

AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES
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Shell Scripting: Assignment 1

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1. Use the `student_info.txt` to create folders for each student as follows:
 - Create a folder named `AY20252026`
 - Create subfolders from the Program column.
 - Create a folder for each student under their program using the student's code as the folder name.
 - In the student's folder, create a txt file containing the student's name in the first row, and generate an email address `firstname.surname@aims.ac.rw` and append it as the second row. Hint: use `echo "${str,,}"` to transform a string `str` to lower case. `echo "${str^^}"` for upper case if needed.
2. Write a function that asks for a positive integer n and computes:
 - (i) The sum of the squares of all numbers from 1 to n that are divisible by 3:

$$\sum_{\substack{i=1 \\ i \bmod 3 = 0}}^n i^2$$

- (ii) The sum of the cubes of all numbers from 1 to n that are **not divisible by 3**:

$$\sum_{\substack{i=1 \\ i \bmod 3 \neq 0}}^n i^3$$

The function should have one argument to check if you want to compute for numbers that are divisible by 3 or not.

3. Write a program reading a number of the day of the week (from 0 to 6). If it is a working day, then the program will write the name of the corresponding day. Otherwise, it will write the word "Weekend".
4. Make a program that, given a month number (from 0 to 11), indicates how many days it has (28, 30 or 31), ignoring the leap years.
5. Write two versions of bash code that display your name 3 times. One version with a "for loop" and another version with a "while loop".
6. Given two numbers x_0 and x_1 , the Fibonacci sequence they generate is constructed from the recursion formula $x_{n+1} = x_n + x_{n-1}$. Calculate the first 15 terms of a Fibonacci sequence, asking the user for the initial values.
7. Compute the first 30 terms of the sequence defined by $x_{n+2} = \frac{1}{2}x_{n+1} - 3x_n$ sequence, given any two initial values x_0 and x_1 .
8. (a) Write bash code that computes the sum of the squares of the first n natural numbers. One version with a "for loop" and another version with a "while loop".
(b) Using a while loop, write code that prints the smallest natural number n such that $1^2 + 2^2 + \dots + n^2 \geq M$ for a natural number M .
9. (a) Write code that prints all the divisors of a given natural number.
(b) Read an integer number input by the user and calculate its prime factors. This will just be some of its divisors.
10. Read an integer number n , between 0 and 9, and print its multiplication table up to N where N is another natural number the program reads.
11. Write a program that prints all the numbers between 0 and 40 that are multiples of 3, 7 or 11.
12. Given a point $A(x, y)$ in the plane by its Cartesian coordinates, determine in which quadrant it is (1st, 2nd, 3rd, 4th), if it lies on an axis, or if it is the origin. Do this for several points in the same execution of the program until the user quits.
13. Ask for an integer number between 0 and 9, denoted x . Once the user has entered a correct number (that is one in the range $[0, 10)$), the program asks for a second integer number between 0 and 255, denoted \max . The program continues asking for the number until it is correct (that it is in the range $[0, 256)$). When this is done, show all multiples of x that are between 0 and \max . Then, ask the user whether he/she wants to continue; if in the affirmative, ask for another couple of numbers; otherwise, finish.