CS 213: System Software Lab
Autumn 2024, IIT Dharwad
Assignment-3
Linux and Bash

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1) Write a bash script to perform the following operations in the file `data.txt`:
   a) Write a bash script to print the first and third columns of the file with a custom separator like " - " between the columns. **[1 Mark]**

```
John - Manager
Alice - Developer
Bob - Analyst
Eve - Manager1
oscar - Developer1
hari - Analyst1
Ian - Manager2
Leo - Developer2
Ivy - Analyst2
Ellie - Manager3
Rory - Developer3
Jude - Analyst3
Reese - Developer4
Ram - Analyst4
Eden - Manager4
Millie - Developer4
mavis - Analyst4
orla - Manager4
Hazel - Developer4
Judi - Analyst4
```

   b) Write a bash script to print "Pass" if the score (second column) is 40 or more, and "Fail" otherwise, for each line in the file. The "Pass" and "Fail" should be displayed corresponding to its name. **[2 Marks]**

```
John: Fail
Alice: Fail
Bob: Pass
Eve: Fail
oscar: Pass
hari: Pass
Ian: Pass
Leo: Fail
Ivy: Pass
Ellie: Fail
Rory: Pass
Jude: Pass
Reese: Pass
Ram: Pass
Eden: Pass
Millie: Pass
mavis: Pass
orla: Pass
Hazel: Pass
Judi: Pass
```

   c) Write a bash script using awk that identifies and prints the names of students whose names start with a vowel and who score more than 50. After filtering, calculate the average score of these students. **[3 Marks]**

```
oscar 85
Ivy 80
Eden 70
orla 74
Average score of students whose names start with a vowel and scored more than 50: 77.25
```

d) Write a bash script using awk, which generates a formatted report from `data.txt` where each line contains the student name, their marks, and a grade (A, B, C, or F) based on their score. The grading system should be: A: 85 and above, B: 70-84, C: 40-69, F: Below 40. **[2 Marks]**

```
John 30 F
Alice 25 F
Bob 40 C
Eve 33 F
oscar 85 A
hari 42 C
Ian 50 C
Leo 25 F
Ivy 80 B
Ellie 34 F
Rory 88 A
Jude 52 C
Reese 95 A
Ram 82 B
Eden 70 B
Millie 65 C
mavis 90 A
orla 74 B
Hazel 88 A
Judi 62 C
```

e) Write a bash script using awk that performs the following from `data.txt` : **[3 Marks]**

i) For students with marks between 50 and 70, increase their marks by 5 points.

ii) For students with marks above 90, add a note "Excellent" next to their name.

```
John 30
Alice 25
Bob 40
Eve 33
oscar 85
hari 42
Ian 55
Leo 25
Ivy 80
Ellie 34
Rory 88
Jude 57
Reese 95 Excellent
Ram 82
Eden 75
Millie 70
mavis 90
orla 74
Hazel 88
Judi 67
```

2) Write a bash script to perform the following operations in the file `data1.txt`: **[5 Marks]**
   a) Write a bash script to insert the line "Start of File" at the beginning of a file.
   b) Write a bash script to replace the word "Make" with "Makefile" only on lines between 5 and 10 in the file.
   c) Write a bash script to print only the lines that contain the word "compilation" in the file.
   d) Write a bash script to append the line "Makefiles are essential for compilation" after the line containing "Linux and MacOS".
   e) Write a bash script to delete all lines that contain either "Linux" or "MacOS" from the file.

3) Write a bash script to check if a variable name is valid or not. The script should print all the errors in std error. The following rules need to be considered for the valid variable names in Bash:
   a) Variable names must start with a letter or underscore (_) and not a number.
   b) After the first character, variable names can include letters, numbers, and underscores.
   c) Variable names cannot contain spaces or special characters (other than underscore).

[3 Marks]

```
ashit@snsrl:~/SSL_lab/Ass-3$ ./q3.sh bhc
bhc is a valid variable name.
ashit@snsrl:~/SSL_lab/Ass-3$ ./q3.sh 1bhc
1bhc is not a valid variable name.
```

4) Create a makefile which will take two numbers from the user and an operator, if I run ‘make say_hello’ it will display “This Makefile will run a simple calculator program and if I run ‘make run_program’ which will execute a calculator program.

Steps:

a) Create a calculator.c program where it considers two numbers and the operator as input and based on that perform the operations also consider the exceptional cases such as division with zero not possible; invalid operator and invalid number. **[1 Mark]**

b) Create a Makefile as mentioned in the question where it compiles and runs the program and finally remove all the executable files and object files. The makefile declares that all, say_hello, run_program, and clean are not actual files but just labels for the targets. **[3 Marks]**

```
ashit@snsrl:~/SSL_lab/Ass-3/3rd$ make run_program
gcc -Wall -o calculator calculator.c
Running the calculator program...
./calculator
Enter first number: 12
Enter second number: 0
Enter operator (+, -, *, /): /
Error: Division by zero
ashit@snsrl:~/SSL_lab/Ass-3/3rd$ make
This Makefile will run a simple calculator program.
To execute the calculator, run 'make run_program'.
Running the calculator program...
./calculator
Enter first number: 15
Enter second number: 25
Enter operator (+, -, *, /): *
Result: 375
ashit@snsrl:~/SSL_lab/Ass-3/3rd$ make
This Makefile will run a simple calculator program.
To execute the calculator, run 'make run_program'.
Running the calculator program...
./calculator
Enter first number: 0
Enter second number:
2
Enter operator (+, -, *, /): 2
Error: Invalid operator
```

Instructions:

- Posted on: 02/09/2024
- Due date: 8th September 2024 (11:59 PM)
- The assignment is available in the drive folder and in the moodle.
- The mode of submission is Moodle. Any other kind of submissions are not accepted.
- Save all the scripts as:
    - script1a.sh, script1b.sh, script1c.sh, script1d.sh, script1e.sh
    - script2a.sh, script2b.sh, script2c.sh, script2d.sh, script2e.sh
    - script3.sh
    - Makefile, calculator.c
- Please zip all your script files, and submit a single file named "<roll-no>.zip", where <roll-no> should be replaced with your IIT Dharwad roll number.
- If you have violated the naming convention then you will be awarded a **10%** penalty of your secured marks.
- There will be a 100% penalty for plagiarism.
- Introducing irrelevant code is considered as malpractice.
- Late submission files are not considered for evaluation.