



SCHOOL OF  
COMPUTING

VAISHNAV H  
CH.SC.U4CSE24049  
OBJECT ORIENTED PROGRAMMING  
(23CSE111)  
LAB RECORD



**SCHOOL OF  
COMPUTING**

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AMRITA SCHOOL OF COMPUTING, CHENNAI**

**BONAFIDE CERTIFICATE**

This is to certify that the Lab Record work for 23CSE111- Object Oriented Programming Subject submitted by **CH.SC.U4CSE24049 – VAISHNAV H** in “**Computer Science and Engineering**” is a Bonafide record of the work carried out under my guidance and supervision at Amrita School of Computing, Chennai.

This Lab examination held on 11/03/2025

Internal Examiner 1

Internal Examiner 2

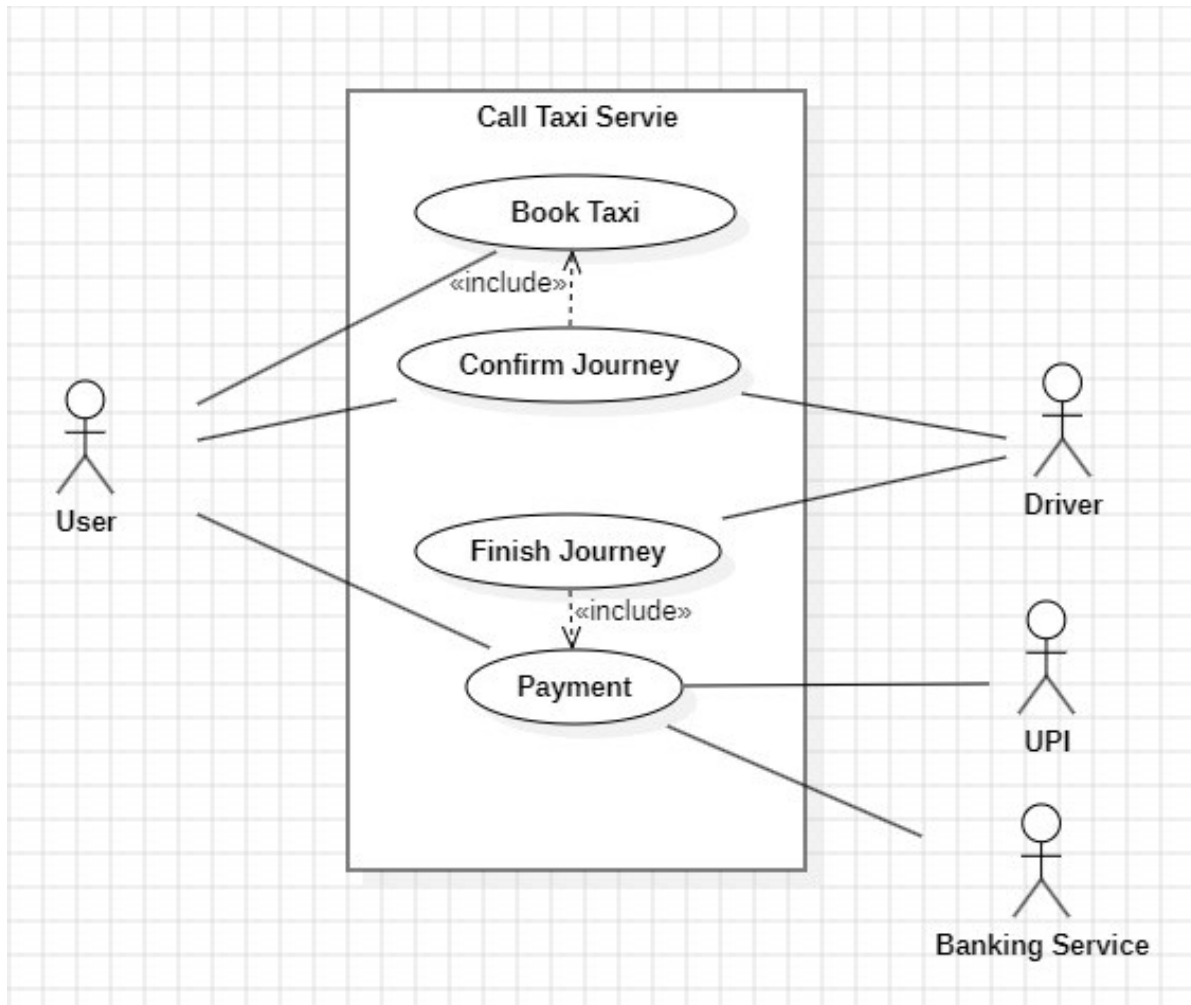
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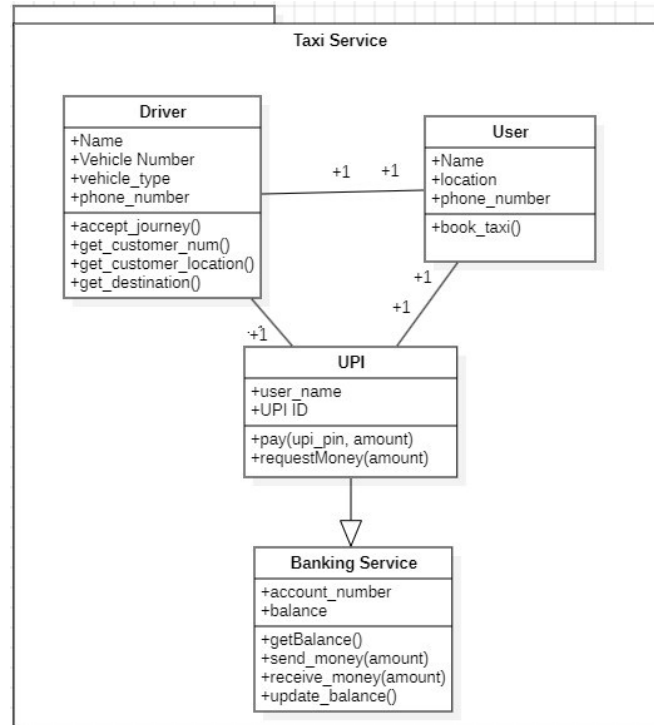
# UML DIAGRAMS

## 1. TAXI SERVICE APPLICATION

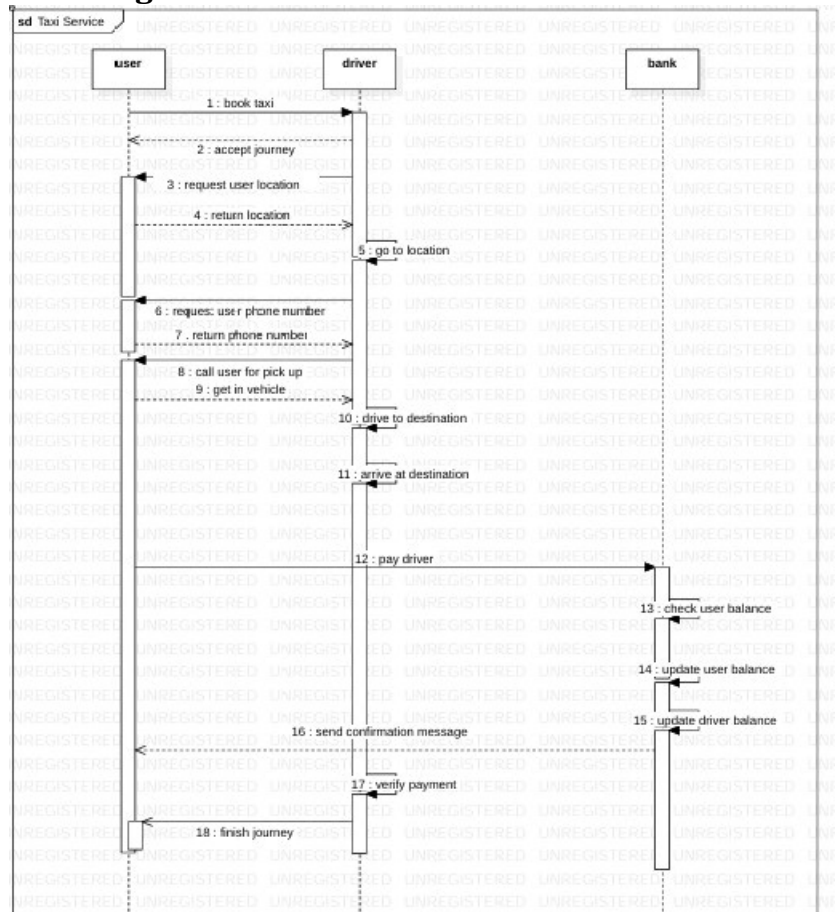
### 1.a) Use Case Diagram:

