ORCHID INTERNATIONAL College
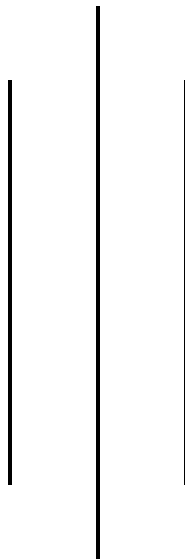
(Affiliated to Tribhuvan University)

Advanced Java Programming

Basic concepts of Java Programming

Submitted by:

Abhinna Ojha, 20788/075

BSc. CSIT - VII

Submitted to:

Mr. Krishna Pandey

Department of CSIT

1. Data Types and Operations

1.1. Use all the data types and given arithmetic operations.

```java
public class DataOperators
{
  public static void main(String[] args)
  {
    int i1 = 6, i2 = 12;
    float f1 = 4, f2 = 5;
    double d1 = 3.1, d2 = 1.3;
    char c1 = 'b', c2 = 'a';
    System.out.println("Addition:");
    System.out.println("int:\t\t " + i1 + " + " + i2 + " = " + (i1 + i2));
    System.out.println("float:\t\t " + f1 + " + " + f2 + " = " + (f1 + f2));
    System.out.println("double:\t\t " + d1 + " + " + f2 + " = " + (d1 + d2));
    System.out.println("char:\t\t " + c1 + " + " + c2 + " = " + (c1 + c2));
    System.out.println("\nSubtraction:");
    System.out.println("int: \t\t" + i1 + " - " + i2 + " = " + (i1 - i2));
    System.out.println("float: \t\t" + f1 + " - " + f2 + " = " + (f1 - f2));
    System.out.println("double: \t\t" + d1 + " - " + f2 + " = " + (d1 - d2));
    System.out.println("char: \t\t" + c1 + " - " + c2 + " = " + (c1 - c2));
    System.out.println("\nMultiplication:");
    System.out.println("int: \t\t" + i1 + " * " + i2 + " = " + (i1 * i2));
    System.out.println("float: \t\t" + f1 + " * " + f2 + " = " + (f1 * f2));
    System.out.println("double: \t\t" + d1 + " * " + f2 + " = " + (d1 * d2));
    System.out.println("char: \t\t" + c1 + " * " + c2 + " = " + (c1 * c2));
    System.out.println("\nDivision:");
    System.out.println("int: \t\t" + i1 + " / " + i2 + " = " + (i1 / i2));
    System.out.println("float: \t\t" + f1 + " / " + f2 + " = " + (f1 / f2));
    System.out.println("double: \t\t" + d1 + " / " + f2 + " = " + (d1 / d2));
    System.out.println("char: \t\t" + c1 + " / " + c2 + " = " + (c1 / c2));
    i1++; f1++; d1++; c1++;
    System.out.println("\nIncrement:");
    System.out.println("int: \t\t" + i1 +   "++ = " + i1);
    System.out.println("float: \t\t" + f1 + "++ = " + f1);
    System.out.println("double: \t\t" + d1 + "++ = " + d1);
    System.out.println("char: \t\t" + c1 + "++ = " + c1);
    i1--; f1--; d1--; c1--;
    System.out.println("\nDecrement:");
    System.out.println("int: \t\t" + i1 + "-- = " + i1);
    System.out.println("float: \t\t" + f1 + "-- = " + f1);
    System.out.println("double: \t\t" + d1 + "-- = " + d1);
    System.out.println("char: \t\t" + c1 + "-- = " + c1);
  }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=1400:C:\Program Files\Je
Addition:
int:            6 + 12 = 18
float:          4.0 + 5.0 = 9.0
double:         3.1 + 5.0 = 4.4
char:           b + a = 195

Subtraction:
int:            6 - 12 = -6
float:          4.0 - 5.0 = -1.0
double:         3.1 - 5.0 = 1.8
char:           b - a = 1

Multiplication:
int:            6 * 12 = 72
float:          4.0 * 5.0 = 20.0
double:         3.1 * 5.0 = 4.03
char:           b * a = 9506

Division:
int:            6 / 12 = 0
float:          4.0 / 5.0 = 0.8
double:         3.1 / 5.0 = 2.3846153846153846
```

```
Division:
int:            6 / 12 = 0
float:          4.0 / 5.0 = 0.8
double:         3.1 / 5.0 = 2.3846153846153846
char:           b / a = 1

Increment:
int:            6++ = 7
float:          4.0++ = 5.0
double:         3.1++ = 4.1
char:           b++ = c

Decrement:
int:            12-- = 11
float:          5.0-- = 4.0
double:         1.3-- = 0.30000000000000004
char:           a-- = `

Process finished with exit code 0
```

