

# **SIKSHA 'O' ANUSANDHAN**

## **DEEMED TO BE UNIVERSITY**

**Admission Batch : 2021 - 25**

**Session : 2023 - 24**

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### **Laboratory Assignment #3**

## **DESIGN OF OPERATING SYSTEMS ( CSE 4049 )**

*Submitted By -*

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**Branch & Section** : CSE - B  
**Semester** : 5th Semester



**Department of Computer Science & Engineering  
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**Jagamohan Nagar, Jagamara, Bhubaneswar, Odisha – 751030**

### Objective of this Assignment:

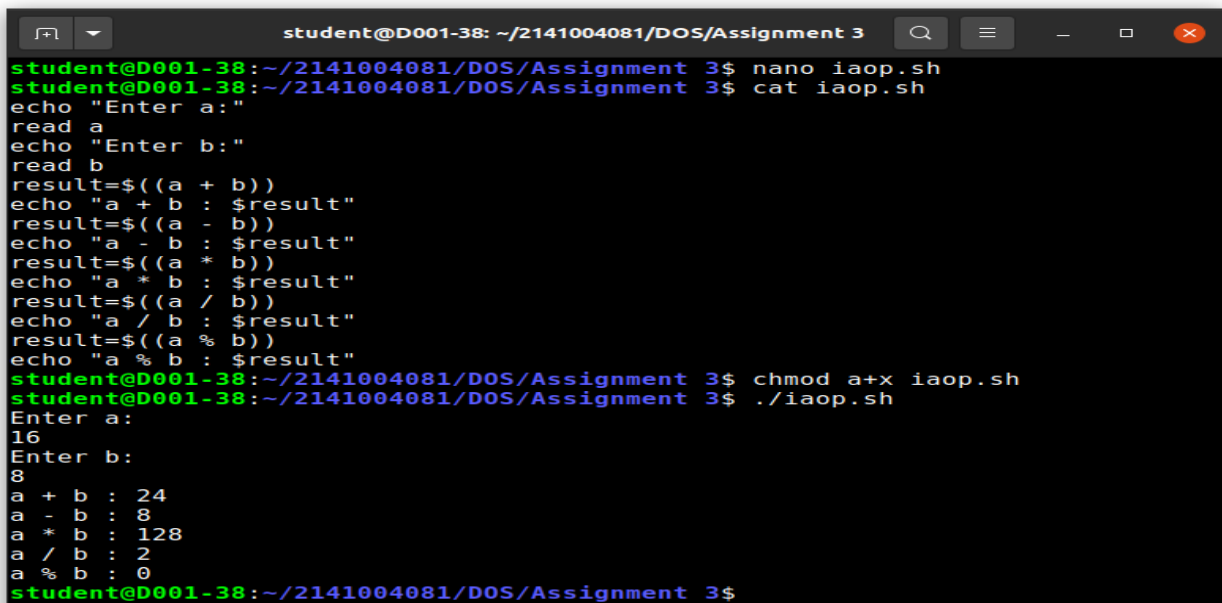
- To learn the proper use of user defined variables and arithmetic operators in shell programming.
- To write shell script producing solution to decision making problems.

**Q1. Write a shell script iaop to perform integer arithmetic on two numbers, where the value of the two numbers will be given during runtime..**

### Command:

```
echo "Enter a:"
read a
echo "Enter b:"
read b
result=$((a + b))
echo "a + b : $result"
result=$((a - b))
echo "a - b : $result"
result=$((a * b))
echo "a * b : $result"
result=$((a / b))
echo "a / b : $result"
result=$((a % b))
echo "a % b : $result"
```

### Output:

A terminal window titled 'student@D001-38: ~/2141004081/DOS/Assignment 3' displays the execution of a shell script. The user enters 'nano iaop.sh' and 'cat iaop.sh' to view the script content. The script prompts for two numbers, 'a' and 'b'. The user enters '16' for 'a' and '8' for 'b'. The script then outputs the results of arithmetic operations: addition (24), subtraction (8), multiplication (128), division (2), and modulus (0).

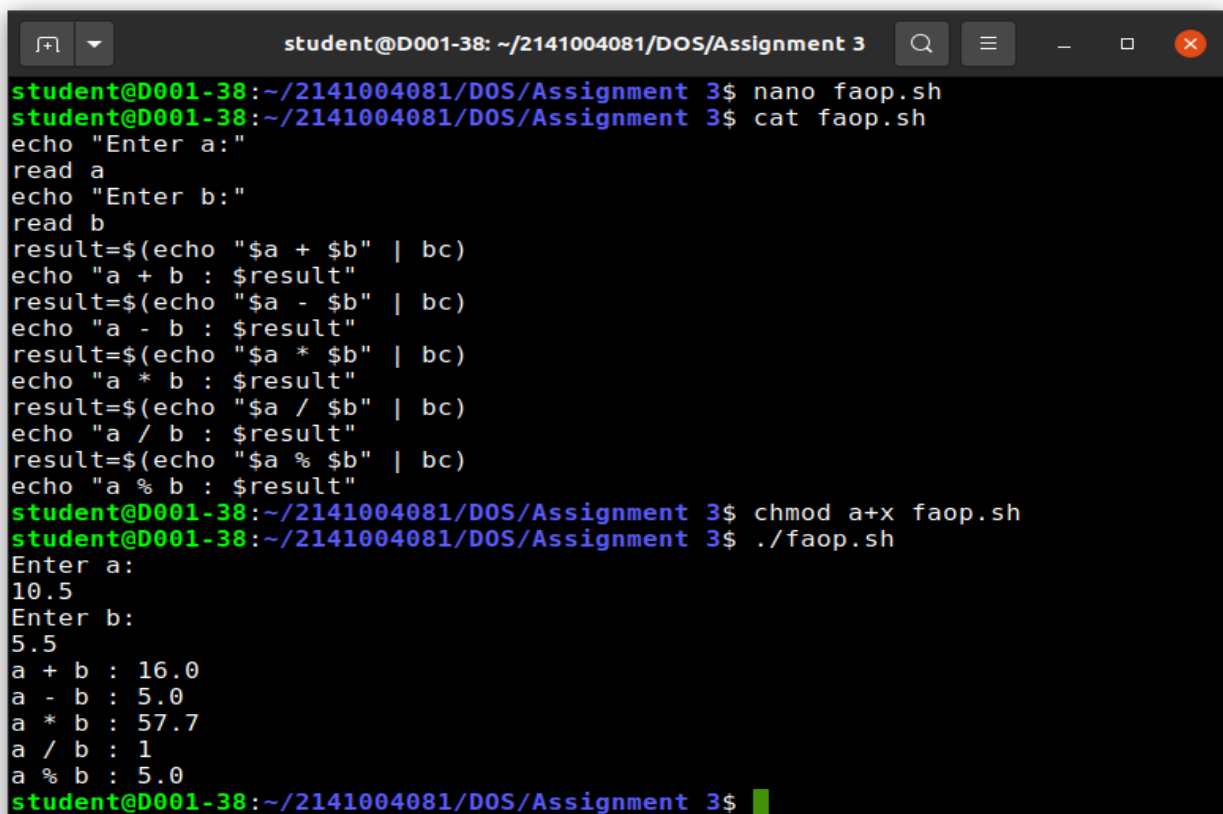
```
student@D001-38: ~/2141004081/DOS/Assignment 3
student@D001-38:~/2141004081/DOS/Assignment 3$ nano iaop.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ cat iaop.sh
echo "Enter a:"
read a
echo "Enter b:"
read b
result=$((a + b))
echo "a + b : $result"
result=$((a - b))
echo "a - b : $result"
result=$((a * b))
echo "a * b : $result"
result=$((a / b))
echo "a / b : $result"
result=$((a % b))
echo "a % b : $result"
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x iaop.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ ./iaop.sh
Enter a:
16
Enter b:
8
a + b : 24
a - b : 8
a * b : 128
a / b : 2
a % b : 0
student@D001-38:~/2141004081/DOS/Assignment 3$
```

