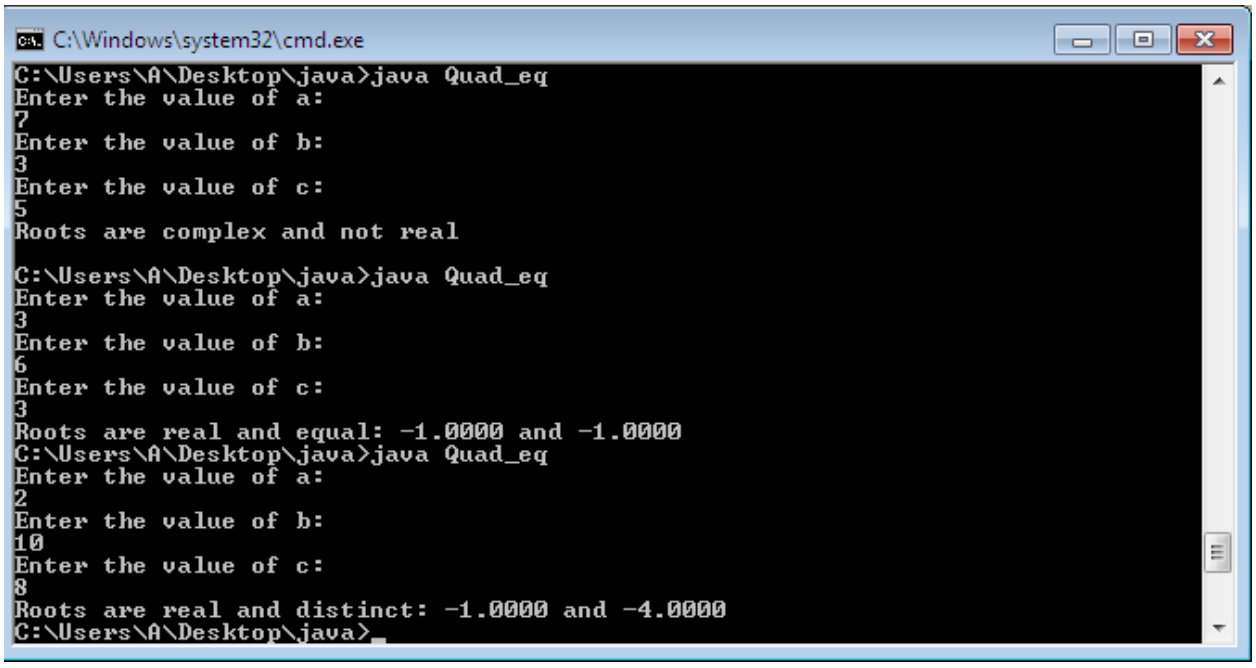
Week 3—Lab 1

Develop a Java program that prints all real solutions to the quadratic equation ax^2 + bx +c = 0.

Read in a, b, c and use the quadratic formula. If the discriminate b^2-4ac is negative, display a message stating that there are no real solutions.

```
import java.util.Scanner;

public class Quad_eq

{

public static void main(String[] args)

{

Scanner sc=new Scanner(System.in);

double r1,r2;

System.out.println("Enter the value of a: ");

double a=sc.nextDouble();

System.out.println("Enter the value of b: ");

double b=sc.nextDouble();

System.out.println("Enter the value of c: ");

double c=sc.nextDouble();


double d= (b*b)-(4*a*c);

double im;

double sqrt= Math.sqrt(d);

if(d>0)

{

  r1= (-b+sqrt)/(2*a);

  r2= (-b-sqrt)/(2*a);
```

```
  System.out.printf("Roots are real and distinct: %.4f and %.4f", r1,r2);

}

else if(d==0)

{

  r1=r2= (-b/(2*a));

  System.out.printf("Roots are real and equal: %.4f and %.4f", r1,r2);

}

else if(d<0){

  System.out.println("Roots are complex and not real");

}

}
```



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29/9/20 Lab 1

Q) Write a java program to find all roots of quad eqn

```
import java.util.Scanner;
public class Quad_eqn {
  public static void main(String[] args)
{
  Scanner sc = new Scanner(System.in);
  double r1, r2;
  System.out.println("Enter the value of a: ");
  double a = sc.nextDouble();
  System.out.println("Enter the value of b: ");
  double b = sc.nextDouble();
  System.out.println("Enter the value of c: ");
  double c=sc.nextDouble();

  double d = (b*b) -(4*a*c);
  double sqrt =Math.sqrt(d);

  if (d>=0)
{   r1 = (-b + sqrt)/(2*a);
    r2 = (-b - sqrt)/(2*a);
  System.out.println("Roots are real and distinct:
  %0.4f and %0.4f",r1, r2);
  }
  else if (d==0)
{
  r1=r2;
System.out.printf("Roots are real and
```

