MATLAB/Exercise-1

$$\mathbf{A} = \begin{bmatrix} 1 & 3 & 5 \\ 7 & 8 & 11 \\ 100 & 1 & 4 \end{bmatrix}$$

Do the operations given below on command window

1) Enter matrix A
2) Compute the determinant of A
3) Compute the inverse of A and assign the answer to matrix B.
4) Compute A*B. Review the solution.
5) Assign a1 as first column of A; assign a3 as third column of A.
6) Create a diagonal matrices namely C, which will be generated from diagonal elements of A.
7) Multiply transpose of a1 with a3.
8) Multiply a1 and a3 element by element.
9) Change the third row of A as [5 6 7] without re-entered the other elements.
10) Delete the first and second rows of A.

MATLAB/Exercise-1: Solution

```
1  >> A=[1 3 5;7 8 11;100 1 4];
2  >> det(A)
   ans =
     -728
3  >> B=inv(A)
   B =

      -0.0288    0.0096    0.0096
      -1.4725    0.6813   -0.0330
       1.0893   -0.4107    0.0179
   >> A*B
4  ans =

       1.0000         0    0.0000
            0    1.0000    0.0000
            0    0.0000    1.0000

   >>a1=A(:,1);a3=A(:,3);
5  >>C=diag(diag(A));
6  >>a1'*a3
7  ans=
      482
```

Identity Matrix

```
8  >> a1.*a3
   ans=
        5
       77
      400

9  >>A(3,:)=[5 6 7]
   A =

        1     3     5
        7     8    11
        5     6     7

10 >> A([1 2],:)=[]
   A =

        5     6     7
   >>
```

MATLAB/Exercise-2

$$\mathbf{B} = \begin{bmatrix} 10 & 5 & 5 \\ 70 & 8 & 7 \\ 10 & 1 & 3 \end{bmatrix}$$

Do the operations given below on command window.

1) Enter matrices B.
2) Save matrices B to the current folder with the name of « **katsayilar**»
3) Check whether saved or not. (from 'Open Files' window)
4) Delete all variables in MATLAB workspace (clear)
5) Delete all statements in Command window (clc)
6) Do the operation: B*2
7) Recall matrices B.
8) Create upper and lower triangle matrices of B
9) **Do the operation: C=[B zeros(3,2)]**

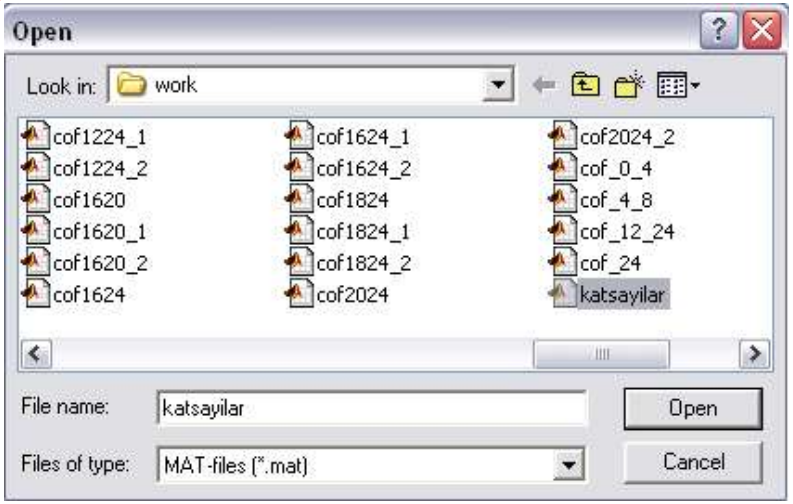
MATLAB/Exercise-2: Solution

```
1  >> B=[10 5 5;70 8 7;10 1 3];
2  >> save katsayilar B

4  >> clear

5  >> clc
```

```
6  >> B*2
   ??? Undefined function or variable 'B'.

7  >> load katsayilar
8  >> triu(B)
ans =
    10     5     5
     0     8     7
     0     0     3
>>tril(B)
ans =

    10     0     0
    70     8     0
    10     1     3
```

WHY?

