

(1) Create a text file with employee details like EmpID, EmpName, Department, Salary, Years of experience (Use awk).

a. Print the rows of employees who belong to a specific Department.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk '$3 ~/CSE/' Ques1.txt
101 Jhon CSE 10000 9
102 Ayesha CSE 20000 8
109 Surya CSE 70000 10
110 Radhika CSE 45000 5
112 Rama CSE 35000 5

nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk '$3 ~/ECE/' Ques1.txt
103 Nandita ECE 30000 2
105 Suamalatha ECE 50000 4
108 Vidya ECE 10000 9
```

b. Print the employee details whose salary is 35000 with line numbers.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk '$4==35000{print NR,$1,$2,$3,$4}' Ques1.txt
12 112 Rama CSE 35000
```

c. Print length of the maximum row in the specific range (use NR for Row Number).

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk 'NR==5,NR==10 {if(length($0)>max) max=length($0)} END{print max}' Ques1.txt
27
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$
```

d. Print employee details with Header and Footer.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk 'BEGIN {print "Employee Details"} {print $0,$1,$2,$3} END{print "End of the file"}' Ques1.txt
Employee Details
101 Jhon CSE 10000 9 101 Jhon CSE
102 Ayesha CSE 20000 8 102 Ayesha CSE
103 Nandita ECE 30000 2 103 Nandita ECE
104 Namrata MSM 40000 7 104 Namrata MSM
105 Sumalatha ECE 50000 4 105 Sumalatha ECE
106 Venugopal MECH 30000 5 106 Venugopal MECH
107 Vaishanavi MECH 20000 8 107 Vaishanavi MECH
108 Vidya ECE 10000 9 108 Vidya ECE
109 Surya CSE 70000 10 109 Surya CSE
110 Radhika CSE 45000 5 110 Radhika CSE
111 Radha MECH 29000 7 111 Radha MECH
112 Rama CSE 35000 5 112 Rama CSE
End of the file
```

e. Print Employee details, whose salary is greater than 45000, print first, second and last column of the file.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk '$4>45000{print $1,$2,$5}' Ques1.txt
105 Suamalatha 4
109 Surya 10
```

f. Print average salary of the employee

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk '{ total += $4 } END { print total/NR }' Ques1.txt
29923.1
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$
```

(2) Use awk command to

a. Print "n" random numbers.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ for i in $(seq 1 5) ; do awk -v seed=$RANDOM 'BEGIN{srand(seed);print rand()}'; done
0.729551
0.346346
0.566673
0.0165074
0.0349843
```

b. Print sum of cubes of first “n” even numbers.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk 'BEGIN { for(i=0;i<=6;i=i+2) sum=sum+(i*i*i); print "Sum of cubes of Even numbers is",sum ;}
Sum of cubes of Even numbers is 288
_
```

c. Print Environmental variables set on Machine.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk 'BEGIN {print ENVIRON["PATH"]}'
/home/nandita/.vscode-server/bin/ee8c7def80afc00dd6e593ef12f37756d8f504ea/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/mnt/c/Windows/system32:/mnt/c/Windows:/mnt/c/Windows/System32/Wbem:/mnt/c/Windows/System32/WindowsPowerShell/v1.0:/mnt/c/Windows/System32/WindowsPowerShell/v1.0:/mnt/c/Windows/System32/WindowsPowerShell/v1.0:/mnt/c/Windows/System32/WindowsPowerShell/v1.0:/mnt/c/Program Files/NVIDIA Corporation/NVIDIA NVOLTSR:/mnt/c/WINDOWS/system32:/mnt/c/WINDOWS:/mnt/c/WINDOWS/System32/Wbem:/mnt/c/WINDOWS/System32/WindowsPowerShell/v1.0:/mnt/c/Program Files/Git/cmd:/mnt/c/Program Files/nodejs:/mnt/c/Program Files/dotnet:/mnt/c/Program Files/MySQL/MySQL Shell 8.0/bin:/mnt/c/Users/Nandita/AppData/Local/Programs/Python/Python37/Scripts:/mnt/c/Users/Nandita/AppData/Local/Programs/Python/Python37:/mnt/c/Users/Nandita/AppData/Local/Microsoft/WindowsApps:/mnt/c/Program Files/mingw-w64/x86_64-8.1.0-posix-seh-rt_v6-rev0/mingw64/bin:/mnt/c/Users/Nandita/AppData/Roaming/npm:/mnt/c/Program Files/MongoDB/Server/4.4/bin:/mnt/c/iverilog/bin:/mnt/c/iverilog/gtkwave/bin:/mnt/c/Users/Nandita/AppData/Local/Programs/Microsoft VS Code/bin:/snap/bin
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$
```

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ awk 'BEGIN {print ENVIRON["SHELL"]}'
/bin/bash
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$
```

