Experiment 8: Shell Programming (Continued)

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Aim:

- To extend shell programming concepts by using conditional statements, advanced scripting constructs, and command-line arguments.
- To practice writing scripts that perform decision-making and parameter handling.

Requirements

- A Linux system with bash shell.
- Text editor and permission to create/execute shell scripts.

Theory

Conditional execution in shell scripts allows branching logic using `if`, `elif`, `else`, and `case` statements. Scripts can accept command-line arguments using `$1`, `$2`, ... and `$@` for all arguments. Control flow constructs combined with user input and arguments allow dynamic and reusable scripts.

Procedure & Observations

Exercise 1: Using `if-else`

Task Statement:

Write a script to check whether a given number is positive, negative, or zero.

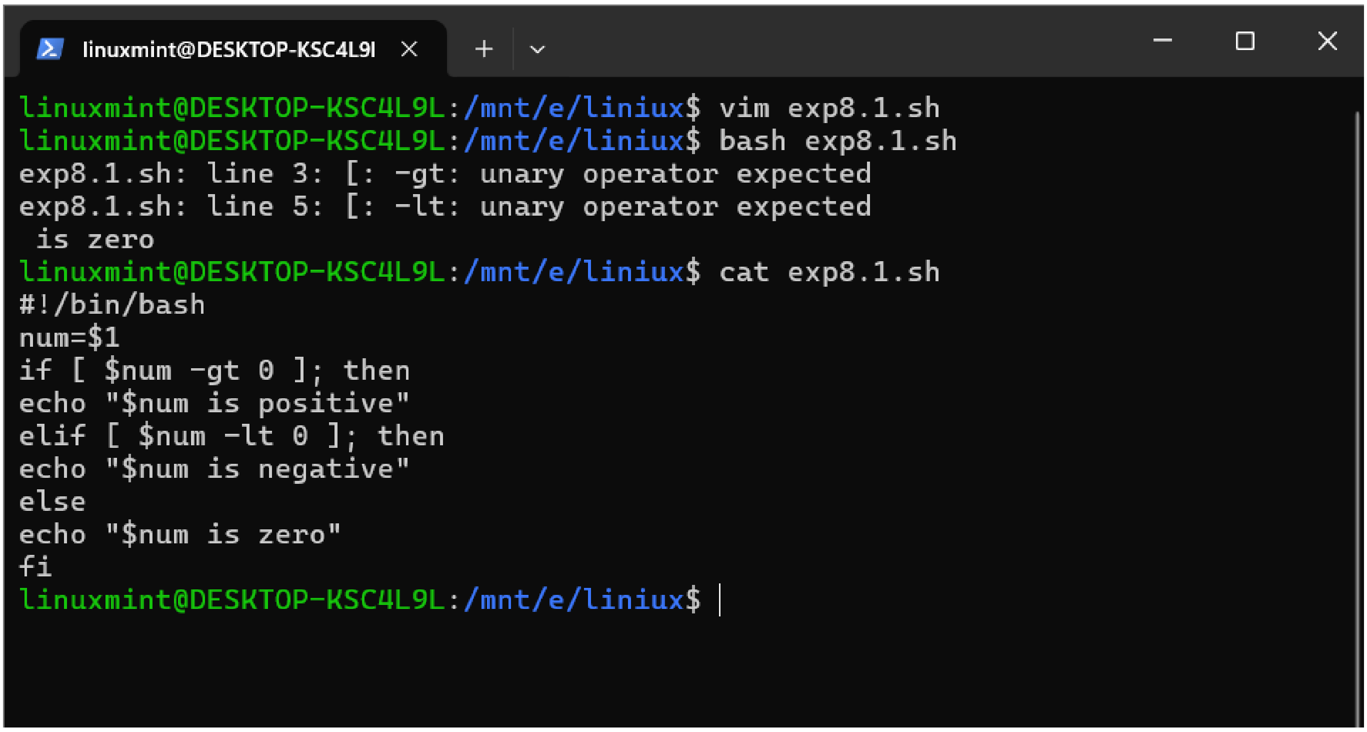
Explanation:

We used an `if-elif-else` construct to compare the number against 0.

