## Contents

# What is Sell Script in linux.

A shell script is a set of commands written in a file.
These commands are read and executed by the Bash shell.
The program executes the commands line by line.
By storing commands in a shell script, it becomes easy to execute them again and again.

## Why do we use shell script

Shell scripting is used to automate repetitive tasks in Linux.
It helps in tasks such as creating backups, monitoring system resources, managing user accounts, and running multiple commands automatically.
Shell scripting saves time, reduces manual effort, and makes system administration easy.

## What is a Variable?

A variable is a named memory location used to store data in a shell script.
The value of a variable can change during program execution.

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Variables are used to store numbers, strings, or command output so that they can be used again and again in a script.

### Types of Variables in Shell Script

There are three types of variables in shell scripting:

## 1 User Defined Variable

User defined variables are variables created by the user to store values.

**Example:**

```
name=Akhilesh
age=20
echo $name
echo $age
```

**Explanation:**
Here name and age are user defined variables.

## 2 System Defined Variable

System defined variables are created and maintained by the Linux system.
They store system related information.

**Examples:**

- HOME
- PATH
- USER
- SHELL

**Example:**

echo $USER

echo $HOME

## 3 Built-in Variable

Built-in variables are special variables provided by the shell.
They give information about script execution.

**Examples:**

- $0 → Script name
- $1 → First argument
- $# → Number of arguments
- $? → Exit status

**Example:**

echo $0

echo $#

## Naming Convention in Shell Script

Naming convention means rules for naming variables in shell scripting.

### Rules for Variable Naming

1 Variable name must start with a letter (a–z / A–Z) or underscore _

| ✓ Correct: | ❌ Wrong: |
|---|---|
| name | 1name |
| _total | -total |
| userName | |

2 Variable name can contain letters, numbers, and underscore only

| ✓ Correct: | ❌ Wrong: |
|---|---|
| user1 | user-name |
| file_name | file@name |
| totalMarks | |

3 No spaces are allowed in variable names

| ✓ Correct: | ❌ Wrong: |
|---|---|
| myvar=10 | my var=10 |

4 Variable names are case-sensitive

Example:

```
name=Akhilesh
NAME=Pal
(name and NAME are different)
```

5 Do not use special characters

❌ Wrong:

name$

total#

6 Variable assignment must be without spaces

✓ Correct:

age=20

❌ Wrong:

age = 20

## What is an Array?

An array is a variable that is used to store multiple values in a single variable name.
Each value in an array is stored at a specific index or key.

**Example:**

```
fruits=(apple banana mango)
echo ${fruits[1]}
```

**Output:**

banana

## Types of Array in Linux (Shell Script)

There are two types of arrays in Linux shell scripting:

## 1Indexed Array

An indexed array stores values using numeric index numbers (0, 1, 2, ...).

**Syntax:--** array_name=(value1 value2 value3)

Example:- 1

```
numbers=(10 20 30 40)
echo ${numbers[2]}
```

**Output:**

30

**Explanation:**

Each element is accessed by its **index number**.

index numbers (0, 1, 2, ...).

## Next Program:-- Indexed Array Example – 2

```
#!/bin/bash
#== Creating indexed array===
subjects=(Math English Science Computer)

echo "First subject  : ${subjects[0]}"
echo "Second subject : ${subjects[1]}"
echo "Third subject  : ${subjects[2]}"
echo "Fourth subject : ${subjects[3]}"

echo "All subjects   : ${subjects[@]}"
echo "Total subjects : ${#subjects[@]}"
```

```
First subject  : Math
Second subject : English
Third subject  : Science
Fourth subject : Computer
All subjects   : Math English Science Computer
Total subjects : 4
```

**Explanation (Easy):**

- ❖ subjects → array name
- ❖ [0] [1] [2] [3] → index numbers
- ❖ Index starts from **0**
- ❖ ${#subjects[@]} → number of elements

## Next Program :- Indexed Array Example – 3

```
#!/bin/bash
# Creating indexed array
marks=(65 72 80 90 88)
echo "Marks of students:"

echo "Student 1 : ${marks[0]}"
echo "Student 2 : ${marks[1]}"
echo "Student 3 : ${marks[2]}"
echo "Student 4 : ${marks[3]}"
echo "Student 5 : ${marks[4]}"

echo "All Marks  : ${marks[@]}"
echo "Total Students : ${#marks[@]}"
```

