Examples

1)Generate the following table using the "for loop".

$$\begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ \text{.....} \\ 20 \end{bmatrix}$$

Solution

```
for kk=1:20,
   qq(kk)=[kk];
end;
qq
```

2)Generate the following table using the "for loop"

$$\begin{bmatrix} 1 & 1 \\ 2 & 4 \\ 3 & 9 \\ 4 & 16 \\ \text{.....} & \\ 20 & 400 \end{bmatrix}$$

Solution

```
for kk=1:20,
   qq(kk,:)=[kk kk^2];
end;
qq
```

3)Generate the following table using the "for loop".

$$\begin{bmatrix} 1 & 1 & 1 \\ 2 & 4 & 8 \\ 3 & 9 & 27 \\ 4 & 16 & 64 \\ \text{.....} & & \\ 20 & 400 & 8000 \end{bmatrix}$$

Solution

```
for kk=1:20,
   qq(kk,:)=[kk kk^2  kk^3];
end;
qq
```

4)Generate the following table using the "for loop".

$$\begin{bmatrix} 0 & 0 \\ 5 & 25 \\ 10 & 100 \\ 15 & 225 \\ \text{.....} & \\ 50 & 2500 \end{bmatrix}$$

Solution

```
inx=0;
for kk=0:5:50,
   inx=inx+1;
   qq(inx,:)=[kk kk^2];
end;
qq
```

5) The voltage across a discharging capacitor is

$$v(t) = 10(1 - e^{-0.2t})$$

Generate a table of voltage, v(t), versus time, t, for t = 0 to 50 seconds with increment of 5 s.

```
inx=0;
for t=0:5:50,
   vt=10*(1-exp(-0.2*t));
   inx=inx+1;
   qq(inx,:)=[t  vt];
end;
qq
```

For loop

445)Write a MATLAB code to construct the following table.

a	a^2	a^3	a^4	a^5
0				
1				
2				
3				
4				
..				
9				

451)write MATLAB code to obtain matrix P1. Use the commands ones, zeros, eye a:b etc. Use for loop. Do not write matrices by typing all numbers. For example to obtain P1

$$P1=\begin{bmatrix}1&0&0&0\\0&2&0&0\\0&0&3&0\\0&0&0&4\end{bmatrix}$$

>>a) aa=zeros(4,4); for kk=1:4, aa(kk,kk)=kk; end;
>>b)P1=[1 0 0 0; 0 2 0 0; 0 0 3 0; 0 0 0 4;];
Both are correct but b) is **not acceptable**. Required answer is a)

452)write MATLAB code to obtain the following matrices.

$$aa=\begin{bmatrix}1&2&3&4&5\\1&4&9&16&25\\1&2^3&3^3&4^3&5^3\\\ldots\ldots\ldots&.&&&\\1&2^6&3^6&4^6&5^6\\&&&&\end{bmatrix},$$

$$bb=\begin{bmatrix}1&2&3&4&5&\ldots\ldots\ldots&20\\1&4&9&16&25&\ldots\ldots.&400\\1&2^3&3^3&4^3&5^3&&8000\\\ldots\ldots\ldots&\ldots\ldots\ldots&\ldots\ldots\ldots&\ldots\ldots\ldots&\ldots\ldots&&\\1&2^9&3^9&4^9&5^9&&20^9\\&&&&&&\end{bmatrix},$$

$$cc=\begin{bmatrix}1&0&0&0&0&0\\0&2^2&0&0&0&0\\0&0&3^2&0&0&0\\0&0&0&4^2&0&0\end{bmatrix}$$

Hint to make cc, obtain the matrix

$$qq=\begin{bmatrix}1&0&0&0\\0&2&0&0\\0&0&3&0\\0&0&0&4\end{bmatrix}$$ and cc=[qq•^2 zeros(4,2)]

Or obtain the matrix $rr=\begin{bmatrix}1&0&0&0\\0&2^2&0&0\\0&0&3^2&0\\0&0&0&4^2\end{bmatrix}$ using for loop, and cc=[rr zeros(,)].