Command(s):

```
#!/bin/bash
num=$1
if [ $num -gt 0 ]; then
  echo "$num is positive"
elif [ $num -lt 0 ]; then
  echo "$num is negative"
else
  echo "$num is zero"
fi
```

Output:



```
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ vim exp8.1.sh
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ bash exp8.1.sh
exp8.1.sh: line 3: [: -gt: unary operator expected
exp8.1.sh: line 5: [: -lt: unary operator expected
 is zero
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ cat exp8.1.sh
#!/bin/bash
num=$1
if [ $num -gt 0 ]; then
echo "$num is positive"
elif [ $num -lt 0 ]; then
echo "$num is negative"
else
echo "$num is zero"
fi
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$
```

Exercise 2: Using `case`

Task Statement:

Write a script that takes a character as input and classifies it as vowel, consonant, digit, or special character.

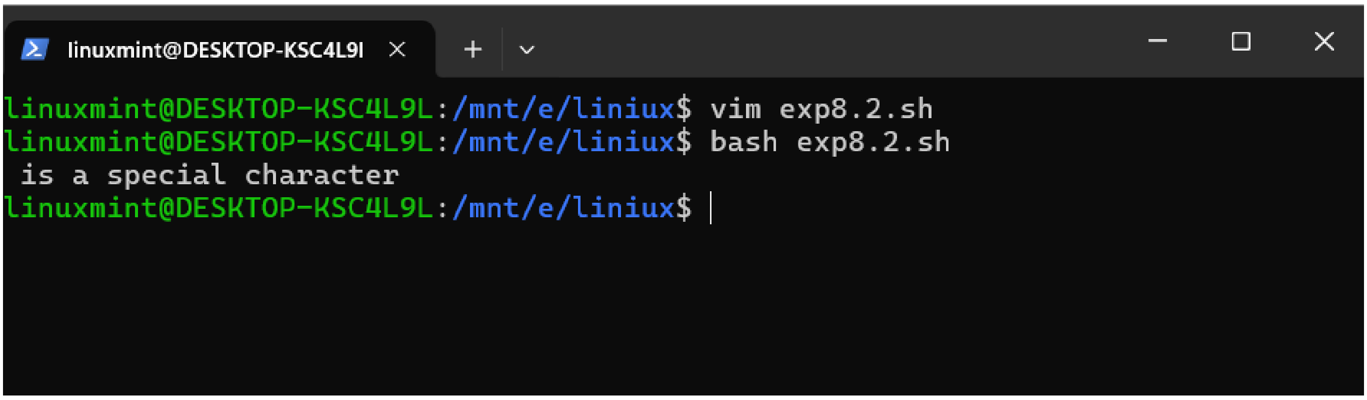
Explanation:

The `case` statement provides pattern matching for multiple options.

Command(s):

```
#!/bin/bash
ch=$1
case $ch in
  [aeiouAEIOU]) echo "$ch is a vowel" ;;
  [bcdfghjklmnpqrstvwxyzBCDFGHJKLMNPQRSTVWXYZ]) echo "$ch is a consonant" ;;
  [0-9]) echo "$ch is a digit" ;;
  *) echo "$ch is a special character" ;;
esac
```

Output:



```
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ vim exp8.2.sh
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ bash exp8.2.sh
 is a special character
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ 
```

Exercise 3: Command-line arguments

Task Statement:

Write a script that accepts filename(s) as arguments and prints the number of lines in each file.