**Q2. Write a shell script faop to perform floating point arithmetic on two numbers, where the value of the two numbers will be given during runtime.**

**Command:**

```
echo "Enter a:"
read a
echo "Enter b:"
read b
result=$(echo "$a + $b" | bc)
echo "a + b : $result"
result=$(echo "$a - $b" | bc)
echo "a - b : $result"
result=$(echo "$a * $b" | bc)
echo "a * b : $result"
result=$(echo "$a / $b" | bc)
echo "a / b : $result"
result=$(echo "$a % $b" | bc)
echo "a % b : $result"
```

**Output:**

A terminal window titled 'student@D001-38: ~/2141004081/DOS/Assignment 3' displays the creation and execution of a shell script named 'faop.sh'. The script performs floating-point arithmetic using 'bc'. The user enters '10.5' for 'a' and '5.5' for 'b'. The script outputs the results of addition, subtraction, multiplication, division, and modulus operations.

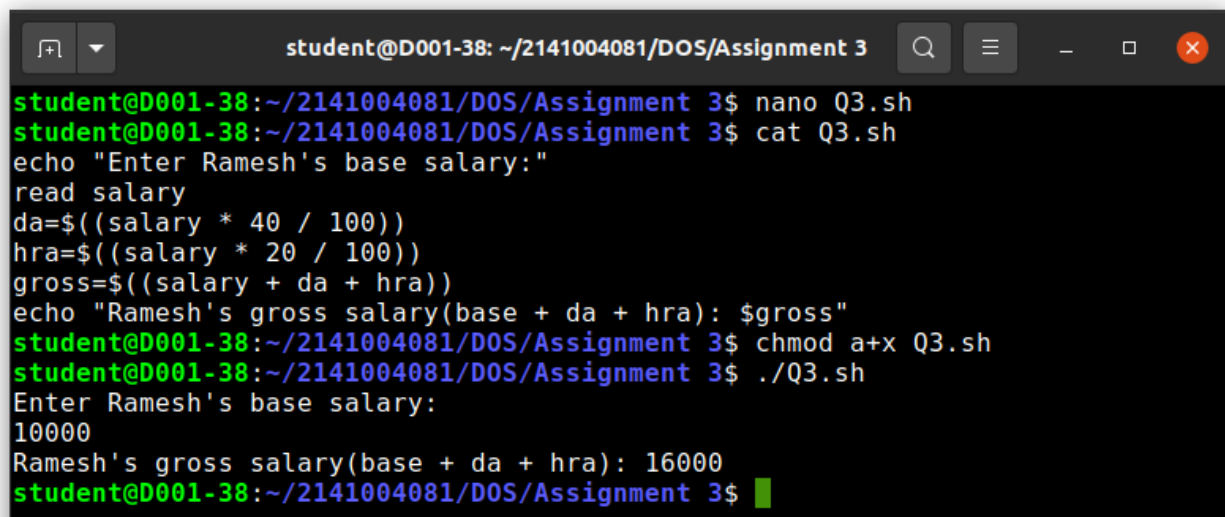
```
student@D001-38: ~/2141004081/DOS/Assignment 3$ nano faop.sh
student@D001-38: ~/2141004081/DOS/Assignment 3$ cat faop.sh
echo "Enter a:"
read a
echo "Enter b:"
read b
result=$(echo "$a + $b" | bc)
echo "a + b : $result"
result=$(echo "$a - $b" | bc)
echo "a - b : $result"
result=$(echo "$a * $b" | bc)
echo "a * b : $result"
result=$(echo "$a / $b" | bc)
echo "a / b : $result"
result=$(echo "$a % $b" | bc)
echo "a % b : $result"
student@D001-38: ~/2141004081/DOS/Assignment 3$ chmod a+x faop.sh
student@D001-38: ~/2141004081/DOS/Assignment 3$ ./faop.sh
Enter a:
10.5
Enter b:
5.5
a + b : 16.0
a - b : 5.0
a * b : 57.7
a / b : 1
a % b : 5.0
student@D001-38: ~/2141004081/DOS/Assignment 3$
```

**Q3. Ramesh's basic salary is input through the keyboard. His dearness allowance is 40% of basic salary, and house rent allowance is 20% of basic salary. Write a program to calculate his gross salary.**

