```
Lab Program 1:
```

```
Develop a Java program that prints all real solutions to the quadratic equation
ax2+bx+c = 0. Read in a, b, c and use the quadratic formula. If the
discriminate b2
-4ac is negative, display a message stating that there are no
real solutions.
import java.util.Scanner;
class Quadratic_eq
         public static void main(String args[])
{
                double a,b,c,d,r1,r2;
                System.out.println("Enter the value of coefficient");
                Scanner s = new Scanner(System.in);
                a=s.nextDouble();
                b=s.nextDouble();
                c=s.nextDouble();
                d=(b*b)-4*a*c;
                if(a==0)
                System.out.println("invalid input");
                else if(d>0)
                {
```

```
r1=(-b + Math.sqrt(d))/(2*a);

r2=(-b - Math.sqrt(d))/(2*a);

System.out.println("roots are real and distint , values are:" + r1 + "and" + r2);

}

else if (d==0)

{

r1 = -b/(2*a);

System.out.println("roots are equal and value is " + r1);

}

else

System.out.println("roots are not real");

}
```

OUTPUT:

```
C:\Users\BMSCE\Desktop\1BM21CS060>java Quadratic_eq
Enter the value of coefficient
1
2
1
roots are equal and value is -1.0
C:\Users\BMSCE\Desktop\1BM21CS060>java Quadratic_eq
Enter the value of coefficient
2
1
2
roots are not real
C:\Users\BMSCE\Desktop\1BM21CS060>java Quadratic_eq
Enter the value of coefficient
2
roots are not real
C:\Users\BMSCE\Desktop\1BM21CS060>java Quadratic_eq
Enter the value of coefficient
3
5
2
roots are real and distint , values are:-0.666666666666666666611.0
```

```
C:\Users\BMSCE\Desktop\1BM21CS060>java Quadratic_ed
Enter the value of coefficient
0
0
0
invalid input
```

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elu System. out. Phintln ("hook are not had"). Out Pat: Enter the value of the coefficient 2 had ton ale stood Enter the value of coefficient 5 hours are head and distint, value ou: -0.66 6 and -1.0 Enter the volor of coefficient. 9 hoots are early and value is -1.0

Develop a Java program to create a class Student with members usn, name, an array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.

```
import java.util.Scanner;
class student
student(){}
String name;
String usn;
double result=0;
int credits[]=new int[3];
int marks[]=new int[3];
int total=0;
void accept()
Scanner s=new Scanner(System.in);
System.out.println("Enter your Name ");
name=s.nextLine();
System.out.println("Enter USN ");
usn=s.nextLine();
System.out.println("Enter credits and marks of each subject respectively "); for(int i=0;i<3;i++)
this.credits[i]=s.nextInt();
this.marks[i]=s.nextInt();
void calculate()
for(int i=0; i<3; i++)
if(marks[i]>=90 && marks[i]<=100)
result+=10*credits[i];
if(marks[i] > = 80 \&\& marks[i] < 90)
result+=9*credits[i];
if(marks[i]>=70 && marks[i]<80)
result+=8*credits[i];
if(marks[i] > = 60 \&\& marks[i] < 70)
result+=7*credits[i];
if(marks[i]>=50 && marks[i]<60)
result+=6*credits[i];
if(marks[i]>=40 && marks[i]<50)
result+=5*credits[i];
else result+=0*credits[i];
for(int i=0; i<3; i++)
total+=credits[i];
result=result/total;
void display()
```

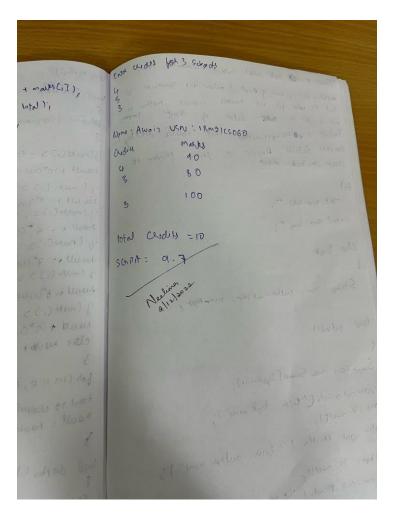
```
System.out.println("Name:"+name+" USN:"+usn);
System.out.println("credits Marks");
for(int i=0;i<3;i++)
System.out.println(credits[i]+" "+marks[i]);
System.out.println("Total credits="+total);
System.out.println("SGPA="+result);
}
```

