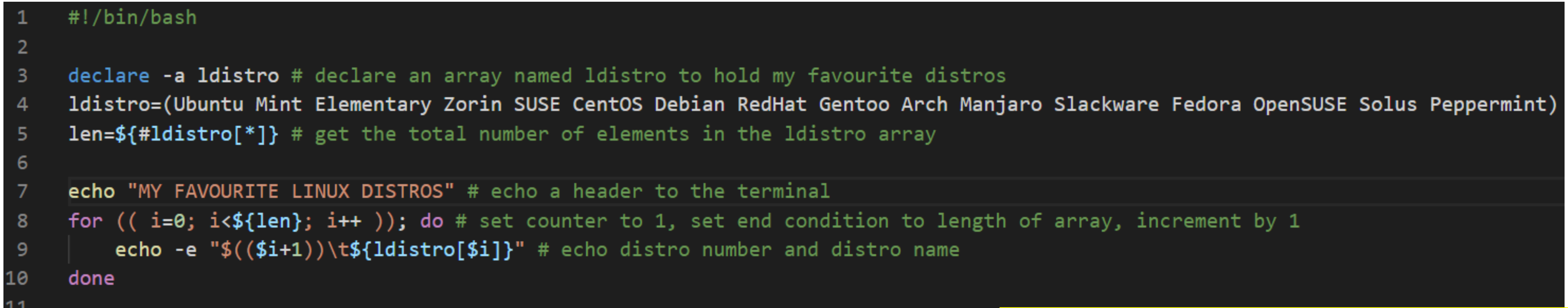
```
for (( i=0; i<=x; i++ )); do
    command(s) to be executed
    for each item/iteration
done
```

Initialise counter to start point

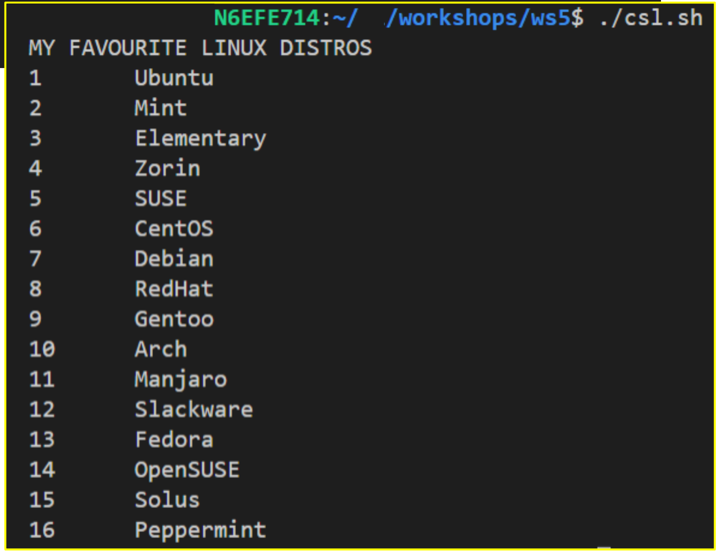
Set criteria at which loop ends

Set increment criteria

C-style for loops



```
1    #!/bin/bash
2
3    declare -a ldistro # declare an array named ldistro to hold my favourite distros
4    ldistro=(Ubuntu Mint Elementary Zorin SUSE CentOS Debian RedHat Gentoo Arch Manjaro Slackware Fedora OpenSUSE Solus Peppermint)
5    len=${#ldistro[*]} # get the total number of elements in the ldistro array
6
7    echo "MY FAVOURITE LINUX DISTROS" # echo a header to the terminal
8    for (( i=0; i<${len}; i++ )); do # set counter to 1, set end condition to length of array, increment by 1
9        echo -e "$(($i+1))\t${ldistro[$i]}" # echo distro number and distro name
10   done
11
12   exit 0
```



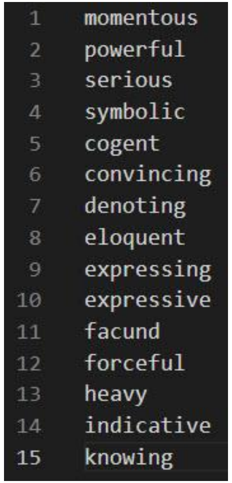
```
N6EFE714:~/  /workshops/ws5$ ./csl.sh
MY FAVOURITE LINUX DISTROS
1       Ubuntu
2       Mint
3       Elementary
4       Zorin
5       SUSE
6       CentOS
7       Debian
8       RedHat
9       Gentoo
10      Arch
11      Manjaro
12      Slackware
13      Fedora
14      OpenSUSE
15      Solus
16      Peppermint
```

CODE EXPLAINED:

1. Declare an array [Line 3]
2. Populate array with values [Line 4]
3. Get length of array [Line 5]
4. Print each array item to terminal with its ordinal position [Lines 8-10]

c-style loop to process values in a file

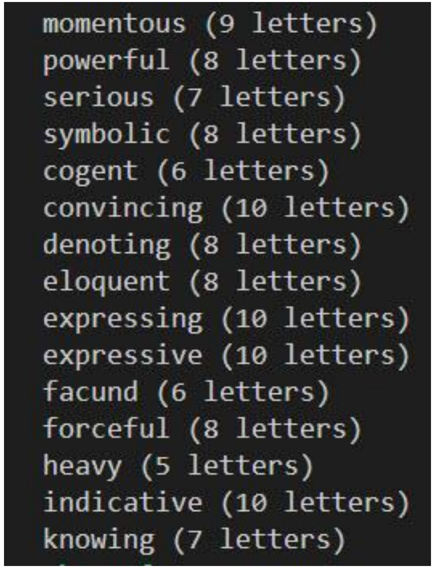
wordlist.txt



```
momentous
powerful
serious
symbolic
cogent
convincing
denoting
eloquent
expressing
expressive
facund
forceful
heavy
indicative
knowing
```

1. Using command substitution, a count of the line in the text file is obtained using the **wc** command and used as the sentinel in the *c-style for* loop
2. For each string value in the file, the **head** and **tail** commands are used in conjunction to isolate the string value that corresponds to current loop count
3. The **tr** command is used to remove the new line character from the end of each string so it is not counted by the **wc** command that follows

script output



```
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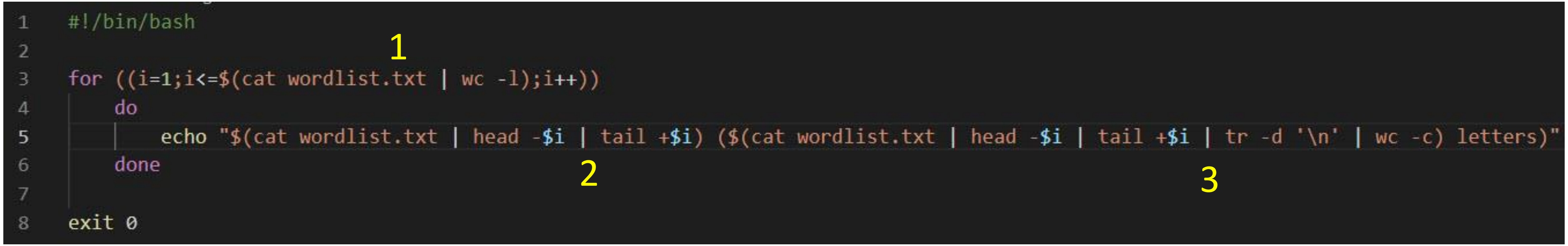
heavy (5 letters)
indicative (10 letters)
knowing (7 letters)
```

bash script



```
#!/bin/bash

for ((i=1;i<=$(cat wordlist.txt | wc -l);i++))
    do
        echo "$(cat wordlist.txt | head -$i | tail +$i) ($(cat wordlist.txt | head -$i | tail +$i | tr -d '\n' | wc -c) letters)"
    done

exit 0
```