**Command:**

```
echo "Enter Ramesh's base salary:"
read salary
da=$((salary * 40 / 100))
hra=$((salary * 20 / 100))
gross=$((salary + da + hra))
echo "Ramesh's gross salary(base + da + hra): $gross"
```

**Output:**

A terminal window titled 'student@D001-38: ~/2141004081/DOS/Assignment 3' displays the execution of a shell script. The user runs 'nano Q3.sh' to create the script, 'cat Q3.sh' to view it, 'chmod a+x Q3.sh' to make it executable, and './Q3.sh' to run it. The script prompts for 'Enter Ramesh's base salary:' and the user enters '10000'. The script then outputs 'Ramesh's gross salary(base + da + hra): 16000'.

```
student@D001-38: ~/2141004081/DOS/Assignment 3
student@D001-38:~/2141004081/DOS/Assignment 3$ nano Q3.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ cat Q3.sh
echo "Enter Ramesh's base salary:"
read salary
da=$((salary * 40 / 100))
hra=$((salary * 20 / 100))
gross=$((salary + da + hra))
echo "Ramesh's gross salary(base + da + hra): $gross"
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x Q3.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ ./Q3.sh
Enter Ramesh's base salary:
10000
Ramesh's gross salary(base + da + hra): 16000
student@D001-38:~/2141004081/DOS/Assignment 3$
```

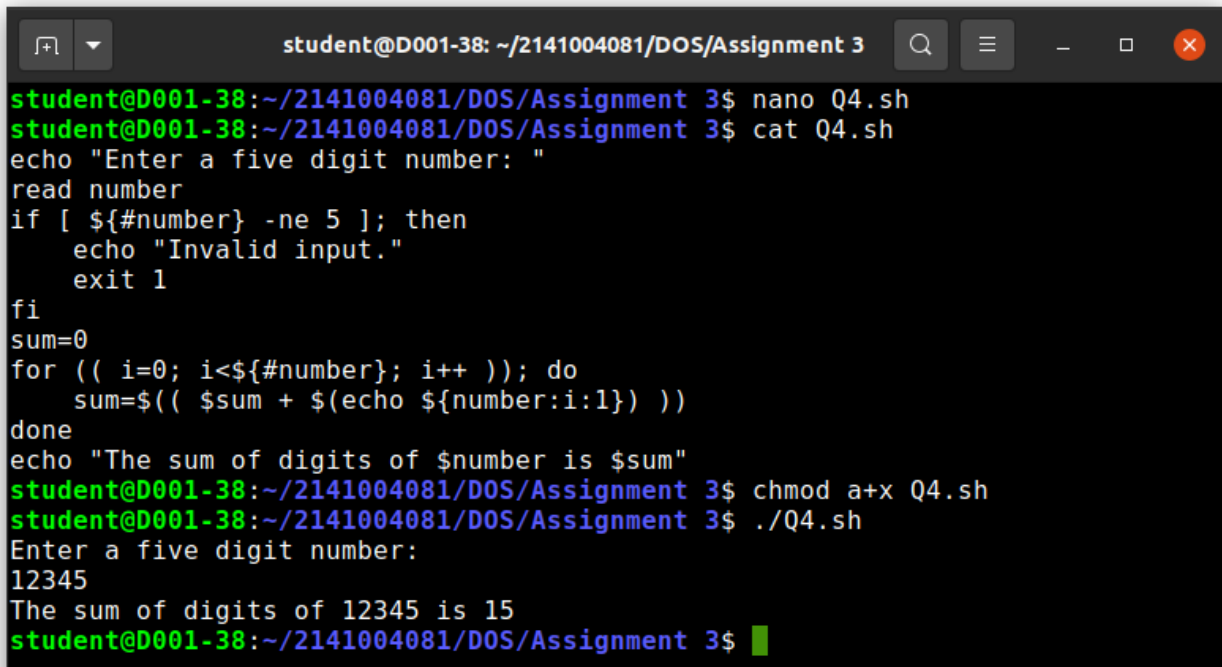
**Q4. . If a five digit number is input given through the keyboard during runtime, write a program to calculate the sum of its digits.**

**Command:**

```
echo "Enter a five digit number: "
read number
if [ ${#number} -ne 5 ]; then
    echo "Invalid input."
    exit 1
fi
sum=0
for (( i=0; i<${#number}; i++ )); do
```

```
sum=$(( $sum + $(echo ${number:i:1}) ))
done
echo "The sum of digits of $number is $sum"
```

**Output:**



```
student@D001-38: ~/2141004081/DOS/Assignment 3
student@D001-38:~/2141004081/DOS/Assignment 3$ nano Q4.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ cat Q4.sh
echo "Enter a five digit number: "
read number
if [ ${#number} -ne 5 ]; then
    echo "Invalid input."
    exit 1
fi
sum=0
for (( i=0; i<${#number}; i++ )); do
    sum=$(( $sum + $(echo ${number:i:1}) ))
done
echo "The sum of digits of $number is $sum"
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x Q4.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ ./Q4.sh
Enter a five digit number:
12345
The sum of digits of 12345 is 15
student@D001-38:~/2141004081/DOS/Assignment 3$
```

**Q5. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Also determine how much profit was made or loss incurred.**

**Command:**

```
echo "Enter the cost price: "
read cost_price
echo "Enter the selling price: "
read selling_price
profit_loss=$(( $selling_price - $cost_price ))
if [ $profit_loss -gt 0 ]; then
    echo "The seller has made a profit of
$profit_loss."
else
    echo "The seller has incurred a loss of
$profit_loss."
fi
```

## Output:

```
student@D001-38: ~/2141004081/DOS/Assignment 3
student@D001-38:~/2141004081/DOS/Assignment 3$ nano Q5.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ cat Q5.sh
echo "Enter the cost price: "
read cost_price
echo "Enter the selling price: "
read selling_price
profit_loss=$(( $selling_price - $cost_price ))
if [ $profit_loss -gt 0 ]; then
    echo "The seller has made a profit of $profit_loss."
else
    echo "The seller has incurred a loss of $profit_loss."
fi
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x Q5.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ ./Q5.sh
Enter the cost price:
50
Enter the selling price:
59
The seller has made a profit of 9.
student@D001-38:~/2141004081/DOS/Assignment 3$ ./Q5.sh
Enter the cost price:
99
Enter the selling price:
49
The seller has incurred a loss of -50.
student@D001-38:~/2141004081/DOS/Assignment 3$
```