d. Print path of “Home”.

```
nandita@DESKTOP-2LH63U6:~/VLSI Lab$ awk 'BEGIN {print ENVIRON["HOME"]}'
/home/nandita
nandita@DESKTOP-2LH63U6:~/VLSI Lab$
```

(3) Create three files with text and Use grep to

a. Print lines from all the files with matching lines with ignored cases.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ grep -i "microsoft windows" test1.txt test2.txt test3.txt
test1.txt:The dominant general-purpose[3] desktop operating system is Microsoft Windows with a market share of around 76.45%.
test2.txt:An operating system (or OS) is a group of computer programs, including device drivers, kernels, and other software that lets people interact with a computer. It manages computer hardware and software resources. It provides common services for computer programs. An OS can be small (like MenuetOS), or large (like Microsoft Windows). Different operating systems can be used for different purposes. Some are used for everyday things like on a personal computer. Others are mobile operating systems or are used for specialized work.
test2.txt:Some examples of commonly used operating systems are macOS, Linux, and Microsoft Windows.
test3.txt:Microsoft Windows, commonly referred to as Windows, is a group of several proprietary graphical operating system families, all of which are developed and marketed by Microsoft. Each family caters to a certain sector of the computing industry. Active Microsoft Windows families include Windows NT and Windows IoT; these may encompass subfamilies, (e.g. Windows Server or Windows Embedded Compact) (Windows CE). Defunct Microsoft Windows families include Windows 9x, Windows Mobile and Windows Phone.
test3.txt:Microsoft introduced an operating environment named Windows on November 20, 1985, as a graphical operating system shell for MS-DOS in response to the growing interest in graphical user interfaces (GUIs).[5] Microsoft Windows came to dominate the world's personal computer (PC) market with over 90% market share, overtaking Mac OS, which had been introduced in 1984.
```

b. Print “n” lines “Previous” and “Next” to the matching pattern with matching line.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ grep -i -C 3 "microsoft windows" test1.txt test2.txt test3.txt
test1.txt-executed directly by the hardware and frequently makes system calls to an OS function or is interrupted by it.
test1.txt-Operating systems are found on many devices that contain a computer - from cellular phones and video game consoles
test1.txt-to web servers and supercomputers.
test1.txt:The dominant general-purpose[3] desktop operating system is Microsoft Windows with a market share of around 76.45%.
test1.txt-macOS by Apple Inc. is in second place (17.72%), and the varieties of Linux are collectively in third place (1.73%).
test1.txt-[4] In the mobile sector (including smartphones and tablets), Android's share is up to 72% in the year 2020.
test1.txt-[5] According to third quarter 2016 data, Android's share on smartphones is dominant with 87.5 percent with also
--
test2.txt:An operating system (or OS) is a group of computer programs, including device drivers, kernels, and other software that lets people interact with a computer. It manages computer hardware and software resources. It provides common services for computer programs. An OS can be small (like MenuetOS), or large (like Microsoft Windows). Different operating systems can be used for different purposes. Some are used for everyday things like on a personal computer. Others are mobile operating systems or are used for specialized work.
test2.txt-
test2.txt-An operating system has many jobs. It makes sure that all the programs can use the CPU, system memory, displays, input devices, and other hardware. Some also give the user an interface to use a computer. An OS is also responsible for sending data to other computers or devices on a network.
test2.txt-
test2.txt:Some examples of commonly used operating systems are macOS, Linux, and Microsoft Windows.
--
test3.txt:Microsoft Windows, commonly referred to as Windows, is a group of several proprietary graphical operating system families, all of which are developed and marketed by Microsoft. Each family caters to a certain sector of the computing industry. Active Microsoft Windows families include Windows NT and Windows IoT; these may encompass subfamilies, (e.g. Windows Server or Windows Embedded Compact) (Windows CE). Defunct Microsoft Windows families include Windows 9x, Windows Mobile and Windows Phone.
test3.txt-
test3.txt:Microsoft introduced an operating environment named Windows on November 20, 1985, as a graphical operating system shell for MS-DOS in response to the growing interest in graphical user interfaces (GUIs).[5] Microsoft Windows came to dominate the world's personal computer (PC) market with over 90% market share, overtaking Mac OS, which had been introduced in 1984.
test3.txt-
test3.txt-Apple came to see Windows as an unfair encroachment on their innovation in GUI development as implemented on products such as the Lisa and Macintosh (eventually settled in court in Microsoft's favor in 1993). On PCs, Windows is still the most popular operating system in all countries.[6][7] However, in 2014, Microsoft admitted losing the majority of the overall operating system market to Android,[8] because of the massive growth in sales of Android smartphones. In 2014, the number of Windows devices sold was less than 25% that of Android devices sold. This comparison, however, may not be fully relevant, as the two operating systems traditionally target different platforms. Still, numbers for server use of Windows (that are comparable to competitors) show one third market share, similar to that for end user use.
test3.txt-
```