The wc command/options

- The **wc** command counts words, lines, and characters in files or the standard input if no file is specified
- By default, **wc** displays the line, word, and byte counts in the given order, e.g. **`wc filename.txt`**
- It also provides several options (flags) to customise its behavior:

Flag	Description
-c	Display the byte count of the input **`wc -c filename.txt`**
-m	Display the character count of the input **`wc -m filename.txt`**
-l	Display the line count of the input **`wc -l filename.txt`**
-w	Display the word count of the input **`wc -w filename.txt`**

The head command/options

- The **head** command is used to display the beginning (head) of a file/input stream, thus limiting the output when dealing with large files
- By default, head displays the first 10 lines of a file.
- It provides several options (flags) to customise its behavior:

Flag	**Description**
-n *N*	Display the first *N* lines of the file, with *N* specifying how many lines to display
-c *N*	Display the first *N* bytes of the file, with *N* specifying how many bytes to display
-q	Suppress the printing of file headers (used when multiple files are given as input)

Code	**Action**
`head filename.txt`	Display the first 10 lines of a file
`head -n 20 filename.txt`	Display the first 20 lines of a file
`head -c 100 filename.txt`	Display the first 100 bytes of a file
`ls –l` *`[dir]`* `| head`	Display the first 10 lines of the output of a command

The tail command/options

- The **tail** command displays the end (tail) of a file or input stream; often used to preview the last few lines of a file or continuously monitoring log files updating in real-time
- By default, tail displays the last 10 lines of a file.
- It provides several options (flags) to customise its behavior:

Flag	Description
-n *N*	Display the last *N* lines of the file, with N specifying how many lines to display
-c *N*	Display the last *N* bytes of the file, specifying how many bytes to display
-f	Output appended data as the file grows - this option is used to continuously monitor log files or streams that are being updated
-q	Suppress the printing of file headers (used when multiple files are given as input)

Code	Action
`tail filename.txt`	Display the last 10 lines of a file
`tail -n 20 filename.txt`	Display the last 20 lines of a file
`tail -f logfile.txt`	Continuously monitor a log file as it grows

The tr command

- The **tr** command in bash is used to translate, delete, or squeeze characters in a given input stream or file
- It can perform simple character-level transformations on the data and is especially useful for tasks like replacing characters, converting case, and deleting specific characters
- The tr command takes two sets of characters as arguments. The first set, SET1, defines the characters to be replaced, deleted, or squeezed. The second set, SET2, defines the characters to be used as replacements

The tr command examples

Replace all occurrences of 'a' with 'b' in a text:

```
echo "Hello, this is an example" | tr 'a' 'b'
```

Output: Hello, this is bn exbmple

Delete all occurrences of 'e' from a text:

```
echo "Hello, this is an example" | tr -d 'e'
```

Output: Hllo, this is an xampl

Convert uppercase letters to lowercase:

```
echo "HELLO" | tr 'A-Z' 'a-z'
```

Output: hello

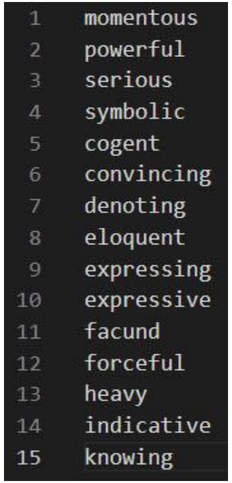
Remove all non-numeric characters:

```
echo "Phone: (555) 123-4567" | tr -cd '0-9'
```

Output: 5551234567

c-style loop to process values in a file

wordlist.txt



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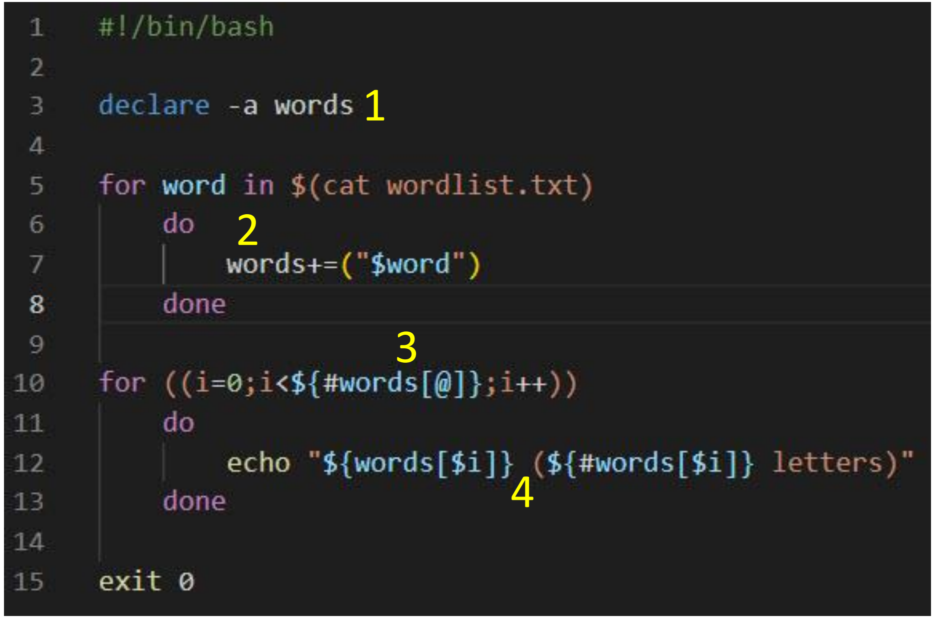
bash script



```
#!/bin/bash

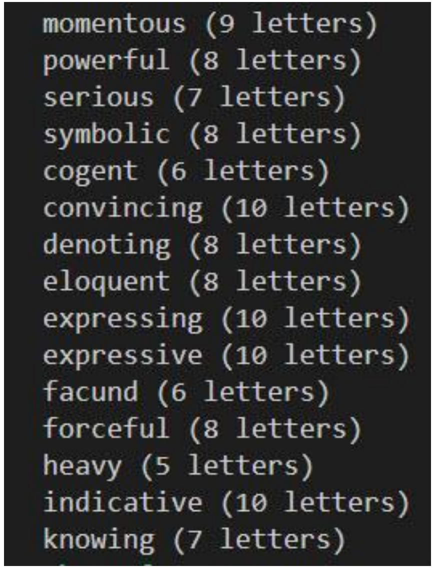
declare -a words

for word in $(cat wordlist.txt)
    do
        words+=("$word")
    done

for ((i=0;i<${#words[@]};i++))
    do
        echo "${words[$i]} (${#words[$i]} letters)"
    done

exit 0
```

