

```
/* 2次関数ラーニング */
```

```
import java.io.*;
```

```
class calcF
```

```
{
```

```
    private double a;
```

```
    private double b;
```

```
    public double getA(){
```

```
        return a;
```

```
    }
```

```
    public double getB(){
```

```
        return b;
```

```
    }
```

```
    public void calc(double t1, double f1, double t2, double f2) throws IOException
```

```
    {
```

```
        /* f1 = a * t1 + b */
```

```
        /* f2 = a * t2 + b */
```

```
        a = 0;
```

```
        b = 0;
```

```
        if((t1) == 0){
```

```
            b = (f1);
```

```
            if((t2) != 0){
```

```
                a = ((f2) - (b)) / (t2);
```

```

    }else{
        throw new IOException();
    }
}else{
    /* f1 = a * t1 + b */
    /* f2 = a * t2 + b */
    /* a * t1 - f1 = a * t2 - f2 */
    /* a * (t1 - t2) = f1 - f2 */

    if((t1) != (t2)){
        a = ((f1) - (f2)) / ((t1) - (t2));
        b = (f1) - ((a) * (t1));
    }else{
        throw new IOException();
    }
}

return;
}
}

```

```
class calcFT
```

```
{
```

```
    private double a;
```

```
    private double b;
```

```
    private double c;
```

```
    public double getA(){
```

```
        return a;
```

```

}

public double getB(){
    return b;
}

public double getC(){
    return c;
}

```

public void calc(double t1, double f1, double t2, double f2, double t3, double f3) throws  
IOException

```

{
    /*
        f1 = a * t1 * t1 + b * t1 + c = (a * t1 + b) * t1 + c = ft1 * t1 + c
        f2 = a * t2 * t2 + b * t2 + c = (a * t2 + b) * t2 + c = ft2 * t2 + c
        f3 = a * t3 * t3 + b * t3 + c = (a * t3 + b) * t3 + c = ft3 * t3 + c
        c = f1 - a*t1*t1 - b*t1 = f2 - a*t2*t2 - b*t2
        (f1 - f2) + a*((t2*t2) - (t1*t1)) + b(t2 - t1) = 0
        ((f1 - f2)/(t2 - t1)) + a*(t2 + t1) + b = 0
        b = ((f1 - f2)/(t1 - t2)) - a*(t1 + t2) = ((f2 - f3)/(t2 - t3)) - a*(t2 + t3)
        a*(t3 - t1) = (((f2 - f3)*(t1 - t2)) - ((f1 - f2)*(t2 - t3)))/((t1 - t2)*(t2 - t3))
        a = (t1*f2 - t1*f3 - t2*f1 + t2*f3 + t3*f1 - t3*f2)/((t1 - t2)*(t2 - t3)*(t3 - t1))
        ft1 = a*t1 + b = a*t1 + ((f1 - f2)/(t1 - t2)) - a*(t1 + t2) = ((f1 - f2)/(t1 - t2)) - a*t2
            = ((f1 - f2)/(t1 - t2)) - ((t2*(t1*f2 - t1*f3 - t2*f1 + t2*f3 + t3*f1 - t3*f2))/((t1 - t2)*(t2 - t3)*(t3 - t1)))
        c = f1 - ft1*t1
    */

    double ft1 = (((f1) - (f2))/((t1) - (t2))) - (((t2)*(((t1)*(f2)) - ((t1)*(f3)) - ((t2)*(f1)) + ((t2)*(f3)) + ((t3)*(f1)) -
((t3)*(f2))))/(((t1) - (t2))*((t2) - (t3))*((t3) - (t1))));

    double ft2 = (((f2) - (f3))/((t2) - (t3))) - (((t3)*(((t2)*(f3)) - ((t2)*(f1)) - ((t3)*(f2)) + ((t3)*(f1)) + ((t1)*(f2)) -

```

```
((t1)*(f3)))/(((t2)-(t3))*((t3)-(t1))*((t1)-(t2))));
```

```
double ft3 = (((f3)-(f1))/((t3)-(t1)))-(((t1)*((t3)*(f1))-((t3)*(f2))-((t1)*(f3))+((t1)*(f2))+((t2)*(f3))-  
((t2)*(f1)))/(((t3)-(t1))*((t1)-(t2))*((t2)-(t3))));
```

```
calcF cfb = new calcF();
```

```
cfb.calc(t1, ft1, t2, ft2);
```

```
a = cfb.getA();
```

```
b = cfb.getB();
```

```
c = ((f1)-((ft1)*(t1)));
```

```
return;
```

```
}
```

```
}
```

```
public class learning20190120
```

```
{
```

```
public static void main(String args[])
```

```
{
```

```
try{
```

```
    InputStreamReader isr = new InputStreamReader(System.in);
```

```
    BufferedReader br = new BufferedReader(isr);
```

```
    String buf = null;
```

```
    int m = 23;
```

```
    int n = m + 1;
```

```
    double[] t1 = new double[n];
```

```
    double[] t2 = new double[n];
```

```
    double[] t3 = new double[n];
```

```
double[] t4 = new double[n];
double[] f1 = new double[n];
double[] f2 = new double[n];
double[] f3 = new double[n];
double[] x1 = new double[n];
double[] x2 = new double[n];
double[] x3 = new double[n];
double[] x4 = new double[n];
double[] a = new double[n];
double[] b = new double[n];
double[] c = new double[n];
```