**Q6. Write a shell script which receives any year from the keyboard and determines, whether the year is a leap year or not. If no argument is supplied the current year should be assumed.**

**Command:**

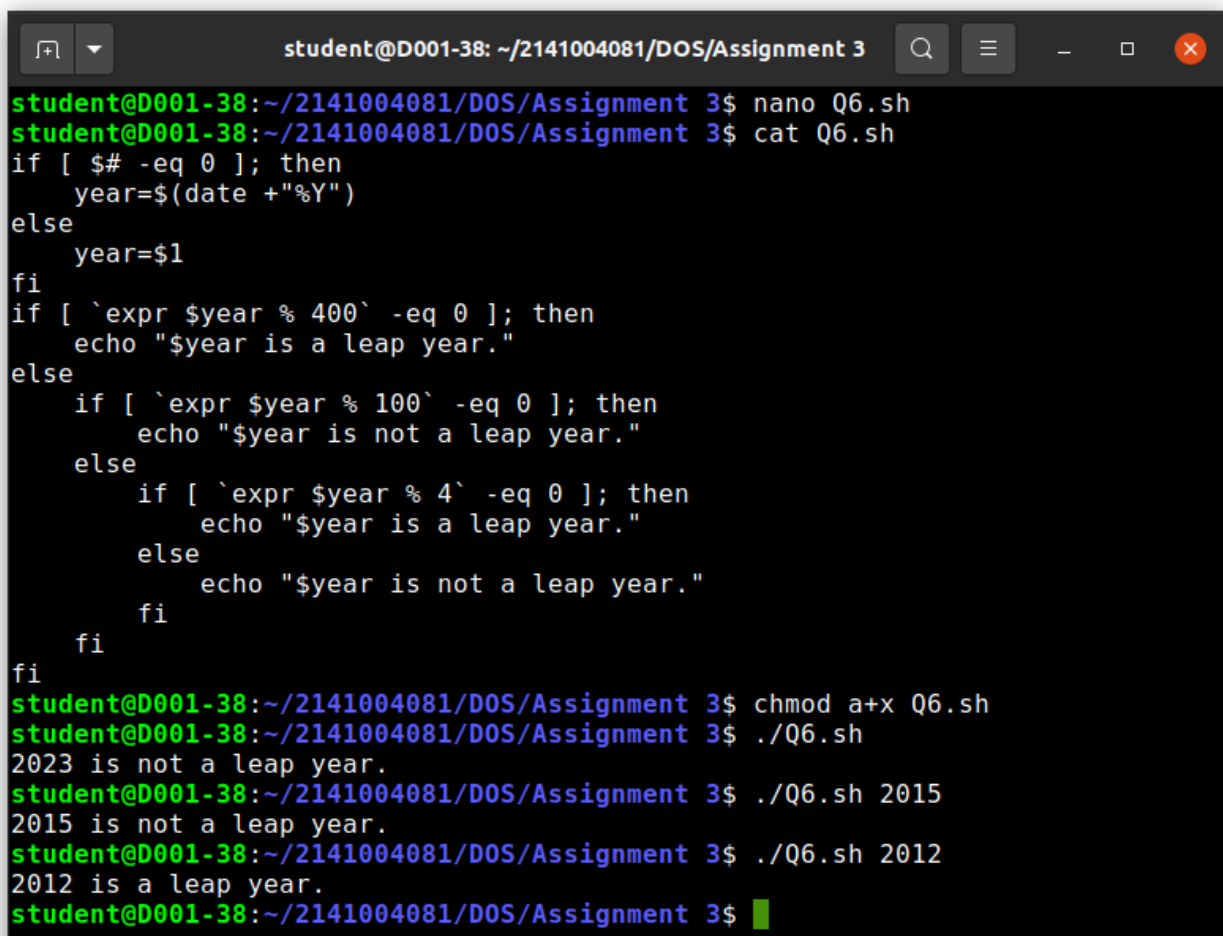
```
if [ $# -eq 0 ]; then
    year=$(date +%Y)
else
    year=$1
fi
if [ `expr $year % 400` -eq 0 ]; then
    echo "$year is a leap year."
else
    if [ `expr $year % 100` -eq 0 ]; then
        echo "$year is not a leap year."
    else
        if [ `expr $year % 4` -eq 0 ]; then
```

```

        echo "$year is a leap year."
    else
        echo "$year is not a leap year."
    fi
fi
fi
fi