script output



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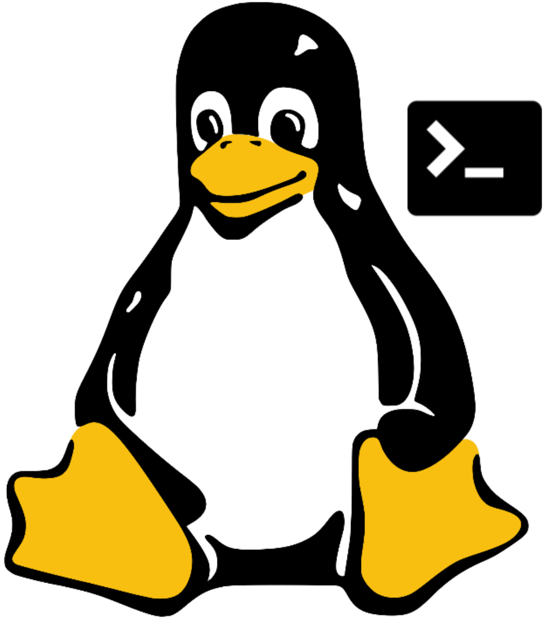
knowing (7 letters)
```

1. An array is declared to hold the string values in the file
2. A for loop is used to add string values to array
3. String tools count method used to get array count to act as sentinel in the *c-style for* loop
4. String tools count method used to get number of characters in each string and print to terminal



While Loops

While loops

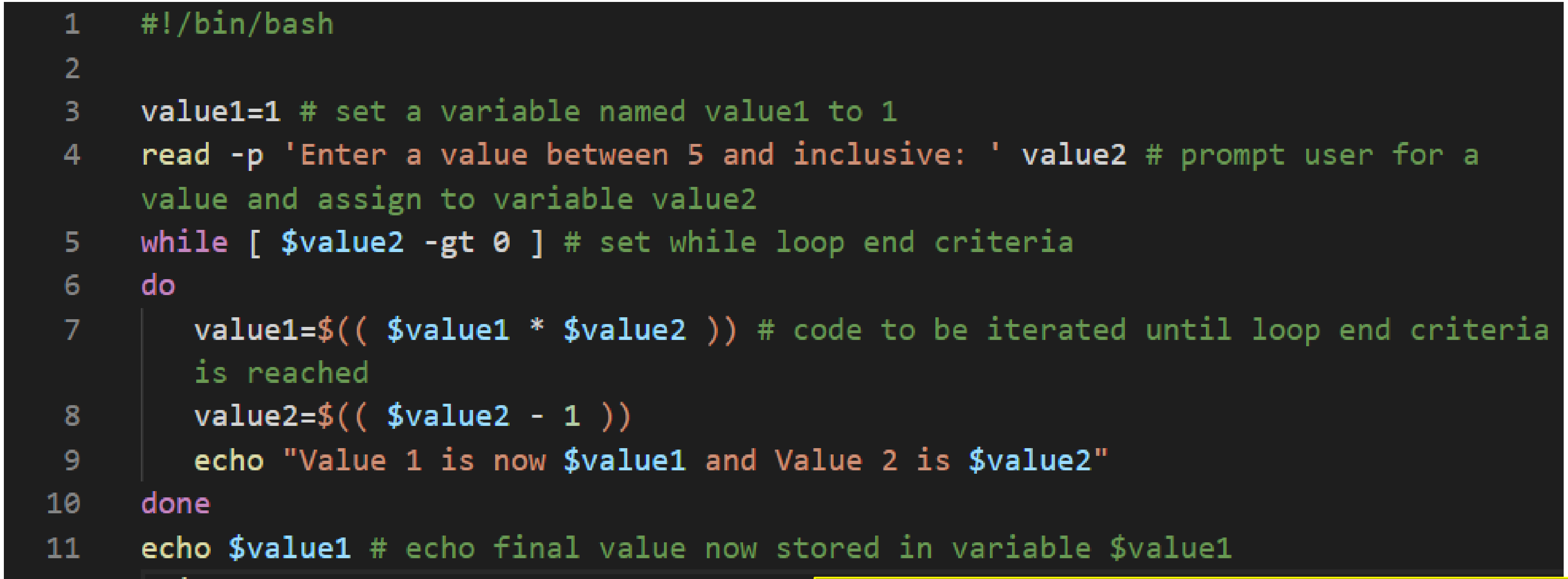
- For loops are mostly useful when we know exactly how many times we want commands to repeat
- In many cases however, we need to keep looping until a certain condition is met, for example:
  - *repeat while* the user has not chosen to exit
  - *repeat until* a correct value is entered
  - *repeat while* there is still additional information being written
- This is when **while** loops come in handy

WHILE LOOP BASIC STRUCTURE

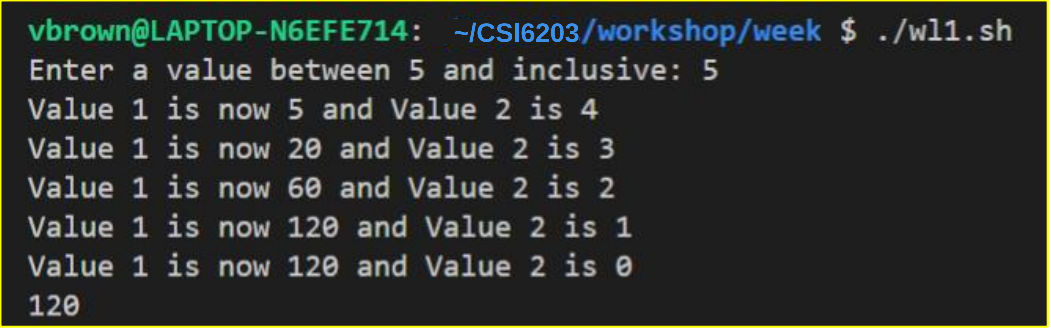
```
while (( x -gt y )); do
    command(s) to be executed
  for each item/iteration
done
```

Loop end criteria

While loop example



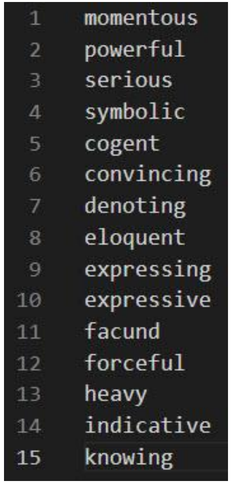
```bash
#!/bin/bash

value1=1 # set a variable named value1 to 1
read -p 'Enter a value between 5 and inclusive: ' value2 # prompt user for a value and assign to variable value2
while [ $value2 -gt 0 ] # set while loop end criteria
do
    value1=$(( $value1 * $value2 )) # code to be iterated until loop end criteria is reached
    value2=$(( $value2 - 1 ))
    echo "Value 1 is now $value1 and Value 2 is $value2"
done
echo $value1 # echo final value now stored in variable $value1
exit 0
```



