ME-19159

ASSIGNMENT#3

Question 01

Use loops to create a 4×6 matrix in which the value of each element is two times its row number minus three times its column number. For example, the value of element (2,5) is $2 \times 2 - 3 \times 5 = -11$.

SCRIPT:

```
%Question#1
clear all,clc
for r=1:4
for c=1:6
        A(r,c)=(2*r)-(3*c);
end   end A
```

COMMAND WINDOW:

Command Window

```
A =

    -1    -4    -7   -10   -13   -16
     1    -2    -5    -8   -11   -14
     3     0    -3    -6    -9   -12
     5     2    -1    -4    -7   -10
```

Question 02

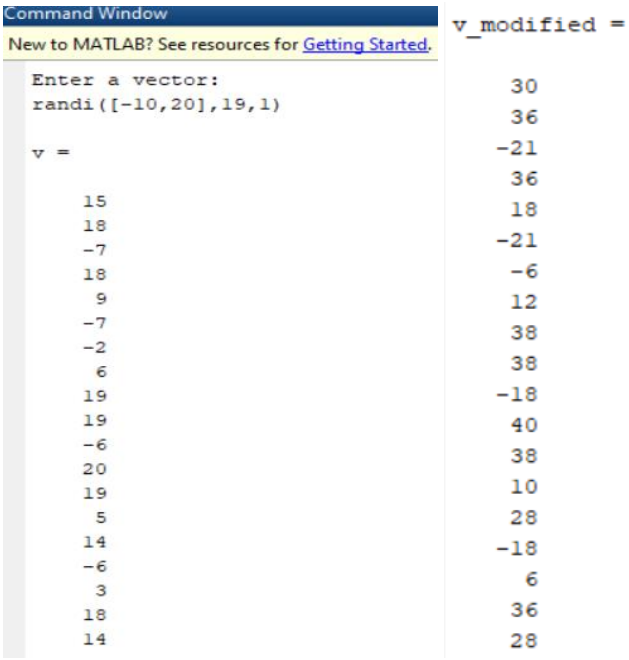
Write a program that asks the user to input a vector of integers of arbitrary length. Then, using a for-end loop the program examines each element of the vector. If the element is positive, its value is doubled. If the element is negative, its value is tripled. The program displays the vector that was entered and the modified vector. Execute the program, and when the program ask the user to input a vector type `randi([-10 20],1,19)`. This creates a 19-element vector with random integers between –10 and 20.

SCRIPT:

```
%Question#2 clear all,clc
v=input('Enter a vector:\n')
n=length(v); for i=1:n
if v(i)>0
v(i)=2*v(i);      elseif
```

```
v(i)<0          v(i)=3*v(i);
end end disp(['v_modified
='])  disp([' '])  disp([v])
```

COMMAND WINDOW:



```
Command Window
New to MATLAB? See resources for Getting Started.

Enter a vector:
randi([-10,20],19,1)

v =

    15
    18
    -7
    18
     9
    -7
    -2
     6
    19
    19
    -6
    20
    19
     5
    14
    -6
     3
    18
    14

v_modified =

    30
    36
   -21
    36
    18
   -21
    -6
    12
    38
    38
   -18
    40
    38
    10
    28
   -18
     6
    36
    28
```

Question 03

The daily high temperature (°F) in New York City and Denver, Colorado, during the month of January 2014 is given in the vectors below (data from the U.S. National Oceanic and Atmospheric Administration).

NYC = [33 33 18 29 40 55 19 22 32 37 58 54 51 52 45 41 45 39 36 45 33 18 19 19 28 34 44 21 23 30 39]

DEN = [39 48 61 39 14 37 43 38 46 39 55 46 46 39 54 45 52 52 62 45 62 40 25 57 60 57 20 32 50 48 28]

where the elements in the vectors are in the order of the days in the month. Write a program in a script file that determines and displays the following information:

(*a*) The average temperature for the month in each city (rounded to the nearest degree).

(*b*) The number of days that the temperature was above the average in each city.

(*c*) The number of days that the temperature in Denver was higher than the temperature in New York.