```

**Output:**



```

student@D001-38: ~/2141004081/DOS/Assignment 3
student@D001-38:~/2141004081/DOS/Assignment 3$ nano Q6.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ cat Q6.sh
if [ $# -eq 0 ]; then
    year=$(date +%Y)
else
    year=$1
fi
if [ `expr $year % 400` -eq 0 ]; then
    echo "$year is a leap year."
else
    if [ `expr $year % 100` -eq 0 ]; then
        echo "$year is not a leap year."
    else
        if [ `expr $year % 4` -eq 0 ]; then
            echo "$year is a leap year."
        else
            echo "$year is not a leap year."
        fi
    fi
fi
fi
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x Q6.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ ./Q6.sh
2023 is not a leap year.
student@D001-38:~/2141004081/DOS/Assignment 3$ ./Q6.sh 2015
2015 is not a leap year.
student@D001-38:~/2141004081/DOS/Assignment 3$ ./Q6.sh 2012
2012 is a leap year.
student@D001-38:~/2141004081/DOS/Assignment 3$ █

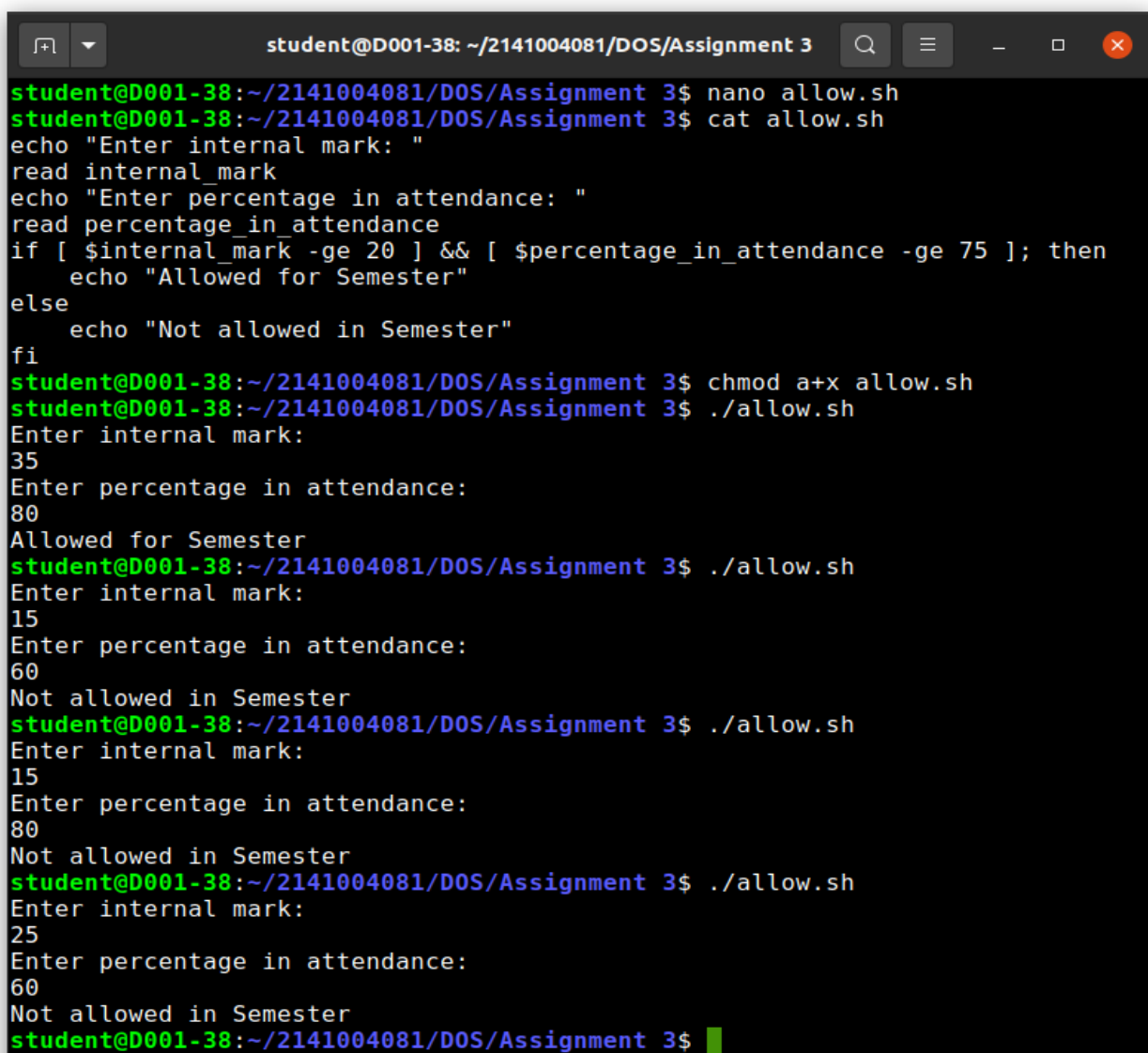
```

**Q7. Write a shell script allow that will display a message to enter internal mark and percentage in attendance, if the entered mark is greater than equal to 20 and entered percentage in attendance is greater that equal to 75 then display the message Allowed for Semester otherwise display the message Not allowed.**

### Command:

```
echo "Enter internal mark: "  
read internal_mark  
echo "Enter percentage in attendance: "  
read percentage_in_attendance  
if [ $internal_mark -ge 20 ] && [   
$percentage_in_attendance -ge 75 ]; then  
    echo "Allowed for Semester"  
else  
    echo "Not allowed in Semester"  
fi
```

### Output:



```
student@D001-38: ~/2141004081/DOS/Assignment 3  
student@D001-38:~/2141004081/DOS/Assignment 3$ nano allow.sh  
student@D001-38:~/2141004081/DOS/Assignment 3$ cat allow.sh  
echo "Enter internal mark: "  
read internal_mark  
echo "Enter percentage in attendance: "  
read percentage_in_attendance  
if [ $internal_mark -ge 20 ] && [ $percentage_in_attendance -ge 75 ]; then  
    echo "Allowed for Semester"  
else  
    echo "Not allowed in Semester"  
fi  
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x allow.sh  
student@D001-38:~/2141004081/DOS/Assignment 3$ ./allow.sh  
Enter internal mark:  
35  
Enter percentage in attendance:  
80  
Allowed for Semester  
student@D001-38:~/2141004081/DOS/Assignment 3$ ./allow.sh  
Enter internal mark:  
15  
Enter percentage in attendance:  
60  
Not allowed in Semester  
student@D001-38:~/2141004081/DOS/Assignment 3$ ./allow.sh  
Enter internal mark:  
15  
Enter percentage in attendance:  
80  
Not allowed in Semester  
student@D001-38:~/2141004081/DOS/Assignment 3$ ./allow.sh  
Enter internal mark:  
25  
Enter percentage in attendance:  
60  
Not allowed in Semester  
student@D001-38:~/2141004081/DOS/Assignment 3$ █
```

