//Newton forward interpolation in c

#include<stdio.h>

#define MAX 100

#define ORDER 4

int main()

{

float ax[MAX+1], ay [MAX+1], diff[MAX+1][ORDER+1], nr=1.0, dr=1.0,x,p,h,yp;

int n,i,j,k;

printf("\nEnter the value of n:\n");

scanf("%d",&n);

printf("\nEnter the values in form x,y:\n");

for (i=0;i<=n;i++)

scanf("%f %f",&ax[i],&ay[i]);

printf("\nEnter the value of x for which the value of y is wanted: \n");

scanf("%f",&x);

h=ax[1]-ax[0];

// making the difference table

//calculating the 1st order of differences

for (i=0;i<=n-1;i++)

diff[i][1] = ay[i+1]-ay[i];

// calculating the second and higher order differences

for (j=2;j<=ORDER;j++)

for(i=0;i<=n-j;i++)

diff[i][j] = diff[i+1][j-1] - diff[i][j-1];

// finding x0

i=0;

while (!(ax[i]>x))

i++;

// ax[i] is x0 and ay[i] is y0

i--;

p = (x-ax[i])/h;

yp = ay[i];

for (k=1;k<=ORDER;k++)

{

nr \*=p-k+1;

dr \*=k;

yp +=(nr/dr)\*diff[i][k];

}

printf("\nWhen x = %6.1f, corresponding y = %6.2f\n",x,yp);

}