QUESTION AND CODE

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OUTPUT

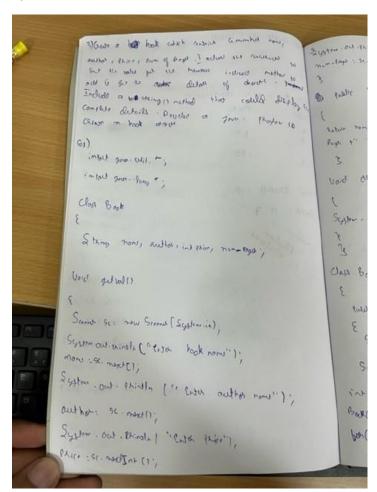
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SGPA=9.1

Create a class Book which contains four members: name, author, price, num_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString() method that could display the complete details of the book. Develop a Java program to create n book objects.

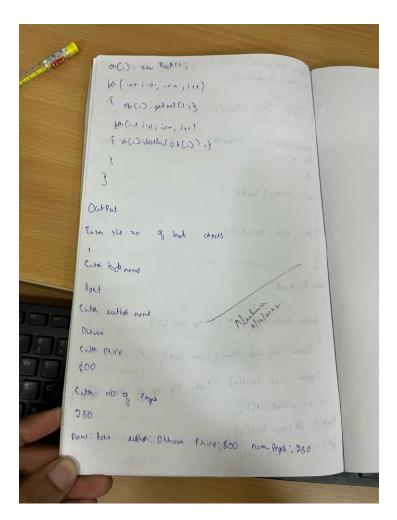
```
import java.util.*;
import java.lang.*;
class Book
{
   String name, author; int price, num pages;
  void getval()
  {
   Scanner sc=new Scanner(System.in);
   System.out.println("Enter book name");
   name=sc.next();
   System.out.println("Enter author name");
   author=sc.next();
   System.out.println("Enter price");
   price=sc.nextInt();
   System.out.println("Enter No. of pages");
   num_pages=sc.nextInt();
  public String toString()
  return "name:"+name+" "+"author:"+author+" "+"pric:"+price+" "+"num_pages:"+num_pages+" ";
  void display(Book o)
  System.out.println(o);
}
class BookDET
 public static void main(String args[])
  Scanner in=new Scanner(System.in);
  System.out.println("Enter the no. of book objects");
```

```
int n=in.nextInt();
Book[] ob=new Book[n];
for(int i=0;i<n;i++)
  ob[i]=new Book();
for(int i=0;i<n;i++)
  { ob[i].getval();}
  for(int i=0;i<n;i++)
    { ob[i].display(ob[i]);}
}</pre>
```

QUESTION AND CODE



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OUTPUT

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300

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150

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Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea() that prints the area of the given shape.

CODE:

```
import java.util.Scanner;
abstract class shape
shape(){}
int h,b;
 abstract void printArea();
 class rectangle extends shape
Scanner s=new Scanner(System.in);
void printArea()
System.out.println("Enter height and width of rectangle");
h=s.nextInt();
b=s.nextInt();
System.out.println("Area of Rectangle is "+b*h);
rectangle(){}
  }
 class triangle extends shape
Scanner s=new Scanner(System.in);
void printArea()
System.out.println("Enter height and base of triangle");
h=s.nextInt();
b=s.nextInt();
System.out.println("Area of Triangle is "+0.5*b*h);
triangle(){}
  }
 class circle extends shape
Scanner s=new Scanner(System.in);
void printArea()
  System.out.println("Enter radius of Circle");
  h=s.nextInt();
  System.out.println("Area of Circle is "+3.14*h*h);
```

```
}
circle(){}
}

class main
{
  public static void main(String xx[])
  {
  rectangle r=new rectangle();
  r.printArea();
  triangle t=new triangle();
  t.printArea();
  circle c=new circle();
  c.printArea();
}
```

