//Problem Statement : Minimizing the cash flow for expenses among a group of friends

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import java.math.BigDecimal;

import java.math.RoundingMode;

import java.util.Scanner;

//class for info of friends

class Fnode

{ //variable declaration

double money;

double mean;

String name;

String phno;

double balance;

int pin;

double roundMean;

double give = 0;

double receive = 0;

double finalAmount = 0 ;

}

//class for methods

class Cashflow

{

//objects of Scanner class

Scanner sc=new Scanner(System.in);

Scanner sc1=new Scanner(System.in);

Fnode friends[];

int n;

int mxDebit ,mxCredit;

double min;

int x = 0;

double f\_graph[][];//2d matrix

//Accept Bill Payment

void acceptBillDetails()

{

double sum = 0;

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

{

System.out.println("Enter amount paid by "+friends[i].name);

friends[i].money = sc.nextFloat();

sum+=friends[i].money;

friends[i].mean = friends[i].money/n;

BigDecimal bd=new BigDecimal(friends[i].mean).setScale(2,RoundingMode.HALF\_DOWN);

friends[i].roundMean = bd.doubleValue();

}

//adjacency matrix

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

{

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

{

if(i==j)

{

f\_graph[i][j]=0;

}

else

{

f\_graph[j][i]=friends[i].roundMean;

}

}

}

//Display Bill Details

System.out.println("\nDetails of friends and expenses");

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

{

System.out.println("\nDetails of friend "+(i+1));

System.out.println("Name : "+friends[i].name);

System.out.println("Amount spent : "+friends[i].money);

System.out.println("Divided amount : "+friends[i].mean);

System.out.println("---------------------------------------------------------");

}

System.out.println("\nTotal money spent by all is Rs"+sum);

System.out.println("Individually each one has to spend Rs"+(sum/n));

System.out.println("\nAfter performing calculations, following are the necessary transactions:");

//Minimize cash Flow Function

minCashFlow(f\_graph);

}

//method to details of friends

void acceptBankDetails()

{

System.out.println("Enter number of friends");

n=sc.nextInt();

friends = new Fnode [n];

f\_graph = new double[n+1][n+1];

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

{

friends[i] = new Fnode();

System.out.println("\nEnter Name of Friend : " +(i+1));

friends[i].name = sc1.nextLine();

System.out.println("Enter bank Balance");

friends[i].balance = sc.nextDouble();

do

{

System.out.println("Enter 4 digit pin");

friends[i].pin = sc.nextInt();

}while((int)(Math.log10(friends[i].pin)+1) != 4);

do

{

System.out.println("Enter Mobile Number");

friends[i].phno = sc.next();

}while(friends[i].phno.length() != 10);

System.out.println("Details accepted successfully");

System.out.println("---------------------------------------------------------");

}

}

//displaying info

void displayBankDetails()

{

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

{ System.out.println("FRIEND "+(i+1));

System.out.println("Name : "+friends[i].name);

System.out.println("Amount spent earlier : "+friends[i].money);

System.out.println("-----After transactions:-----");

System.out.println("Amount given : "+friends[i].give);

System.out.println("Amount received : "+friends[i].receive);

if(friends[i].receive>friends[i].give)

{

friends[i].finalAmount += friends[i].money - friends[i].receive;

}

else

{

friends[i].finalAmount += friends[i].money + friends[i].give;

}

System.out.println("Final amount spent after give and take:Rs"+friends[i].finalAmount);

System.out.println("---------------------------------------------------------");

}

}

//index at which minimum amount is present

int getMin(double arr[])

{

int minInd = 0;

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

if (arr[i] < arr[minInd])

minInd = i;

return minInd;

}

int getMax(double arr[])

{

int maxInd = 0;

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

if (arr[i] > arr[maxInd])

maxInd = i;

return maxInd;

}

// returns minimum of 2 values

double minOf2(double x, double y)

{

return (x < y) ? x: y;

}

//recursive function

void minCashFlowRec(double amount[])

{

mxCredit = getMax(amount);

mxDebit = getMin(amount);

if (amount[mxCredit] == 0 && amount[mxDebit] == 0)

return;

// Find the minimum of two amounts

min = minOf2(-amount[mxDebit], amount[mxCredit]);

amount[mxCredit] -= min;

amount[mxDebit] += min;

// If minimum is the maximum amount to be

System.out.println("\n------------------Transaction "+(x+1)+"---------------------------------------");

System.out.println(friends[mxDebit].name + " has to pay " + min+ " to " + friends[mxCredit].name);

friends[mxDebit].give = friends[mxDebit].give + min;

friends[mxCredit].receive = friends[mxCredit].receive+min;

x++;

minCashFlowRec(amount);//recursive method call

}

//method for initiating transactions

void pay()