453)write MATLAB code to obtain the following matrices. The matrices are 5x5. write your code so that you can obtain 100x100 matrix at the same style.

$$a=\begin{bmatrix}0&0&0&0&1\\0&0&0&1&0\\0&0&1&0&0\\0&1&0&0&0\\1&0&0&0&0\end{bmatrix},\quad b=\begin{bmatrix}0&0&0&0&1\\0&0&0&2&0\\0&0&3&0&0\\0&4&0&0&0\\5&0&0&0&0\end{bmatrix},$$

$$c=\begin{bmatrix}0&0&0&0&-1\\0&0&0&1&0\\0&0&-1&0&0\\0&1&0&0&0\\-1&0&0&0&0\end{bmatrix},\quad d=\begin{bmatrix}0&0&0&0&1\\0&0&0&-1&0\\0&0&1&0&0\\0&-1&0&0&0\\1&0&0&0&0\end{bmatrix},$$

$$e=\begin{bmatrix}0&0&1&0&0\\0&0&-1&0&0\\0&0&1&0&0\\0&0&-1&0&0\\0&0&1&0&0\end{bmatrix},$$

$$f=\begin{bmatrix}1&0&0&0&1\\0&1&0&1&0\\0&0&1&0&0\\0&1&0&1&0\\1&0&0&0&1\end{bmatrix},\quad g=\begin{bmatrix}1&0&0&0&1\\0&2&0&2&0\\0&0&3&0&0\\0&4&0&4&0\\5&0&0&0&5\end{bmatrix},$$

$$h=\begin{bmatrix}1&0&0&0&1\\0&-1&0&-1&0\\0&0&1&0&0\\0&-1&0&-1&0\\1&0&0&0&0\end{bmatrix},\quad j=\begin{bmatrix}0&0&1&0&0\\0&0&1&0&0\\1&1&1&1&1\\0&0&1&0&0\\0&0&1&0&0\end{bmatrix},$$

452)write MATLAB code to obtain the following matrices. Examine the diagonals.

$$Q1=\begin{bmatrix} 0 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 \end{bmatrix}, \quad Q2=\begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{bmatrix},$$

$$Q3=\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 2 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 \\ 1 & 1 & 1 & 4 & 1 \\ 1 & 1 & 1 & 1 & 5 \end{bmatrix}, \quad Q4=\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 2 & 1 & 2 & 1 \\ 1 & 1 & 3 & 1 & 1 \\ 1 & 4 & 1 & 4 & 1 \\ 5 & 1 & 1 & 1 & 5 \end{bmatrix}$$

$$Q5=\begin{bmatrix} 1 & 1 & 1 & 1 & 5 \\ 1 & 2 & 1 & 4 & 1 \\ 1 & 1 & 3 & 1 & 1 \\ 1 & 2 & 1 & 4 & 1 \\ 1 & 1 & 1 & 1 & 5 \end{bmatrix},$$

$$Q6=\begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \end{bmatrix},$$

$$Q7=\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix},$$

$$Q8=\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \end{bmatrix}, \quad Q9=$$

$$\begin{bmatrix} 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \end{bmatrix},$$