**OUTPUT :-**

```
Marks of students:
Student 1 : 65
Student 2 : 72
Student 3 : 80
Student 4 : 90
Student 5 : 88
All Marks  : 65 72 80 90 88
```

**Explanation (Simple):**

- marks → indexed array
- Index starts from **0**
- ${marks[i]} → access element
- ${marks[@]} → all elements
- ${#marks[@]} → array length

# 2 :-- Associative Array

An associative array stores values in the form of key-value pairs instead of numbers.

**Syntax:-** declare -A array_name

Example 1 **:-**

```
declare -A student
student[name]=Akhilesh
student[course]=BCA
echo ${student[course]}
```

**Output:-** BCA

**Explanation:-** Values are accessed using meaningful keys.

## Next Program - Associative Array Example – 2

```
#!/bin/bash
declare -A product
# Store key–value pairs
product[id]=P101
product[name]="Laptop"
product[brand]="Dell"
product[series]="Latitude 5320"
product[price]=28000
product[stock]="Available"

# Display product details
echo "Product ID    : ${product[id]}"
echo "Product Name  : ${product[name]}"
echo "Brand         : ${product[brand]}"
echo "Series        : ${product[series]}"
echo "Price         : ${product[price]}"
echo "Stock Status  : ${product[stock]}"

# Display all keys and values
echo "All Keys   : ${!product[@]}"
echo "All Values : ${product[@]}"
```

**OUTPUT :-**

```
[root@clint shellscript]# sh array.sh
Product ID    : P101
Product Name  : Laptop
Brand         : Dell
Series        : Latitude 5320
Price         : 28000
Stock Status  : Available
All Keys   : price brand id series name stock
All Values : 28000 Dell P101 Latitude 5320 Laptop Available
[root@clint shellscript]#
```

**Explanation (Easy):**

1. declare -A product → associative array declare karta hai
2. id, name, brand, series, price, stock → keys hote hain
3. Values ko keys ke through access kiya jata hai
4. ${product[key]} → particular key ki value show karta hai
5. ${!product[@]} → all keys show karta hai
6. ${product[@]} → all values show

# Difference between Indexed Array and Associative Array

| **Indexed Array** | **Associative Array** |
|---|---|
| Uses numeric index numbers (0, 1, 2, ...) | Uses key–value pairs |
| Index starts from 0 | Uses string keys |
| declare -a required | declare -A required |
| Stores elements in sequence/order | Order of elements is not fixed |
| Suitable for simple lists | Suitable for complex records |
| Uses less memory | Uses more memory |
| Access is faster using index | Access depends on key lookup |
| Easy to learn for beginners | Slightly complex |
| Example: arr[1]=50 | Example: arr[name]="Linux" |
| Bash version independent | Needs Bash 4.0 or above |

## Explanation (Easy in Hindi ):

- Indexed Array → values access hote hain index number se
- Associative Array → values access hote hain keys se
- Indexed array simple data ke liye use hota hai
- Associative array structured data ke liye use hota hai

# Operator in Linux

An operator in Linux is a symbol or keyword used to perform operations such as calculation, comparison, and condition checking in shell scripting.

**Explanation:**

Operators are used to compare values, check conditions, and perform actions in Linux commands and shell scripts.

## Types of Operators in Linux:

1. Arithmetic Operators
2. Relational Operators
3. File operators
4. String Operators
5. Boolean Operators

## 1 Arithmetic Operators (Linux)

Arithmetic operators are used to perform mathematical calculations in Linux shell scripting.
List of Arithmetic Operators

| Operator | Meaning |
|---|---|
| + | Addition |
| - | Subtraction |

| Operator | Meaning |
|---|---|
| * | Multiplication |
| / | Division |
| % | Remainder (Modulus) |

PROGRAM 1 :----

```
#!/bin/bash
a=20
b=10
echo "Addition = $((a+b))"
echo "Subtraction = $((a-b))"
echo "Multiplication = $((a*b))"
echo "Division = $((a/b))"
echo "Remainder = $((a%b))"
```