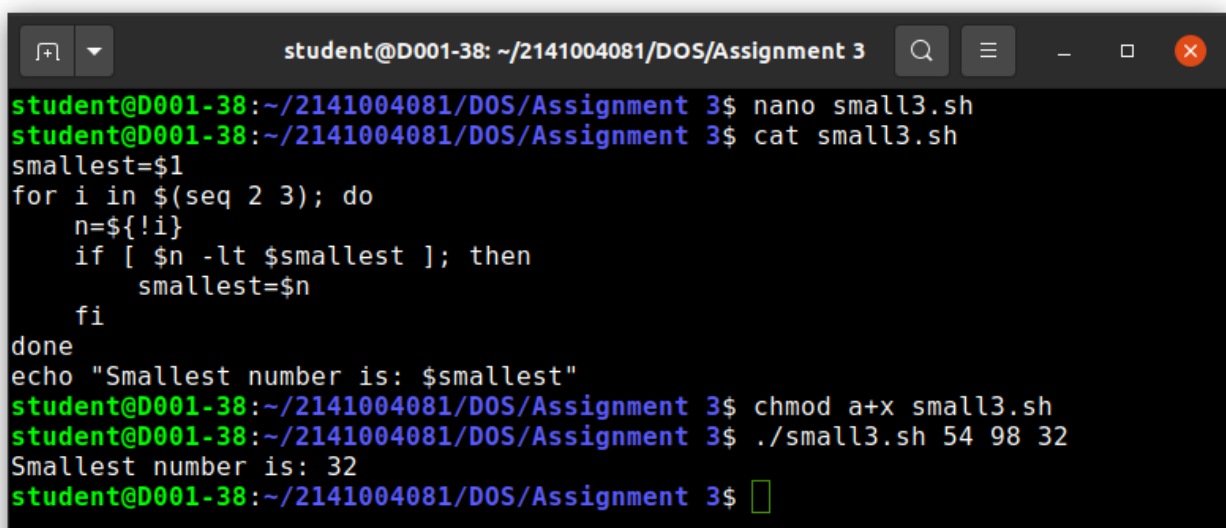


**Q8. Write a shell script small3 that will compare three numbers passed as command line arguments and display the smallest one.**

**Command:**

```
smallest=$1
for i in $(seq 2 3); do
    n=${!i}
    if [ $n -lt $smallest ]; then
        smallest=$n
    fi
done
echo "Smallest number is: $smallest"
```

**Output:**

A terminal window titled 'student@D001-38: ~/2141004081/DOS/Assignment 3' shows the following commands and output:

```
student@D001-38:~/2141004081/DOS/Assignment 3$ nano small3.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ cat small3.sh
smallest=$1
for i in $(seq 2 3); do
    n=${!i}
    if [ $n -lt $smallest ]; then
        smallest=$n
    fi
done
echo "Smallest number is: $smallest"
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x small3.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ ./small3.sh 54 98 32
Smallest number is: 32
student@D001-38:~/2141004081/DOS/Assignment 3$
```

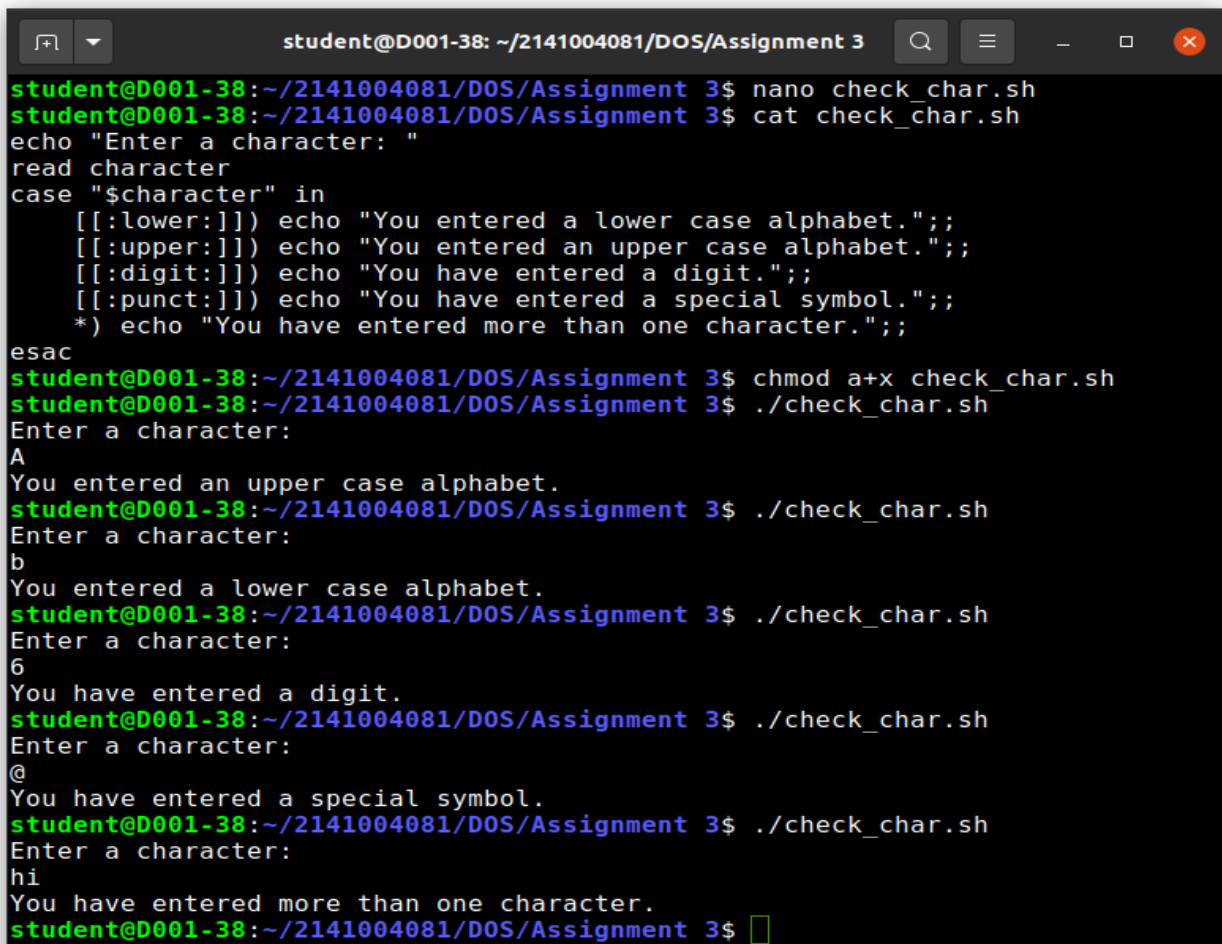
**Q9. Write a shell script check\_char which will display one message to enter a character and according to the character entered it will display appropriate message from the following options:**

- You entered a lower case alphabet
- You entered an upper case alphabet.
- You have entered a digit.
- You have entered a special symbol.
- You have entered more than one character.

