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Experiment No.	2

AIM:	Programs on Encapsulation. Write a program to demonstrate constructor.
Program 1	
PROBLEM STATEMENT:	<p>A program to simulate a simple banking system in which the initial balance and rate of interest are read from the keyboard and these values are initialised using the constructor member function. The program consists of the following methods:</p> <ul style="list-style-type: none"> • To initialise the balance amount and the rate of interest using constructor member function • To make a deposit • To withdraw an amount for the balance • To find compound interest based on the rate of interest • To know the balance amount • To display the menu options
PROGRAM:	<pre>import java.util. *; import java.lang.Math; class bank { Scanner sc = new Scanner(System.in); double in_bal; double roi; double time; bank() { roi = 3.5; in_bal = 10000; } double deposit(double dep) { if(dep>0) {</pre>

```

        in_bal = in_bal + dep;
    }
    else {
        System.out.println("Enter valid deposit amount!");
    }
    return in_bal;
}
double withdraw(double with) {
    if(with<in_bal) {
        in_bal = in_bal - with;
    }
    else {
        System.out.println("Withdraw amount cant be more than
balance!");
    }
    return in_bal;
}
double comp_int() {
    double amt;
    System.out.println("Enter Rate of interest: ");
    roi = sc.nextDouble();
    System.out.println("Enter Time period in yrs: ");
    time = sc.nextDouble();
    amt = in_bal*Math.pow((double)(1 + roi/100),time);
    return amt;
}
public static void main(String[] args) {
    Scanner input = new Scanner(System.in);
    bank b1 = new bank();
    System.out.println("Welcome to Banking System:");
    while(true) {
        System.out.println("Select 1 choice:\n1 -> Deposit\n2 ->
Withdraw\n3 -> Compund Interest");
        int choice = input.nextInt();
        double deposit,bal,withdraw;
        int flag;

```

```

switch (choice) {
    case 1:
        System.out.println("Enter deposit amount: ");
        deposit = input.nextDouble();
        bal = b1.deposit(deposit);
        System.out.println("Current Balance: $" + bal);
        break;
    case 2:
        System.out.println("Enter Withdraw amount: ");
        withdraw = input.nextDouble();
        bal = b1.withdraw(withdraw);
        System.out.println("Current Balance: $" + bal);
        break;
    case 3:
        bal = b1.comp_int();
        System.out.printf("Final amount: $%.2f\n", (float) bal);
        break;
    default:
        System.out.println("Invalid Choice!");
        break;
}
System.out.println("Do you want to continue?(yes=1/no=0)");
flag = input.nextInt();
if(flag==0) {
    break;
}
}
}
}

```

RESULT:

Deposit Option:

```
PS D:\Java Practicals\Experiment_2> c
Welcome to Banking System:
Select 1 choice:
1 -> Deposit
2 -> Withdraw
3 -> Compund Interest
1
Enter deposit amount:
1200
Current Balance: $11200.0
Do you want to continue?(yes=1/no=0)
1
```

Withdraw Option:

```
Select 1 choice:
1 -> Deposit
2 -> Withdraw
3 -> Compund Interest
2
Enter Withdraw amount:
11200
Withdraw amount cant be more than balance!
Current Balance: $11200.0
Do you want to continue?(yes=1/no=0)
1
```

Compund Interest:

```
Select 1 choice:
1 -> Deposit
2 -> Withdraw
3 -> Compund Interest
3
Enter Rate of interest:
3.5
Enter Time period in yrs:
2
Final amount: $11997.72
Do you want to continue?(yes=1/no=0)
0
PS D:\Java Practicals\Experiment_2> █
```

Program 2

PROBLEM STATEMENT:

Create a four-function calculator for fractions. Here are the formulas for the four arithmetic operations applied to fractions:

Addition: $a/b + c/d = (a*d + b*c) / (b*d)$

Subtraction: $a/b - c/d = (a*d - b*c) / (b*d)$

Multiplication: $a/b * c/d = (a*c) / (b*d)$

Division: $a/b / c/d = (a*d) / (b*c)$

Create the class fraction. Use default constructor to set numerator and denominator to 1.

a) There are methods to print the four functions for fractions.

b) Program generates a multiplication table for fractions. Let the user input a denominator, and then generate all combinations of two such fractions that are between 0 and 1 and multiply them together.