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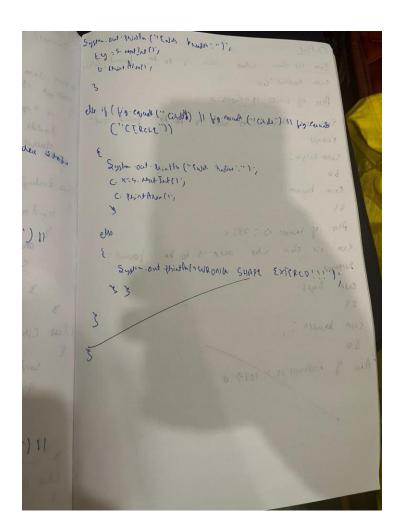
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```

OUTPUT

```
Enter the shape whose area is to be found out: rectangle
Enter Length:

3
Enter breadth:
4
Area of rectangle is: 12.0
Enter the shape whose area is to be found out: triangle
Enter height:
4
Enter breadth:
5
Area of triangle is: 10.0
Enter the shape whose area is to be found out: circle
Enter the shape whose area is to be found out: circle
Enter the shape whose area is to be found out: circle
Enter radius:
4
Area of circle is: 50.24
```

Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called a savings account and the other a current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class Account that stores customer name, account number and type of account. From this derive the classes Cur-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:

- a) Accept deposit from customer and update the balance.
- b) Display the balance.
- c) Compute and deposit interest
- d) Permit withdrawal and update the balance Check for the minimum balance, impose penalty if necessary and update the balance.

CODE:

```
import java.util.Scanner;
import java.lang.*;
class Account
String name, type;
int accno;
double balance;
void setD()
Scanner s=new Scanner(System.in);
System.out.print("Enter customer name: ");
name=s.next();
System.out.print("Enter type of account: ");
type=s.next();
System.out.print("Enter account number: ");
accno=s.nextInt();
System.out.print("Enter bank balance: ");
balance=s.nextDouble();
}
void display()
System.out.println("Customer name is: "+name);
System.out.println("Customer account type is: "+type);
System.out.println("Customer account number is: "+accno);
System.out.println("Current balance is: "+balance);
}
void deposit()
System.out.print("Enter the amount to be deposited: ");
Scanner s=new Scanner(System.in);
double amt=s.nextDouble();
```

```
balance+=amt;
class Sav_acc extends Account
double interest;
void complnt()
int time_in_yrs;
float intr_rate_inPerc;
int n; Scanner s=new Scanner(System.in);
System.out.println("Enter time in yrs: "); time_in_yrs=s.nextInt();
System.out.println("Enter rate of interest: "); intr_rate_inPerc=s.nextFloat();
System.out.println("Enter the number of times interest is compounded per year: "); n=s.nextInt();
interest=balance*(Math.pow((1+intr_rate_inPerc/n),(n*time_in_yrs)));
balance+=interest;
void withdraw()
System.out.println("Enter the amount to be withdrawn: "); Scanner s=new Scanner(System.in);
double amt=s.nextDouble();
if(balance>amt)
{balance-=amt;}
else
{System.out.println("Amount to be withdrawn greater than balance!!!");}
class Cur_acc extends Account
double check_amt;
void debit_check()
System.out.print("Enter the check amount: ");
Scanner s=new Scanner(System.in);
check_amt = s.nextDouble();
if(check_amt>balance-10000)
System.out.println("Rupees 1000 penalty imposed...Is it ok to proceed? Enter y for yes and n for no");
String option=s.next();
if(option.equals("y")) {balance=balance-check_amt-1000;}
else {System.out.println("no check debited");}
}
else
System.out.println("Rupees "+check_amt+" debited"); balance-=check_amt;
void withdraw()
System.out.println("Enter the amount to be withdrawn: "); Scanner s=new Scanner(System.in);
```

```
double amt=s.nextDouble();
if(balance>amt)
{balance-=amt;}
else
{System.out.println("Amount to be withdrawn greater than balance!!!");}
}
class Bank
public static void main(String ss[])
Scanner s=new Scanner(System.in);
String op1,op2;
Sav acc s1=new Sav acc();
Cur_acc c1=new Cur_acc();
while(true)
System.out.print("Enter the choice: \n1a.Set the values for savings acc\n1b. display\n1c. deposit\n1d.
Interest\n1e. Withdraw\n1f. exit\n");
op1=s.next();
switch(op1)
case "1a":s1.setD();
 break;
case "1b":s1.display();
 break;
case "1c":s1.deposit();
 break;
case "1d":s1.compInt();
 break:
case "1e":s1.withdraw();
 break;
case "1f":System.exit(0);
System.out.print("Enter the choice: \n2a.Set the values for current account\n2b. display\n2c.
deposit\n2d. transferCheck\n2e. Withdraw\n2f. exit\n");
op2=s.next();
switch(op2)
case "2a":c1.setD();
 break;
case "2b":c1.display();
 break;
case "2c":c1.deposit();
 break;
case "2d":c1.(debit_check);
case "2e":c1.withdraw();
 break;
```