1.2.   Perform all the arithmetic operations given in the table.

```java
public class Operators
{
    public static void main(String[] args)
    {
        int a = 1, b = 2;

        System.out.println("Addition, a + b = " + a + " + " + b + " = " + (a + b));
        System.out.println("Subtraction, a - b = " + a + " - " + b + " = " + (a - b));
        System.out.println("Multiplication, a * b = " + a + " * " + b + " = " + (a * b));
        System.out.println("Division, a / b = " + a + " / " + b + " = " + (a / b));
        System.out.print("Increment, a++ = " + a + "++ => " + "a = " + a + " + 1" + " = ");
        a++;
        System.out.print(a);
        System.out.print("\nDecrement, b-- = " + b + "-- => " + "b = " + b + " - 1" + " = ");
        b--;
        System.out.print(b);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=1406:C:\Program Files\Je
Addition, a + b = 1 + 2 = 3
Subtraction, a - b = 1 - 2 = -1
Multiplication, a * b = 1 * 2 = 2
Division, a / b = 1 / 2 = 0
Increment, a++ = 1++ => a = 1 + 1 = 2
Decrement, b-- = 2-- => b = 2 - 1 = 1
Process finished with exit code 0
```

2. if Condition

2.1. Program to check if a candidate is eligible for voting or not.

```java
public class VoterCheck
{
    public static void main(String[] args)
    {
        int age = 18;
        if(age < 18)
        {
            System.out.println("Not eligible to vote");
        }
        else
        {
            System.out.println("Eligible to vote");
        }
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=2116:C:\Program Files\Je
Eligible to vote

Process finished with exit code 0
```

2.2. Program to check if the number is positive or negative.

```java
public class PositiveNegative
{
    public static void main(String[] args)
    {
        int n = 1;

        if ( n < 0)
        {
            System.out.println("less than zero so negative");
        }
        else
        {
            System.out.println("greater than zero so positive");
        }
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=2171:C:\Program Files\Je
greater than zero so positive

Process finished with exit code 0
```

2.3. Program to check whether if a number is positive, zero or negative.

```java
public class PositiveNegativeZero
{
    public static void main(String[] args)
    {
        int n = 1;

        if ( n < 0)
        {
            System.out.println("less than zero so negative");
        }
        else if ( n > 0)
        {
            System.out.println("greater than zero so positive");
        }
        else
        {
            System.out.println("zero");
        }
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=6284:C:\Program Files\Je
greater than zero so positive

Process finished with exit code 0
```

2.4. Program to find largest of two numbers.

```java
public class LargerOf2Num
{
    public static void main(String[] args)
    {
        int a = 13, b = 17;
        if(a < b)
        {
            System.out.println("b = " + b + " is larger than a =" + a);
        }
        else if(a > b)
        {
            System.out.println("a = " + a + " is larger than b =" + b);
        }
        else
        {
            System.out.println("a = b = " + a);
        }
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=7069:C:\Program Files\Je
b = 17 is larger than a =13

Process finished with exit code 0
```

2.5. Program to check given number is even or odd.

```java
public class EvenOdd
{
    public static void main(String[] args)
    {
        int n = 5;

        if (n % 2 == 0)
        {
            System.out.println("n = " + n + " is even");
        }
        else
        {
            System.out.println("n = " + n + " is odd");
        }
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=7078:C:\Program Files\Je
n = 5 is odd

Process finished with exit code 0
```