Sample solutions

```
%331 F)
f1=[ ones(2,5)*8    zeros(2,3) ],
f2=[ eye(3)   2*ones(3,3)  3*ones(3,2) ],
ff=[   [ f1;  f2; ]    8*ones(5,2);    9*ones(2,10)   ]


%331 G
g=zeros(9,11),   g(5:7,5:7)=1

%K
kk=[zeros(13,13)];
kk(3:5,3:11)=1
kk(6:11,6:8)=1


%342
a=0; qq=[ 2  3; 9 a]; bb=[8;  20],
xy_solution=inv(qq)*bb,   xy_table(1,:)=[a
xy_solution' ]
a=1; qq=[ 2  3; 9 a]; bb=[8;  20],
xy_solution=inv(qq)*bb,   xy_table(2,:)=[a
xy_solution' ]
```

```
a=2; qq=[ 2  3; 9 a]; bb=[8;  20],
xy_solution=inv(qq)*bb,   xy_table(3,:)=[a
xy_solution' ]
a=3; qq=[ 2  3; 9 a]; bb=[8;  20],
xy_solution=inv(qq)*bb,   xy_table(4,:)=[a
xy_solution' ]
a=4; qq=[ 2  3; 9 a]; bb=[8;  20],
xy_solution=inv(qq)*bb,   xy_table(5,:)=[a
xy_solution' ]

%351.a
w=[0:4],   x=j*w,  qq=x.^2+1,  table=[w; x;  qq]

%351.b
w=[0:4]',   x=j*w,  qq=x.^2+1,  table=[w, x  qq]

%412b
xcoor1=[ 6   10  10   6  6],  ycoor1=[ 5   5  21  21
5],
xcoor2=[ 7   9   9  7   7  ],   ycoor2=[ 10   10  18
18  10 ],
plot(xcoor1,ycoor1,xcoor2,ycoor2)
axis([-1   15   -1   25])


%413c
xcoor1=[ -5   7    7   -5   -5  7],  ycoor1=[ -5   -5
10    10   -5   10],
xcoor2=[ -5   7 ],   ycoor2=[10   -5  ],
plot(xcoor1,ycoor1,xcoor2,ycoor2)
axis([-10   15   -10   25])

clear all; close all;
%415
t=linspace(0,20,1000); x=sin(t);
ii=x<0; x(ii)=0;
plot(t,x);
axis([-1   30   -2   2])


%420a
x1=10; y1=15; r1=7;
xcoor1=linspace(x1-r1,  x1+r1, 100);
yy=sqrt(r1^2-(x1-xcoor1).^2 );
ycoor1=abs(yy)+y1;
ycoor2=-abs(yy)+y1;
plot(xcoor1,ycoor1,xcoor1,ycoor2)
axis([0   30   -0   30])

clear all close all
%422c
x1=10,  y1=15,  r1=8
xcoor1=linspace(x1-r1,  x1+r1, 100);
yy=sqrt(r1^2-(x1-xcoor1).^2 );
ycoor1=abs(yy)+y1;
ycoor2=-abs(yy)+y1;
xcoor3=[x1-r1  x1+r1]; ycoor3=[y1  y1];
xcoor4=[x1  x1]; ycoor4=[y1-r1  y1+r1];

plot(xcoor1,ycoor1,xcoor1,ycoor2,xcoor3,ycoor3,
xcoor4,ycoor4)
axis([0   30   -0   30])



%424a
x1=10,  y1=15,  r1=8
xcoor1=linspace(x1-r1,  x1+r1, 100);
yy=sqrt(r1^2-(x1-xcoor1).^2 );
ycoor1=abs(yy)+y1;
ycoor2=-abs(yy)+y1;
xcoor3=[x1-r1  x1+r1]; ycoor3=[y1  y1];
xcoor4=[x1  x1]; ycoor4=[y1-r1  y1+r1];

%calculation of the points.
px1=x1+r1;   px2=x1+r1*cos(pi/3);
px3=x1+r1*cos(2*pi/3);   px4=x1-r1;   px5=px3;
px6=px2;
py1=y1;  py2=y1+r1*sin(pi/3);    py3=py2;
py4=y1;   py5= y1-r1*sin(pi/3);   py6=py5;

xcoor11=[x1  px1];  ycoor11=[y1   py1];
xcoor12=[x1  px2];  ycoor12=[y1   py2];
xcoor13=[x1  px3];  ycoor13=[y1   py3];
xcoor14=[x1  px4];  ycoor14=[y1   py4];
xcoor15=[x1  px5];  ycoor15=[y1   py5];
xcoor16=[x1  px6];  ycoor16=[y1   py6];

plot(xcoor1,ycoor1,xcoor1,ycoor2,xcoor3,ycoor3,
xcoor4,ycoor4, ...

xcoor11,ycoor11,xcoor12,ycoor12,xcoor13,ycoor
13,xcoor14,ycoor14, ...
    xcoor15,ycoor15,xcoor16,ycoor16)
axis([0   30   -0   30])
```

```
%453a
aa=zeros(5,5);
for kk=1:5,   aa(kk,6-kk)=1; end;
aa


%453b
aa=zeros(5,5);
for kk=1:5,   aa(kk,6-kk)=kk; end;
aa

%453c
aa=zeros(5,5);
for kk=1:5,   aa(kk,6-kk)=(-1)^kk; end;
aa


%453d
aa=zeros(5,5);
for kk=1:5,   aa(kk,6-kk)=-(-1)^kk; end;
aa
```