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```
equal : " + (-b/(2*a)) + ";  %.0.4f and %.0.4f, r1, r2);
}
else if (d<0)
{
  System.out.println("Roots are not real and complex");
  " + (-b/(2*a)) + " + i " + sqrt + " and " + (-b/(2*a)) + " - i " + sqrt);
}
}
}
```

Algorithm –

1. Start
2. Read / input a, b, c.
3. Define d as determinant and calculate $d = b^2 - 4ac$.
4. If $d > 0$, 2 real & distinct roots exist.
5. If $d = 0$, 2 real & equal roots exist.
6. If $d < 0$, imaginary roots (complex).
7. Print roots r_1 & r_2 for each case.
8. End

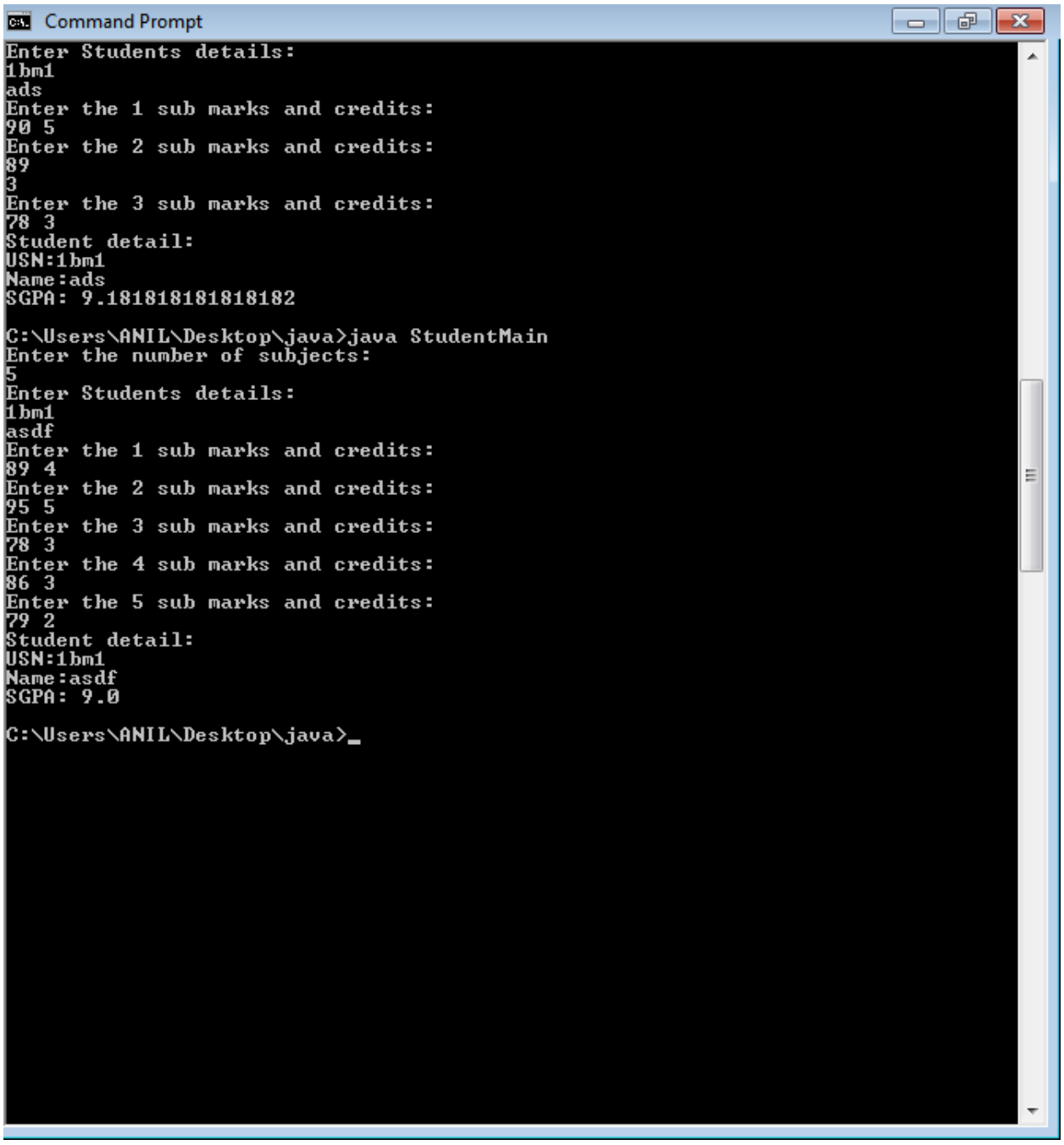
Week 4—Lab 2

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
{
 private String usn, name;
 private double sgpa;
 private int n, i, sum=0, cred_sum=0,grade;
 double[] marks=new double[n];
 int credit[]=new int[n];

Student()
{
 Scanner sc=new Scanner(System.in);
 System.out.println("Enter the number of subjects: ");
 n=sc.nextInt();
 }

void getStdData(){
 Scanner sc=new Scanner(System.in);
 System.out.println("Enter Students details:");
```

```
 usn=sc.next();
 name=sc.next();

for(i=0; i<n; i++){
System.out.println("Enter the "+(i+1)+" sub marks and credits:");
 marks[i] = sc.nextDouble();
 credit[i]=sc.nextInt();
}
}
 void sgpa_cal(){
for(i=0; i<n; i++){
if(marks[i]>=90 && marks[i]<=100)
grade=10;
else if(marks[i]>=80 && marks[i]<90)
grade= 9;
else if(marks[i]>=70 && marks[i]<80)
grade=8;
else if(marks[i]>=60 && marks[i]<70)
grade=7;
else if(marks[i]>=50 && marks[i]<60)
grade=6;
else if(marks[i]>=40 && marks[i]<50)
grade=5;
else if(marks[i]<40)
grade=0;
```

```
sum+= grade*credit[i];
}
for(i=0; i<n; i++){
cred_sum+=credit[i];
}
sgpa= (double)sum/cred_sum;
}
  void printData()
  {
  System.out.println("Student detail: ");
  System.out.println("USN:"+usn);
  System.out.println("Name:"+name);
  System.out.println("SGPA: "+sgpa);
  }
}

class StudentMain
{
 public static void main(String[] args){
            Student s1= new Student();
            s1.getStdData();
        s1.sgpa_cal();
            s1.printData();
}
}
```