3. for loop

3.1. Program to print 10 even numbers and 10 odd numbers.

```java
public class OddEvenDisplay
{
    public static void main(String[] args)
    {
        int i, os = 0, es = 0, o = 1, e = 2;
        System.out.println("\t\tOdd\t\t\tEven");
        for (i = 0; i < 10; i++)
        {
            os = os + o;
            es = es + e;
            System.out.println((i + 1) + ".\t\t " + o + "\t\t\t " + e);
            o += 2;
            e += 2;
        }
        System.out.println("sum:\t " + os + "\t\t " + es);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=7204:C:\Program Files\Je
        Odd         Even
1.      1            2
2.      3            4
3.      5            6
4.      7            8
5.      9            10
6.      11           12
7.      13           14
8.      15           16
9.      17           18
10.     19           20
sum:    100          110

Process finished with exit code 0
```

3.2. Program to find factorial of a number.

```java
public class Factorial
{
    public static void main(String[] args)
    {
        int n = 13, f = 1;
        for (int i = 1; i <= n; i++)
        {
            f *= i;
        }
        System.out.println("Factorial of " + n + " is " + f);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=7207:C:\Program Files\Je
Factorial of 13 is 1932053504

Process finished with exit code 0
```

3.3. Program to generate tables of 10.

```java
public class TablesOf
{
    public static void main(String[] args)
    {
        int n = 13;
        for (int i = 0; i <= 10; i++)
        {
            System.out.println(n + " x " + i + " = " + (n * i));
        }
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=7209:C:\Program Files\Je
13 x 0 = 0
13 x 1 = 13
13 x 2 = 26
13 x 3 = 39
13 x 4 = 52
13 x 5 = 65
13 x 6 = 78
13 x 7 = 91
13 x 8 = 104
13 x 9 = 117
13 x 10 = 130

Process finished with exit code 0
```

3.4. Program to add the digits of a number.

```java
public class AddDigits
{
    public static void main(String[] args)
    {
        int n = 659, sum = 0;
        for (int i = n; i != 0; i /= 10)
        {
            int x = i % 10;
            sum += x;
        }
        System.out.println("The sum of digits of " + n + " is " + sum);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=11372:C:\Program Files\J
The sum of digits of 659 is 20

Process finished with exit code 0
```

3.5. Program to reverse the digits of a number.

```java
public class ReverseDigits
{
    public static void main(String[] args)
    {
        int n = 659, rev = 0;
        for (int i = n; i != 0; i /= 10)
        {
            int x = i % 10;
            rev = rev * 10 + x;
        }
        System.out.println("The reverse of digits of " + n + " is " + rev);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=5555:C:\Program Files\Je
The reverse of digits of 659 is 956

Process finished with exit code 0
```

3.6. Program to generate 10 Fibonacci numbers.

```java
public class Fibonacci
{
    public static void main(String[] args)
    {
        int a = 0, b = 1, c;
        for (int i = 0; i < 10; i++)
        {
            c = a + b;
            System.out.println(c);
            a = b;
            b = c;
        }
    }
}
```
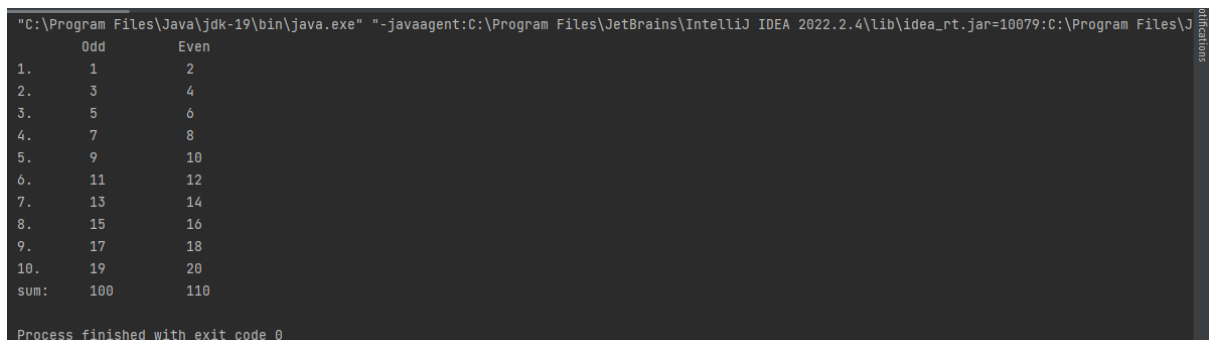
```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=5558:C:\Program Files\Je
1
2
3
5
8
13
21
34
55
89

Process finished with exit code 0
```