3



9

```
>> C=[B zeros(3,2)]
C =

    10     5     5     0     0
    70     8     7     0     0
    10     1     3     0     0
```

MATLAB/Exercise-3

1. **Create two different vectors of the same length and add them.**
2. **Now subtract them.**
3. **Perform element-by-element multiplication on them.**
4. **Perform element-by-element division on them.**
5. **Raise one of the vectors to the second power.**
6. **Create a 3 × 3 matrix and display the first row of and the second column on the screen.**

MATLAB/Exercise-3: Solution

```
>> a = [5, 6, 3]; b = [4 7 1];
```

```
1. >> c=a+b
c =
    9   13    4
2. >> c=a-b
c =
    1   -1    2
3. >> c=a.*b
c =
   20   42    3
```

```
4. >> c=a./b
c =
    1.2500    0.8571    3.0000
```

```
5. >> c=a.^2
c =
   25   36    9
```

```
6. >> e=[5 8 4; 8 7 6; 9 4 1]
e =
    5    8    4
    8    7    6
    9    4    1
```

```
>> e(1,:)
ans =
    5    8    4
```

```
>> e(:,2)
ans =
    8
    7
    4
```

MATLAB/Exercise-4

- **Create a vector:**

>> a=[4 25 45 21 25 77 95 22 78 44]

- **Find minimum value in a, and name it as M**
- **Find maximum value in a, and name it as N**
- **Define a vector, named as B shows M and N**
- **Find average of B and named as D**
- **Find average of a and named as T**
- **Subtract them and named as O**

MATLAB/Exercise-4: Solution

- **>> M=min(a)** **M = 4**
- **>> N=max(a)** **N = 95**
- **>> B=[M N]** **B = 4 95**
- **>> D=mean(B)** **D = 49.5000**
- **>> T=mean(a)** **T = 43.6000**
- **>> O=D-T** **O = 5.9000**

MATLAB/Exercise-5

Do the operations in command window:

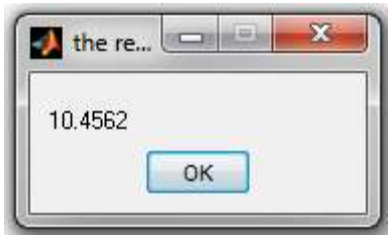
1. Using fprintf function, present a=10.45623 with 3 decimals
2. Present the expression: [‘the value=‘ a], with 2 decimals for a.
3. Assign above expression to a variable namely b. (sprintf)
4. Check whether b is string or not.
5. With 5 space and 2 decimals, present the a.
6. For a; use msgbox(a,’result’) to write it on GUI
7. For b; msgbox(b,’result’) to write it on GUI
8. Assign root of a to c. b and [‘root of result’, c] should be top and down; and (c with 5 decimals) write them in msgbox

msgbox(message,title) **Message is a string vector, string matrix or cell array.**

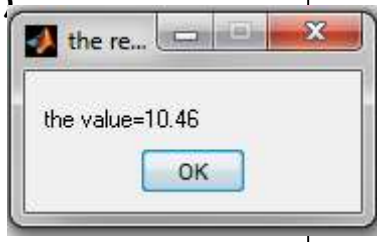
MATLAB/Exercise-5: Solution

```
① >> a=10.45623;fprintf('%1.3f',a)
  10.456
  >>
② >>fprintf('the value=%1.2f',a)
  the value=10.46
  >>
③ >>b=sprintf('the value= %1.2f',a)
  b =
  the value=10.46

④ >>ischar(b)
  ans=
      1
⑤ >>fprintf('%10.2f',a)
       10.46
⑥ >>msgbox(num2str(a),'the result')
```

5 blank+5 character




```
⑦ >> msgbox(b,'the result')
  >>
⑧ >>c=sqrt(a)
  c =

      3.2336
  >>b1=sprintf('root of
  result=%1.5f',c);
  >>g=char(b,b1);
  >>msgbox(g,'the result')
```



PS: Another way of writing b and b1 top and down is to consider them in a cell array;

```
G=cell(2,1);G{1}=b;G{2}=b1;
msgbox(G,'the result')
```