Command Prompt
Enter Students details:
1bm1
ads
Enter the 1 sub marks and credits:
90 5
Enter the 2 sub marks and credits:
89
3
Enter the 3 sub marks and credits:
78 3
Student detail:
USN:1bm1
Name:ads
SGPA: 9.181818181818182
C:\Users\ANIL\Desktop\java>java StudentMain
Enter the number of subjects:
5
Enter Students details:
1bm1
asdf
Enter the 1 sub marks and credits:
89 4
Enter the 2 sub marks and credits:
95 5
Enter the 3 sub marks and credits:
78 3
Enter the 4 sub marks and credits:
86 3
Enter the 5 sub marks and credits:
79 2
Student detail:
USN:1bm1
Name:asdf
SGPA: 9.0
C:\Users\ANIL\Desktop\java>

6/10/20 Lab 2

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```
import java.util.Scanner;
class Student {
private String usn, name;
private double sgpa;
private int n, i, sum=0; cred_sum =0, grade;
double mark[] = new double[n];
int credit[] = new int[n];

Student () {
Scanner sc = new Scanner(System.in);
System.out.println("Enter the num of subjects: ");
n = sc.nextInt();
}
void getStdData(){
Scanner sc = new Scanner(System.in);
System.out.println("Enter student details: ");
usn = sc.next();
name = sc.next();

for(i=0; i<n; i++){
System.out.println("Enter "+(i+1)+" sub marks
and credits :");
marks[i] = sc.nextDouble();
credit[i] = sc.nextInt();
}
}
}

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

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```
if(marks[i] >= 90 && marks <= 100)
 grade = 10;
else if (marks[i] >= 80 && marks[i] < 90)
 grade = 9;
else if (marks[i] >= 70 && marks[i] < 80)
 grade = 8;
else if (marks[i] >= 60 && marks[i] < 70)
 grade = 7;
else if (marks[i] >= 50 && marks[i] < 60)
 grade = 6;
else if (marks[i] >= 40 && marks[i] < 50)
 grade = 5;
else if (marks < 40);
 grade = 0;
 sum += grade * credit[i];
}

 for (i=0; i<n; i++) {
 cred_sum += credit[i];
}

 sgpa = (double) sum/cred_sum;
}

 void printData()
{
 System.out.println("Student detail: ");
 System.out.println("USN: " +usn);
 System.out.println("Name: " +name);
 System.out.println("SGPA: " +sgpa);
}
}
```

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```
class studentMain
{
public static void main (String [] args)
{
  student S1 = new student ();
   S1.getStdData();
   S1.sgpa_cal();
   S1.printData();
  }
}
```