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SCRIPT:

```
%Question#3 clear
all,clc
NYC = [33 33 18 29 40 55 19 22 32 37 58 54 51 52 45 41 45 39 36 45 33 18 19
19 28 34 44 21 23 30 39];
DEN = [39 48 61 39 14 37 43 38 46 39 55 46 46 39 54 45 52 52 62 45 62 40 25
57 60 57 20 32 50 48 28];
%Part(a)
Avg_NYC=round(mean(NYC));
Avg_DEN=round(mean(DEN)); fprintf('The average temperature of the
month for New York City is: %g F.\n',Avg_NYC) fprintf('The average
temperature of the month fot Denver city is: %gF.\n',Avg_DEN) %Part(b)
x=NYC>Avg_NYC; n_NYC=sum(x); y=DEN>Avg_DEN; n_DEN=sum(y);
fprintf('During % g days the temperature in New York City was above the
average.\n',n_NYC) fprintf('During % g days the temperature in Denver
was above the average.\n',n_DEN) %Part(c) z=DEN>NYC;
Number_of_days=sum(z); fprintf('During % g days the temperature in Denver
was higher than in New York City.\n',Number_of_days)
```

COMMAND WINDOW:

```
Command Window
The average temperature of the month for New York City is: 35 F.
The average temperature of the month fot Denver city is: 44F.
During  15 days the temperature in New York City was above the average.
During  18 days the temperature in Denver was above the average.
During  22 days the temperature in Denver was higher than in New York City.
fx >>
```

Question 04

Fibonacci numbers are the numbers in a sequence in which the first three elements are 0, 1, and 1, and the value of each subsequent element is the sum of the previous three elements:

0, 1, 1, 2, 4, 7, 13, 24, ...

Write a MATLAB program in a script file that determines and displays the first 25 Fibonacci numbers.

SCRIPT:

```
%Question#4
clear all,clc
f_s=[0 1 1]; for
k=4:25
 f_s(k)=f_s(k-1)+f_s(k-2)+f_s(k-3);
end f_s
```

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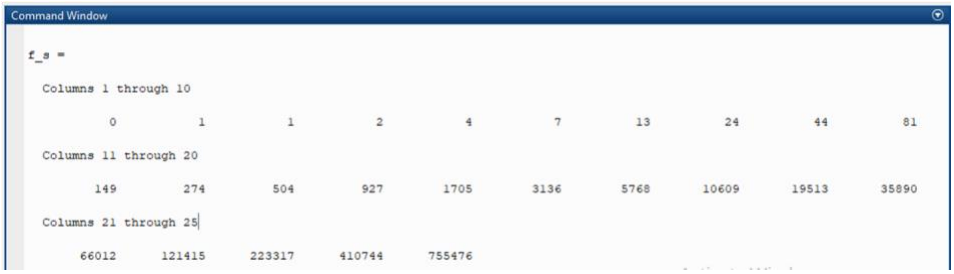
COMMAND WINDOW:



Question 05

A vector is given by x = [9 –1.5 13.4 13.3 –2.1 4.6 1.1 5 –6.1 10 0.2]. Using conditional statements and loops, write a program that rearranges the elements of x in order from the smallest to the largest. Do not use MATLAB's built-in function `sort`.

SCRIPT:

```
%Question#05 clear all,clc x=[9 -1.5 13.4 13.3
-2.1 4.6 1.1 5 -6.1 10 0.2] for i=1:length(x);
```

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```
[min_x,r]=min(x);      sorted_x(i)=min(x);
x(r)=[]; end
sorted_x
```

SCRIPT:

```
% Question#6 clear
all,clc
S=[72 81 44 68 90 53 80 75 74 65 50 92 85 69 41 73 70 86 61 65 79 94 69];
Av=round(mean(S)) Sd=round(std(S)) for
i=1:length(S)      if S(i)>=(Av+1.3*Sd)
fprintf('%d%% Letter Grade A \n',S(i))      elseif
```

COMMAND WINDOW:

```
Command Window

x =

    9.0000   -1.5000   13.4000   13.3000   -2.1000    4.6000    1.1000    5.0000   -6.1000   10.0000    0.2000


sorted_x =

   -6.1000   -2.1000   -1.5000    0.2000    1.1000    4.6000    5.0000    9.0000   10.0000   13.3000   13.4000

fx >>
```

Question 06

A list of exam scores (S) (in percent out of 100%) is given: 72, 81, 44, 68, 90, 53, 80, 75, 74, 65, 50, 92, 85, 69, 41, 73, 70, 86, 61, 65, 79, 94, 69.
Write a computer program that calculates the average (Av) and standard deviation (Sd) of the scores, which are rounded to the nearest integer. Then, the program determines the letter grade of each of the scores according to the following scheme:

Score (%)	$S \geq Av + 1.3Sd$	$Av + 0.5Sd \leq S < Av + 1.3Sd$
Letter grade	A	B
Score (%)	$Av - 0.5Sd \leq S < Av + 0.5Sd$	$Av - 1.3Sd \leq S < Av - 0.5Sd$
Letter grade	C	D
Score (%)	$S < Av - 1.3Sd$	
Letter grade	F	

The program displays the values of Av and Sd followed by a list that shows the scores and the corresponding letter grade (e.g., 72% Letter grade C).