```
vbrown@LAPTOP-N6EFE714: ~/CSI6203/workshop/week $ ./wl1.sh
Enter a value between 5 and inclusive: 5
Value 1 is now 5 and Value 2 is 4
Value 1 is now 20 and Value 2 is 3
Value 1 is now 60 and Value 2 is 2
Value 1 is now 120 and Value 2 is 1
Value 1 is now 120 and Value 2 is 0
120
```

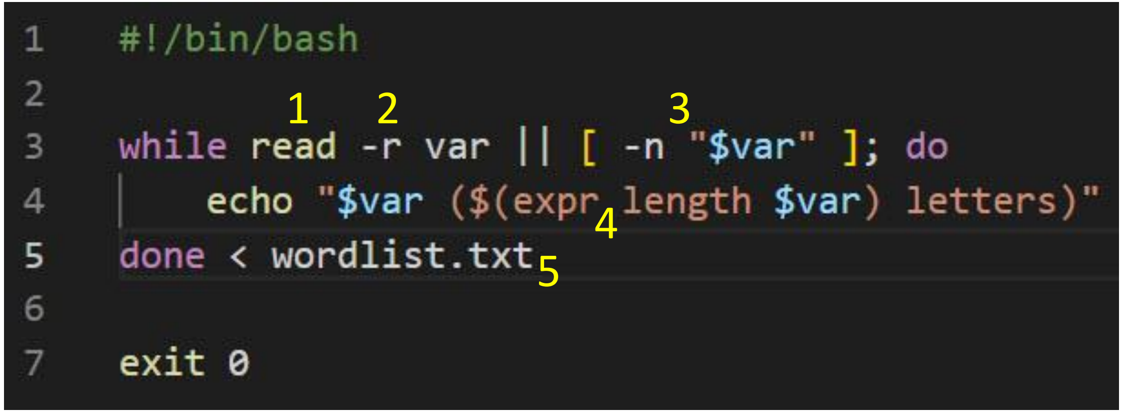
while loop to process values in a file

wordlist.txt



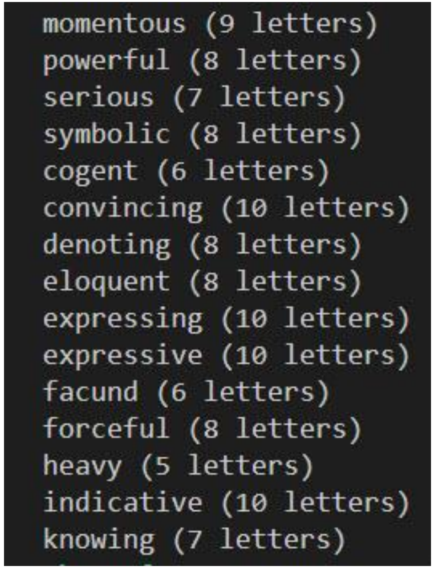
```
momentous
powerful
serious
symbolic
cogent
convincing
denoting
eloquent
expressing
expressive
facund
forceful
heavy
indicative
knowing
```

bash script



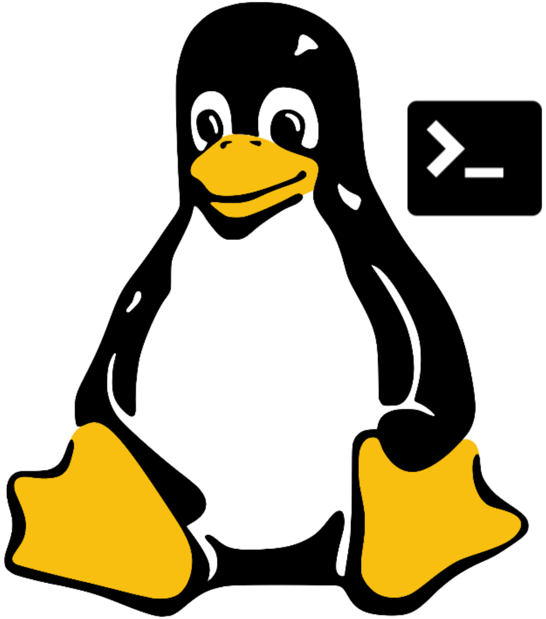
```bash
#!/bin/bash

while read -r var || [ -n "$var" ]; do
    echo "$var ($(expr length $var) letters)"
done < wordlist.txt

exit 0
```

script output



```
momentous (9 letters)
powerful (8 letters)
serious (7 letters)
symbolic (8 letters)
cogent (6 letters)
convincing (10 letters)
denoting (8 letters)
eloquent (8 letters)
expressing (10 letters)
expressive (10 letters)
facund (6 letters)
forceful (8 letters)
heavy (5 letters)
indicative (10 letters)
knowing (7 letters)
```

1. The **read** command is used to get each line from the text file
2. The **-r** option prevents backslashes escaping characters
3. Should any line not contain a new line character, it will still be processed
4. Use the **expr** *length* function to get the length count of the current string from the text file
5. The text file from which the strings (words) are being extracted



Until Loops

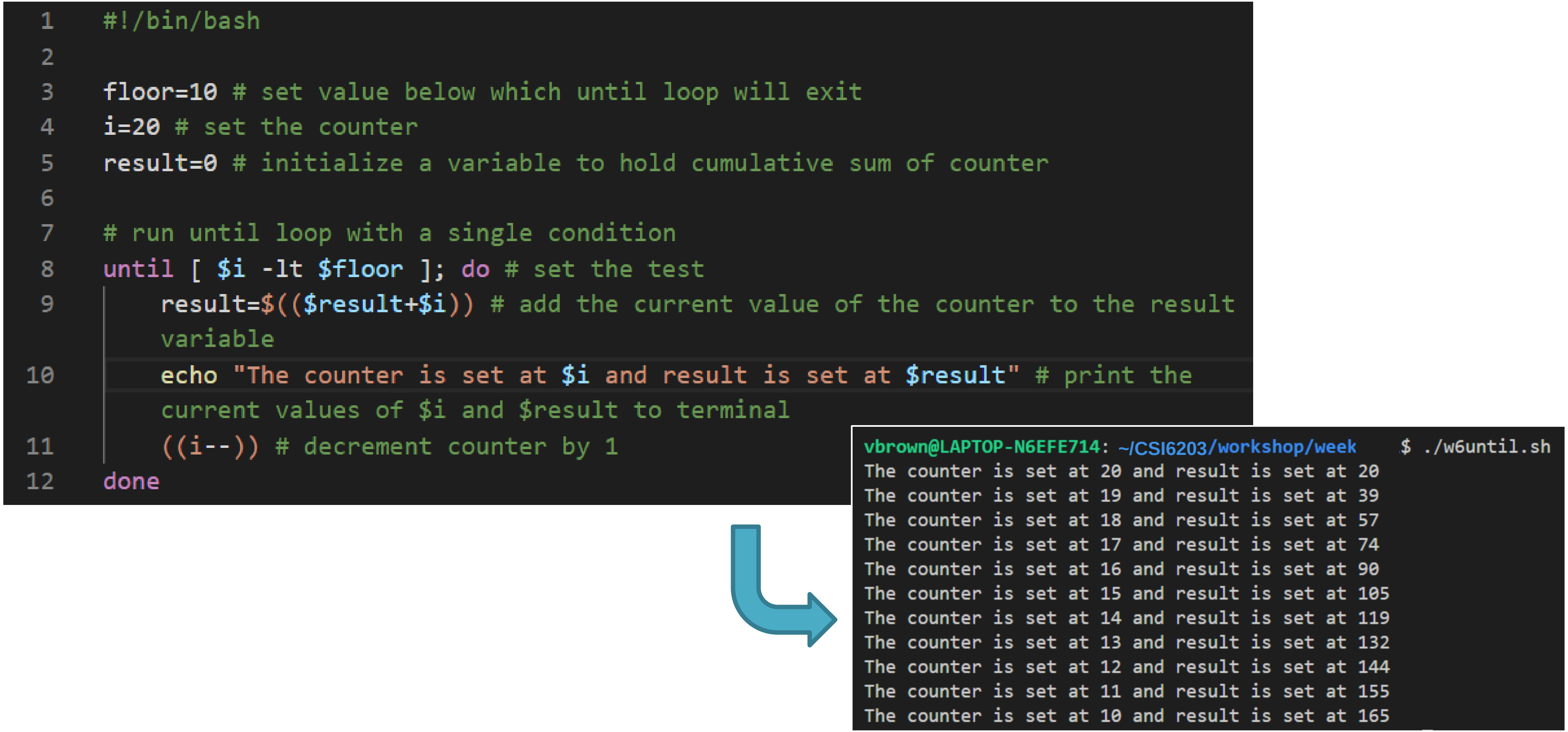
Until Loops

- An **until** loop is used to execute a given set of commands as long as the given condition evaluates to *false*
- The condition is evaluated *before* executing the commands
- If the condition evaluates to false, commands are executed
- Otherwise, if the condition evaluates to *true*, the loop will be terminated and program control will be passed to whatever code follows

UNTIL LOOP BASIC STRUCTURE

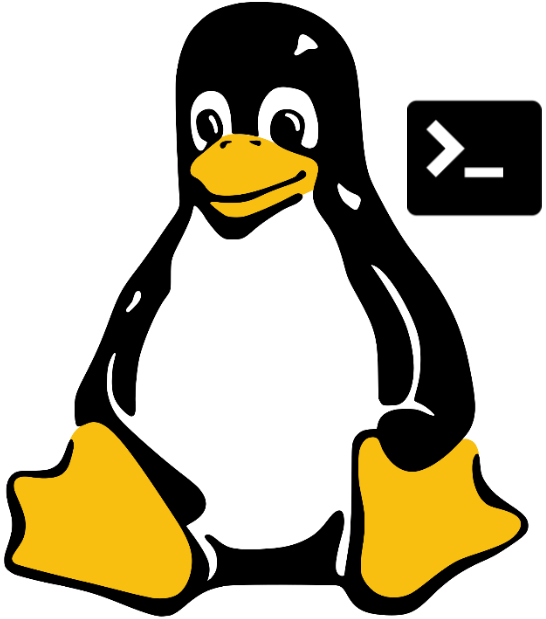
```
until [ conditional_test ]; do
    command(s) to execute if
    condition is false
done
```

Until Loop Example