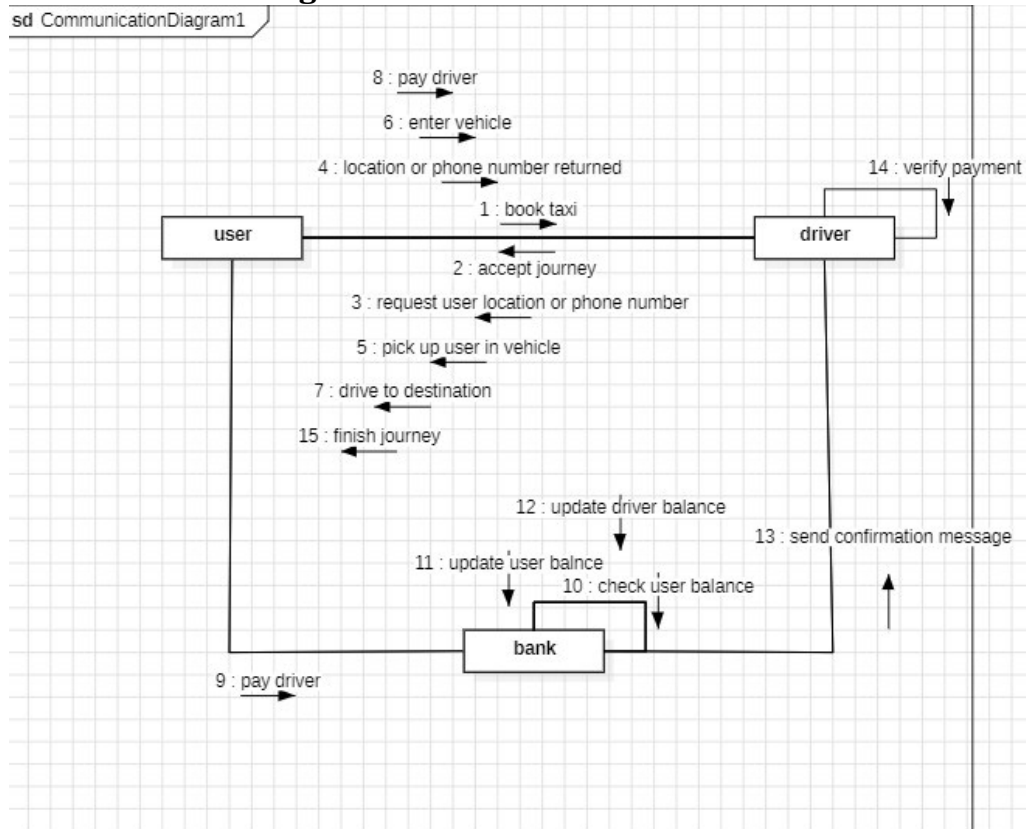
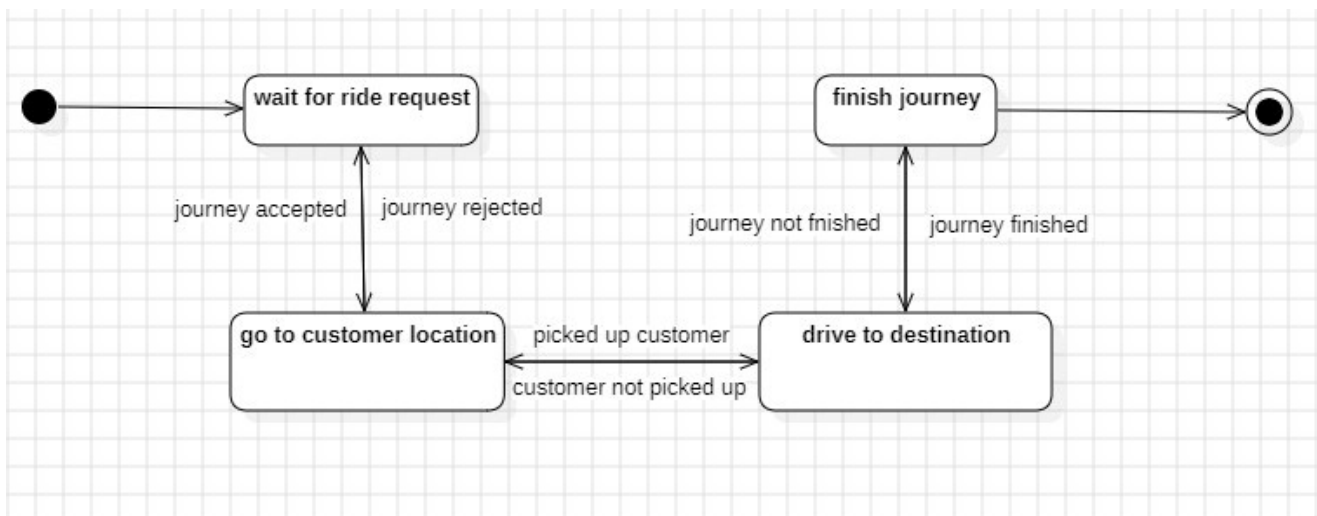