c. Print all the lines that do not match the given pattern.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ grep -v "microsoft windows" test1.txt test2.txt test3.txt
test1.txt:An operating system (OS) is system software that manages computer hardware, software resources, and provides
test1.txt:common services for computer programs.
test1.txt:Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting
test1.txt:software for cost allocation of processor time, mass storage, printing, and other resources.
test1.txt:For hardware functions such as input and output and memory allocation, the operating system acts as a
test1.txt:n intermediary between programs and the computer hardware,[1][2] although the application code is usually
test1.txt:executed directly by the hardware and frequently makes system calls to an OS function or is interrupted by it.
test1.txt:Operating systems are found on many devices that contain a computer - from cellular phones and video game consoles
test1.txt:to web servers and supercomputers.
test1.txt:The dominant general-purpose[3] desktop operating system is Microsoft Windows with a market share of around 76.45%.
test1.txt:macOS by Apple Inc. is in second place (17.72%), and the varieties of Linux are collectively in third place (1.73%).
test1.txt:[4] In the mobile sector (including smartphones and tablets), Android's share is up to 72% in the year 2020.
test1.txt:[5] According to third quarter 2016 data, Android's share on smartphones is dominant with 87.5 percent with also
test1.txt:a growth rate of 10.3 percent per year, followed by Apple's iOS with 12.1 percent with per year decrease in market
test1.txt:share of 5.2 percent, while other operating systems amount to just 0.3 percent.[6] Linux distributions are dominant
test1.txt:in the server and supercomputing sectors. Other specialized classes of operating systems (special-purpose operating
test1.txt:systems),[3][7] such as embedded and real-time systems, exist for many applications. Security-focused operating systems
test1.txt:also exist. Some operating systems have low system requirements (e.g. light-weight Linux distribution).Others may have higher system requirements.
test1.txt:Some operating systems require installation or may come pre-installed with purchased computers (OEM-installation),
test1.txt:whereas others may run directly from media (i.e. live CD) or flash memory (i.e. USB stick).
test2.txt:An operating system (or OS) is a group of computer programs, including device drivers, kernels, and other software that lets people interact with
a computer. It manages computer hardware and software resources. It provides common services for computer programs. An OS can be small (like MenuetOS), or l
arge (like Microsoft Windows). Different operating systems can be used for different purposes. Some are used for everyday things like on a personal computer
. Others are mobile operating systems or are used for specialized work.
test2.txt:
test2.txt:An operating system has many jobs. It makes sure that all the programs can use the CPU, system memory, displays, input devices, and other hardware
. Some also give the user an interface to use a computer. An OS is also responsible for sending data to other computers or devices on a network.
test2.txt:
test2.txt:Some examples of commonly used operating systems are macOS, Linux, and Microsoft Windows.
test3.txt:Microsoft Windows, commonly referred to as Windows, is a group of several proprietary graphical operating system families, all of which are develo
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test3.txt:Apple came to see Windows as an unfair encroachment on their innovation in GUI development as implemented on products such as the Lisa and Macinto
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phones. In 2014, the number of Windows devices sold was less than 25% that of Android devices sold. This comparison, however, may not be fully relevant, as
the two operating systems traditionally target different platforms. Still, numbers for server use of Windows (that are comparable to competitors) show one t
hird market share, similar to that for end user use.
```

d. Print lines that match the given pattern in specific colour.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ grep --color=always "Windows" test1.txt test2.txt test3.txt
test1.txt:The dominant general-purpose[3] desktop operating system is Microsoft Windows with a market share of around 76.45%.
test2.txt:An operating system (or OS) is a group of computer programs, including device drivers, kernels, and other software that lets people interact with a computer. It manages computer
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in Microsoft's favor in 1993). On PCs, Windows is still the most popular operating system in all countries.[6][7] However, in 2014, Microsoft admitted losing the majority of the overall op
erating system market to Android,[8] because of the massive growth in sales of Android smartphones. In 2014, the number of Windows devices sold was less than 25% that of Android devices so
ld. This comparison, however, may not be fully relevant, as the two operating systems traditionally target different platforms. Still, numbers for server use of Windows (that are comparabl
e to competitors) show one third market share, similar to that for end user use.
test3.txt:As of October 2021, the most recent version of Windows for PCs and tablets is Windows 11, version 21H2. The most recent version for embedded devices is Windows 10, version 21H1.
The most recent version for server computers is Windows Server 2022, version 21H2.[9] A specialized version of Windows also runs on the Xbox One and Xbox Series X/S video game consoles.[10]
]
```

