#include<bits/stdc++.h>

using namespace std;

int n;

double x, y, sumX=0, sumY=0, sumXX=0, sumYY=0, sumXY=0,xBar, yBar, denom, a, b, R,sumX2=0, sumY2=0, sumXX2=0, sumYY2=0, sumXY2=0, xBar2, yBar2, denom2;

double X[50], Y[50],XP[50],YP[50];

int main(){

cout<<"Input number of data points: ";

cin>>n;

cout<<"Data values of x and y: "<<endl;

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

cin>>X[i]>>Y[i];

}

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

sumX += X[i];

sumY += Y[i];

sumXX += pow(X[i], 2);

sumYY += pow(Y[i], 2);

sumXY += X[i] \* Y[i];

}

xBar = sumX / n;

yBar = sumY / n;

denom = n \* sumXX - pow(sumX, 2);

if(denom != 0){

b = (n\*sumXY - sumX\*sumY)/denom;

a = yBar - b\*xBar;

cout<<endl<<"Linear Regression line:\n\t y = "<<a;

if(b < 0)

cout<<" - "<<fabs(b)<<"x";

else if(b > 0)

cout<<" + "<<b<<"x";

else

cout<<endl;

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

{

XP[i]=2019+i;

}

cout<<endl<<"Year"<<"\t"<<"Approximate Average Temperature in Degree Celsius"<<endl;

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

YP[i] = a + b\*XP[i];

cout<<XP[i]<<"\t\t"<<YP[i]<<endl;

}

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

sumX2 += XP[i];

sumY2 += YP[i];

sumXX2 += pow(XP[i], 2);

sumYY2 += pow(YP[i], 2);

sumXY2 += XP[i] \* YP[i];

}

xBar2 = sumX2/n;

yBar2 = sumY2/n;

denom2 = n \* sumXX2 - pow(sumX2, 2);

double R1 = n \* sumXY2 - sumX2 \* sumY2;

double R2 = sqrt((n\*sumXX2 - pow(sumX2, 2)) \* (n \* sumYY2 - pow(sumY2, 2)));

R = R1 / R2;

cout<<endl<<"Here R = "<<R<<endl;

if(R < 0){

cout<<"Strong Negative Relation.";

}

else if(R == 0){

cout<<"No relationship at all.";

}

else{

cout<<"Strong Positive Relation.";

}

}

else{

cout<<"No solution."<<endl;

}

return 0;

}