## 1.b) Class Diagram:



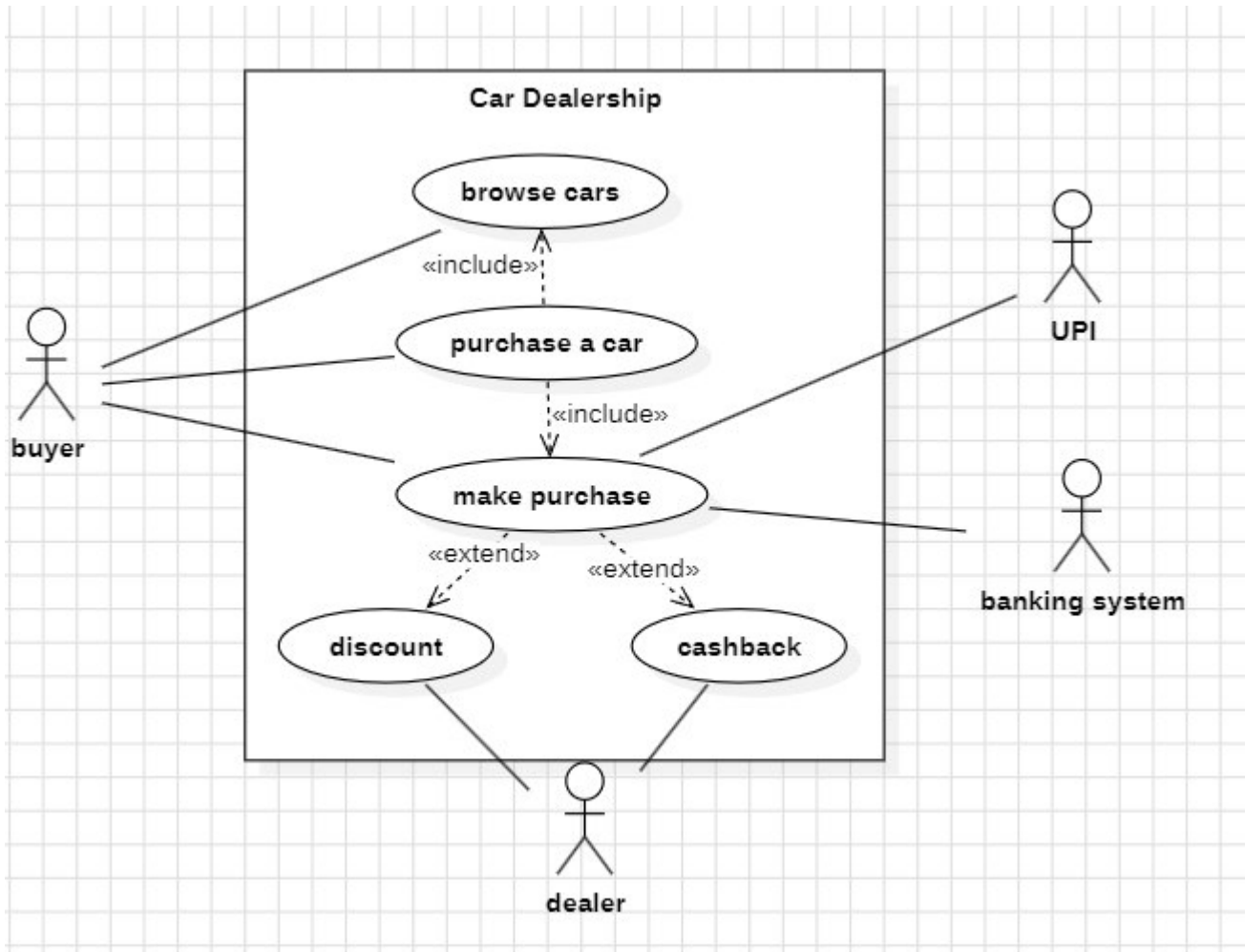
## 1.c) Sequence Diagram:

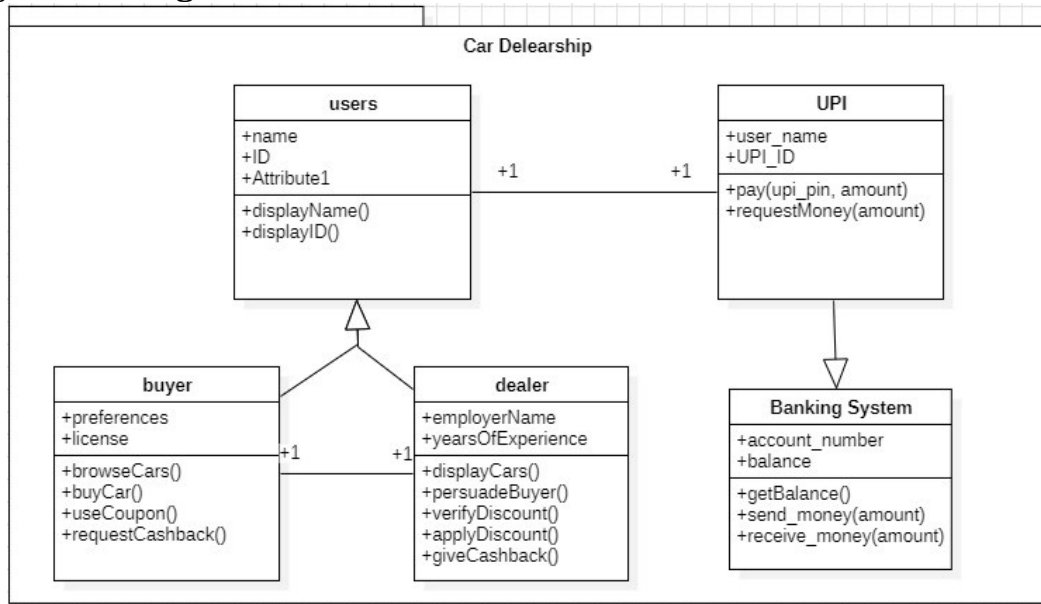


**1.d) Collaboration Diagram:****1.e) State-Activity Diagram:**

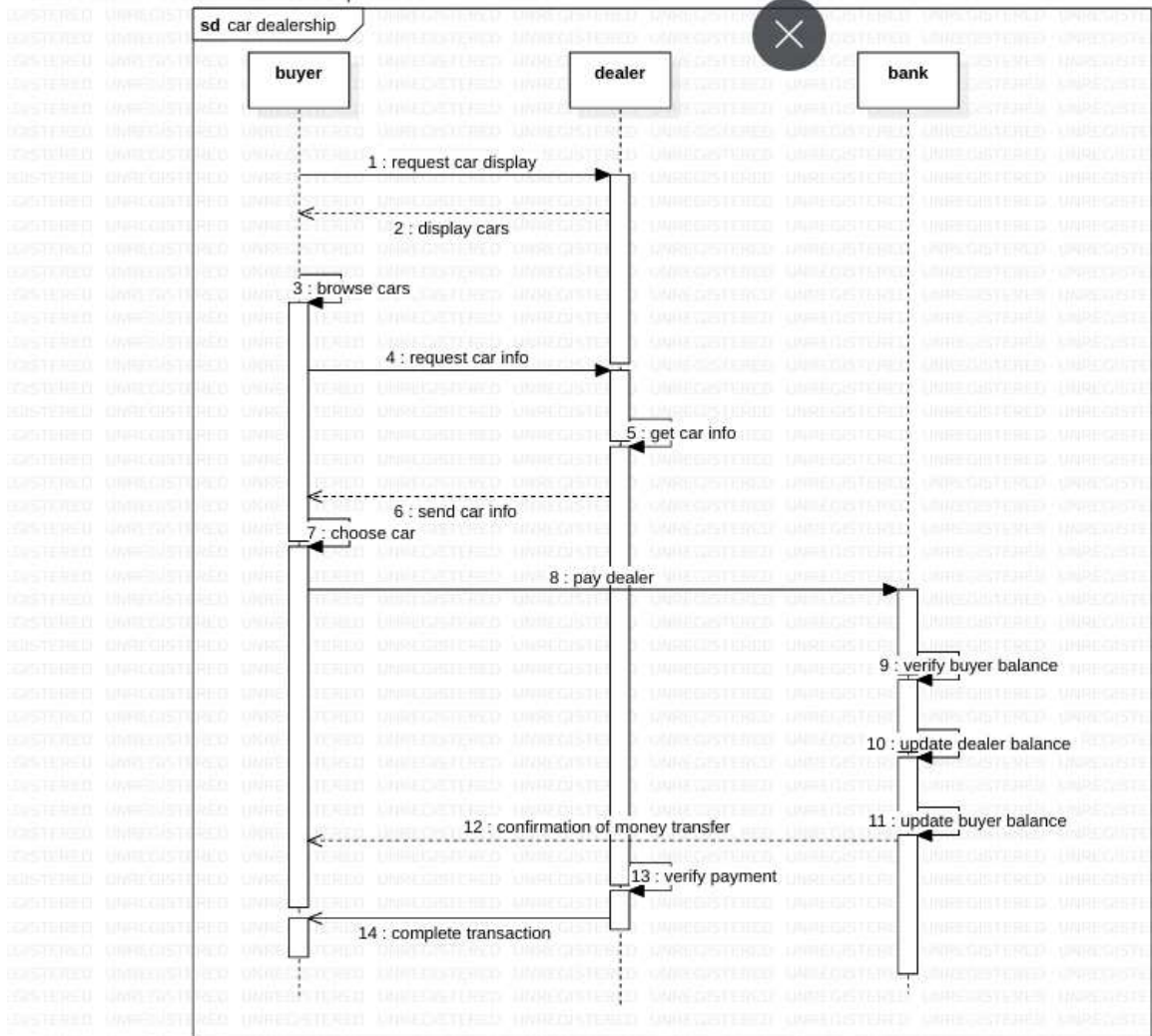
## 2. CAR DEALERSHIP APPLICATION

### 2.a) Use Case Diagram:



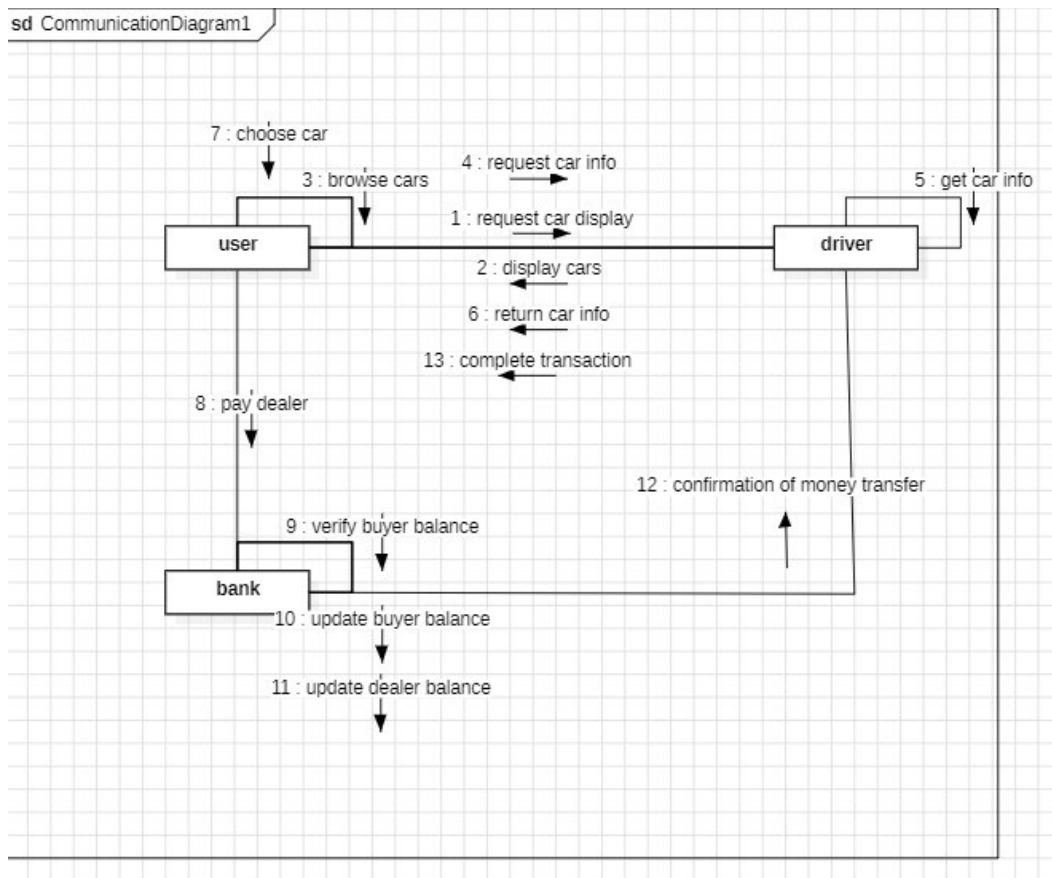
**2.b) Class Diagram:****2.c) Sequence Diagram:**