PROGRAM:

```
import java.util. *;
class fraction {
    Scanner sc = new Scanner(System.in);
    int a,b,c,d;
    int num,den,gcd;
    fraction() {
        a = 1;
        b = 1;
        c = 1;
        d = 1;
    }
    void input() {
        System.out.println("Numerator 1: ");
        a = sc.nextInt();
        System.out.println("Denominator 1: ");
        b = sc.nextInt();
        System.out.println("Numerator 2: ");
        c = sc.nextInt();
        System.out.println("Denominator 2: ");
        d = sc.nextInt();
    }
}
```

```

void add() {
    num = a*d + b*c;
    den = b*d;
    gcd = reduce(num, den);
    System.out.println("Result: "+num/gcd+"/"+den/gcd);
}
void sub() {
    num = a*d - b*c;
    den = b*d;
    gcd = reduce(num, den);
    System.out.println("Result: "+num/gcd+"/"+den/gcd);
}
void mul() {
    num = a*c;
    den = b*d;
    gcd = reduce(num, den);
    System.out.println("Result: "+num/gcd+"/"+den/gcd);
}
void div() {
    num = a*d;
    den = b*c;
    gcd = reduce(num, den);
    System.out.println("Result: "+num/gcd+"/"+den/gcd);
}
int reduce(int n,int d) {
    if(d==0)
        return n;
    else if(n==0)
        return d;
    if(n>d)
        return reduce(n-d, d);
    else
        return reduce(d-n, n);
}
void multiplier(int a,int b,int c,int d) {
    num = a*c;

```

```

        den = b*d;
        gcd = reduce(num, den);
        System.out.print("\t"+num/gcd+"/"+den/gcd);
    }
    void mul_table(int d) {
        den = d;
        for(int k=1;k<d;k++) {
            num = k;
            gcd = reduce(num, den);
            System.out.print("\t"+num/gcd+"/"+den/gcd);
        }
        System.out.println("\n");
        for(int i=1;i<d;i++) {
            num = i;
            den = d;
            gcd = reduce(num, den);
            System.out.print(num/gcd+"/"+den/gcd);
            for(int j=1;j<d;j++) {
                multiplier(i, d, j, d);
            }
            System.out.println("\n");
        }
    }
}

public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    fraction f = new fraction();
    int choice,dem,flag;
    System.out.println("Welcome to Fraction Calculator:");
    while(true) {
        System.out.println("Select a choice\n1 -> Addition\n2 ->
Subtraction\n3 -> Multiplication\n4 -> Division\n5 -> Multiple Table");
        choice = sc.nextInt();
        switch(choice) {
            case 1:
                f.input();
                f.add();

```

```
        break;
    case 2:
        f.input();
        f.sub();
        break;
    case 3:
        f.input();
        f.mul();
        break;
    case 4:
        f.input();
        f.div();
        break;
    case 5:
        System.out.println("Enter the Denominator: ");
        dem = sc.nextInt();
        f.mul_table(dem);
        break;
    default:
        System.out.println("Invalid choice!");
        break;
}
System.out.println("Do you want to continue?(yes=1/0=no)");
flag = sc.nextInt();
if(flag==0){
    break;
}
}
}
```


RESULT:

Fraction Calculator:

```
Welcome to Fraction Calculator:
Select a choice
1 -> Addition
2 -> Subtraction
3 -> Multiplication
4 -> Division
5 -> Multiple Table
2
Numerator 1: 2
Denominator 1: 8
Numerator 2: 3
Denominator 2: 6
Result: -1/4
Do you want to continue?(yes=1/0=no)
1
Select a choice
1 -> Addition
2 -> Subtraction
3 -> Multiplication
4 -> Division
5 -> Multiple Table
1
Numerator 1: 5
Denominator 1: 7
Numerator 2: 3
Denominator 2: 6
Result: 17/14
Do you want to continue?(yes=1/0=no)
1
Select a choice
1 -> Addition
2 -> Subtraction
3 -> Multiplication
4 -> Division
5 -> Multiple Table
3
Numerator 1: 2
Denominator 1: 6
Numerator 2: 3
Denominator 2: 8
Result: 1/8
Do you want to continue?(yes=1/0=no)
1
Select a choice
1 -> Addition
2 -> Subtraction
3 -> Multiplication
4 -> Division
5 -> Multiple Table
4
Numerator 1: 4
Denominator 1: 10
Numerator 2: 16
Denominator 2: 24
Result: 3/5
Do you want to continue?(yes=1/0=no)
1
```

Multiplication Table:

```
Select a choice
1 -> Addition
2 -> Subtraction
3 -> Multiplication
4 -> Division
5 -> Multiple Table
5
Enter the Denominator:
7
      1/7    2/7    3/7    4/7    5/7    6/7
1/7    1/49   2/49   3/49   4/49   5/49   6/49
2/7    2/49   4/49   6/49   8/49  10/49  12/49
3/7    3/49   6/49   9/49  12/49  15/49  18/49
4/7    4/49   8/49  12/49  16/49  20/49  24/49
5/7    5/49  10/49  15/49  20/49  25/49  30/49
6/7    6/49  12/49  18/49  24/49  30/49  36/49

Do you want to continue?(yes=1/0=no)
0
PS D:\Java Practicals\Experiment_2>
```

CONCLUSION:

In this experiment, we learned how to declare a constructor and set default values to members or use a parameterized constructor to take user input.