//Berkeley Clock Synchronization Algorithm.Vishal-Yadav-211P042

import java.io.\*;

import java.util.\*;

public class Berkley

{

float diff(int h,int m, int s, int nh, int nm, int ns)

{

int dh = h-nh;

int dm = m-nm;

int ds = s-ns;

int diff = (dh\*60\*60)+(dm\*60)+ds;

return diff;

}

float average(float diff[],int n)

{

int sum=0;

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

sum+=diff[i];

float average = (float)sum/(n+1);

System.out.println("The Average of all Time Differences is "+average);

return average;

}

void sync(float diff[], int n, int h, int m, int s, int nh[], int nm[], int ns[], float average)

{

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

{

diff[i]+=average;

int dh=(int)diff[i]/(60\*60);

diff[i]%=(60\*60);

int dm=(int)diff[i]/60;

diff[i]%=60;

int ds = (int)diff[i];

nh[i]+=dh;

if(nh[i]>23)

nh[i]%=24;

nm[i]+=dm;

if(nm[i]>59)

{

nh[i]++;

nm[i]%=60;

}

ns[i]+=ds;

if(ns[i]>59)

{

nm[i]++;

ns[i]%=60;

}

if(ns[i]<0)

{

nm[i]--;

ns[i]+=60;

}

}

h+=(int)(average/(60\*60));

if(h>23)

h%=24;

m+=(int)(average/(60\*60\*60));

if(m>59)

{

h++;

m%=60;

}

s+=(int)(average%(60\*60\*60));

if(s>59)

{

m++;

s%=60;

}

if(s<0)

{

m--;

s+=60;

}

System.out.println("The Synchronized Clocks are:\nTime Server ---> "+h+":"+m+" :"+s);

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

System.out.println("Node "+(i+1)+" ---> "+nh[i]+" : "+ns[i]);

}

public static void main(String[] args) throws IOException

{

Berkley b = new Berkley();

Date date = new Date();

BufferedReader obj = new BufferedReader(new InputStreamReader(System.in));

System.out.println("Enter Number of Nodes:");

int n = Integer.parseInt(obj.readLine());

int h = date.getHours();

int m = date.getMinutes();

int s = date.getSeconds();

int nh[]=new int[n];

int nm[]=new int[n];

int ns[]=new int[n];

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

{

System.out.println("ENTER TIME FOR NODE"+(i+1)+"\n HOURS:");

nh[i]=Integer.parseInt(obj.readLine());

System.out.println("MINUTES:");

nm[i]=Integer.parseInt(obj.readLine());

System.out.println("SECONDS:");

ns[i]=Integer.parseInt(obj.readLine());

}

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

{

System.out.println("TIME SERVER SENT TIME"+h+":"+m+":"+s+"TO NODE "+(i+1));

}

float diff[]=new float[n];

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

{

diff[i]=b.diff(h,m,s,nh[i],nm[i],ns[i]);

System.out.println("NODE "+(i+1)+" SENT TIME DIFFERENCE OF "+(int) diff[i]+" TO TIME SERVER.");

}

float average=b.average(diff,n);

b.sync(diff,n,h,m,s,nh,nm,ns,average);

}

}