Collaboration1: Interaction1: car dealership

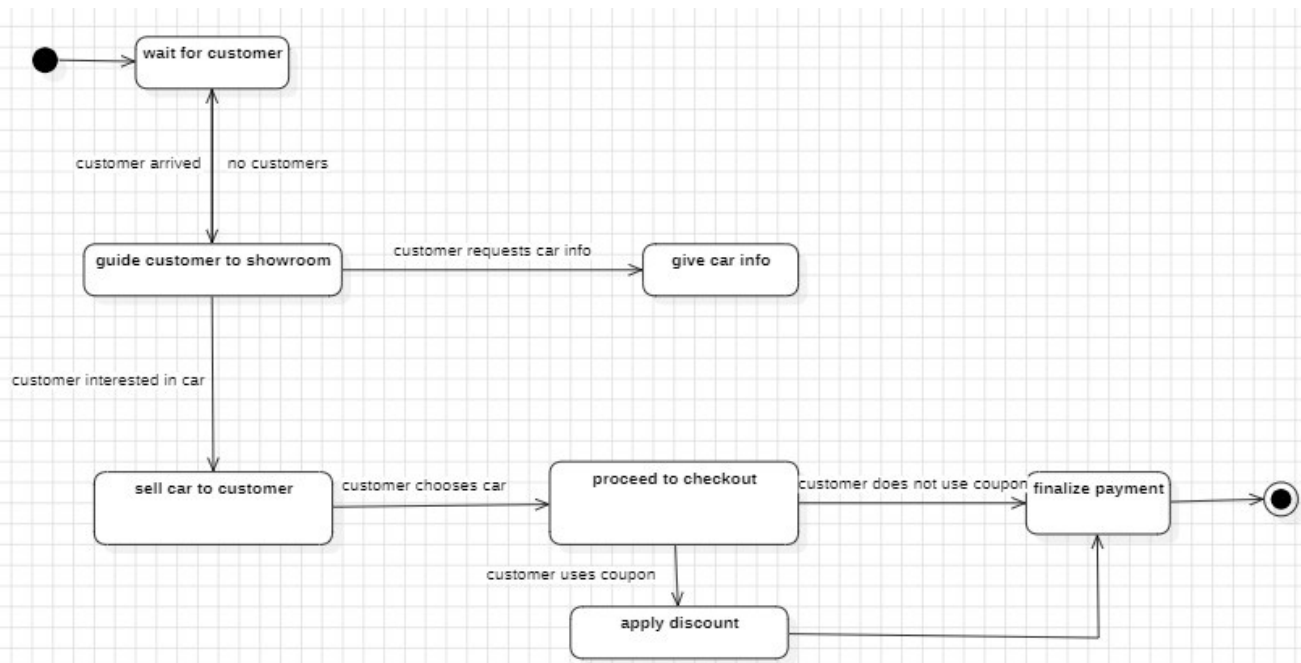




## 2.d) Collaboration Diagram:



## 2.e) State-Activity Diagram:



### 3. Basic Java Programs

#### 3.a) CalculateArea of Rectangle, Circle, Triangle:

**Code:**

```
import java.util.Scanner;

class Area{
    public static void main(String[] args){
        int choice=0;
        double l;
        double b;
        double h;
        double r;
        findArea find=new findArea();
        Scanner scan=new Scanner(System.in);
        while(choice!=4){
            System.out.println("FIND AREA FOR:");
            System.out.println("1.RECTANGLE");
            System.out.println("2.CIRCLE");
            System.out.println("3.TRIANGLE");
            System.out.println("4.EXIT");
            choice=scan.nextInt();
            switch (choice) {
                case 1:
                    System.out.print("Enter length: ");
                    l=scan.nextDouble();
                    System.out.print("Enter breadth: ");
                    b=scan.nextDouble();
                    find.rectArea(l, b);
```

```
        break;
    case 2:
        System.out.print("Enter radius: ");
        r=scan.nextDouble();
        find.CircleArea(r);
        break;
    case 3:
        System.out.print("Enter base: ");
        b=scan.nextDouble();
        System.out.print("Enter height: ");
        h=scan.nextDouble();
        find.triArea(b, h);
        break;
    case 4:
        System.out.println("EXITING.....");
        break;
    default:
        System.out.println("-----INVALID-----");
    }

}

}

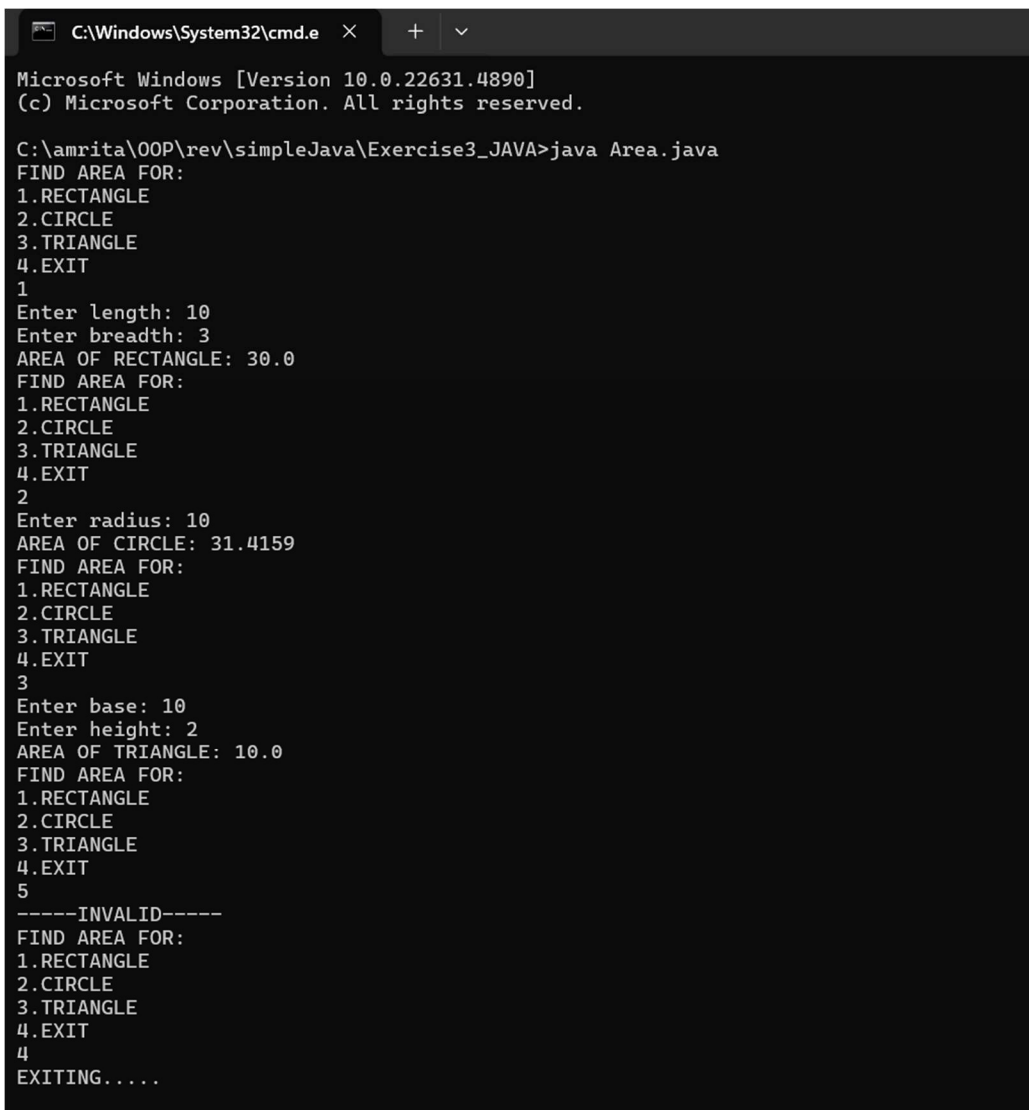
}

}

class findArea{
    public void rectArea(double l, double b){
        double c=l*b;
        System.out.println("AREA OF RECTANGLE: "+c );
    }
}
```

```
}  
  
    public void CircleArea(double r){  
        double c=3.14159*r;  
        System.out.println("AREA OF CIRCLE: "+c );  
    }  
  
    public void triArea(double b, double h){  
        double c=0.5*b*h;  
        System.out.println("AREA OF TRIANGLE: "+c );  
    }  
  
}
```

### Output:



```
C:\Windows\System32\cmd.e  X  +  v  
Microsoft Windows [Version 10.0.22631.4890]  
(c) Microsoft Corporation. All rights reserved.  
  
C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java Area.java  
FIND AREA FOR:  
1.RECTANGLE  
2.CIRCLE  
3.TRIANGLE  
4.EXIT  
1  
Enter length: 10  
Enter breadth: 3  
AREA OF RECTANGLE: 30.0  
FIND AREA FOR:  
1.RECTANGLE  
2.CIRCLE  
3.TRIANGLE  
4.EXIT  
2  
Enter radius: 10  
AREA OF CIRCLE: 31.4159  
FIND AREA FOR:  
1.RECTANGLE  
2.CIRCLE  
3.TRIANGLE  
4.EXIT  
3  
Enter base: 10  
Enter height: 2  
AREA OF TRIANGLE: 10.0  
FIND AREA FOR:  
1.RECTANGLE  
2.CIRCLE  
3.TRIANGLE  
4.EXIT  
5  
-----INVALID-----  
FIND AREA FOR:  
1.RECTANGLE  
2.CIRCLE  
3.TRIANGLE  
4.EXIT  
4  
EXITING.....
```

### 3.b) Basic Math Operations:

**Code:**

```
import java.util.Scanner;

class calculate{

    public static void main(String[] args){

        int choice=0;

        Calc calc=new Calc();

        Scanner scan=new Scanner(System.in);

        System.out.print("Enter num1: ");

        int num1=scan.nextInt();

        System.out.print("Enter num2: ");

        int num2=scan.nextInt();

        while(choice!=5){

            System.out.println("PICK AN OPERATION:");

            System.out.println("1.Addition");

            System.out.println("2.Subtraction");

            System.out.println("3.Multiplication");

            System.out.println("4.Division");

            System.out.println("5.EXIT");

            choice=scan.nextInt();

            switch (choice) {

                case 1:

                    calc.add(num1, num2);

                    break;

                case 2:

                    calc.subtract(num1, num2);

                    break;

                case 3:

                    calc.multiply(num1, num2);
```

```
        break;
    case 4:
        calc.divide(num1, num2);
        break;
    case 5:
        System.out.println("EXITING.....");
        break;
    default:
        System.out.println("-----INVALID-----");
    }

}

}

}

}

class Calc{
    public void add(int a, int b){
        int c=a+b;
        System.out.println("ANSWER: "+a + "+"+b+"="+c+"\n");
    }
    public void subtract(int a, int b){
        int c=a-b;
        System.out.println("\nANSWER: "+a + "-" +b + "=" + c+"\n");
    }
    public void multiply(int a , int b){
        int c=a*b;
        System.out.println("\nANSWER: "+a+"x"+b+"="+c+"\n");
    }
    public void divide(double a, double b){
```


```
        double c=a/b;

        System.out.println("\nANSWER: "+a+"/"+b+"="+c+"\n");

    }

}
```