```bash
#!/bin/bash

floor=10 # set value below which until loop will exit
i=20 # set the counter
result=0 # initialize a variable to hold cumulative sum of counter

# run until loop with a single condition
until [ $i -lt $floor ]; do # set the test
    result=$(($result+$i)) # add the current value of the counter to the result variable
    echo "The counter is set at $i and result is set at $result" # print the current values of $i and $result to terminal
    ((i--)) # decrement counter by 1
done
```

```
vbrown@LAPTOP-N6EFE714: ~/CSI6203/workshop/week    $ ./w6until.sh
The counter is set at 20 and result is set at 20
The counter is set at 19 and result is set at 39
The counter is set at 18 and result is set at 57
The counter is set at 17 and result is set at 74
The counter is set at 16 and result is set at 90
The counter is set at 15 and result is set at 105
The counter is set at 14 and result is set at 119
The counter is set at 13 and result is set at 132
The counter is set at 12 and result is set at 144
The counter is set at 11 and result is set at 155
The counter is set at 10 and result is set at 165
```

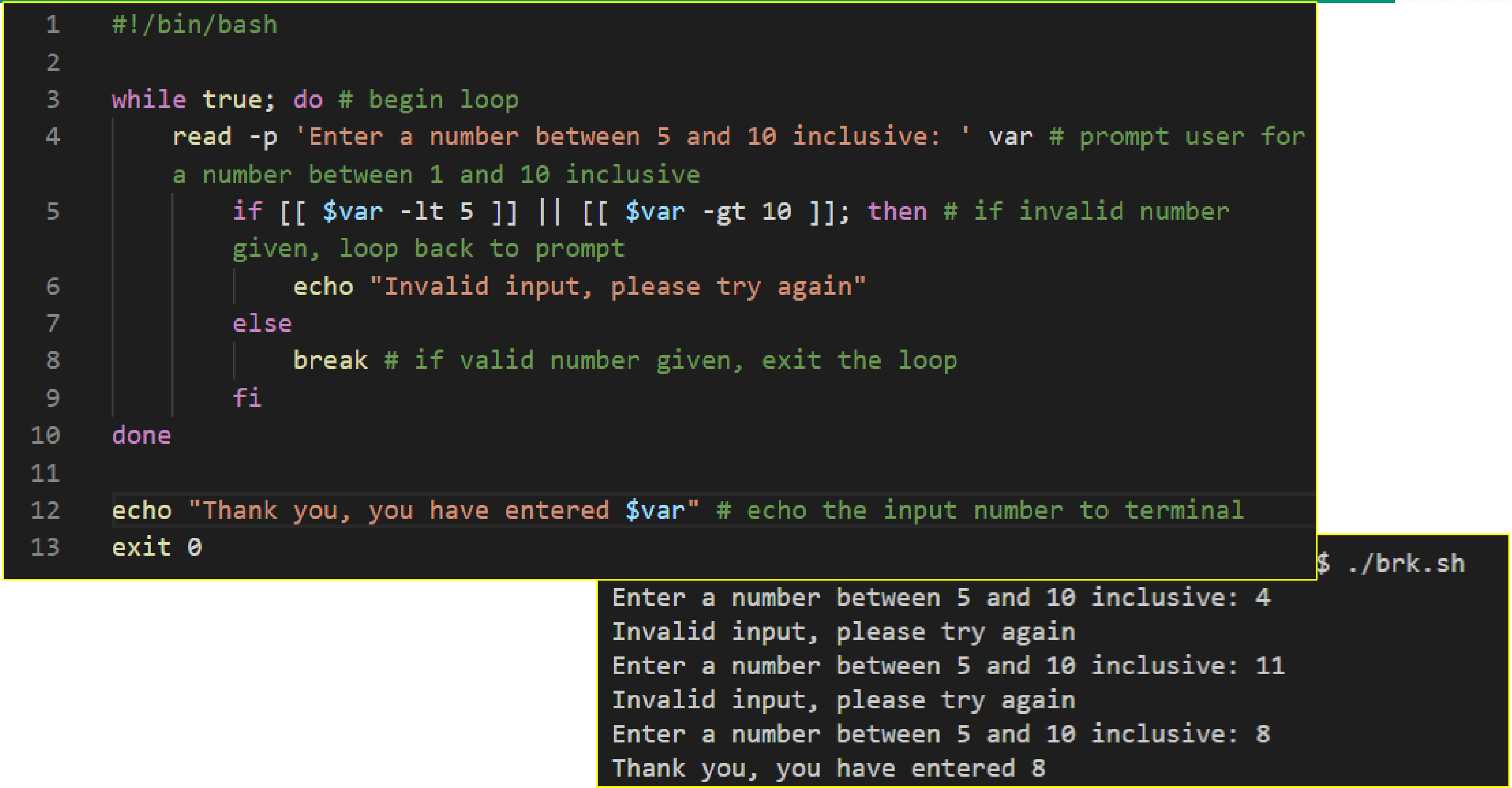


Break and Continue

Loop Controls – Break and Continue