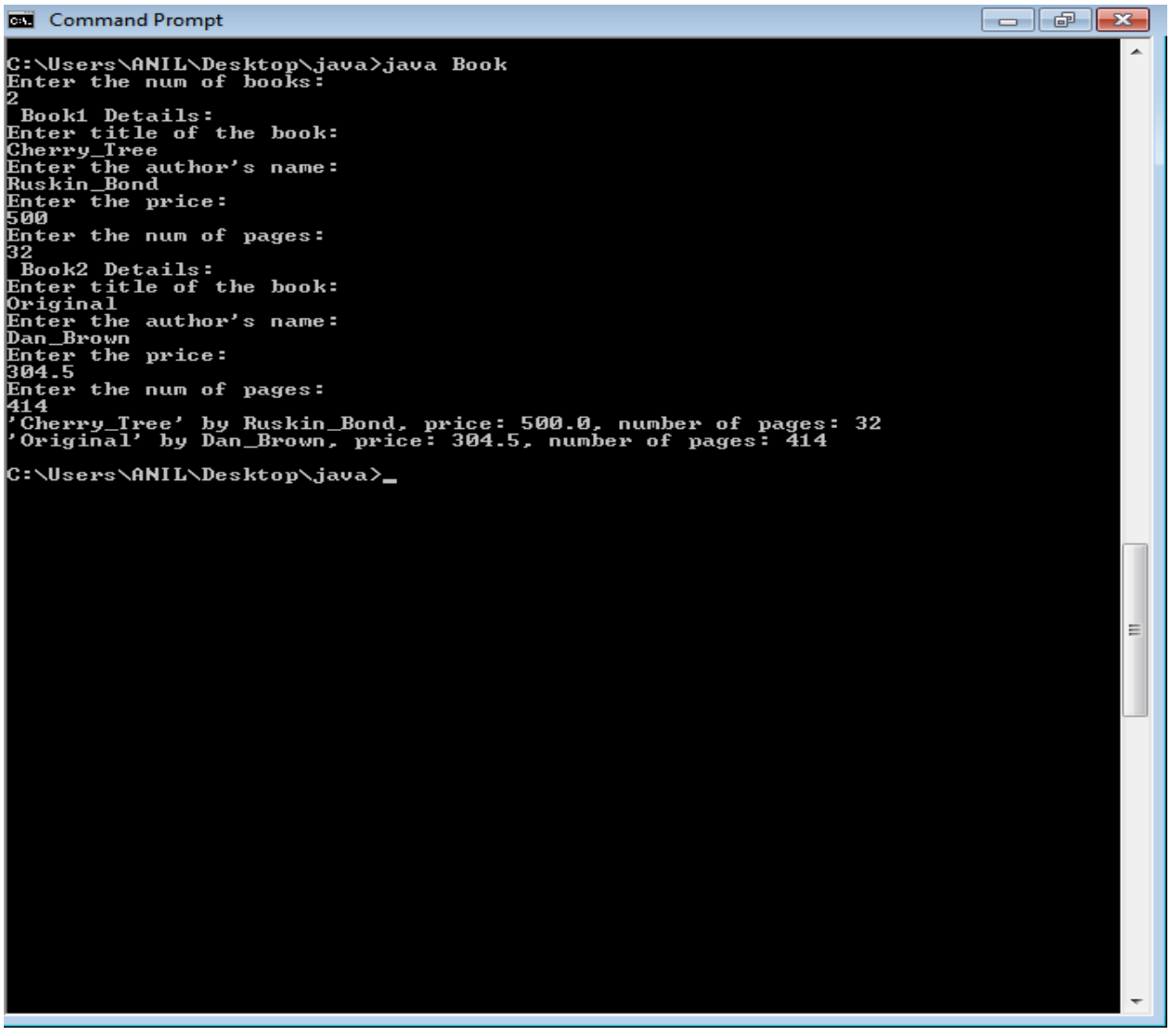
Week 5—Lab 3

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.Scanner;
class Book {
private String name;
private String author;
private double price;
private int num_pages;

Book(){
name=" ";
author=" ";
price= 0.0;
num_pages=0;
}

void getDetails(){
 Scanner sc= new Scanner(System.in);

 System.out.println("Enter title of the book: ");
```

```
 name = sc.next();
 System.out.println("Enter the author's name: ");
 author = sc.next();
 System.out.println("Enter the price: ");
 price = sc.nextDouble();
 System.out.println("Enter the num of pages: ");
 num_pages = sc.nextInt();
}

public String toString()
{
return ("'" +name+"' by " +author+ ", price: " +price+ ", number of pages: "+num_pages);
}

   public static void main(String ss[])
    {
    Scanner sc= new Scanner(System.in);
    int i,n;
    System.out.println("Enter the num of books: ");
    n= sc.nextInt();
    Book b[]=new Book[n];
    for(i=0; i<n; i++)
   {
    b[i]= new Book();
    System.out.println(" Book" +(i+1)+" Details: ");
```

```
    b[i].getDetails();
    }
  for(i=0; i<n; i++){
   System.out.println(b[i]);
   }
}
}
```



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13/10/20 Lab 3

Q) 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 & get details of the objects. Include a toString() method that could display the complete details of the book.

```
import java.util.Scanner;
class book {
private String name;
private String author;
private double price;
private int num_pages;

Book() {
name = " ";
author = " ";
price = 0.0;
num_pages = 0;
}

void getDetails() {
Scanner sc = new Scanner (System.in);
System.out.println("Enter the title of book: ");
name = sc.nextLine();
System.out.println("Enter the author's name: ");
author = sc.next();
System.out.println("Enter the price: ");
```

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```
price = sc.nextDouble();
System.out.println("Enter the num of pages : ");
num_pages = sc.nextInt();
}

public String toString()
{
return ("'" + name + "' by " + author + ", price: "
+ price + ", number of pages: " + num_pages);
}

public static void main(String ss[])
{
Scanner sc = new Scanner(System.in);
int i, n;
System.out.println("Enter the number of books
: ");
n = sc.nextInt();
Book b[] = new Book[n];
for (i=0; i<n; i++)
{
b[i] = new Book();
System.out.println("Book "+(i+1)+ "Details : ");
b[i].getDetails();
}
for (i=0; i<n; i++) {
System.out.println(b[i]);
}
}
}
```