4. while loop

4.1. Program to print 10 even numbers and 10 odd numbers.

```java
public class OddEvenDisplay {
    public static void main(String[] args) {
        int i = 0, os = 0, es = 0, o = 1, e = 2;
        System.out.println("\t\tOdd\t\t\tEven");
        while (i < 10)
        {
            os = os + o;
            es = es + e;
            System.out.println((i + 1) + ".\t\t " + o + "\t\t\t " + e);
            o += 2;
            e += 2;
            i++;
        }
        System.out.println("sum:\t " + os + "\t\t " + es);
    }
}
```
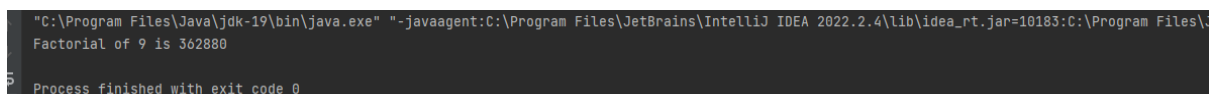
```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10079:C:\Program Files\J
        Odd        Even
1.      1          2
2.      3          4
3.      5          6
4.      7          8
5.      9          10
6.      11         12
7.      13         14
8.      15         16
9.      17         18
10.     19         20
sum:    100        110

Process finished with exit code 0
```

4.2. Program to find factorial of a number.

```java
public class Factorial
{
    public static void main(String[] args)
    {
        int n = 9, f = 1, i = 1;
        while (i <= n)
        {
            f *= i;
            i++;
        }
        System.out.println("Factorial of " + n + " is " + f);
    }
}
```
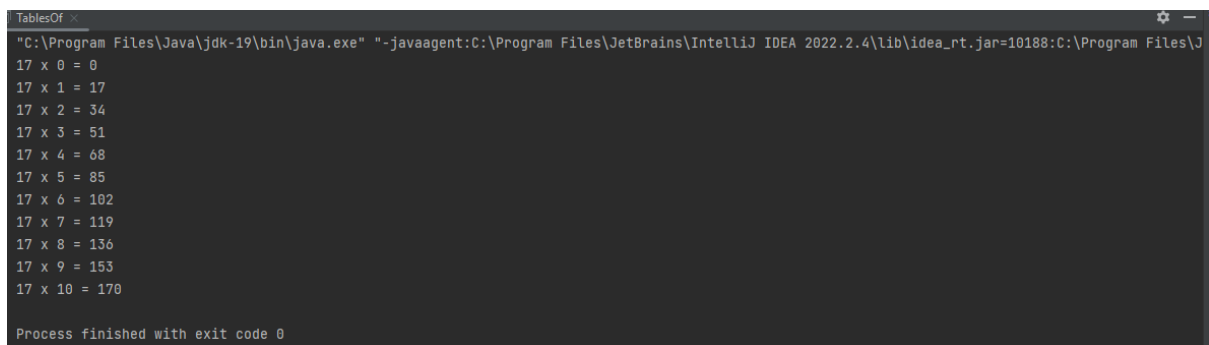
```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10183:C:\Program Files\J
Factorial of 9 is 362880

Process finished with exit code 0
```