**OUTPUT:-**

Addition = 30

Subtraction = 10

Multiplication = 200

Division = 2

Remainder = 0

Program 2 :- Arithmetic Operators (By User)

```
#!/bin/bash
read -p "Enter first number:" a
read -p "Enter second number:" b
echo "Addition = $((a+b))"
echo "Subtraction = $((a-b))"
echo "Multiplication = $((a*b))"
echo "Division = $((a/b))"
echo "Remainder = $((a%b))"
```

**OUTPUT:-**

Enter first number:10

Enter second number:3

Addition = 13

Subtraction = 7

Multiplication = 30

Division = 3

Remainder = 1

## 2 Relational Operators (Linux)

Relational operators are used to compare two values and check conditions in shell scripting.

**List of Relational Operators**

| Operator | Meaning |
|---|---|
| -eq | equal to |
| -ne | ssnot equal |
| -gt | greater than |
| -lt | less than |
| -ge | greater than or equal |
| -le | less than or equal |

**Program 1 : Relational Operators (By User)**

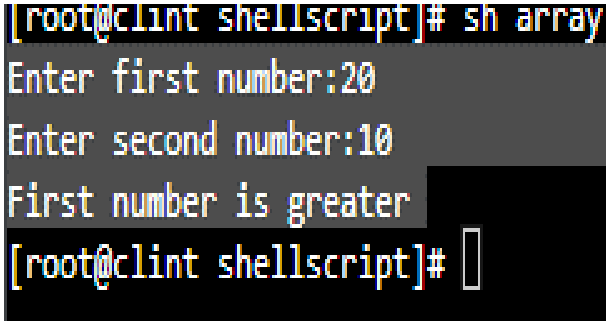
```
#!/bin/bash
read -p "Enter first number:" a
read -p "Enter second number:" b
if [ $a -eq $b ];then
        echo "Both numbers are equal"
fi
if [ $a -gt $b ];then
        echo "First number is greater"
fi
if [ $a -lt $b ]
   then
      echo "First number is smaller"
fi
```

OUTPUT:-

Enter first number:20

Enter second number:10

First number is greater

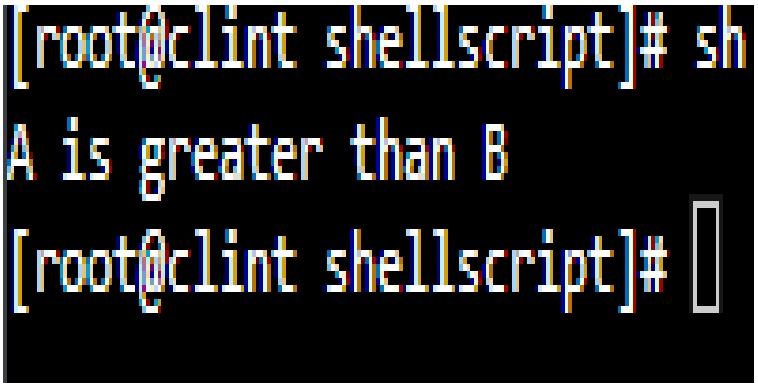


# Program 2 : Relational Operators

```
#!/bin/bash
a=15
b=10
if [ $a -eq $b ]
then
echo "Both values are equal"
fi
if [ $a -gt $b ]
then
echo "A is greater than B"
fi
if [ $a -lt $b ]
then
echo "A is less than B"
fi
```

OUTPUT:-

A is greater than B




**Explanation (Short):**

- a=15 and b=10
- 15 -eq 10 → false
- 15 -gt 10 → true
- 15 -lt 10 → false

# 3 File Test Operators (Linux)

File test operators are used to check file or directory properties in Linux shell scripting.

