#include<bits/stdc++.h>

using namespace std;

int n=7;

double table[100][100],sum,value,x[100],y[100],X[100],Y[100],concentrationCL = 0,sumMSE=0;

void newtondivide()

{

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

{

table[i][0] = y[i];

}

for(int j=1; j<n; j++)

{

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

{

table[i][j] = ((table[i+1][j-1] - table[i][j-1])/(x[i+j] - x[i]));

}

}

for(int k=0; k<n; k++)

{

for(int i = 1; i < n; i++)

{

value = 1;

for(int j = 0; j < i; j++)

{

value \*= (X[k] - x[j]);

}

sum += (value \* table[0][i]);

}

Y[k] = sum;

}

cout<<"T\_degC | Dissolved Oxygen (mg/L) for temperature (degree Celsius) and concentration of chloride C"<<endl;

for(int k=0; k<3; k++)

{

cout<<X[k]<<"\t\t"<<Y[k]/1000<<endl;

}

}

void mse()

{

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

{

table[i][0] = y[i];

}

for(int j=1; j<n; j++)

{

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

{

table[i][j] = ((table[i+1][j-1] - table[i][j-1])/(x[i+j] - x[i]));

}

}

for(int k=0; k<n; k++)

{

for(int i = 1; i < n; i++)

{

value = 1;

for(int j = 0; j < i; j++)

{

value \*= (x[k] - x[j]);

}

sum += (value \* table[0][i]);

}

Y[k] = sum/1000;

}

for(int k=0; k<n; k++)

{

sumMSE+=((Y[k]-y[k])\*(Y[k]-y[k]));

}

sumMSE/=7;

cout<<"Mean Squared Error (MSE) "<<sumMSE<<endl;

}

int main()

{

cout<<"Enter the values : "<<endl;

cout<<"T(degree) \t";

cout<<" Y (concentration of CL) "<<endl;

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

{

cin>>x[i];

cin>>y[i];

}

sum = y[0];

cout<<"Interpolation points "<<endl;

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

{

cin>>X[i];

}

newtondivide();

mse();

return 0;

}

/\*

0 12.9

5 11.3

10 10.1

15 9.03

20 8.17

25 7.46

30 6.86

40

45

50

55

60

65

70

\*/