- The loop controls break and continue can be use to change the behaviour of loops
- These are primarily useful for error handling or to skip unwanted items
- The break statement allows *exit* from a loop when a condition is met
- The continue statement *skips* the current iteration and moves on to the next one

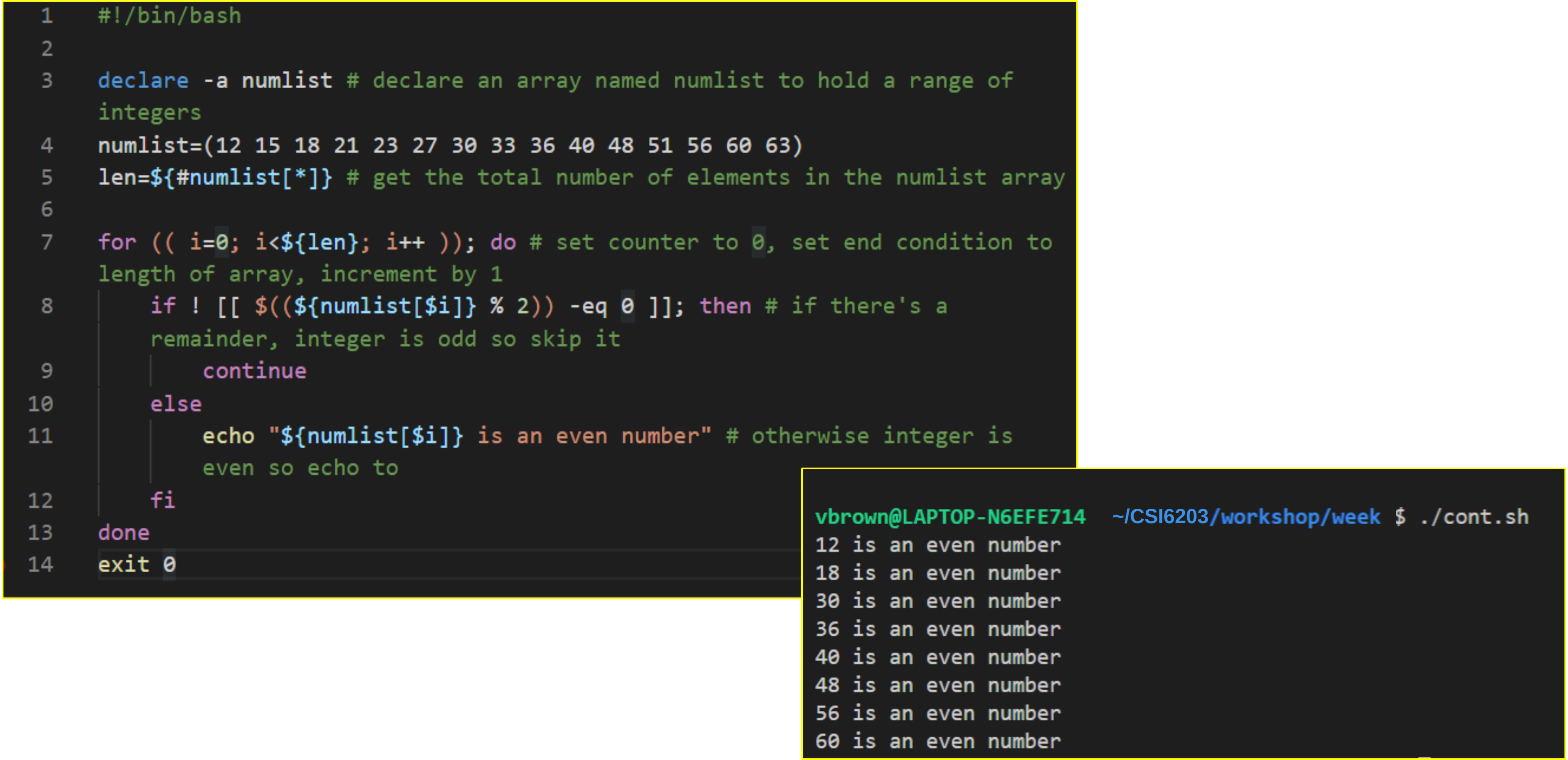
Break Example



```bash
#!/bin/bash

while true; do # begin loop
    read -p 'Enter a number between 5 and 10 inclusive: ' var # prompt user for a number between 1 and 10 inclusive
        if [[ $var -lt 5 ]] || [[ $var -gt 10 ]]; then # if invalid number given, loop back to prompt
            echo "Invalid input, please try again"
        else
            break # if valid number given, exit the loop
        fi
done

echo "Thank you, you have entered $var" # echo the input number to terminal
exit 0
```

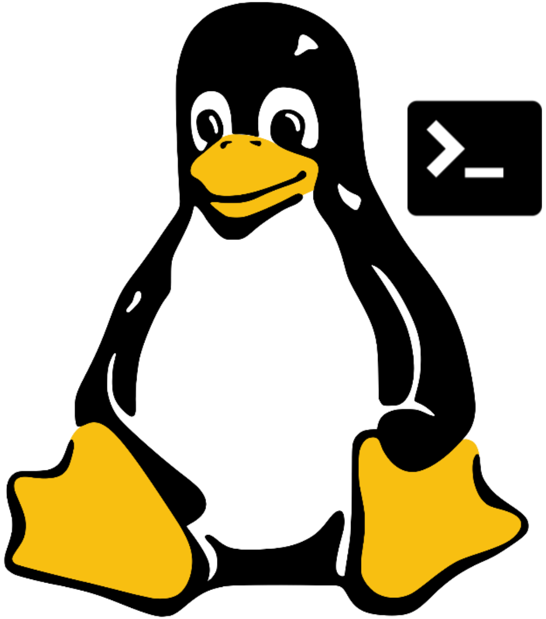
```
$ ./brk.sh
Enter a number between 5 and 10 inclusive: 4
Invalid input, please try again
Enter a number between 5 and 10 inclusive: 11
Invalid input, please try again
Enter a number between 5 and 10 inclusive: 8
Thank you, you have entered 8
```

Continue Example



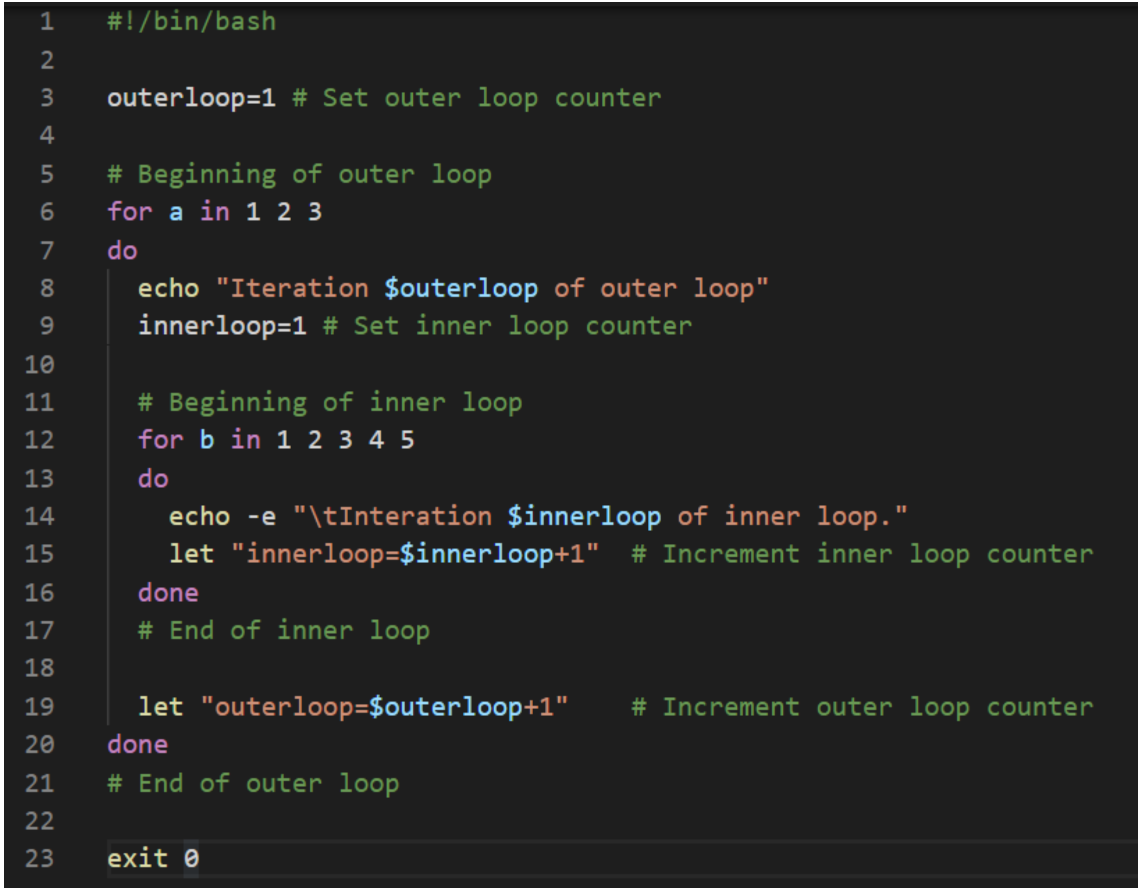
```bash
#!/bin/bash