## Command:

```
echo "Enter a character: "
read character
case "$character" in
    [[:lower:]] ) echo "You entered a lower case
alphabet.";;
    [[:upper:]] ) echo "You entered an upper case
alphabet.";;
    [[:digit:]] ) echo "You have entered a digit.";;
    [[:punct:]] ) echo "You have entered a special
symbol.";;
    *) echo "You have entered more than one
character.";;
esac
```

## Output:

A terminal window titled 'student@D001-38: ~/2141004081/DOS/Assignment 3' displays the following commands and output:

```
student@D001-38:~/2141004081/DOS/Assignment 3$ nano check_char.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ cat check_char.sh
echo "Enter a character: "
read character
case "$character" in
    [[:lower:]] ) echo "You entered a lower case alphabet.";;
    [[:upper:]] ) echo "You entered an upper case alphabet.";;
    [[:digit:]] ) echo "You have entered a digit.";;
    [[:punct:]] ) echo "You have entered a special symbol.";;
    *) echo "You have entered more than one character.";;
esac
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x check_char.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ ./check_char.sh
Enter a character:
A
You entered an upper case alphabet.
student@D001-38:~/2141004081/DOS/Assignment 3$ ./check_char.sh
Enter a character:
b
You entered a lower case alphabet.
student@D001-38:~/2141004081/DOS/Assignment 3$ ./check_char.sh
Enter a character:
6
You have entered a digit.
student@D001-38:~/2141004081/DOS/Assignment 3$ ./check_char.sh
Enter a character:
@
You have entered a special symbol.
student@D001-38:~/2141004081/DOS/Assignment 3$ ./check_char.sh
Enter a character:
hi
You have entered more than one character.
student@D001-38:~/2141004081/DOS/Assignment 3$
```

**Q10. Write a shell script class\_time which will display one message to enter a day and according to the day entered it will display the DOS class time along with the room information or the message "No class on day\_name" or "Holiday" for Sunday..**

**Command:**

```
echo "Enter a day: "  
read day  
case "$day" in  
    "Monday") echo "DOS class time on Monday is 10:00  
AM to 11:00 AM in room C019";;  
    "Tuesday") echo "DOS class time on Tuesday is 12:00  
PM to 1:00 PM in room C019.";;  
    "Wednesday") echo "DOS class time on Wednesday is  
2:00 PM to 3:00 PM in room C019.";;  
    "Thursday") echo "DOS class time on Thursday is  
3:00 PM to 4:00 PM in room C019.";;  
    "Friday") echo "DOS class time on Friday is 4:00  
PM to 5:00 PM in room C019.";;  
    "Saturday") echo "No class on Saturday.";;  
    "Sunday") echo "Holiday on Sunday.";;  
    *) echo "Invalid day.";;  
Esac
```

**Output:**

```
student@D001-38: ~/2141004081/DOS/Assignment 3
student@D001-38:~/2141004081/DOS/Assignment 3$ nano class_time.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ cat class_time.sh
echo "Enter a day: "
read day

case "$day" in
    "Monday") echo "DOS class time on Monday is 10:00 AM to 11:00 AM in room C019.>";;
    "Tuesday") echo "DOS class time on Tuesday is 12:00 PM to 1:00 PM in room C019.>";;
    "Wednesday") echo "DOS class time on Wednesday is 2:00 PM to 3:00 PM in room C019.>";;
    "Thursday") echo "DOS class time on Thursday is 3:00 PM to 4:00 PM in room C019.>";;
    "Friday") echo "DOS class time on Friday is 4:00 PM to 5:00 PM in room C019.>";;
    "Saturday") echo "No class on Saturday.>";;
    "Sunday") echo "Holiday on Sunday.>";;
    *) echo "Invalid day.>";;
esac
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x class_time.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ ./class_time.sh
Enter a day:
Thursday
DOS class time on Thursday is 3:00 PM to 4:00 PM in room C019.
student@D001-38:~/2141004081/DOS/Assignment 3$
```

**Q11. Write a shell script filechk that will take two file names as command line arguments, and check whether the content of two files are same or not. If contents of two files are same, then it will display the message: Files filename1 and filename2 have same content.**

- then delete the second file
- and display the message: So filename2 is deleted.