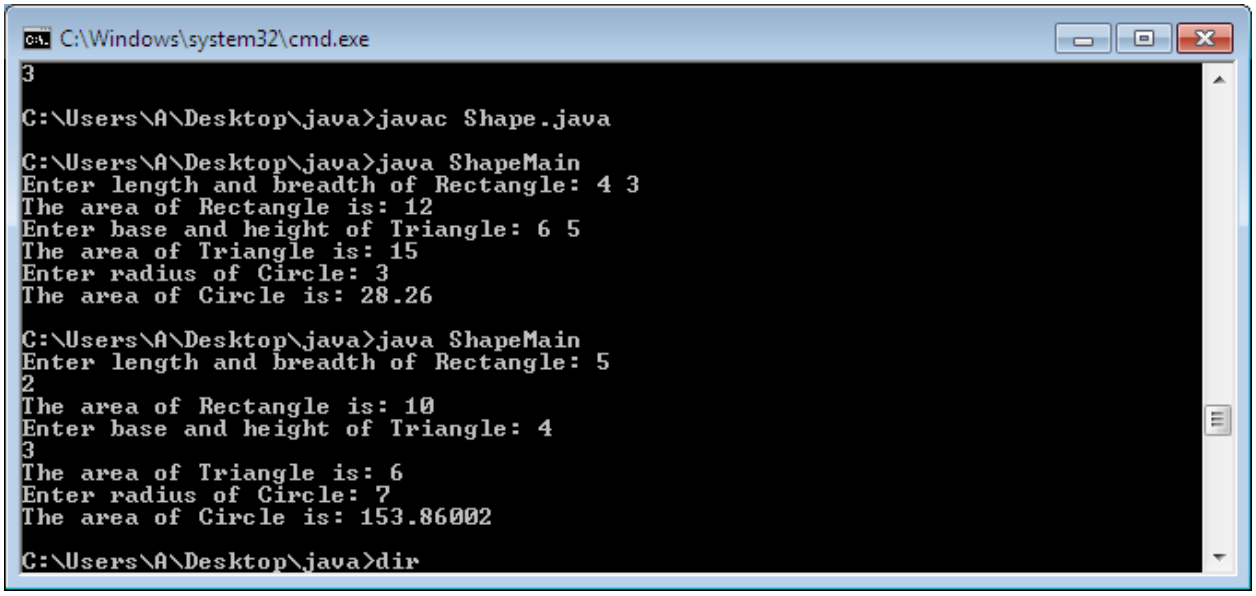
Week 8—Lab 4

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.

```
import java.util.Scanner;
abstract class Shape{
int a,b;
Scanner sc = new Scanner(System.in);
abstract void printArea();
}

class Rectangle extends Shape
{
void printArea()
{
System.out.print("Enter length and breadth of Rectangle: ");
a = sc.nextInt();
b = sc.nextInt();
System.out.println("The area of Rectangle is: "+a*b);
}
}

class Triangle extends Shape
```

```
 {
void printArea()
 {
System.out.print("Enter base and height of Triangle: ");
a = sc.nextInt();
b = sc.nextInt();
System.out.println("The area of Triangle is: "+(a*b)/2);
}
}

class Circle extends Shape
{
void printArea()
 {
System.out.print("Enter radius of Circle: ");
a = sc.nextInt();
System.out.println("The area of Circle is: " +3.14f*a*a);
}
}

 class ShapeMain
 {
public static void main(String[] args)
{
Rectangle rec = new Rectangle();
```

```
rec.printArea();


Triangle tri = new Triangle();

tri.printArea();


Circle cir = new Circle();

cir.printArea();

}

}
```



$P\left(1+\frac{R}{100}\right)^n$ IBM19CS006

5/11/20 Week 8

Lab 4

1)
```
import java.util.Scanner;
abstract class Shape {
int a, b;
Scanner sc = new Scanner (System.in);
abstract void printArea ();
}

class Rectangle extends Shape {
void printArea () {
System.out.println ("Enter length and breadth of
    Rectangle: ");
a = sc.nextInt ();
b = sc.nextInt ();
System.out.println ("Area of Rectangle is: "+a*b);
}
}

class Triangle extends Shape {
void printArea () {
System.out.println ("Enter base and height of Triangle
    : ");
a = sc.nextInt ();
b = sc.nextInt ();
System.out.println ("Area of Triangle is: "+(a*b)/2);
}
}
```

```
class Circle extends Shape {
void printArea () {
System.out.println ("Enter radius of Circle : ");
a = sc.nextInt ();
System.out.println ("Area of Circle is : " +3.14f *a*a);
}
}
}

class ShapeMain {
public static void main (String[] args) {
Rectangle rec = new Rectangle ();
rec.printArea ();

Triangle tri = new Triangle ();
tri.printArea ();

Circle cir = new Circle ();
cir.printArea ();
}
}
```

Week 8 – Lab 5

Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other 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 Curr-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks: • Accept deposit from customer and update the balance. • Display the balance. • Compute and deposit interest • Permit withdrawal and update the balance • Check for the minimum balance, impose penalty if necessary and update the balance.

```
import java.util.Scanner;
abstract class Account
{
String name, acctype;

long accNo;
double bal;
Account(String name, long accNo, double bal, String acctype)
{
this.accNo = accNo;
this.name = name;
this.bal = bal;
```

```
this.acctype = acctype;

}

abstract void addBal(double amt);

abstract void displayBal();

abstract void withdrawBal(double amt);

}

class Curr_acct extends Account

{

final double minBal = 1000.0;

Curr_acct(String name, long accNo, double bal)

{

super(name, accNo, bal, "Current");

System.out.println("Name: "+name+"\n Accno: "+accNo+"\n Balance: "+bal+"\n Account Type:
"+acctype);

}

void addBal(double amt)

{

this.bal  += amt;

}

void displayBal()

{

System.out.println("The balance is: "+this.bal);

}

void checkBal(){

if(this.bal<minBal)

{
```

