MATLAB

Essential MATLAB for Scientists

Tutorials Chap 3

Exercise - 1

1) Create a x vector starting from 1 to 5, with an increment of 0.5. y=3x+2. Use a for loop to calculate y.
2) What would be the last value of y? Detail
3) Create a x vector starting from 1 to 5, with an increment of 0.5. Create a z vector starting from 10 to 18, with an increment of 1. y=3x+2. You would like to check if each value of y is equal to the same value of z. For instance z(1) is equal to y(1)? z(2) is equal to y(2)? If it is equal, display "y is equal to z". Write a Matlab program with a for loop and if decision.
4) Same question with z vector starting from 10 to 15, with an increment of 5. What do you expect from Matlab? Why?
5) Create a x vector starting from 1 to 5, with an increment of 0.5. Create a z vector starting from 10 to 20, with an increment of 1. y=3x+2. You would like to check for a single value of y, if you can find this value among the z vector. For instance y(1) is equal to z(1)? y(1) is equal to z(2)? y(1) is equal to z(3)? Etc… y(2) is equal to z(1)? y(2) is equal to z(2)? Etc…If it is equal, display both indexes (index of y and index of z). Write a Matlab program with two for loops.

Exercise - 2

1) Write MATLAB program in 3 different ways with an input question, such as "How old are you?" and check if the answer is greater than 18, display "Greater", lower than 18 display "Lower" or equal to 18 display "Same". The answer of the input question would be between 17 and 20 years old.

2) $ax^2+bx+c=0$. a=[3 3 2];b=[5 -6 3];c=[2 3 1];calculate the solution(s) if the discriminant delta is greater than 0 or equal to 0. Write a Matlab program to get the solution(s) while changing the a, b, c parameters of the equation.

Exercise - 3

1) Write MATLAB program with for loop : $\frac{1}{2^3} - \frac{2}{3^4} + \frac{3}{4^5} - \cdots + \frac{19}{20^{21}}$.

2) Write MATLAB program with vectorization $\frac{1}{2^3} - \frac{2}{3^4} + \frac{3}{4^5} - \cdots + \frac{19}{20^{21}}$.

Exercise 4

Without the calculator.

You worked for 20 days in a month as a consultant for different companies. Your hourly rate is different for each company, and you did not work the same number of hours per day as well.

Working day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nb of working hours per day	8	7	7	4	3	11	5	6	9	8	4	7	10	8	6	7	9	8	7	7
Hourly rate (AED)	80	70	75	72	90	60	100	82	86	74	78	81	100	63	92	65	61	100	72	71

-Create the algorithm to calculate the salary at the end of the month and if the salary is lower than 8000 AED, mention that no taxes would be paid, if salary is between 8000 and 12000 AED, mention that taxes of 1000 AED would be paid, and finally if salary is greater than 12000, mention that taxes of 2000 AED would be paid. In this algorithm, calculate the number of working hours per week as well, if it is more than 35h, then you will get a bonus of 400 AED per extra hour.
-Translate the algorithm to 2 Matlab programs (with and without using for loop)

-What is the final salary (with or without taxes, with or without extra hour)?

Exercise 5

5	3	2	1	9
3	8	7	6	4
9	0	5	NaN	3
4	8	2	7	6

-Create the algorithm to find NaN (number of rows and number of column)

-Translate the algorithm to a Matlab program.

Hint: use the function isnan:
isnan(A) returns a logical array containing 1 (true) where the elements of A are NaN, and 0 (false) where they are not.

Exercise - 6

Some lead sheets/panels can be used to cover a cathedral roof. After a fire, lead sheets/panels melted. For the restoration, the architects need to put lead sheets/panels back to create a new roof. However the framework (wood structure) can't support more than 37 tons. The total area of the roof is 1050m². [Lead density=11.35gm/cm³]

There are 3 manufacturers, with different dimensions of lead sheets/panels where W is the width, L is the length, and T is the thickness.
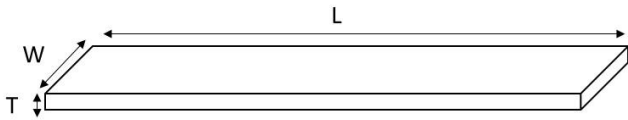
Different possibilities	L (m)	W (m)	T (mm)	Number of sheets
Case 1	2	0.5	4	1050
Case 2	3	0.5	2	1000
Case 3	1.5	0.7	3	1000

Write a Matlab program to accomplish the following tasks:
1) estimate for each case the area, and if it is greater than the total area needed for the cathedral, display "greater", or if it is equal display "perfect" else display "lower".
2) estimate for each case the total mass of the roof and if the total mass is greater than what the framework (wood structure) could support (37 tons), display "Could not support".
3) Join both programs from question 1) and question 2) in a single one to know among the 3 cases which case would correspond to the recommendations? (recommendations: area should be equal to 1050m² and total mass lower than 37 tons)
4) Which case is conformed to the recommendations? Detail your calculations.