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

```
    t1[i] = 0;
```

```
    t2[i] = 0;
```

```
    t3[i] = 0;
```

```
    t4[i] = 0;
```

```
    f1[i] = 0;
```

```
    f2[i] = 0;
```

```
    f3[i] = 0;
```

```
    x1[i] = 0;
```

```
    x2[i] = 0;
```

```
    x3[i] = 0;
```

```
    x4[i] = 0;
```

```
    a[i] = 0;
```

```
    b[i] = 0;
```

```
    c[i] = 0;
```

```
}
```

```

for(int i = 0; i < n; i++){
    System.out.print("1日目時刻" + (i + 1));
    t1[i] = (i + 1);
    System.out.print("測定値1:");
    buf = br.readLine();
    x1[i] = Double.parseDouble(buf);
}

```

```

for(int i = 0; i < n; i++){
    System.out.print("2日目時刻" + (i + 1));
    t2[i] = (i + n + 1);
    System.out.print("測定値2:");
    buf = br.readLine();
    x2[i] = Double.parseDouble(buf);
}

```

```

for(int i = 0; i < n; i++){
    System.out.print("3日目時刻" + (i + 1));
    t3[i] = (i + n + n + 1);
    System.out.print("測定値3:");
    buf = br.readLine();
    x3[i] = Double.parseDouble(buf);
}

```

```

/* x1[0] = f1[1] + f1[2] + f1[3] = a[1] * t1[1] + a[2] * t1[2] + a[3] * t1[3] + b[1] + b[2] +
b[3] */

```

```

/* x2[0] = f2[1] + f2[2] + f2[3] = a[1] * t2[1] + a[2] * t2[2] + a[3] * t2[3] + b[1] + b[2] +
b[3] */

```

```
/* x3[0] = f3[1] + f3[2] + f3[3] = a[1] * t3[1] + a[2] * t3[2] + a[3] * t3[3] + b[1] + b[2] +  
b[3] */
```

```
/* x1[0] = f1[1] + f1[2] + f1[3] */
```

```
/* X1 = 3 * F1 */
```

```
/* F1 = f1[0] + x1[0] */
```

```
/* f1[0] = (X1 / 3) - x1[0] */
```

```
double X1 = 0;
```

```
double X2 = 0;
```

```
double X3 = 0;
```

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

```
    X1 += (x1[i]);
```

```
    X2 += (x2[i]);
```

```
    X3 += (x3[i]);
```

```
}
```

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

```
    f1[i] = ((X1) / m) - x1[i];
```

```
    f2[i] = ((X2) / m) - x2[i];
```

```
    f3[i] = ((X3) / m) - x3[i];
```

```
    calcFT cft = new calcFT();
```

```
    cft.calc(t1[i], f1[i], t2[i], f2[i], t3[i], f3[i]);
```

```
    a[i] = cft.getA();
```

```
    b[i] = cft.getB();
```

```
    c[i] = cft.getC();
```

```
    f1[i] = (a[i] * (t1[i]) * (t1[i]) + (b[i]) * (t1[i]) + (c[i]));
```

```
    f2[i] = (a[i] * (t2[i]) * (t2[i]) + (b[i]) * (t2[i]) + (c[i]));
```

```

        f3[i] = (a[i]) * (t3[i]) * (t3[i]) + (b[i]) * (t3[i]) + (c[i]);
        System.out.println("f[" + i + "] = " + (a[i]) + "t[" + i + "]t[" + i + "] + " + (b[i]) + "t[" + i
+ "]" + " + (c[i]));
    }

    for(int i = 0; i < n; i++){
        x1[i] = 0;
        x2[i] = 0;
        for(int j = 0; j < m; j++){
            x1[i] += (f1[(i + j + 1) % n]);
            x2[i] += (f2[(i + j + 1) % n]);
        }
        System.out.print("x[" + i + "] = ");
        for(int j = 0; j < m; j++){
            System.out.print((a[(i + j + 1) % n]) + "t[" + ((i + j + 1) % n) + "]t[" + ((i + j + 1) %
n) + "]" + ");
            System.out.print((b[(i + j + 1) % n]) + "t[" + ((i + j + 1) % n) + "]" + ");
        }
        double C = 0;
        for(int j = 0; j < m; j++){
            C += (c[(i + j + 1) % n]);
        }
        System.out.println(C);
    }

    for(int i = 0; i < n; i++){
        t4[i] = (i + n + n + n + 1);
        x4[i] = 0;
    }

```



```
        for(int i = 0; i < n; i++){
            for(int j = 0; j < m; j++){
                x4[i] += ((a[(i + j + 1) % n]) * (t4[(i + j + 1) % n]) * (t4[(i + j + 1) % n]) + (b[(i + j +
1) % n]) * (t4[(i + j + 1) % n]) + (c[(i + j + 1) % n]));
            }
            System.out.print("4日目時刻" + (i + 1));
            System.out.println("予測4 = " + (x4[i]));
        }

    }catch(IOException e){
        System.out.println("例外" + e + "が発生しました");
    }

    return;
}
}
```