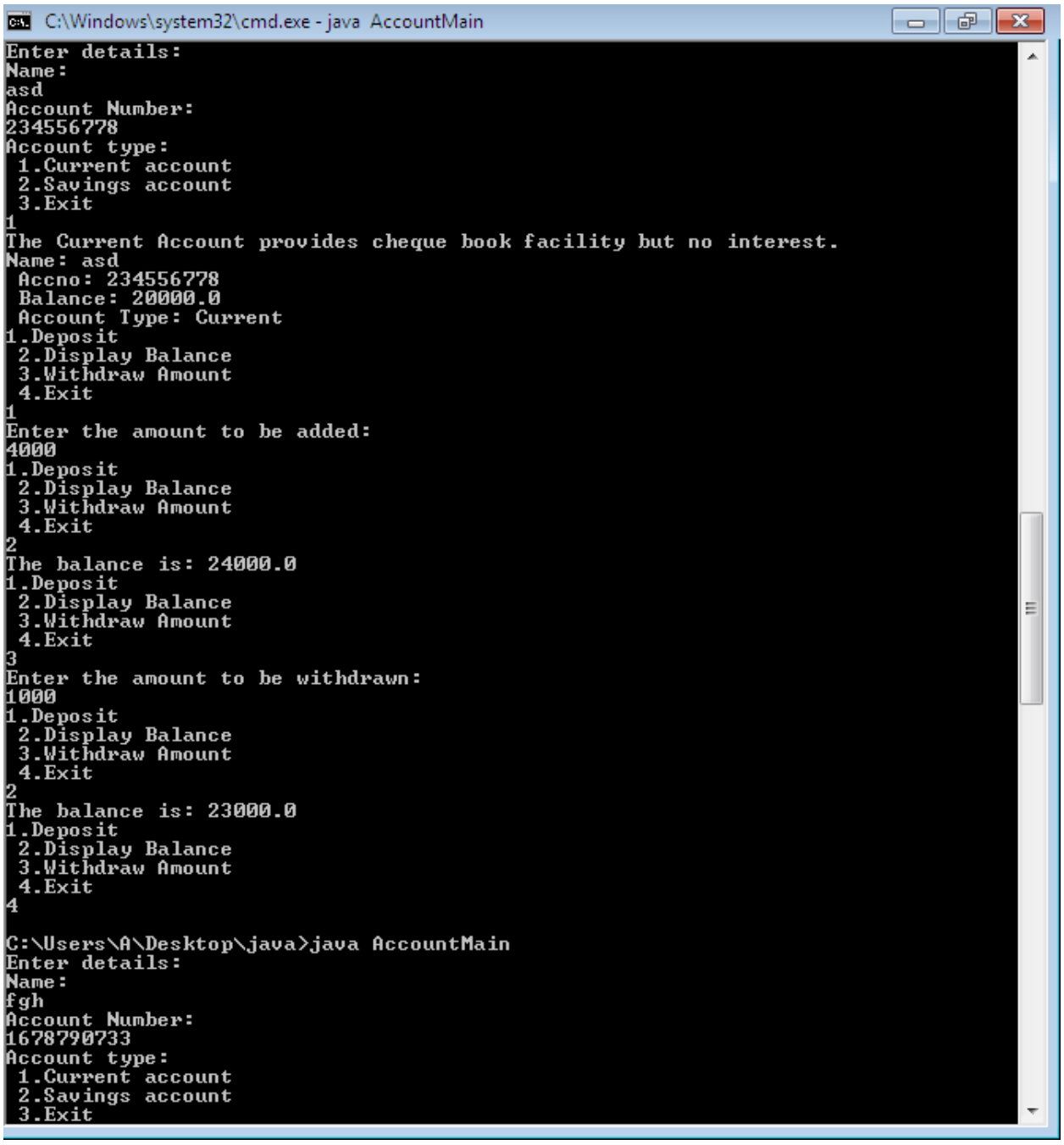
```
System.out.println("Insufficient balance, service charge imposed");
this.bal -= this.bal*0.02;
}
}
void withdrawBal(double amt)
{
this.bal -= amt;
checkBal();
}
}

class Sav_acct extends Account
{
Sav_acct(String name, long accNo, double bal)
{
super(name, accNo, bal, "Savings");
System.out.println("Name: "+name+"\n Accno: "+accNo+"\n Balance: "+bal+"\n Account Type:
"+acctype);

}
void addBal(double amt)
{
this.bal+= amt;
}
void addCI(double amt)
{
```