MATLAB/Exercise-6

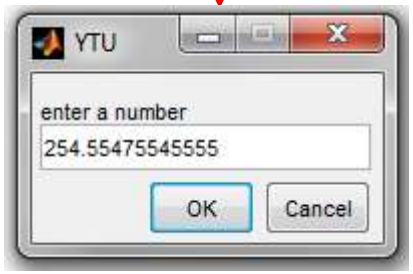
Do the operations in command window:

1. Type the command using inputdlg function for a numerical value (namely, a), which will be used for the next steps.
2. Check a whether it is numerical value or not.
3. Do a*2. Review the result you obtained.
4. Change a into numerical array if necessary.

inputdlg('prompt','name')

MATLAB/Exercise-7: Solution

1
```
>> a=inputdlg('enter a number','YTU')
```




```
a =

    '254.55475545555'
```

inputdlg creates cell array of string.
The input value must be convert to numeric for this example

2
```
>>isnumeric(a)
ans =
     0
```

3
```
>>a*2
>>?? Error using ==> *
Undefined function 'mtimes' for input arguments of type
cell'.
```

4
```
>>a=str2num(char(a))
>>
a =

  254.5548
```

MATLAB/Exercise-8

- Find the result for the sum of two numbers entered from keyboard and displaying the result in 3 decimals with an expression “the sum is found as …….“

```
clear
clc
% finding sum of two numbers
A=input(‘enter the first number= ');
B=input(‘enter the second number= ');
sum2=A+B;
fprintf(‘the sum is found as %1.3f \n',sum2)
```

MATLAB/Exercise-9

- Find the result of factorial N entered from keyboard and displaying the result in 3 decimals with an expression “the result is found as …….“

```
clear,clc
        N=input(‘enter a number=');
        factorial=1; % count
        for i=1:N
            factorial=factorial*i;
        end
        factorial
fprintf(‘the result is found as %d \n',factorial)
```

N!=N*(N-1)!

MATLAB/Exercise-10

- According to N entered from keyboard;
  - Find the sum the integers from 1 to N
  - Find the sum of the odd numbers from 1 to N
  - Find the sum of the even numbers from 1 to N.

```
clear
clc
% sum of the numbers from 1 to N (T1)
% sum of the odd numbers from 1 to N (T2)
% sum of the even numbers from 1 to N (T3)

N=input(‘ enter the upper number N= ');
T1=0;T2=0;T3=0;
for i=1:N
    T1=T1+i;
end
for j=1:2:N
    T2=T2+j;
end
for k=2:2:N
    T3=T3+k;
end
fprintf(‘Sum of the numbers from 1 to %d = %d \n',N,T1)
fprintf(‘Sum of the odd numbers from 1 to %d = %d \n',N,T2)
fprintf(‘Sum of the even numbers from 1 to %d = %d \n',N,T3)
```

MATLAB/Exercise-11

- Write a program, which displays containing how many a in a text
- a=how many a are there in a text

```
clear
clc
a='how many a are there in a text';
s=0;
for i=1:1:length(a)
    if a(i)=='a'
        s=s+1;
    end
end
s
```

MATLAB/Exercise-12

- Create elements of matrix A using input function and for end loop.

```
clear
clc
m=input('Enter number of rows for matrix A= ');
n=input('Enter number of columns for matrix A= ');
for i=1:m
    for j=1:n
        fprintf('Enter the matrix A %d,%d.th element:',i,j)
        A(i,j)=input('');
    end
end
A
```

MATLAB/Exercise-13

Prepare a program for determining the quadrant of the azimuth angle (P1P2) after entering the coordinates of Point 1 and Point 2. After running the program, the related quadrant should be seen in a message box (msgbox)

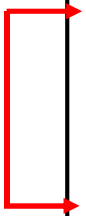
Solution

```
clear
clc
X1=input('X1=');Y1=input('Y1=');
X2=input('X2=');Y2=input('Y2=');
DX=X2-X1;DY=Y2-Y1;
if (DX>0) & (DY>0)
    a='Angle is in the first quadrant';
end

if (DX<0) & (DY>0)
    a='Angle is in the second quadrant';
end

if (DX<0) & (DY<0)
    a='Angle is in the third quadrant';
end

if (DX>0) & (DY<0)
    a='Angle is in the forth quadrant';
end

msgbox(a,'Quadrant?')
```

MATLAB/Exercise-14

Prepare a program for computing the azimuth angle (P1P2) after entering the coordinates of Point 1 and Point 2.