### List of File Test Operators

| Operator | Meaning |
|---|---|
| -e | File or directory exists |
| -f | Exists and is a regular file |
| -d | Exists and is a directory |
| -s | File exists and is not empty |
| -r | File is readable |
| -w | File is writable |
| -x | File is executable |
| -L | File is a symbolic link |
| -h | File is a symbolic link |
| -b | File is a block special file |
| -c | File is a character special file |
| -p | File is a named pipe (FIFO) |
| -S | File is a socket |
| -O | File is owned by current user |
| -G | File group ID matches current user |

| Operator | Meaning |
|---|---|
| -u | Set-user-ID (SUID) bit is set |
| -g | Set-group-ID (SGID) bit is set |
| -k | Sticky bit is set |
| -nt | File is newer than another file |
| -ot | File is older than another file |
| -ef | Both files refer to same file |

**Program: File Operators**

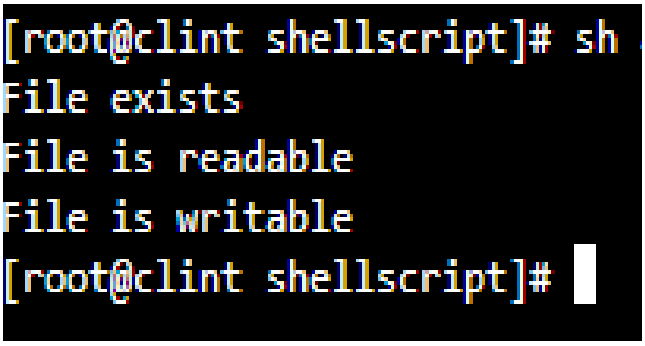
```
#!/bin/bash
file="/etc/passwd"
if [ -f $file ]
then
echo "File exists"
fi

if [ -r $file ]
then
echo "File is readable"
fi

if [ -w $file ]
then
echo "File is writable"
fi
```

**OUTPUT:-**

File exists

File is readable

File is writable




**Explanation**

- -f checks whether file exists
- -r checks read permission
- -w checks write permission
- File path already defined in variable

## 4 String Operators (Linux)

String operators are used to compare strings and check string conditions in Linux shell scripting.

### List of String Operators

| Operator | Meaning |
|---|---|
| = | strings are equal |
| != | strings are not equal |
| -z | string is empty |
| -n | string is not empty |

**Program: String Operators**

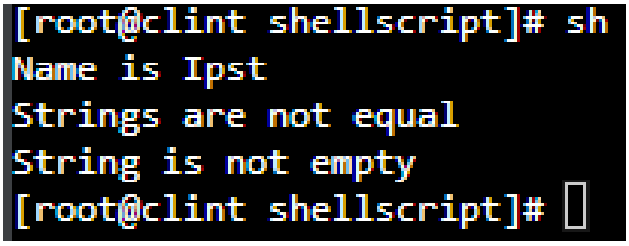
```
#!/bin/bash
name="Ipst"
user="Admin"
if [ $name = "Ipst" ];then
echo "Name is Ipst"
fi
if [ $name != $user ];then
echo "Strings are not equal"
fi
if [ -n $name ];then
echo "String is not empty"
fi
```

**OUTPUT:-**

Name is Ipst

Strings are not equal

String is not empty




**Explanation (short):**

- = compares two strings
- != checks strings are different
- -n checks string is not empty
- Values are already defined

## 5 Boolean Operators (Linux)

Boolean operators are used to combine conditions and return true or false in Linux shell scripting.

### List of Boolean Operators

| Operator | Meaning |
|---|---|
| -a | AND |
| -o | OR |
| ! | NOT |

### Program: Boolean Operators (Value Defined)

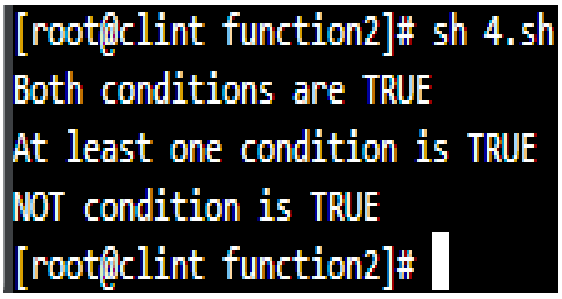
```
#!/bin/bash
x=25
y=15
# AND operator
if [ $x -gt 20 -a $y -gt 10 ];then
echo "Both conditions are TRUE"
fi
# OR operator
if [ $x -lt 20 -o $y -gt 10 ];then
echo "At least one condition is TRUE"
fi
# NOT operator
if [ ! $x -lt 10 ];then
echo "NOT condition is TRUE"
fi
```