## Output:



```
C:\Windows\System32\cmd.e  X  +  v

Microsoft Windows [Version 10.0.22631.4890]
(c) Microsoft Corporation. All rights reserved.

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java calculate.java
Enter num1: 10
Enter num2: 5
PICK AN OPERATION:
1.Addition
2.Subtraction
3.Multiplication
4.Division
5.EXIT
1
ANSWER: 10+5=15

PICK AN OPERATION:
1.Addition
2.Subtraction
3.Multiplication
4.Division
5.EXIT
2
ANSWER: 10-5=5

PICK AN OPERATION:
1.Addition
2.Subtraction
3.Multiplication
4.Division
5.EXIT
3
ANSWER: 10x5=50

PICK AN OPERATION:
1.Addition
2.Subtraction
3.Multiplication
4.Division
5.EXIT
4
ANSWER: 10.0/5.0=2.0

PICK AN OPERATION:
1.Addition
2.Subtraction
3.Multiplication
4.Division
5.EXIT
6
-----INVALID-----
PICK AN OPERATION:
1.Addition
2.Subtraction
3.Multiplication
4.Division
5.EXIT
5
EXITING....

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>
```

### 3.c) Factorial:

**Code:**

```
import java.util.Scanner;

class factorial{

    public static void main(String[] args){

        Scanner scan=new Scanner(System.in);

        calculate obj=new calculate();

        System.out.print("Enter number to find factorial: ");

        long num=scan.nextLong();

        long fact=obj.fac(num);

        System.out.println("factorial of "+num+" is "+fact);

    }

}

class calculate{

    public long fac(long num){

        long fac=1;

        for(long i=1; i<=num;i++){

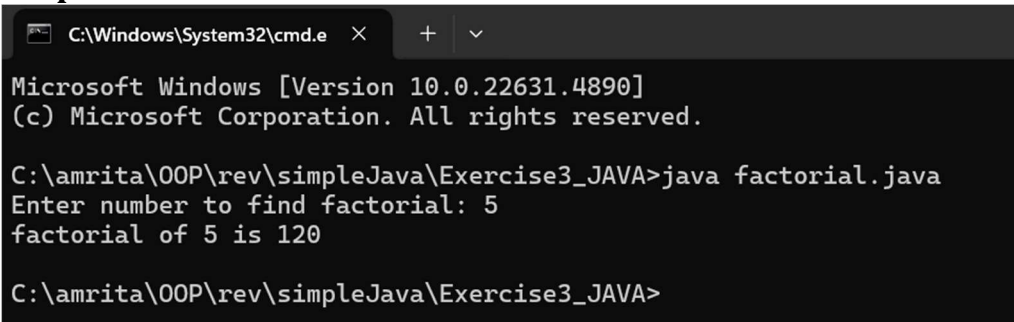
            fac=fac*i;

        }

        return fac;

    }

}
```

**Output:**

```
C:\Windows\System32\cmd.e  X  +  v

Microsoft Windows [Version 10.0.22631.4890]
(c) Microsoft Corporation. All rights reserved.

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java factorial.java
Enter number to find factorial: 5
factorial of 5 is 120

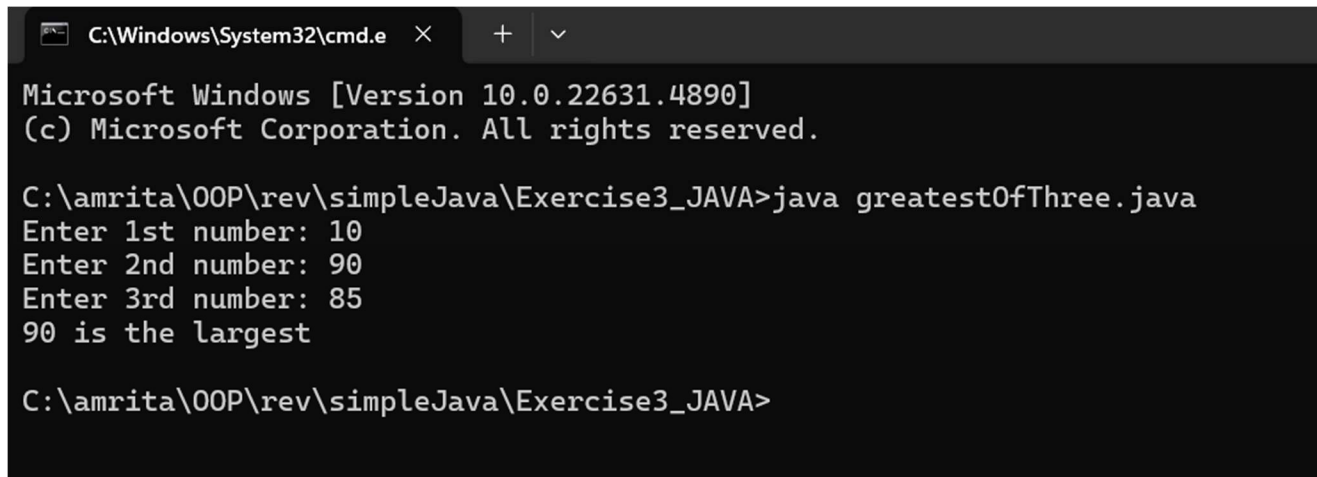
C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>
```



### 3.d) Finding the Greatest of Three Numbers:

**Code:**

```
import java.util.Scanner;
class greatestOfThree{
    public static void main(String[] args){
        Scanner scan=new Scanner(System.in);
        System.out.print("Enter 1st number: ");
        int a=scan.nextInt();
        System.out.print("Enter 2nd number: ");
        int b=scan.nextInt();
        System.out.print("Enter 3rd number: ");
        int c=scan.nextInt();
        if (a>b){
            if(a>c){
                System.out.println(a+" is the largest");
            }
        }
        if (b>c){
            if (b>a){
                System.out.println(b+" is the largest");
            }
        }
        if (c>a){
            if(c>b){
                System.out.println(c+" is the largest");
            }
        }
    }
}
```

**Output;**

```
C:\Windows\System32\cmd.e  X  +  v

Microsoft Windows [Version 10.0.22631.4890]
(c) Microsoft Corporation. All rights reserved.

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java greatestOfThree.java
Enter 1st number: 10
Enter 2nd number: 90
Enter 3rd number: 85
90 is the largest

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>
```

### 3.e) Number Guessing Game:

**Code:**

```
import java.util.Scanner;

class guessNumber{

    public static void main(String[] args){

        int choice=0;
        int tries=5;
        Scanner scan=new Scanner(System.in);
        System.out.print("GUESS THE NUMBER BETWEEN 1 and 5 (you have 5
tries): ");
        while(tries>0){
            choice=scan.nextInt();
            System.out.println("-----YOU GUESSED: "+choice+"-----");
            if (choice==3){
                System.out.println("-----YOU GUESSED THE CORRECT NUMBER
3-----");
                break;
            }
            else{
                System.out.println("-----YOU GUESSED WRONG-----");
                tries=tries-1;
                System.out.println("-----You have "+tries+" tries-----
");
            }
            if (tries==0){
                System.out.println("-----YOU LOSE-----");
                break;
            }
        }
    }
}
```

```
}
```

