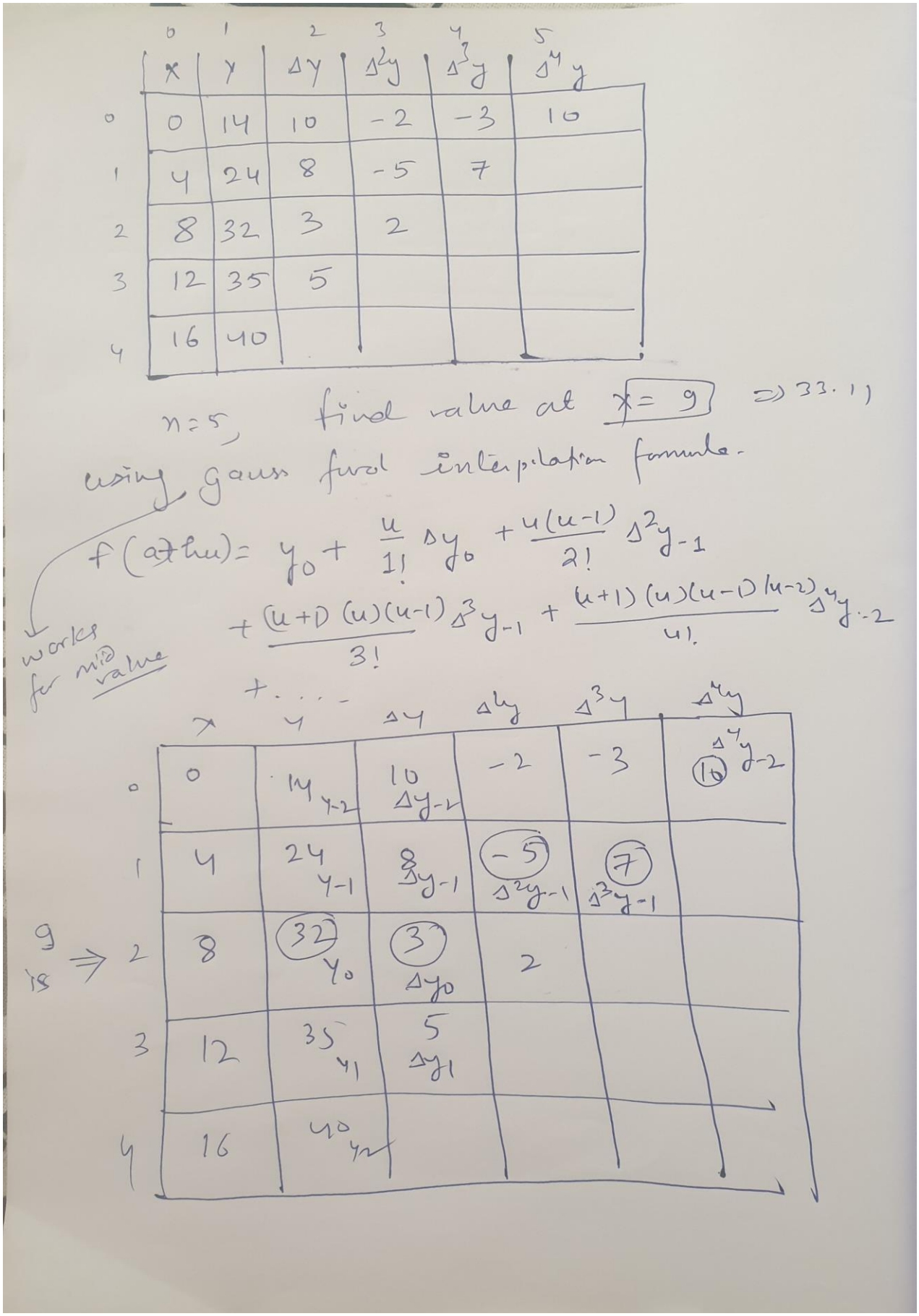
Gauss forward interpolation formula implementation



	0	1	2	3	4	5
	x	y	Δy	$\Delta^2 y$	$\Delta^3 y$	$\Delta^4 y$
0	0	14	10	-2	-3	10
1	4	24	8	-5	7	
2	8	32	3	2		
3	12	35	5			
4	16	40				

$n=5$, find value at $x=9$ $\Rightarrow 33.1$

using Gauss forward interpolation formula.

works for mid value

$$f(a+hu) = y_0 + \frac{u}{1!}\Delta y_0 + \frac{u(u-1)}{2!}\Delta^2 y_{-1} + \frac{(u+1)(u)(u-1)}{3!}\Delta^3 y_{-1} + \frac{(u+1)(u)(u-1)(u-2)}{4!}\Delta^4 y_{-2} + \dots$$

	x	y	Δy	$\Delta^2 y$	$\Delta^3 y$	$\Delta^4 y$
0	0	14 y_{-2}	10 Δy_{-2}	-2	-3	10 $\Delta^4 y_{-2}$
1	4	24 y_{-1}	8 Δy_{-1}	-5 $\Delta^2 y_{-1}$	7 $\Delta^3 y_{-1}$	
2 ⇒ 9 is	8	32 y_0	3 Δy_0	2		
3	12	35 y_1	5 Δy_1			
4	16	40 y_2				

```
#include <stdio.h>
#include <math.h>
int main()
{
   float a[10][10],x,u1,u,y;
   int i,j,n,n1,fact=1;
   printf("enter the n\n");
   scanf("%d",&n);
   printf("enter the x");
   for(i=0;i<n;i++)
   scanf("%f",&a[i][0]);
   printf("enter the y");
   for(i=0;i<n;i++)
   scanf("%f",&a[i][1]);
   printf("enter the value to predict\n");
   scanf("%f",&x);
   for(j=2;j<n+1;j++)
   {
      for(i=0;i<n-j+1;i++)
      a[i][j]=a[i+1][j-1]-a[i][j-1];
   }
   printf("the differnce table is \n");
   for(i=0;i<n;i++)
   {
      for(j=0;j<=n-i;j++)
      printf("%0.2f\t",a[i][j]);
      printf("\n");
   }
y=a[n/2][1];
printf("%f",y);
```

```
u=(x-a[n/2][0])/(a[1][0]-a[0][0]);
printf("%f",u);
u1=u;
for(i=2;i<=n;i++)
{
   y=y+(((i/3)*(u+1))*u1*a[n/i][i])/fact;
   fact=fact*i;
   u1=u1*(u-(i-1));

}
printf("the desired value is %f",y);

return 0;
}
```