4.3. Program to generate tables of 10.

```java
public class TablesOf
{
    public static void main(String[] args)
    {
        int n = 17, i = 0;
        while (i <= 10)
        {
            System.out.println(n + " x " + i + " = " + (n * i));
            i++;
        }
    }
}
```
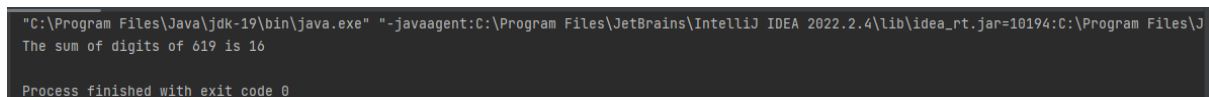
```
TablesOf
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10188:C:\Program Files\J
17 x 0 = 0
17 x 1 = 17
17 x 2 = 34
17 x 3 = 51
17 x 4 = 68
17 x 5 = 85
17 x 6 = 102
17 x 7 = 119
17 x 8 = 136
17 x 9 = 153
17 x 10 = 170

Process finished with exit code 0
```

4.4. Program to add the digits of a number.

```java
public class AddDigits
{
    public static void main(String[] args)
    {
        int n = 619, sum = 0, i = n;
        while (i != 0)
        {
            int x = i % 10;
            sum += x;
            i /= 10;
        }
        System.out.println("The sum of digits of " + n + " is " + sum);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10194:C:\Program Files\J
The sum of digits of 619 is 16

Process finished with exit code 0
```

4.5. Program to reverse the digits of a number.

```java
public class ReverseDigits
{
    public static void main(String[] args)
    {
        int n = 6059, rev = 0, i = n;
        while (i != 0)
        {
            int x = i % 10;
            rev = rev * 10 + x;
            i /= 10;
        }
        System.out.println("The reverse of digits of " + n + " is " + rev);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10199:C:\Program Files\J
The reverse of digits of 6059 is 9506

Process finished with exit code 0
```

4.6. Program to generate 10 Fibonacci numbers.

```java
public class Fibonacci
{
    public static void main(String[] args)
    {
        int a = 0, b = 1, c, i = 0;
        while (i < 10)
        {
            c = a + b;
            System.out.println(c);
            a = b;
            b = c;
            i++;
        }
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10203:C:\Program Files\J
1
2
3
5
8
13
21
34
55
89

Process finished with exit code 0
```

5. do while loop

5.1. Program to print 10 even numbers and 10 odd numbers.

```java
public class OddEvenDisplay
{
   public static void main(String[] args)
   {
      int i = 0, os = 0, es = 0, o = 1, e = 2;
      System.out.println("\t\tOdd\t\t\tEven");
      do
      {
         os = os + o;
         es = es + e;
         System.out.println((i + 1) + ".\t\t " + o + "\t\t\t " + e);
         o += 2;
         e += 2;
         i++;
      }while (i < 10);
      System.out.println("sum:\t " + os + "\t\t " + es);
   }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10218:C:\Program Files\J
        Odd         Even
1.      1           2
2.      3           4
3.      5           6
4.      7           8
5.      9           10
6.      11          12
7.      13          14
8.      15          16
9.      17          18
10.     19          20
sum:    100         110

Process finished with exit code 0
```

5.2. Program to find factorial of a number.

```java
public class Factorial
{
   public static void main(String[] args)
   {
      int n = 6, f = 1, i = 1;
      do {
         f *= i;
         i++;
      }while (i <= n);
      System.out.println("Factorial of " + n + " is " + f);
   }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10223:C:\Program Files\J
Factorial of 6 is 720

Process finished with exit code 0
```

5.3.   Program to generate tables of 10.

```java
public class TablesOf
{
    public static void main(String[] args)
    {
        int n = 59, i = 0;
        do
        {
            System.out.println(n + " x " + i + " = " + (n * i));
            i++;
        }while (i <= 10);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10230:C:\Program Files\J
59 x 0 = 0
59 x 1 = 59
59 x 2 = 118
59 x 3 = 177
59 x 4 = 236
59 x 5 = 295
59 x 6 = 354
59 x 7 = 413
59 x 8 = 472
59 x 9 = 531
59 x 10 = 590

Process finished with exit code 0
```