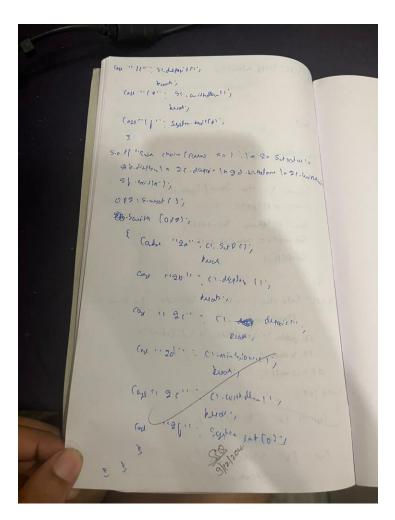
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case "2f":System.exit(0);
}
}
}
```

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OUTPUT

```
Enter the choice:

1a.Set the values for savings acc

1b. display

1c. deposit

1d. Interest

1e. Withdraw

1f. exit

1a

Enter customer name: dhruva

Enter type of account: saving

Enter account number: 34

Enter bank balance: 34000

Enter the choice:

2a.Set the values for current account

2b. display

2c. deposit

2d. transferCheck

2e. Withdraw

2f. exit

2a

Enter ustomer name: dhruva

Enter type of account: current

Enter customer name: dhruva

Enter type of account: current

Enter stype of account: current

Enter the choice:

1a.Set the values for savings acc

1b. display

1c. deposit

1d. Interest

1e. Withdraw

1f. exit

1d. Interest

1d. Interest

2ustomer account type is: saving

Customer account sumber is: 340

Eustomer account sumber is: 340
```

```
Enter the choice:

2a.Set the values for current account

2b. display

2c. deposit

2d. transfercheck

2e. Withdraw

2f. exit

2b

Customer name is: dhruva

Customer account type is: current

Customer account type is: 333

Current balance is: 67000.0

Enter the choice:

1a.Set the values for savings acc

1b. display

1c. deposit

1d. Interest

1e. Withdraw

1f. exit

1c.

Enter the amount to be deposited: 34000

Enter the choice:

2a.Set the values for current account

2b. display

2c. deposit

2d. transfercheck

2e. Withdraw

2f. exit

2c.

Enter the amount to be deposited: 38000

Enter the choice:

1a.Set the values for savings acc

1b. display

2c. deposit

2d. transfercheck

2e. Withdraw

2f. exit

2c.

Enter the amount to be deposited: 38000

Enter the choice:

1a.Set the values for savings acc

1b. display

1c. deposit

1d. Interest

1e. Withdraw

1f. exit

2c.

Enter the impuse for savings acc

1b. display

1c. deposit

1d. Interest

1e. Withdraw

1f. exit

1c.

2c.

Enter time in yrs:

10

Enter rate of interest:

10

Enter the number of times interest is compounded per year:
```

```
Enter the choice:

2a.Set the values for current account

2b. display

2c. deposit

2d. transferCheck

2e. withdraw

2f. exit

2b

Customer name is: dhruva

Customer account type is: current

Customer account number is: 333

Current balance is: 97080.0

Enter the choice:

1a.Set the values for savings acc

1b. display

1c. deposit

1d. Interest

1e. withdraw

1f. exit

1b

Customer account number is: 347

Customer account type is: saving

Customer account type is: saving

Customer account number is: 34

Customer account number is: 34

Current balance is: 4.3698512967112005E8

Enter the choice:

2a.Set the values for current account

2b. display

2c. deposit

2d. transferCheck

2e. withdraw

2f. exit

2d

Enter the choice:

1a.Set the values for savings acc

1b. display

1c. deposit

1d. Interest

1d. Javiner account type is: saving

Customer account number is: 34

Customer account number is: 34

Current balance is: 4,3408151967112005E8
```

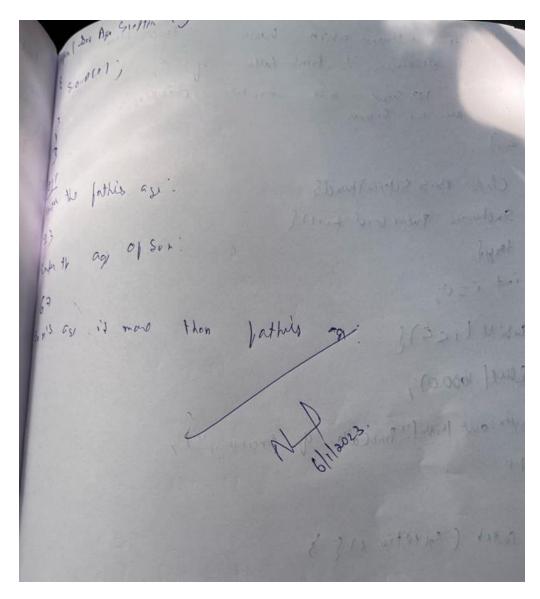
Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called "Father" and derived class called "Son" which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge() when the input age<0. In Son class, implement a constructor that cases both father and son's age and throws an exception if son's age is >=father's age.

```
import java.util.Scanner;
class WrongAgeException extends Exception{
  public String toString(){
    return ("Negative age can't be accepted");
  }
}
class AgeException extends Exception{
  public String toString(){
    return ("Son can't be older than father");
  }
}
class Father{
  int father_age;
  Father(int x) throws WrongAgeException{
    father_age=x;
    if(father_age<0){
      throw new WrongAgeException();
    }
  }
class Son extends Father{
  int son_age;
  Son(int x,int y) throws AgeException, WrongAgeException{
    super(x);
    son_age=y;
    if(son_age<0){
      throw new WrongAgeException();
```

```
}
    if(son_age>=father_age){
      throw new AgeException();
    }
  }
}
class age{
  public static void main(String[] args) {
    try {
      Scanner s=new Scanner(System.in);
      System.out.println("Enter father's and son's ages");
      int x=s.nextInt();
      int y=s.nextInt();
      Son so=new Son(x,y);
      System.out.printf("Father is %d years old and son is %d years old",so.father_age,so.son_age);
    } catch (WrongAgeException wa) {
     System.out.println(wa);
    }
    catch (AgeException a){
      System.out.println(a);
    }
    catch (Exception e){
      System.out.println("Enter valid values");
    }
  }
}
```

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```



OUTPUT

```
C:\Users\BMSCE\Desktop\1BM21CS060>java age
Enter father's and son's ages

22

1
Father is 22 years old and son is 1 years old
C:\Users\BMSCE\Desktop\1BM21CS060>java age
Enter father's and son's ages

22

33
Son can't be older than father
```

Program 7

Write a program which creates two threads, one thread displaying "BMS

College of Engineering" once every ten seconds and another displaying

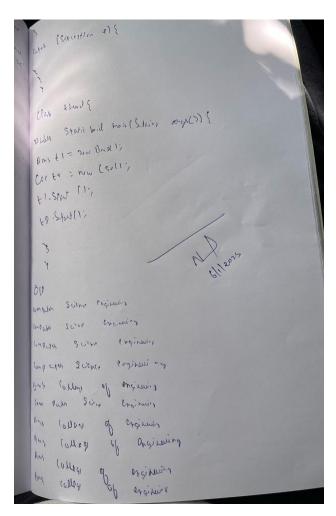
"CSE" once every two seconds.

Code

```
import java.util.Scanner;
class Bms extends Thread {
synchronized public void run() {
try {
int i=0;
while (i<5) {
sleep(10000);
System.out.println("BMS college of engineering");
i++;
}
} catch (Exception e) {
}
}
class Cse extends Thread {
synchronized public void run() {
try {
int i=0;
while (i<5) {
sleep(2000);
System.out.println("Computer science engineering");
i++;
} catch (Exception e) {
}
class Main{
public static void main(String args[]) {
Bms t1 = new Bms();
```

```
Cse t2 = new Cse();
t1.start();
t2.start();
}
}
observation
```

```
There a theorem which been the theorem the thorn of the theorem to the theorem the theorem to the theorem the tend to the t
```



Output