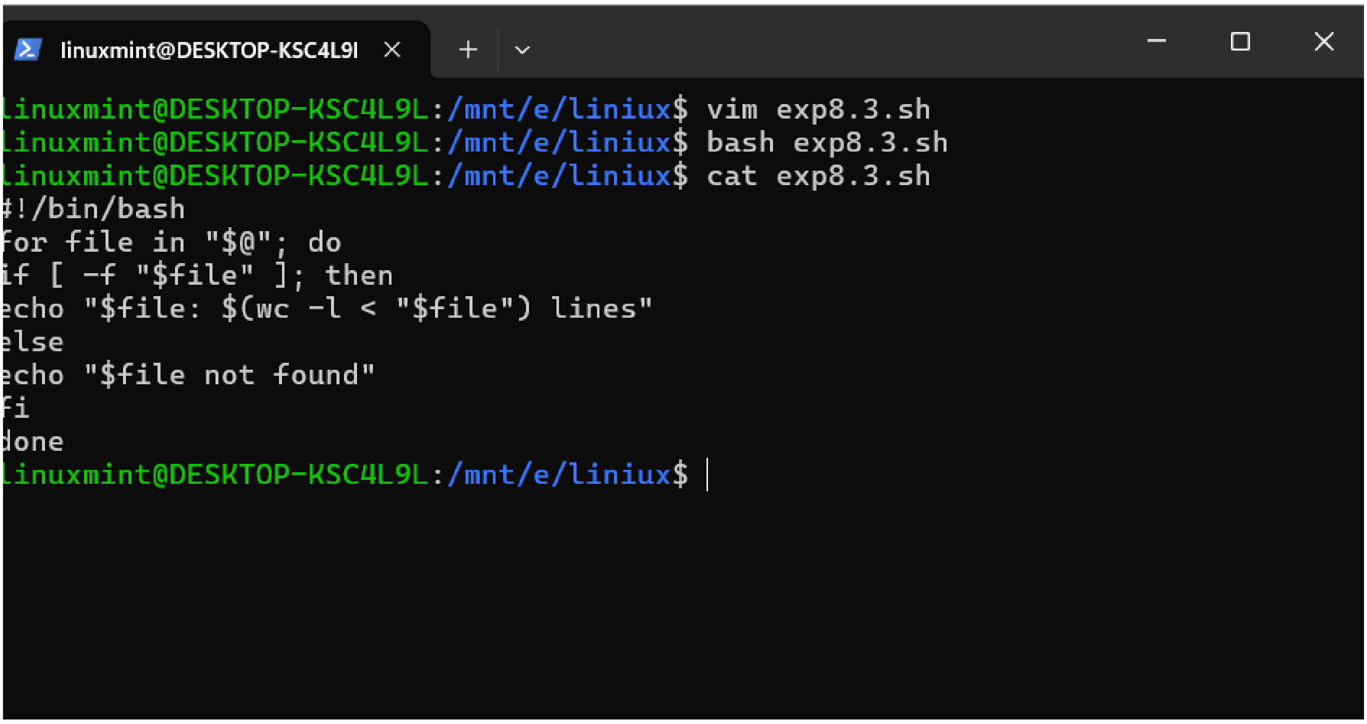
Explanation:

Command-line arguments are accessed using `$@`. Looping through each argument allows file-wise operations.

Command(s):

```
#!/bin/bash
for file in "$@"; do
  if [ -f "$file" ]; then
    echo "$file: $(wc -l < "$file") lines"
  else
    echo "$file not found"
  fi
done
```

Output:



```
Linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ vim exp8.3.sh
Linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ bash exp8.3.sh
Linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ cat exp8.3.sh
#!/bin/bash
for file in "$@"; do
if [ -f "$file" ]; then
echo "$file: $(wc -l < "$file") lines"
else
echo "$file not found"
fi
done
Linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$
```

Exercise 4: Nested conditionals

Task Statement:

Write a script to check if a year is a leap year.