Solution




```
clear
clc
X1=input('X1=');Y1=input('Y1=');
X2=input('X2=');Y2=input('Y2=');
DX=X2-X1;DY=Y2-Y1;

if (DX~=0)&(DY~=0),a=atan(DY/DX);a=a*200/pi;
  if (DX>0)&(DY>0),a=a;end
  if (DX<0)&(DY>0),a=a+200;end
  if (DX<0)&(DY<0),a=a+200;end
  if (DX>0)&(DY<0),a=a+400;end
end

if (DX==0)&(DY>0),a=100;end
if (DX==0)&(DY<0),a=300;end
if (DX>=0)&(DY==0),a=0;end
if (DX<0)&(DY==0),a=200;end
a
%or output a, can be written as follow.
fprintf('(1-2) azimuth angle= %1.5f grad \n',a)
```

MATLAB/Exercise-15

Prepare a program for computing the azimuth angle (P1P2) and horizontal distance between two points (S) after entering the coordinates of Point 1 and Point 2.

Solution

External Condition

```
clear
clc
X1=input('X1=');Y1=input('Y1=');
X2=input('X2=');Y2=input('Y2=');
DX=X2-X1;DY=Y2-Y1;

if (DX~=0)&(DY~=0),a=atan(DY/DX);a=a*200/pi;
  if (DX>0)&(DY>0),a=a;end
  if (DX<0)&(DY>0),a=a+200;end
  if (DX<0)&(DY<0),a=a+200;end
  if (DX>0)&(DY<0),a=a+400;end
end

if (DX==0)&(DY>0),a=100;end
if (DX==0)&(DY<0),a=300;end
if (DX>=0)&(DY==0),a=0;end
if (DX<0)&(DY==0),a=200;end

S=sqrt(DX^2+DY^2);% length

fprintf('(1-2) azimuth angle= %1.5f grad \n' ,a)
fprintf('(1-2) side= %1.3f m',S)
```

MATLAB/Exercise-16

- **Prepare a program, if the user selects option 1, then direct the user to the YTU web site, otherwise direct the user to any web site you prefer.**

Solution

```
clear
clc
disp('[1]...YTU web sayfasi')
disp('[2]…Bahattin Erdogan web sayfasi')
a=input('<Selection>=');

while (a>2)|(a<=0)
    a=input('Please enter correct to the option number');
end


if a==1
    web www.yildiz.edu.tr -browser
end
if a==2
    web www.yildiz.edu.tr/~berdogan -browser
end
```

Exercise-17

Write a Matlab code as a function which converts the arc length given on sphere as degree into arc length in meter.

yaykenari.m

```
1   function [S] = yaykenari(aci,R,ro)
2   %[S] = yaykenari(aci,R,ro)
3   %This function computes the arc length
4   % aci describes the angle value to be computed
5   % R is the radius of sphere
6   % ro can be either 180/pi or 200/pi
7
8   S=aci/ro*R;
9
10
11  end
12
```

Exercise-18

Write a Matlab code as function file, which computes the hypotenuse and area of a right triangle by legs.

hipoalan.m

```
function [ hipo,alan ] = hipoalan( a,b )
%This function computes hypotenuse and area
%in a right triangle
%if the legs are given

hipo=sqrt(a^2+b^2);
alan=a*b/2;

 end