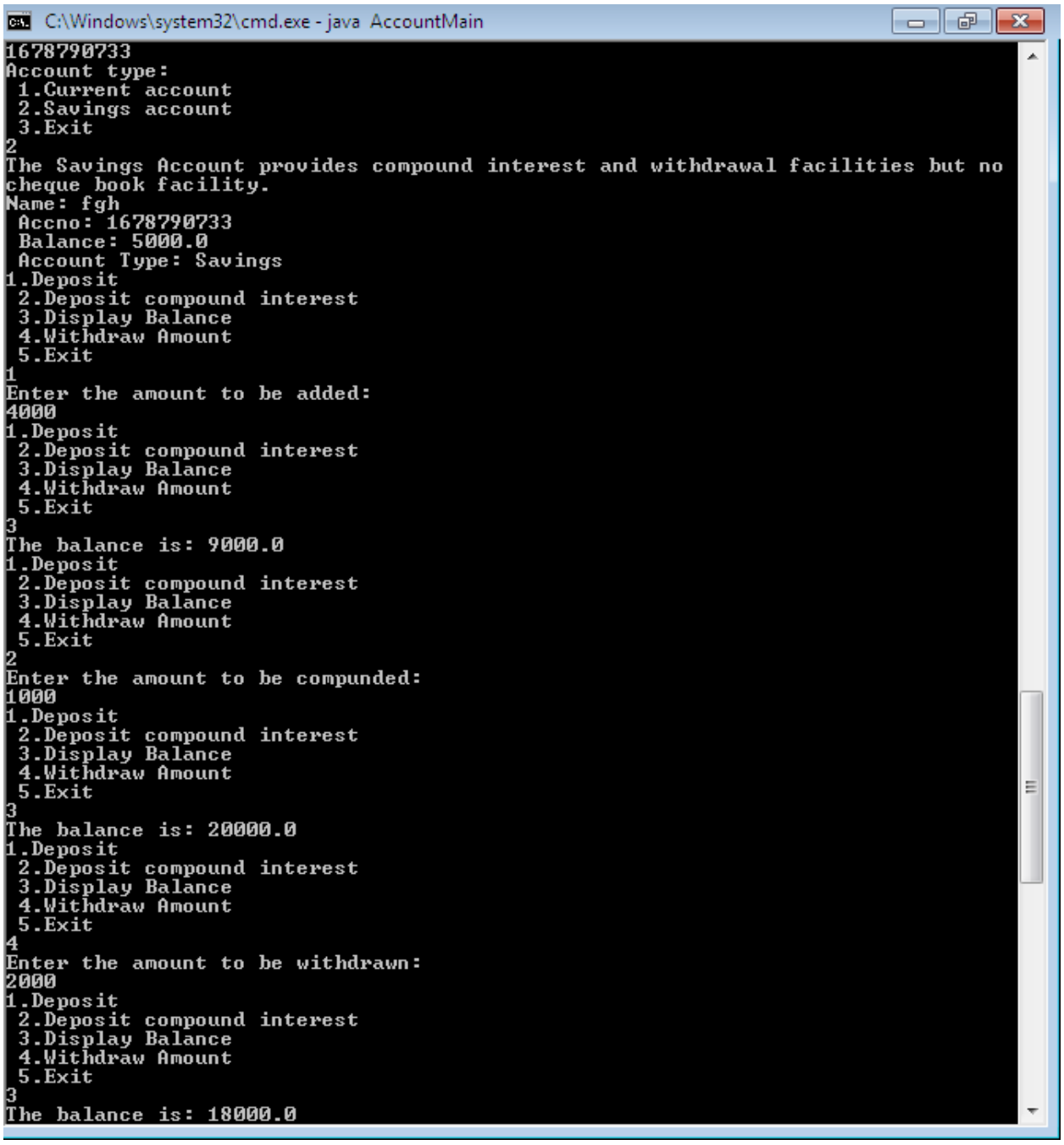
```
this.bal+= amt;
addIntr();
}
void addIntr()
{
int tm=2, R=7;
this.bal+= this.bal*(Math.pow((1+(R/100)), tm));
}
void displayBal()
{
System.out.println("The balance is: "+this.bal);
}
void withdrawBal(double amt)
{
this.bal-= amt;
}
}

class AccountMain   {
public static void main(String[] args) {
Scanner sc = new Scanner(System.in);
double amt;
System.out.println("Enter details:");
System.out.println("Name:");
String s1=sc.next();
```

```
System.out.println("Account Number:");
long s2=sc.nextLong();
while(true) {
System.out.println("Account type:\n 1.Current account\n 2.Savings account\n 3.Exit");
int o=sc.nextInt();
if(o==1){
System.out.println("The Current Account provides cheque book facility but no interest.");
Curr_acct cr = new Curr_acct(s1, s2, 20000);
while(true) {
System.out.println("1.Deposit\n 2.Display Balance\n 3.Withdraw Amount\n 4.Exit");
int ch = sc.nextInt();
switch (ch) {
case 1:
System.out.println("Enter the amount to be added:");
amt = sc.nextDouble();
cr.addBal(amt);
break;
case 2:
cr.displayBal();
break;
case 3:
System.out.println("Enter the amount to be withdrawn:");
amt = sc.nextDouble();
cr.withdrawBal(amt);
break;
```

```
case 4:System.exit(0);

default:System.out.println("Invalid choice");

}

}

}

else if(o==2){

System.out.println("The Savings Account provides compound interest and withdrawal facilities but no cheque book facility.");

Sav_acct sv = new Sav_acct(s1, s2, 5000);

while(true) {

System.out.println("1.Deposit\n 2.Deposit compound interest\n 3.Display Balance\n 4.Withdraw Amount\n 5.Exit");

int ch = sc.nextInt();

switch (ch) {

case 1:

System.out.println("Enter the amount to be added:");

amt = sc.nextDouble();

sv.addBal(amt);

break;

case 2:

System.out.println("Enter the amount to be compunded: ");

amt=sc.nextDouble();

sv.addCI(amt);

break;

case 3:

sv.displayBal();
```

```
break;
case 4:
System.out.println("Enter the amount to be withdrawn:");
amt = sc.nextDouble();
sv.withdrawBal(amt);
break;
case 5:System.exit(0);
default:System.out.println("Invalid choice");
}
}
}
else if(o==3)
System.exit(0);
else
System.out.println("Invalid choice");
}
}
}
```


C:\Windows\system32\cmd.exe - java AccountMain
Enter details:
Name:
asd
Account Number:
234556778
Account type:
1.Current account
2.Savings account
3.Exit
1
The Current Account provides cheque book facility but no interest.
Name: asd
Accno: 234556778
Balance: 20000.0
Account Type: Current
1.Deposit
2.Display Balance
3.Withdraw Amount
4.Exit
1
Enter the amount to be added:
4000
1.Deposit
2.Display Balance
3.Withdraw Amount
4.Exit
2
The balance is: 24000.0
1.Deposit
2.Display Balance
3.Withdraw Amount
4.Exit
3
Enter the amount to be withdrawn:
1000
1.Deposit
2.Display Balance
3.Withdraw Amount
4.Exit
2
The balance is: 23000.0
1.Deposit
2.Display Balance
3.Withdraw Amount
4.Exit
4
C:\Users\A\Desktop\java>java AccountMain
Enter details:
Name:
fgh
Account Number:
1678790733
Account type:
1.Current account
2.Savings account
3.Exit