**Otherwise display the message: Files filename1 and filename2 have different content.**

**Command:**

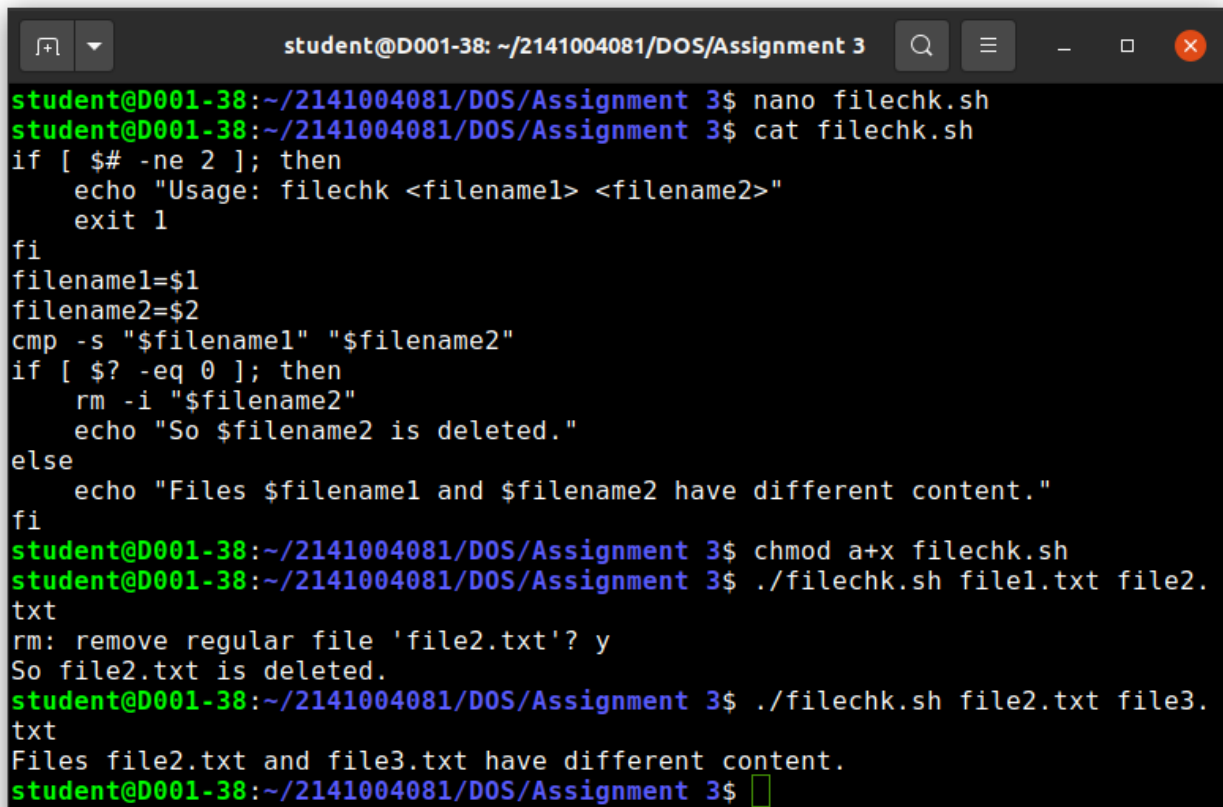
```
if [ $# -ne 2 ]; then
    echo "Usage: filechk <filename1> <filename2>"
    exit 1
fi
filename1=$1
filename2=$2
cmp -s "$filename1" "$filename2"
if [ $? -eq 0 ]; then
    rm -i "$filename2"
```

```

        echo "So $filename2 is deleted."
    else
        echo "Files $filename1 and $filename2 have
different content."
    Fi

```

**Output:**



```

student@D001-38: ~/2141004081/DOS/Assignment 3
student@D001-38:~/2141004081/DOS/Assignment 3$ nano filechk.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ cat filechk.sh
if [ $# -ne 2 ]; then
    echo "Usage: filechk <filename1> <filename2>"
    exit 1
fi
filename1=$1
filename2=$2
cmp -s "$filename1" "$filename2"
if [ $? -eq 0 ]; then
    rm -i "$filename2"
    echo "So $filename2 is deleted."
else
    echo "Files $filename1 and $filename2 have different content."
fi
student@D001-38:~/2141004081/DOS/Assignment 3$ chmod a+x filechk.sh
student@D001-38:~/2141004081/DOS/Assignment 3$ ./filechk.sh file1.txt file2.
txt
rm: remove regular file 'file2.txt'? y
So file2.txt is deleted.
student@D001-38:~/2141004081/DOS/Assignment 3$ ./filechk.sh file2.txt file3.
txt
Files file2.txt and file3.txt have different content.
student@D001-38:~/2141004081/DOS/Assignment 3$ 

```

**Q12.** Write a shell script calculator that will take three command line arguments, where the first argument will specify the first operand, second argument will specify the operator and the third argument will specify the second operand and display the output of the arithmetic operation specified in the following format: op1 operator op2 = result. If the arguments will be passed in any other sequence, it will display the message: "Invalid input "

Enter input in following format: op1 operator op2

The symbols to be used for different operators are as follows:

Addition:	+	Subtraction:	-
Multiplication:	x	Division:	/
Modulo:	%	Exponent:	^

**Command:**

```
if [ $# -ne 3 ]; then
    echo "Usage:  calculator  <operand1>  <operator>
<operand2>"
    exit 1
fi
operand1=$1
operator=$2
operand2=$3
case "$operator" in
    "+")
        result=$(echo "$operand1 + $operand2" | bc)
        ;;
    "-")
        result=$(echo "$operand1 - $operand2" | bc)
        ;;
    "x")
        result=$(echo "$operand1 * $operand2" | bc)
        ;;
    "/")
        result=$(echo "$operand1 / $operand2" | bc)
        ;;
    "%")
        result=$(echo "$operand1 % $operand2" | bc)
        ;;
    "^")
        result=$(echo "$operand1 ^ $operand2" | bc)
        ;;
    *)
        echo "Invalid operator."
        exit 1
        ;;
esac
echo "$operand1 $operator $operand2 = $result"
```

## Output:

```
student@D001-38: ~/2141004081/DOS/Assignment 3
if [ $# -ne 3 ]; then
    echo "Usage: calculator <operand1> <operator> <operand2>"
    exit 1
fi
operand1=$1
operator=$2
operand2=$3
case "$operator" in
    "+")
        result=$(echo "$operand1 + $operand2" | bc)
        ;;
    "-")
        result=$(echo "$operand1 - $operand2" | bc)
        ;;
    "x")
        result=$(echo "$operand1 * $operand2" | bc)
        ;;
    "/")
        result=$(echo "$operand1 / $operand2" | bc)
        ;;
    "%")
        result=$(echo "$operand1 % $operand2" | bc)
        ;;
    "^")
        result=$(echo "$operand1 ^ $operand2" | bc)
        ;;
    *)
        echo "Invalid operator."
        exit 1
        ;;
esac
echo "$operand1 $operator $operand2 = $result"
student@D001-38:~/2141004081/DOS/Assignment 3$ ./calculator.sh 1 + 2
1 + 2 = 3
student@D001-38:~/2141004081/DOS/Assignment 3$ ./calculator.sh 5 - 8
5 - 8 = -3
student@D001-38:~/2141004081/DOS/Assignment 3$ ./calculator.sh 2 x 7
2 x 7 = 14
student@D001-38:~/2141004081/DOS/Assignment 3$ ./calculator.sh 20 / 4
20 / 4 = 5
student@D001-38:~/2141004081/DOS/Assignment 3$ ./calculator.sh 69 % 2
69 % 2 = 1
student@D001-38:~/2141004081/DOS/Assignment 3$ ./calculator.sh 25 ^ 30
25 ^ 30 = 867361737988403547205962240695953369140625
student@D001-38:~/2141004081/DOS/Assignment 3$
```