

??

let

```
#!/usr/bin/env bash

let NUMBER1=10
let NUMBER2=3

# Addition => + operator
let ADD=$NUMBER1+$NUMBER2
echo "Addition of two numbers : ${ADD}"

# Subtraction => - operator
let SUB=$NUMBER1-$NUMBER2
echo "Subtraction of two numbers : ${SUB}"

# Multiply => * operator
let MUL=$NUMBER1*$NUMBER2
echo "Multiply two numbers : ${MUL}"

# Divide => / operator
let DIV=$NUMBER1/$NUMBER2
echo "Division of two numbers : ${DIV}"

# Remainder => % operator
let REM=$NUMBER1%$NUMBER2
echo "Remainder of two numbers : ${REM}"

# Exponent => ** operator
let EXPO=$NUMBER1**$NUMBER2
echo "Exponent of two numbers : ${EXPO}"

# post increment and post decrement operations
let variable++
let variable--
```

Double Brackets

???????????

```
((NUMBER2++))  
((NUMBER1--))  
  
(( NUMBER2 = NUMBER2 + 10 ))  
(( NUMBER2 += 10 )) # Shorthand
```

expr

???????

```
expr 10 + 3 # Addition  
expr 10 - 3 # Subtraction  
expr 10 * 3 # Multiply  
expr 10 / 3 # Divide  
expr 10 % 3 # Remainder
```

bc

```
# Add  
$ echo "10 + 100" | bc  
=> 110  
  
$ echo "10.15 + 11.20" | bc  
21.35  
  
# Subtract  
$ echo "100 - 25" | bc  
=> 75  
  
$ echo "100 - 25.5" | bc  
=> 74.5  
  
# Multiply  
$ echo "10 * 5" | bc  
=> 50
```

```
$ echo "10.10 * 4" | bc
=> 40.40

# without scale
echo "10.10 / 4" | bc
=> 2

# with scale
echo "scale=2;10.10 / 4" | bc
=> 2.52

$ echo "2.2^4" | bc
=> 23.4
```

awk

```
$ awk "BEGIN {print 23 * 4.5 }"
=> 103.5

$ awk "BEGIN{print int(10.111) }"
=> 10

$ awk "BEGIN{print sqrt(10) }"
=> 3.16228

# Since this is a CSV file, I am setting the field separator to(-F ",").
# Here the entire second column is first added and divided by the NR(number of records).
$ awk -F "," '{sum+=$2} END { print "average value from column 2 = ",sum/NR}' data.csv
```

Rounding ???

???????	$X / Y \text{ (} 3 / 2 \text{)} = 1.5$
????? (floor rounding)	$X / Y , \text{ (} 3 / 2 \text{)} = 1$
????? (ceiling rounding)	$(X + Y - 1) / Y , \text{ (} 3 + 2 - 1 \text{)} / 2 = 2$
???? (half-up rounding)	$(X + Y / 2) / Y , \text{ (} 3 + 2 / 2 \text{)} / 2 = 2$

```
# [] float [] integer
## Way #1
float_num = 12.63333
```

```
round_num = $(printf "%.0f" $float_num)
```

```
# round_num is 12
```

```
## Way #2
```

```
float_num = 12.63333
```

```
round_num = ${float_num%.*}
```

```
# round_num is 12
```

```
# 3/2 (3/2)
```

```
X=3
```

```
Y=2
```

```
echo $(( X / Y ))
```

```
# Output 1
```

```
# 3/2 (3/2)
```

```
echo $(( (X + Y / 2) / Y ))
```

```
# Output 2
```

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