declare -a numlist # declare an array named numlist to hold a range of integers
numlist=(12 15 18 21 23 27 30 33 36 40 48 51 56 60 63)
len=${#numlist[*]} # get the total number of elements in the numlist array

for (( i=0; i<${len}; i++ )); do # set counter to 0, set end condition to length of array, increment by 1
    if ! [[ $((${numlist[$i]} % 2)) -eq 0 ]]; then # if there's a remainder, integer is odd so skip it
        continue
    else
        echo "${numlist[$i]} is an even number" # otherwise integer is even so echo to
    fi
done
exit 0
```

```
vbrown@LAPTOP-N6EFE714  ~/CSI6203/workshop/week $ ./cont.sh
12 is an even number
18 is an even number
30 is an even number
36 is an even number
40 is an even number
48 is an even number
56 is an even number
60 is an even number
```



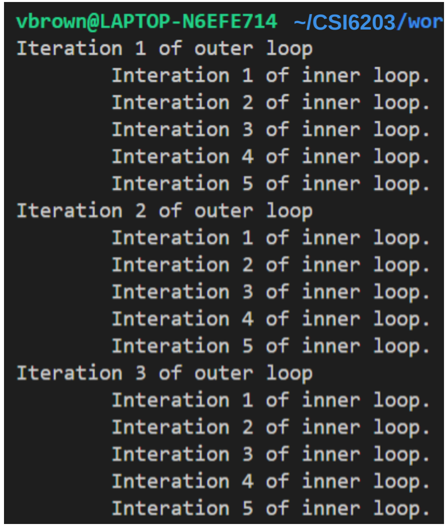
Nested Loops

Nested loops

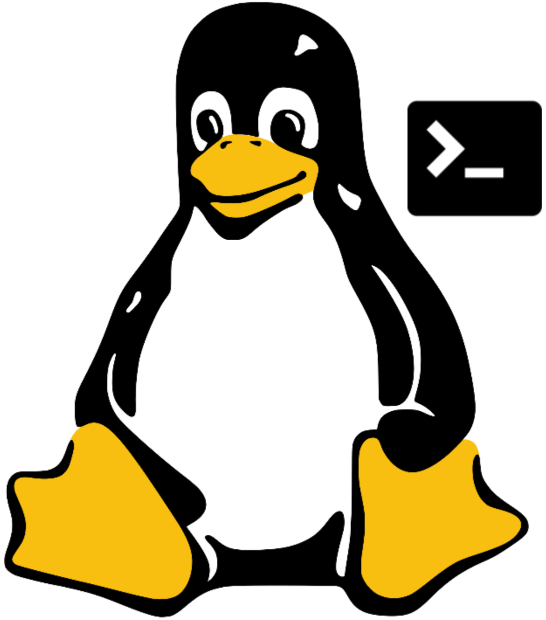


```bash
#!/bin/bash

outerloop=1 # Set outer loop counter

# Beginning of outer loop
for a in 1 2 3
do
  echo "Iteration $outerloop of outer loop"
  innerloop=1 # Set inner loop counter

  # Beginning of inner loop
  for b in 1 2 3 4 5
  do
    echo -e "\tInteration $innerloop of inner loop."
    let "innerloop=$innerloop+1"  # Increment inner loop counter
  done
  # End of inner loop

  let "outerloop=$outerloop+1"    # Increment outer loop counter
done
# End of outer loop