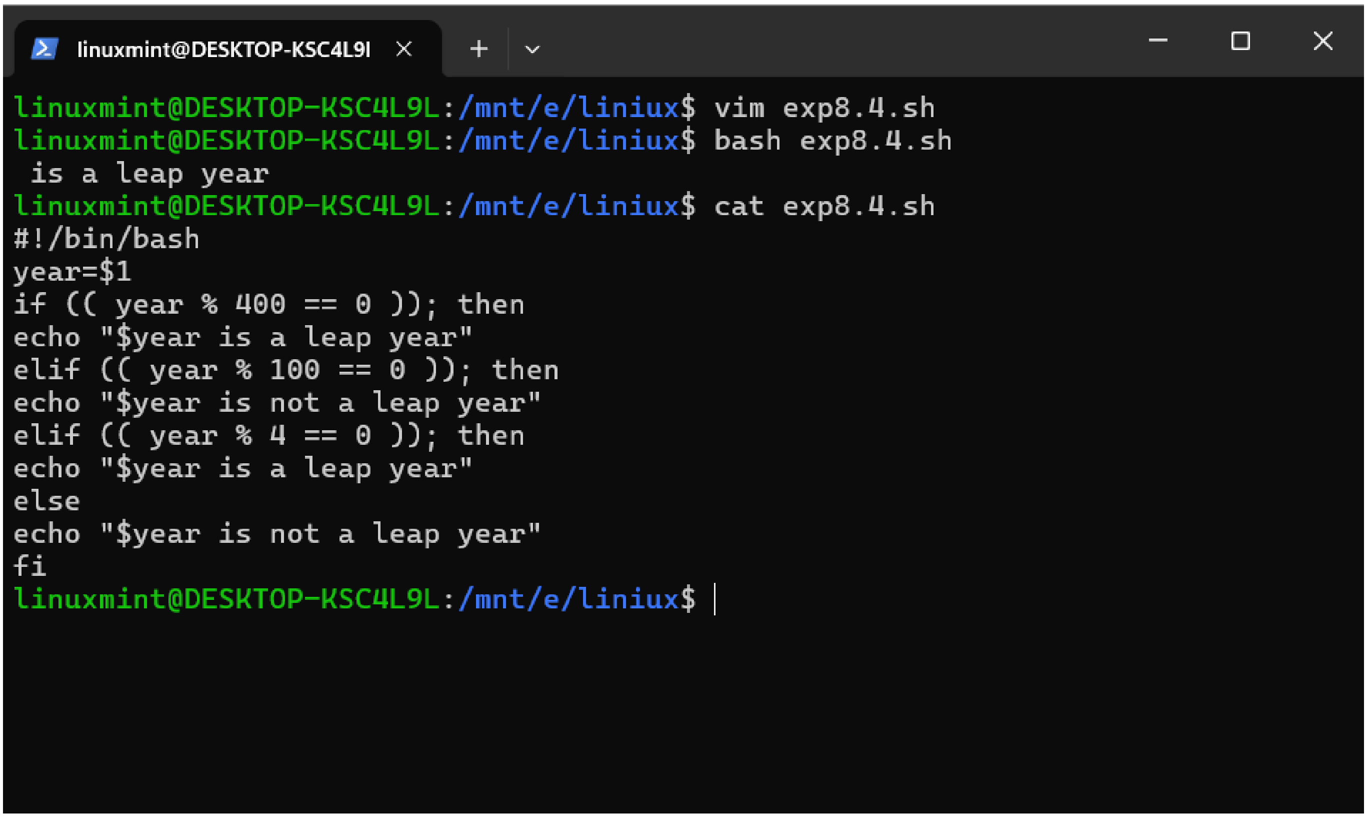
Explanation:

A leap year is divisible by 4, but if divisible by 100 it must also be divisible by 400.

Command(s):

```
#!/bin/bash
year=$1
if (( year % 400 == 0 )); then
  echo "$year is a leap year"
elif (( year % 100 == 0 )); then
  echo "$year is not a leap year"
elif (( year % 4 == 0 )); then
  echo "$year is a leap year"
else
  echo "$year is not a leap year"
fi
```

Output:



```
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ vim exp8.4.sh
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ bash exp8.4.sh
 is a leap year
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ cat exp8.4.sh
#!/bin/bash
year=$1
if (( year % 400 == 0 )); then
echo "$year is a leap year"
elif (( year % 100 == 0 )); then
echo "$year is not a leap year"
elif (( year % 4 == 0 )); then
echo "$year is a leap year"
else
echo "$year is not a leap year"
fi
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$
```

Result

- Implemented conditional statements (`if-else`, `case`) in shell scripts.
- Practiced handling command-line arguments and nested conditions.
- Wrote reusable and flexible shell scripts.

Challenges Faced & Learning Outcomes

- Challenge 1: Forgetting to quote variables in conditions — resolved by using `"$var"` to avoid word splitting.
- Challenge 2: Pattern matching in `case` — practiced with multiple examples.

Learning:

- Learned practical use of branching and decision-making in shell scripting.
- Understood command-line argument handling for automation.

Conclusion

This experiment extended shell programming by introducing decision-making and parameter handling. The scripts demonstrate the flexibility of shell programming for different use cases.