C:\Windows\system32\cmd.exe - java AccountMain
1678790733
Account type:
1.Current account
2.Savings account
3.Exit
2
The Savings Account provides compound interest and withdrawal facilities but no cheque book facility.
Name: fgh
Accno: 1678790733
Balance: 5000.0
Account Type: Savings
1.Deposit
2.Deposit compound interest
3.Display Balance
4.Withdraw Amount
5.Exit
1
Enter the amount to be added:
4000
1.Deposit
2.Deposit compound interest
3.Display Balance
4.Withdraw Amount
5.Exit
3
The balance is: 9000.0
1.Deposit
2.Deposit compound interest
3.Display Balance
4.Withdraw Amount
5.Exit
2
Enter the amount to be compunded:
1000
1.Deposit
2.Deposit compound interest
3.Display Balance
4.Withdraw Amount
5.Exit
3
The balance is: 20000.0
1.Deposit
2.Deposit compound interest
3.Display Balance
4.Withdraw Amount
5.Exit
4
Enter the amount to be withdrawn:
2000
1.Deposit
2.Deposit compound interest
3.Display Balance
4.Withdraw Amount
5.Exit
3
The balance is: 18000.0

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3/11/20

Lab 5

```
import java.util.Scanner;
abstract class Account
{
 String name, acctype;
 long accNo;
 double bal;

 Account (String name, long accNo, double bal~~ance~~,
   String acctype )
 {
 this.accNo = accNo;
 this.name = name;
 this.bal = bal;
 this.acctype = acctype;
 }
 abstract void addBal (double amt);
 abstract void displayBal ();
 abstract void withdrawBal (double amt);
}

class Curr_actt extends Account
{ final double minBal = 1000.0;
 Curr_acct (String name, long accNo, double bal)
{ super (name, accNo, bal, "Current ");
System.out.println ("Name: "+name+ "\n Accno: "
 +accNo+ "\n Balance: "+bal+"\n Account Type: "
   +acctype );
}
```

```
void addBal (double amt)
{ this.bal += amt;
 }
 void displayBal ()
{
System.out.println ("The balance is : "+this.bal);
}
 void checkBal()
{ if ( this.bal< minBal)
{
 System.out.println ("Insufficient balance, service charge
 will be imposed ");
 this.bal -= this.bal * 0.02;
 }
 }
}

 void withdrawBal (double amt)
{ this.bal -= amt;
 checkBal();
 }
}


class Sav_acct extends Account
{

Sav_acct (String name, long accNo, double bal)
{ super (name, accNo, bal, "Savings");
System.out.println("Name : "+name+"\n Accno : "+
 accNo + "\n Balance : "+bal+"\n Account Type : "
  +acctype);
}
```

IBM19CS006

```
void addBal (double amt)
{
  this . bal += amt;
}

void addCI (double amt)
{
   this . bal += amt ;
  addInte ();
}

void addInte()
{
   int  tm = 2 , R=7;
 this . bal += this . bal* (Math . pow((1+(R/100)),tm));
}

 void displayBal()
{
 System . out . println ("The balance is : " +this . bal);
}

 void withdrawBal (double amount)
{
 this . bal -= amt;
}
}
}


class AccountMain {
public static void main(String [] args) {
Scanner sc = new Scanner(System . in );
double amt;
System . out . println ("Enter details : ");
System . out . println ("Name : ");
String s1 = sc . next();
```

```
System.out.println("Account Number: ");
long s2=sc.nextLong();
while (true){
System.out.println("Account type:\n1.Current account\n
2.Savings account\n3.Exit");
int o=sc.nextInt();
if (o==1){
System.out.println("The current account provides cheque
book facility but no interest");
Curr_acct cr=new Curr_acct(s1,s2,20000);
while(true){
System.out.println("1.Deposit\n2.Display balance\n
3.Withdraw Amount\n4.Exit");
int ch=sc.nextInt();
switch(ch){
case 1: System.out.println("Enter the amount to be
added:");  amt=sc.nextDouble();
cr.addBal(amt);
break;
case 2: cr.displayBal();
break;
case 3: System.out.println("Enter amount to be withdrawn:");
amt=sc.nextDouble();
cr.withdrawBal(amt);
break;
case 4: System.exit(0);
default: System.out.println("Invalid choice");
}
}
}
```

1BM19CS006

```
else if(o==2){
System.out.println("The Savings Account provides compound interest and withdrawal facilities but no cheque book facility");
Sav_acct sv=new Sav_acct(s1,s2,5000);
while(true){
System.out.println("1.Deposit \n 2.Deposit compound interest \n 3.Display Balance \n 4.Withdraw Amount \n 5.Exit");
int ch=sc.nextInt();
switch(ch){
case 1: System.out.println("Enter the amount to be added:");
amt=sc.nextDouble();
sv.addBal(amt);
break;
case 2: System.out.println("Enter the amount to be compounded:");
amt=sc.nextDouble();
sv.addCI(amt);
break;
case 3: sv.displayBal();
break;
case 4: System.out.println("Enter the amount to be withdrawn:");
amt=sc.nextDouble();
sv.withdrawBal(amt);
break;
case 5: System.exit(0);
```

```
default : System.out.println ("Invalid choice");
}
}
}
else if(o==3)
System.exit(0);
else
System.out.println ("Invalid choice");
}
}
}
```