e. Print all patterns that match A-Z and 0-9 from the file.

```
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ grep '[A-Z][0-9]' test1.txt test2.txt test3.txt
test3.txt:As of October 2021, the most recent version of Windows for PCs and tablets is Windows 11, version 21H2. The most recent version for embedded devic
es is Windows 10, version 21H1. The most recent version for server computers is Windows Server 2022, version 21H2.[9] A specialized version of Windows also
runs on the Xbox One and Xbox Series X/S video game consoles.[10]
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$ grep '[A-Z0-9]' test1.txt
An operating system (OS) is system software that manages computer hardware, software resources, and provides
Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting
For hardware functions such as input and output and memory allocation, the operating system acts as a
n intermediary between programs and the computer hardware,[1][2] although the application code is usually
executed directly by the hardware and frequently makes system calls to an OS function or is interrupted by it.
Operating systems are found on many devices that contain a computer - from cellular phones and video game consoles
The dominant general-purpose[3] desktop operating system is Microsoft Windows with a market share of around 76.45%.
macOS by Apple Inc. is in second place (17.72%), and the varieties of Linux are collectively in third place (1.73%).
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systems),[3][7] such as embedded and real-time systems, exist for many applications. Security-focused operating systems
also exist. Some operating systems have low system requirements (e.g. light-weight Linux distribution).Others may have higher system requirements.
Some operating systems require installation or may come pre-installed with purchased computers (OEM-installation),
whereas others may run directly from media (i.e. live CD) or flash memory (i.e. USB stick).
nandita@DESKTOP-2LH63U6:~/OSLab/OSLab7$
```


Awk .

Awk is a utility that enables a programmer to write tiny but effective programs in the form of statements that define text patterns that are to be searched for in each line of the document and the action that is to be taken when a match is found within the line.

NR \rightarrow keeps a count of the number of input records.

We can use NR to display line numbers.

length(\$0) \Rightarrow used for the length of the line to be determined in the number of characters.

Syntax for AWK

awk options 'selection-criteria' {action}' input file

Grep

Globally search regular expression and print out.

options

- i : ignore case for matching.
- v : print lines that do not match the pattern.
- C n : prints n lines above and below match.
- color=always : colors the matching phrase. usually in red.