**OUTPUT:-**

Both conditions are TRUE

At least one condition is TRUE

NOT condition is TRUE



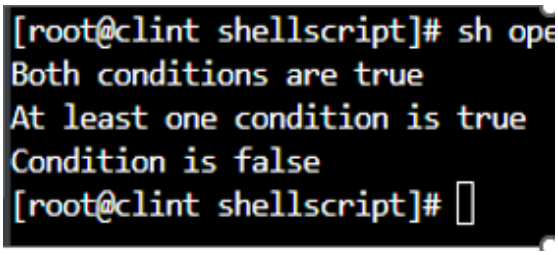
```
#!/bin/bash
a=10
b=5
if [ $a -gt 5 -a $b -lt 10 ];then
echo "Both conditions are true"
fi

if [ $a -lt 5 -o $b -lt 10 ];then
echo "At least one condition is true"
fi

if [ ! $a -lt 5 ];then
echo "Condition is false"
fi
```

## OUTPUT:-

Both conditions are true

At least one condition is true

Condition is false




**Explanation**

- -a (AND) → both conditions must be true
- -o (OR) → any one condition true
- ! (NOT) → reverses the condition

# Function in Shell Script

A function is defined with a name, a set of parameters, and a block of code that performs a particular operation.
A function is a reusable block of code that performs a specific task.
It helps to reuse code, provides better readability, and is easy to maintain.

## 1 No Argument – No Return

This type of function does not take any argument and does not return any value.
It is used only to display output or perform a fixed task.

**Example:**

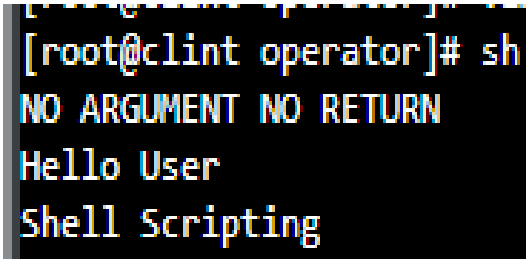
```
#!/bin/bash
echo "NO ARGUMENT NO RETURN "
function fun1() {
   echo "Hello User"
   echo "Shell Scripting"
}
fun1
```

**OUTPUT:-**

NO ARGUMENT NO RETURN

Hello User

Shell Scripting




## 2 With Argument – No Return

This type of function takes arguments but does not return any value.
It uses the arguments to perform an operation and show the result.

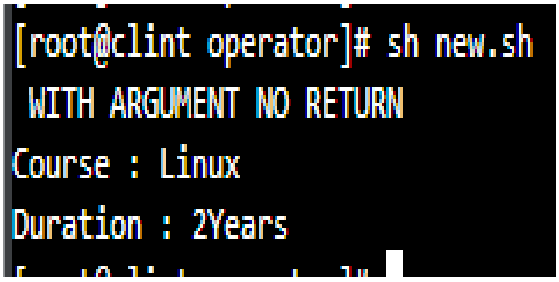
```
#!/bin/bash

echo " WITH ARGUMENT NO RETURN "


function fun2() {
   echo "Course : $1"
   echo "Duration : $2"
}


fun2 Linux 2Years
```

**OUTPUT:-**

WITH ARGUMENT NO RETURN

Course : Linux

Duration : 2Years




## 3 No Argument – With Return

This type of function does not take any argument but returns a value after calculation.

**Example:**

```
#!/bin/bash

fun3() {
   num=4
   multi=$(($num * $num))
   return $multi
}

fun3

echo " Multi..value is : " $?
```

**OUTPUT:-**

Multi..value is :  16

num=4 → variable num ko value **4** assign karta hai

multi=$(($num * $num)) → num ka square calculate karta hai (**4 × 4 = 16**)

return $multi → function se calculated value **16** return karta ha

## 4 With Argument – With Return

This type of function takes arguments and returns a value after processing them.

**Example:**

```
#!/bin/bash


add() {
   sum=$(( $1 + $2 ))
   echo $sum
}


result=$(add 10 20)
echo "Result = $result"
```

**OUTPUT:-**

Result= 30

### Explaination:-

- add() → function name
- $1 $2 → arguments
- echo $sum → return value
- result=$(add 10 20) → returned value store ki