```
C:\Users\BMSCE\Desktop\1BM21CS060>java thread
Computer science engineering
Computer science engineering
Computer science engineering
Computer science engineering
BMS college of engineering
Computer science engineering
BMS college of engineering
```

Week 8

Create a package CIE

which has two classes- Student and Internals. The class Personal has members

like usn, name, sem. The class internals has an array that stores the internal

marks scored in five courses of the current semester of the student. Create

another package SEE which has the class External which is a derived class of

Student. This class has an array that stores the SEE marks scored in five courses of the current semester of the student. Import the two packages in a

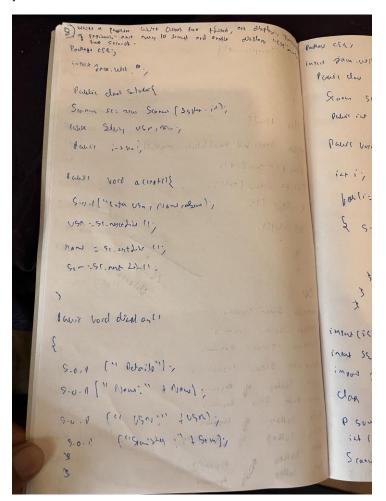
file that declares the final marks of n students in all five courses.

```
CODE
package SEE;
import CIE.*;
import java.util.*;
public class externals extends CIE.student{
  Scanner sc=new Scanner(System.in);
  public int seem[]=new int[5];
  public void accept(){
    for(int i=0;i<5;i++)
      System.out.println("Enter SEE marks of subject "+(i+1));
      seem[i]=sc.nextInt();
    }
  }
}
package CIE;
import java.util.*;
public class internals extends CIE.student {
  Scanner sc=new Scanner(System.in);
  public int ciem[]=new int[5];
  public void accept(){
    int i;
    for(i=0;i<5;i++)
    { System.out.println("Enter CIE marks of subject "+(i+1));
     ciem[i]=sc.nextInt();
    }
```

```
}
}
import CIE.*;
import SEE.*;
import java.util.*;
class total{
  public static void main(String args[]) {
    int i,j,n;
    Scanner sc=new Scanner(System.in);
    int total[]=new int[5];
    System.out.println("Enter number of students: ");
    n=sc.nextInt();
    CIE.student s[]=new CIE.student[n];
    CIE.internals ci[]=new CIE.internals[n];
    SEE.externals se[]=new SEE.externals[n];
    for(i=0;i<n;i++)
    {
       System.out.println("\nEnter student "+(i+1)+" details");
       s[i]=new CIE.student();
       s[i].accept();
       ci[i]=new CIE.internals();
       ci[i].accept();
       se[i]=new SEE.externals();
       se[i].accept();
    }
    for(i=0;i<n;i++)
       System.out.println("\nDetails of student "+(i+1));
       s[i].display();
       for(j=0;j<5;j++)
         total[j]=ci[i].ciem[j]+se[i].seem[j];
         System.out.println("Total marks in subject "+(j+1)+": "+total[i]);
       }
       System.out.println();
    }
  }
package CIE;
import java.util.*;
public class student{
  Scanner sc=new Scanner(System.in);
  public String usn, name;
  public int sem;
```

```
public void accept(){
    System.out.println("Enter USN, Name and Current semester: ");
    usn=sc.nextLine();
    name=sc.nextLine();
    sem=sc.nextInt();
}

public void display(){
    System.out.println("\nStudent Details");
    System.out.println("Name: "+name);
    System.out.println("USN: "+usn);
    System.out.println("Semester: "+sem);
}
```



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```

OUTPUT

```
Enter number of students:

Enter student 1 details
Enter USN, Name and Current semester:
18M20CS100
NITHIN BS

Benter CIE marks of subject 1
47
Enter CIE marks of subject 2
46
Enter CIE marks of subject 3
45
Enter CIE marks of subject 4
43
Enter CIE marks of subject 5
44
Enter SEE marks of subject 1
48
Enter SEE marks of subject 1
48
Enter SEE marks of subject 2
47
Enter SEE marks of subject 3
44
Enter SEE marks of subject 3
45
Enter SEE marks of subject 5
50

Details of student 1

Student Details
Name: NITHIN BS
USN: 1BM20CS100
Semester: 3
Total marks in subject 1: 95
Total marks in subject 2: 93
Total marks in subject 3: 89
Total marks in subject 4: 92
Total marks in subject 5: 94
```