{

System.out.println("Enter your name :");

String inputname = sc.next();

String receiver = null;

int f1 = 0;

int f2 = 0;

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

{

if(inputname.equalsIgnoreCase(friends[i].name))

{

f1 = 1;

System.out.println("Enter receiver's name :");

receiver = sc.next();

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

{

if(receiver.equalsIgnoreCase(friends[j].name))

{ f2 = 1;

System.out.println("Enter amount to be credited to the account of "+friends[j].name);

double amt = sc.nextDouble();

if((friends[i].balance-amt)<500)

{

System.out.println("Sorry, cannot initiate the transaction as minimum balance after transaction should be Rs500");

}

else

{

int count = 0; int enteredPin; int flag = 0;

Scanner sc = new Scanner(System.in);

do {

System.out.println("Please enter correct account Pin : ");

enteredPin =sc.nextInt(); count++;

}

while ((friends[i].pin!=enteredPin) &&

count!=3);

if (friends[i].pin==(enteredPin)) {

System.out.println( "---------------------------------------------------------");

System.out.println("Correct PIN detected");

friends[i].balance -= amt;

friends[j].balance += amt;

System.out.println("-----Transaction Complete-----");

System.out.println("Amount of Rs"+amt+" debited from your account");

System.out.println("Amount of Rs"+amt+" credited to "+friends[j].name);

System.out.println("Current balance : Rs"+friends[i].balance);

System.out.println(

"---------------------------------------------------------");

flag = 1;

enteredPin = 0;

}

if (flag == 0) { System.out.println(

"---------------------------------------------------------");

System.out.println("Transaction Unsuccessful\nYou have exceeded the limit of the wrong PIN.\nTry again in 24 Hours"

); System.out.println(

"---------------------------------------------------------"); }

}

}

}

}

}

//account not found

if(f1 == 0)

{

System.out.println("Account with name "+inputname+" not found");

}

if(f2 == 0)

{

System.out.println("Account with name "+receiver+" not found");

}

}

//function

void minCashFlow(double f\_graph[][])

{

double amount[]=new double[n];

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

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

amount[p] += (f\_graph[i][p] - f\_graph[p][i]);

minCashFlowRec(amount);

}

//function to check balance

void checkBalance()

{

int id = 100;

int flag = 0;

int count = 0;

System.out.println("---------------------------------------------");

System.out.println("Check your Bank Balance");

System.out.println("Enter your Name");

String inputName = sc1.nextLine();

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

{

if (friends[i].name.equalsIgnoreCase(inputName))

{

System.out.println("Account found");

id = i;

flag = 1;

break;

}

}

if (flag == 0)

{

System.out.println("---------------------------------------------------------");

System.out.println("No Account found by the name : "+inputName);

System.out.println("---------------------------------------------------------");

}

do

{

System.out.println("Enter correct PIN");

int inputPin = sc.nextInt();

if(friends[id].pin==inputPin)

{

flag = 1;

System.out.println("---------------------------------------------------------");

System.out.println("Correct PIN detected");

System.out.println("Bank Balance : "+friends[id].balance);

break;

}

else

{

count++;

}

}while (flag != 1 || count != 3);

if (flag == 0)

{

System.out.println("---------------------------------------------------------");

System.out.println("Transaction Unsuccessful\nYou have exceeded the limit of the wrong PIN.\nTry again in 24 Hours");

System.out.println("---------------------------------------------------------");

}

}

}

public class Main

{

public static void main (String args [])

{

Cashflow cf = new Cashflow();

Scanner kb = new Scanner (System.in);

System.out.println("PROBLEM STATEMENT : Minimizing the cash flow for expenses among a group of friends");

System.out.println("UCE2021609 : Monali Borekar\nUCE2021611 : Felicia Carvalho\nUCE2021613 : Charu Tiwari\nUCE2021614 : Vedika Chavan");

System.out.println("\n\n------------Accepting details of friends----------");

cf.acceptBankDetails();

int option;

do

{

//menu

System.out.println("---------------------------------------------------------");

System.out.println("Choose from the following operations\n0. Exit\n1. Split money\n2. View details of cashflow \n3. Check Bank Balance\n4. Perform transactions\n");

option = kb.nextInt();

switch(option)

{

case 1://accepting details

cf.acceptBillDetails();

break;

case 2: //displaying details of minimum cash flow

cf.displayBankDetails();

break;

case 3://balance check

cf.checkBalance();

break;

case 4: //making transactions

cf.pay();

break;

default :

if(option !=0)

System.out.println("Option does not exist");

}

} while (option!=0);

System.out.println("Thank you !!\nPROGRAM TERMINATED");

kb.close();

}

}//end of program