exit 0
```

- Loops can be placed inside each other.
- The entire inner loop will be repeated by the outer loop



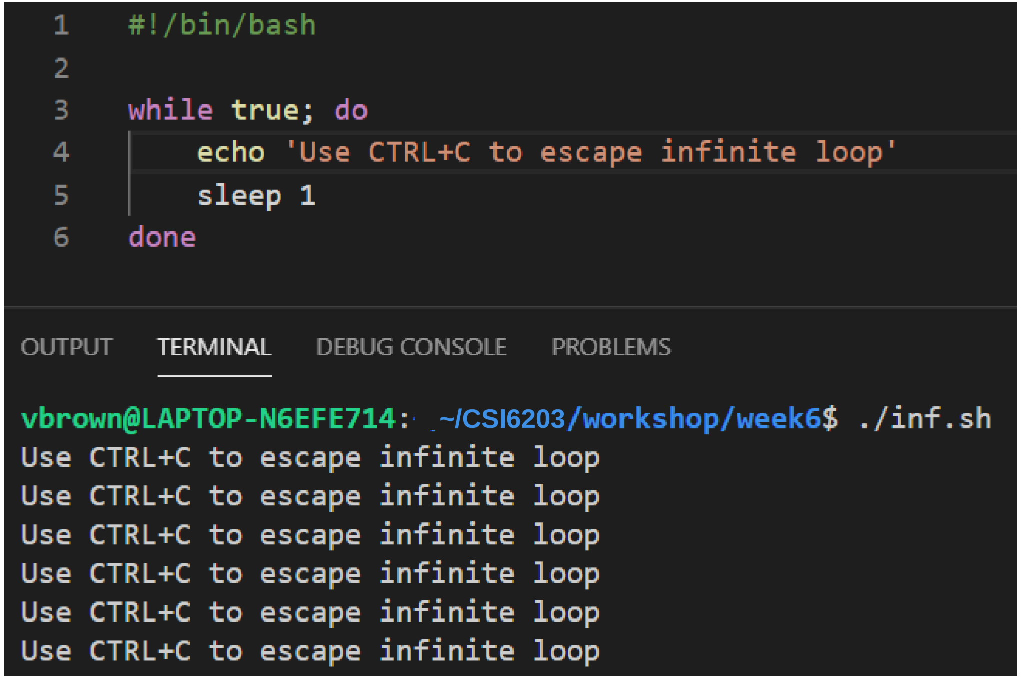
```
vbrown@LAPTOP-N6EFE714 ~/CSI6203/wor
Iteration 1 of outer loop
        Interation 1 of inner loop.
        Interation 2 of inner loop.
        Interation 3 of inner loop.
        Interation 4 of inner loop.
        Interation 5 of inner loop.
Iteration 2 of outer loop
        Interation 1 of inner loop.
        Interation 2 of inner loop.
        Interation 3 of inner loop.
        Interation 4 of inner loop.
        Interation 5 of inner loop.
Iteration 3 of outer loop
        Interation 1 of inner loop.
        Interation 2 of inner loop.
        Interation 3 of inner loop.
        Interation 4 of inner loop.
        Interation 5 of inner loop.
```



Infinte Loops

Infinite Loops

- There is nothing in bash that stops you from creating loops that cannot finish.
- These can be created by using a *guard* that:
  - ○ Has a boolean expression that can never be false
  - ○ Has a boolean expression that can be false but doesn’t reach that case
  - ○ Has an error that causes the loop to not execute the statements within

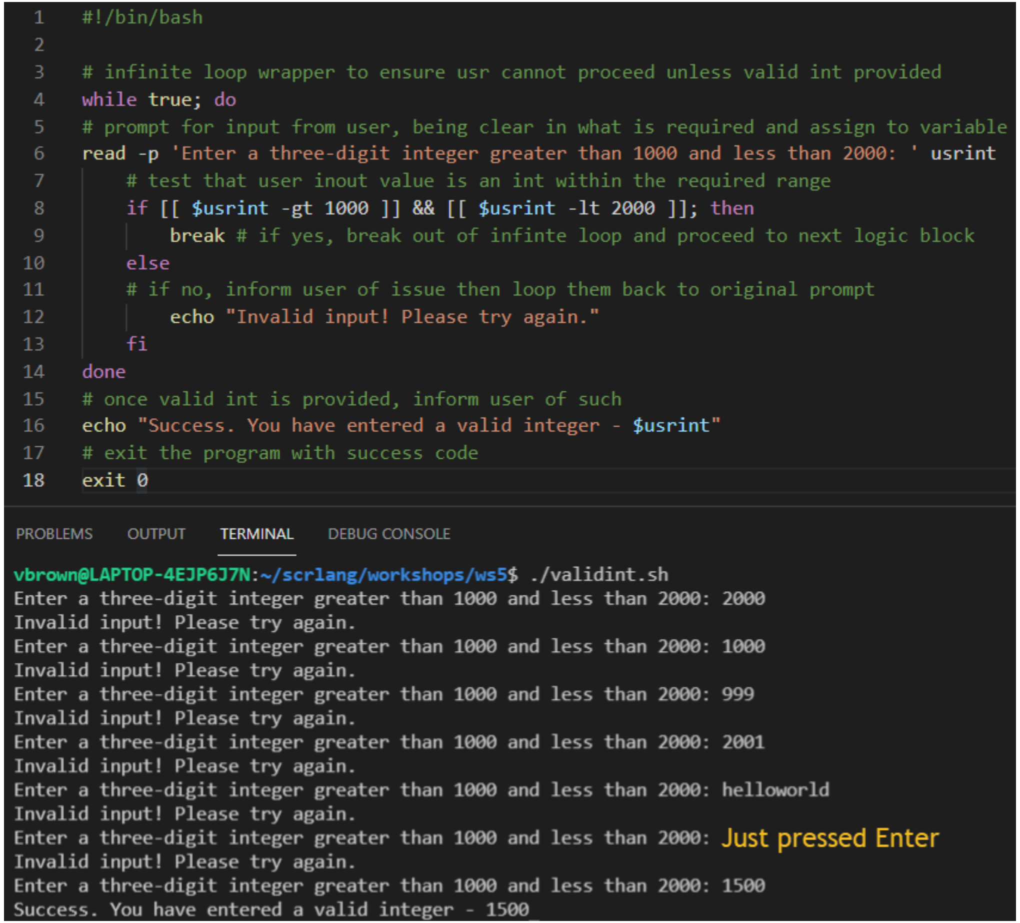


```bash
#!/bin/bash

while true; do
    echo 'Use CTRL+C to escape infinite loop'
    sleep 1
done
```

```
vbrown@LAPTOP-N6EFE714: ~/CSI6203/workshop/week6$ ./inf.sh
Use CTRL+C to escape infinite loop
Use CTRL+C to escape infinite loop
Use CTRL+C to escape infinite loop
Use CTRL+C to escape infinite loop
Use CTRL+C to escape infinite loop
Use CTRL+C to escape infinite loop
```

Infinite Loop Example

- Write a script that when run, prompts the user to enter a three-digit integer that is **> 1000** but **< 2000**
- In this case, an infinite loop structure is used to ensure user cannot proceed until a valid input is provided
- The **break** keyword allows the loop to be escaped when a valid value has been provided



```bash
#!/bin/bash

# infinite loop wrapper to ensure usr cannot proceed unless valid int provided
while true; do
# prompt for input from user, being clear in what is required and assign to variable
read -p 'Enter a three-digit integer greater than 1000 and less than 2000: ' usrint
    # test that user inout value is an int within the required range
    if [[ $usrint -gt 1000 ]] && [[ $usrint -lt 2000 ]]; then
        break # if yes, break out of infinte loop and proceed to next logic block
    else
    # if no, inform user of issue then loop them back to original prompt
        echo "Invalid input! Please try again."
    fi
done
# once valid int is provided, inform user of such
echo "Success. You have entered a valid integer - $usrint"
# exit the program with success code
exit 0
```

```
vbrown@LAPTOP-4EJP6J7N:~/scrlang/workshops/ws5$ ./validint.sh
Enter a three-digit integer greater than 1000 and less than 2000: 2000
Invalid input! Please try again.
Enter a three-digit integer greater than 1000 and less than 2000: 1000
Invalid input! Please try again.
Enter a three-digit integer greater than 1000 and less than 2000: 999
Invalid input! Please try again.
Enter a three-digit integer greater than 1000 and less than 2000: 2001
Invalid input! Please try again.
Enter a three-digit integer greater than 1000 and less than 2000: helloworld
Invalid input! Please try again.
Enter a three-digit integer greater than 1000 and less than 2000: Just pressed Enter
Invalid input! Please try again.
Enter a three-digit integer greater than 1000 and less than 2000: 1500
Success. You have entered a valid integer - 1500
```

Terms to Know

- Iteration
- For Loops
- C-Style Loops
- While Loops
- Until Loops
- Break and Continue
- Nested Loops
- Infinite Loops