```
((Av+0.5*Sd)<=S(i)) & S(i)<(Av+1.3*Sd)
fprintf('%d%% Letter Grade B \n',S(i))      elseif
((Av-0.5*Sd)<=S(i)) & S(i)<(Av+0.5*Sd)
fprintf('%d%% Letter Grade C \n',S(i))      elseif
((Av-1.3*Sd)<=S(i)) & S(i)<(Av-0.5*Sd)
fprintf('%d%% Letter Grade D \n',S(i))      elseif
S(i)<(Av-1.3*Sd)
     fprintf('%d%% Letter Grade F \n',S(i))
end end
```

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COMMAND WINDOW:

Command Window

```
Av =

    71


Sd =

    14

72% Letter Grade C
81% Letter Grade B
44% Letter Grade F
68% Letter Grade C
90% Letter Grade A
53% Letter Grade D
80% Letter Grade B
75% Letter Grade C
74% Letter Grade C
65% Letter Grade C
50% Letter Grade F
92% Letter Grade A
85% Letter Grade B
69% Letter Grade C
41% Letter Grade F
73% Letter Grade C
70% Letter Grade C
```

```
86% Letter Grade B
61% Letter Grade D
65% Letter Grade C
79% Letter Grade B
94% Letter Grade A
69% Letter Grade C
```

Question 07

Write a MATLAB program in a script file that finds and displays all the numbers between 100 and 999 whose product of digits is 6 times the sum of the digits. [e.g. 347 since $3 \times 4 \times 7 = 6(3+4+7)$]. Use a for-end loop in the program. The loop should start from 100 and end at 999.

SCRIPT:

```
% Question#7 clear
all,clc for n=100:999
x=fix(n/100);
v=fix((n-100*x)/10);
u=n-x*100-v*10;
multi=x*v*u;
add=6*(x+v+u);  if
multi == add  n  end
end
```

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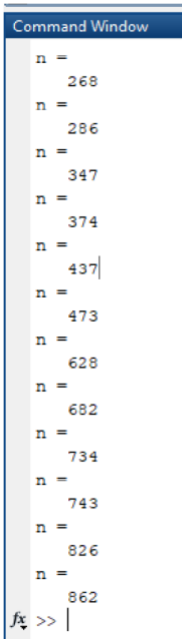
COMMAND WINDOW:



Question 08

Body mass index (*BMI*) is a measure of obesity. In standard units, it is calculated by the formula

$$BMI = 703\frac{W}{H^2}$$

where W is weight in pounds, and H is height in inches. The obesity classification is:

BMI	Classification
Below 18.5	Underweight
18.5 to 24.9	Normal
25 to 29.9	Overweight
30 and above	Obese

Write a program in a script file that calculates the *BMI* of a person. The program asks the person to enter his or her weight (lb) and height (in.). The program displays the result in a sentence that reads: "Your BMI value is XXX, which classifies you as SSSS," where XXX is the BMI value rounded to the nearest tenth, and SSSS is the corresponding classification. Use the program for determining the obesity of the following two individuals:

(*a*) A person 6 ft 2 in. tall with a weight of 180 lb.

(*b*) A person 5 ft 1 in. tall with a weight of 150 lb.

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SCRIPT:

```
% Question#8 clear
all,clc
W=input('Enter your weight in lb: ');
H=input('Enter your height in inches: ');
BMI=round(703*W/H^2,1); if
BMI<18.5
A='Underweight';
elseif (BMI>=18.5) & (BMI<=24.9)
A='Normal'; elseif (BMI>=25) &
(BMI<=29.9)
    A='Overweight'; elseif BMI>=30      A='Obese'; end fprintf('Your BMI
value is %0.1f , Which classifies you as %s \n',BMI,A)
```

COMMAND WINDOW:

a)

```
Command Window
  Enter your weight in lb: 180
  Enter your height in inches: 6*12+2
  Your BMI value is 23.1 , Which classifies you as Normal
fx >>
```

b)

```
Command Window
  Enter your weight in lb: 150
  Enter your height in inches: 5*12+1
  Your BMI value is 28.3 , Which classifies you as Overweight
fx >>
```

Question 09

Write a program in a script file that calculates the cost of renting a car according to the following price schedule:

Duration of rent	Sedan			SUV		
	Daily rate	Free miles (per day)	Cost of additional mile	Daily rate	Free miles (per day)	Cost of additional mile
1-6 days	$79	80	$0.69	$84	80	$0.74
7-29 days	$69	100	$0.59	$74	100	$0.64
30 or more days	$59	120	$0.49	$64	120	$0.54

The program asks the user to enter the type of car (sedan or SUV), the number of days, and the number of miles driven. The program then displays the cost (rounded to cents) for the rent. Run the program three times for the following cases:
(*a*) Sedan, 10 days, 769 miles. (*b*) SUV, 32 days, 4,056 miles.
(*c*) Sedan, 3 days, 511 miles.

SCRIPT:

```
% Question#9 clear
all,clc
Car=input('Enter the type of car (Sedan or SUV): ','s');;
```

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```
N=input('Enter the Number of days: ');
M=input('Enter the Number of miles driven: ');
switch Car      case 'Sedan'          if (N<=6)
& (M<=80*N)              Cost=79*N;
elseif (N<=6) & (M>80*N)
Cost=79*N+(M-80*N)*0.69;          elseif (N>=7)
& (N<=29) & (M<=100*N)              Cost=69*N;
elseif (N>=7) & (N<=29) & (M>100*N)
Cost=69*N+(M-100*N)*0.59;          elseif
(N>=30) & (M<=120*N)              Cost=59*N;
elseif (N>=30) & (M>120*N)
Cost=59*N+(M-120*N)*0.49;          end     case
'SUV'
        if (N<=6) & (M<=80*N)              Cost=84*N;
elseif (N<=6) & (M>80*N)              Cost=84*N+(M-
80*N)*0.74;          elseif (N>=7) & (N<=29) &
(M<=100*N)              Cost=74*N;          elseif (N>=7)
& (N<=29) & (M>100*N)              Cost=74*N+(M-
100*N)*0.64;          elseif (N>=30) & (M<=120*N)
Cost=64*N;          elseif (N>=30) & (M>120*N)
Cost=64*N+(M-120*N)*0.54;          end end fprintf('The
cost of renting a car is %0.2f$. \n',Cost)
```

COMMAND WINDOW:

A)

```
Command Window
Enter the type of car (Sedan or SUV): Sedan
Enter the Number of days: 10
Enter the Number of miles driven: 769
The cost of renting a car is 690.00$.
```

B)

```
Command Window
Enter the type of car (Sedan or SUV): SUV
Enter the Number of days: 32
Enter the Number of miles driven: 4056
The cost of renting a car is 2164.64$.
```

C)

```
Command Window
Enter the type of car (Sedan or SUV): Sedan
Enter the Number of days: 3
Enter the Number of miles driven: 511
The cost of renting a car is 423.99$.
```

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Question 10

Write a program in a script file that converts a measure of area given in units of either m^2, cm^2, in^2, ft^2, yd^2, or acre to the equivalent quantity in different units specified by the user. The program asks the user to enter a numerical value for the size of an area, its current units, and the desired new units. The output is the size of the area in the new units. Use the program to:

(*a*) Convert 55 $in.^2$ to cm^2. (*b*) Convert 2400 ft^2 to m^2.

(*c*) Convert 300 cm^2 to yd^2.

SCRIPT:

```
% Question#10 clear
all,clc
n=input('numerical value for the size of area:');
units=input('Enter the current units(sqm, sqcm, sqin, sqft or sqyd):','s');
a=input('Enter the units to be converted (sqm, sqcm, sqin, sqft or
sqyd):','s'); switch units  case 'sqm'  Asqm=n;  case 'sqcm'  Asqm=1E-4*n;
case 'sqin'
 Asqm=(1/1550.0031)*n;  case
'sqft'  Asqm=(1/10.7639)*n;
case 'sqyd'
Asqm=(1/1.19599)*n; end
switch a  case 'sqm'
sqm=Asqm;  fprintf('%3.3f
sqm\n',sqm)  case 'sqcm'
sqcm=1E4*Asqm;  fprintf('%3.3f
sqcm\n',sqcm)  case 'sqin'
sqin=1550.0031*Asqm;
fprintf('%3.3f sqin\n',sqin)
case 'sqft'
sqft=10.7639*Asqm;
fprintf('%3.3f sqft\n',sqft)
case 'sqyd'
sqyd=1.19599*Asqm;
fprintf('%3.4f sqyd\n',sqyd)
end
```

COMMAND WINDOW:

A)

```
Command Window
numerical value for the size of area:55
Enter the current units(sqm, sqcm, sqin, sqft or sqyd):sqin
Enter the units to be converted (sqm, sqcm, sqin, sqft or sqyd):sqcm
354.838 sqcm
```

B)

```
Command Window
numerical value for the size of area:2400
Enter the current units(sqm, sqcm, sqin, sqft or sqyd):sqft
Enter the units to be converted (sqm, sqcm, sqin, sqft or sqyd):sqm
222.968 sqm
```

C)

```
Command Window
numerical value for the size of area:300
Enter the current units(sqm, sqcm, sqin, sqft or sqyd):sqcm
Enter the units to be converted (sqm, sqcm, sqin, sqft or sqyd):sqyd
0.0359 sqyd
```

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