### Output:

```
C:\Windows\System32\cmd.e  X  +  v

Microsoft Windows [Version 10.0.22631.4890]
(c) Microsoft Corporation. All rights reserved.

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java guessNumber.java
GUESS THE NUMBER BETWEEN 1 and 5 (you have 5 tries): 1
-----YOU GUESSED: 1-----
-----YOU GUESSED WRONG-----
-----You have 4 tries-----
2
-----YOU GUESSED: 2-----
-----YOU GUESSED WRONG-----
-----You have 3 tries-----
3
-----YOU GUESSED: 3-----
-----YOU GUESSED THE CORRECT NUMBER 3-----

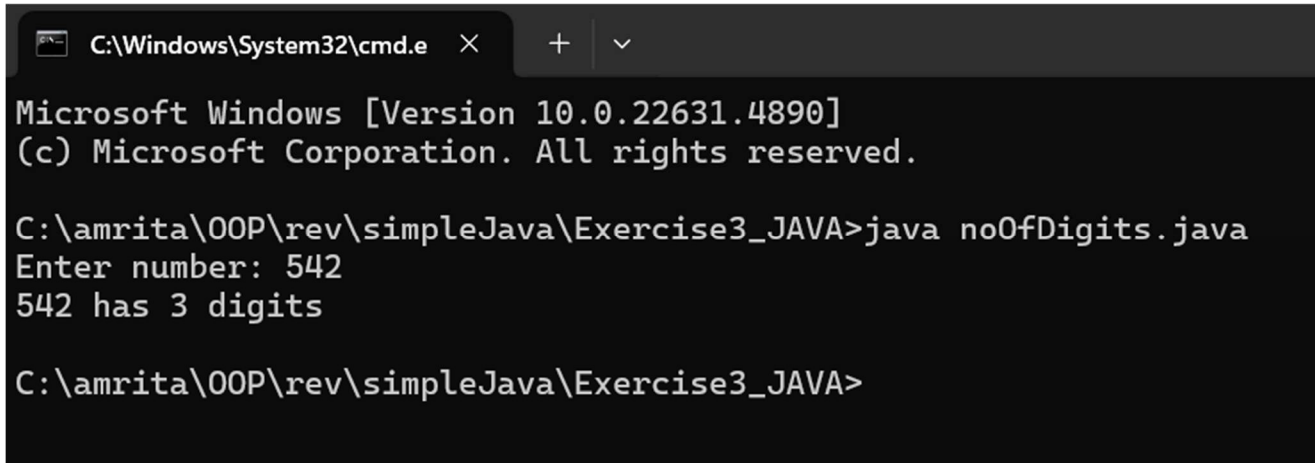
C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java guessNumber.java
GUESS THE NUMBER BETWEEN 1 and 5 (you have 5 tries): 1
-----YOU GUESSED: 1-----
-----YOU GUESSED WRONG-----
-----You have 4 tries-----
2
-----YOU GUESSED: 2-----
-----YOU GUESSED WRONG-----
-----You have 3 tries-----

4
-----YOU GUESSED: 4-----
-----YOU GUESSED WRONG-----
-----You have 2 tries-----
5
-----YOU GUESSED: 5-----
-----YOU GUESSED WRONG-----
-----You have 1 tries-----
6
-----YOU GUESSED: 6-----
-----YOU GUESSED WRONG-----
-----You have 0 tries-----
-----YOU LOSE-----

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>
```

**3.f) Find Number of Digits in a Number:****Code:**

```
public class NumberPattern {  
    import java.util.Scanner;  
  
    class noOfDigits{  
  
        public static void main(String[]  
            args){  
  
            Scanner scan=new  
            Scanner(System.in);  
  
            System.out.print("Enter number:  
            ");  
  
            int num=scan.nextInt();  
  
            int tnum=num;  
  
            int digits=0;  
  
            while (tnum>0){  
  
                int digit=tnum%10;  
  
                tnum=tnum/10;  
  
                digits+=1;  
  
            }  
  
            System.out.println(num+" has  
            "+digits+" digits");  
  
        }  
  
    }  
}
```

**Output:**

```
C:\Windows\System32\cmd.e  ×  +  ∨  
Microsoft Windows [Version 10.0.22631.4890]  
(c) Microsoft Corporation. All rights reserved.  
  
C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java noOfDigits.java  
Enter number: 542  
542 has 3 digits  
  
C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>
```

### 3.g) Permutaions and Combinations:

**Code:**

```
import java.util.Scanner;

class PermAndComb{

    public static void main(String[] args){

        int ch=0;
        while(ch!=3){

            Operations obj=new Operations();
            Scanner scan=new Scanner(System.in);
            System.out.println("\n1.nCr");
            System.out.println("2.nPr");
            System.out.println("3.EXIT");
            ch=scan.nextInt();
            if(ch==1){

                System.out.print("Enter n: ");
                int n=scan.nextInt();
                System.out.print("Enter r: ");
                int r=scan.nextInt();
                System.out.println("Answer: "+obj.C(n,r));
            }
            else if(ch==2){

                System.out.print("Enter n: ");
                int n=scan.nextInt();
                System.out.print("Enter r: ");
                int r=scan.nextInt();
                System.out.println("Answer: "+obj.P(n,r));
            }
            else if(ch==3){

                System.out.println("Exiting...");
            }
        }
    }
}
```

```
        break;
    }
    else{
        System.out.println("Invalid Input");
    }
}
}

class factorial{
    public long factorial(long n){
        long fac=1;
        for(int i=2;i<=n;i++){
            fac=fac*i;
        }
        return fac;
    }
}

class Operations extends factorial{
    public long P(int n, int r){
        return factorial(n)/factorial(n-r);
    }
    public long C(int n, int r){
        return factorial(n)/((factorial(n-r))*factorial(r));
    }
}
```



**Output:**

```
C:\Windows\System32\cmd.e  ×  +  ∨  
Microsoft Windows [Version 10.0.22631.4890]  
(c) Microsoft Corporation. All rights reserved.  
  
C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java PermAndComb.java  
  
1.nCr  
2.nPr  
3.EXIT  
1  
Enter n: 5  
Enter r: 3  
Answer: 10  
  
1.nCr  
2.nPr  
3.EXIT  
2  
Enter n: 5  
Enter r: 3  
Answer: 60  
  
1.nCr  
2.nPr  
3.EXIT  
4  
Invalid Input  
  
1.nCr  
2.nPr  
3.EXIT  
3  
Exiting...  
  
C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>
```