```

Exercise-19

In a class, the total number of the students is 20 and, the distribution of ages of these students is classified in 18, 19 and 20. Write a Matlab code for entering the ages of the students from keyboard, compute how many students there are in each classified groups and represent the results in bar plot.

```
clear, clc
count18=0;count19=0;count20=0;
stud_no=20;
count=0;
while count<stud_no
    stucount=input('Enter the age of student: ');
    if stucount==18
        count18=count18+1;
    end
    if stucount==19
        count19=count19+1;
    end
    if stucount==20
        count20=count20+1;
    end
    count=count+1;
    disp([num2str(count) 'Student input is done'])
end

bar([18 19 20],[count18 count19 count20])
xlabel('Students Ages')
ylabel('Total Student Number')

```

Exercise-20

15 observations of a side are given below in kenar.txt file.
Write a Matlab code to ensure the following items:

- Find the mean value of these observations
- Find the differences of each observations from mean value (residuals)
- Compute the standard deviation of observations
- Remove the observations if there is a deviation from |residual|>3*standard deviation
- Write the remaining observations to a new file, namely ‘temizolcu.txt’

Observation

15.538
16.834
12.741
15.862
15.319
13.692
14.566
15.343
18.578
17.769
13.650
18.035
25.725
14.937
15.715

Residual=mean – observation

Standard deviation=([residual^2]/(number of observation-1))$^{(1/2)}$

Exercise-20: Solution

hatali.m

```
clear
clc
a=textread('kenar.txt','%f','headerlines',1); %data are read by textread function
orta=mean(a); %by mean function, the mean value of observations are computed

for i=1:length(a)    % residuals computed by for loop
    duzeltme(i,1)=orta-a(i);
end
stan=sqrt(duzeltme'*duzeltme/(length(a)-1)); %standard deviation of obsevations computed

hata=0;
artim=0;
for i=1:length(duzeltme)  %observations, whose residuals are bigger than residuals are computed
    if abs(duzeltme(i))>3*stan
        artim=artim+1;
        hata(artim)=i;
    end
end

hata=sort(hata)
for i=1:artim  % remove errorneous observations
    a(hata(artim+1-i),:)=[];
end
        veri=fopen('temizolcu.txt','w+') % error-free observations are written
        fprintf(veri,'%1.3f\n',a)
        fclose(veri)
```

Exercise-21

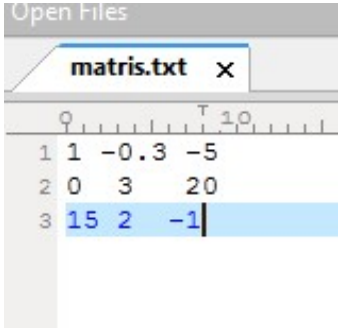
A function, f(x,y), with two variables are defined below. Write a Matlab code, which computes the results by entering x and y values from keyboard.

$$f(x,y)=\begin{cases}\frac{x}{y} & x\geq 0\ \&\ y\geq 0\\ \frac{x}{5}+y & x\geq 0\ \&\ y<0\\ x+\frac{y}{5} & x<0\ \&\ y\geq 0\\ \frac{x}{5}+\frac{y}{5} & x<0\ \&\ y<0\end{cases}$$

```
clear
clc
x=input('Enter x= ');
y=input('Enter y= ');
if x>=0 & y>=0
    f=x/y;
elseif x>=0 & y<0
    f=x/5+y;
elseif x<0 & y>=0
    f=x+y/5;
elseif x<0 & y<0
    f=x/5+y/5;
end
fprintf('According to %1.4f and %1.4f,the value of function is %1.4f.\n',x,y,f)
```

Exercise-22

Write a matlab code that represents the number of positive and negative elements of a matrices or vector stored in a matris.txt file.




```
1 -   clear
2 -   clc
3 -   veri=fopen('matris.txt','r+');
4 -   a=fscanf(veri,'%f',[3 3]);
5 -   fclose(veri);
6 -   [nsatir, nsutun]=size(a);
7 -   pozitif=0;
8 -   negatif=0;
9 -   for i=1:nsatir
10 -      for j=1:nsutun
11 -          if a(i,j)<0
12 -              negatif=negatif+1;
13 -          else
14 -              pozitif=pozitif+1;
15 -          end
16 -      end
17 -  end
18
```