### 3.h) Reversing an Integer:

**Code:**

```
import java.util.Scanner;

class reverse{

    public static void main(String[] args){

        Scanner scan=new Scanner(System.in);

        System.out.print("Enter number to reverse: ");

        int num=scan.nextInt();

        int rev=0;

        int digit=0;

        while(num>0){

            digit=num%10;

            rev=rev*10+digit;

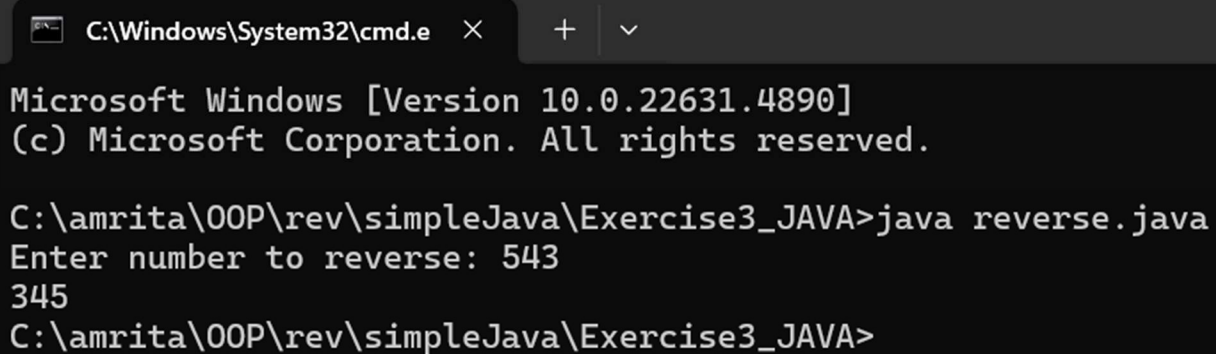
            num=num/10;

        }

        System.out.print(rev);

    }

}
```

**Output:**

```
C:\Windows\System32\cmd.e  ×  +  ∨

Microsoft Windows [Version 10.0.22631.4890]
(c) Microsoft Corporation. All rights reserved.

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java reverse.java
Enter number to reverse: 543
345
C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>
```

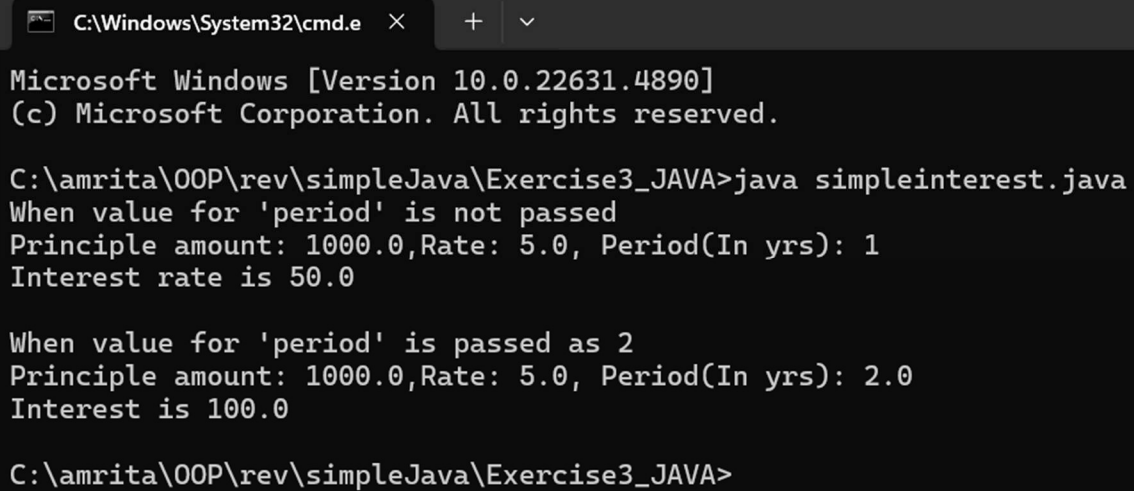
### 3.i) Calculate Simple Interest:

**Code:**

```
class simpleInterest{
    public static void main(String[] args){
        Calc obj=new Calc();
        System.out.println("When value for 'period' is not passed");
        obj.s_interest(1000,5);
        System.out.println("\nWhen value for 'period' is passed as 2");
        obj.s_interest(1000,5,2);

    }
}

class Calc{
    public static void s_interest(double principle, double rate, double
period){
        double interest=principle*(rate/100.0)*period;
        System.out.println("Principle amount: " + principle +",Rate: "+
rate +", Period(In yrs): " + period );
        System.out.println("Interest is " + interest);
    }
    public static void s_interest(double principle, double rate){
        double interest=principle*(rate/100.00)*1.00;
        System.out.println("Principle amount: "+principle+",Rate: "+rate+",
Period(In yrs): "+ 1 );
        System.out.println("Interest rate is "+interest);
    }
}
```

**Output:**

The screenshot shows a Windows command prompt window with the title bar 'C:\Windows\System32\cmd.e'. The window content displays the output of a Java program. It starts with the standard Windows version and copyright information. Then, the user runs 'java simpleinterest.java'. The program outputs two scenarios: one where the period is not passed (resulting in an interest rate of 50.0) and another where the period is passed as 2 (resulting in an interest of 100.0). The prompt ends at the command line.

```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.22631.4890]
(c) Microsoft Corporation. All rights reserved.

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java simpleinterest.java
When value for 'period' is not passed
Principle amount: 1000.0,Rate: 5.0, Period(In yrs): 1
Interest rate is 50.0

When value for 'period' is passed as 2
Principle amount: 1000.0,Rate: 5.0, Period(In yrs): 2.0
Interest is 100.0

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>
```

### 3.j) Sum of Squares of First n Natural Numbers:

**Code:**

```
import java.util.Scanner;

class sqaureSum{

    public static void main(String[] args){

        Scanner scan=new Scanner(System.in);

        System.out.print("Enter number: ");

        int n=scan.nextInt();

        int sum=0;

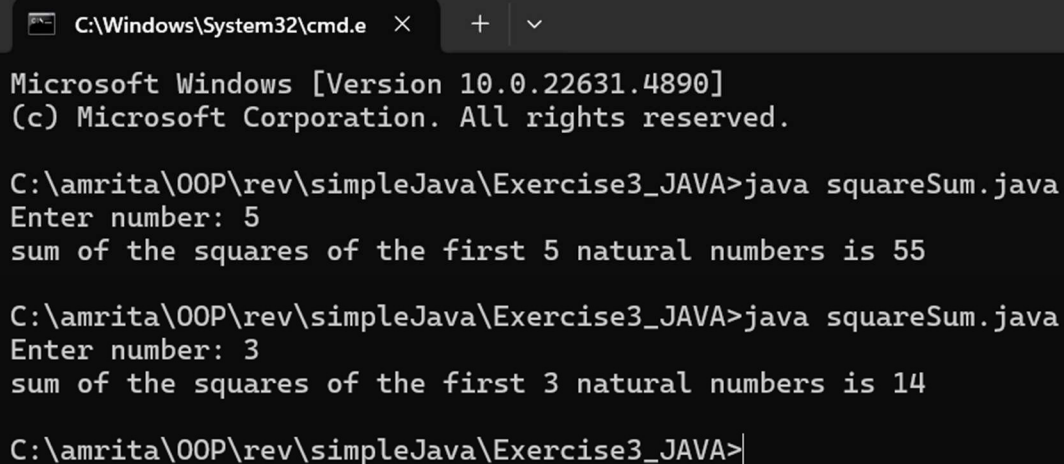
        for(int count=0;count<=n;count++){

            sum+=count*count;}

        System.out.println("sum of the squares of the first "+n+" natural numbers is "+sum);

    }

}
```

**Output:**

The screenshot shows a Windows command prompt window with the title bar 'C:\Windows\System32\cmd.e'. The window displays the following text:

```
Microsoft Windows [Version 10.0.22631.4890]
(c) Microsoft Corporation. All rights reserved.

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java squareSum.java
Enter number: 5
sum of the squares of the first 5 natural numbers is 55

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>java squareSum.java
Enter number: 3
sum of the squares of the first 3 natural numbers is 14

C:\amrita\OOP\rev\simpleJava\Exercise3_JAVA>
```