5.4.   Program to add the digits of a number.

```java
public class AddDigits
{
    public static void main(String[] args)
    {
        int n = 666, sum = 0, i = n;
        do
        {
            int x = i % 10;
            sum += x;
            i /= 10;
        }while (i != 0);
        System.out.println("The sum of digits of " + n + " is " + sum);
    }
}
```
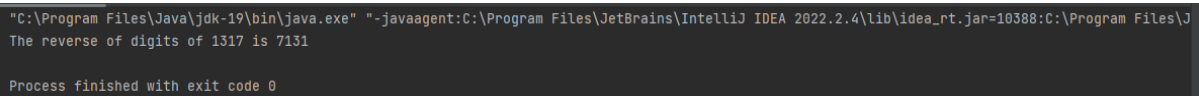
```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10386:C:\Program Files\J
The sum of digits of 666 is 18

Process finished with exit code 0
```

5.5. Program to reverse the digits of a number.

```java
public class ReverseDigits
{
    public static void main(String[] args)
    {
        int n = 1317, rev = 0, i = n;
        do
        {
            int x = i % 10;
            rev = rev * 10 + x;
            i /= 10;
        }while (i != 0);
        System.out.println("The reverse of digits of " + n + " is " + rev);
    }
}
```
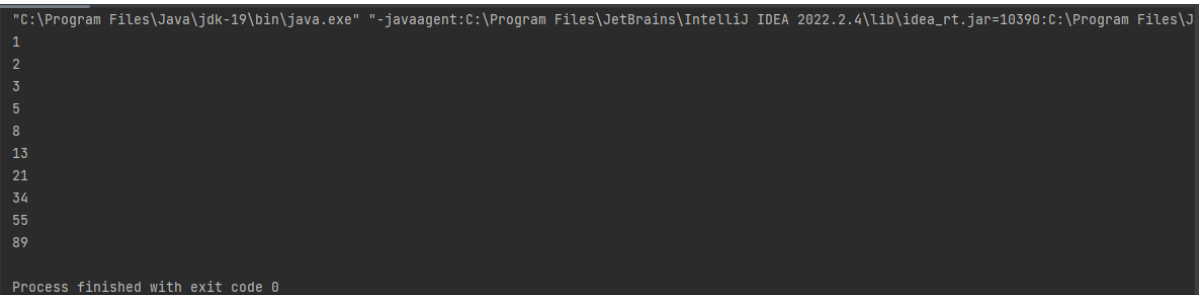
```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10388:C:\Program Files\J
The reverse of digits of 1317 is 7131

Process finished with exit code 0
```

5.6. Program to generate 10 Fibonacci numbers.

```java
public class Fibonacci
{
    public static void main(String[] args)
    {
        int a = 0, b = 1, c, i = 0;
        do
        {
            c = a + b;
            System.out.println(c);
            a = b;
            b = c;
            i++;
        }while (i < 10);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10390:C:\Program Files\J
1
2
3
5
8
13
21
34
55
89

Process finished with exit code 0
```

6. Case studies

6.1. Case 1, Amusement Park

```java
public class Case1AmusementPark {
    public static void main(String[] args) {
        int price = 400, number = 15;
        int amount, discount;
        if (number > 10) {
            amount = price * number;
            discount = amount * 10 / 100;
            amount = amount - discount;
        } else {
            amount = price * number;
            discount = 0;
        }
        System.out.println("The total amount for " + number + " tickets at rate of Rs." +
                price + " per ticket is " + amount);
        System.out.println("You recieved Rs." + discount + " as discount");
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10395:C:\Program Files\J
The total amount for 15 tickets at rate of Rs.400 per ticket is 5400
You recieved Rs.600 as discount

Process finished with exit code 0
```

6.2. Case 2, Theatre

```java
public class Case2Theatre {
    public static void main(String[] args) {
        String category = "silver";
        int price = 0;
        if(category.equals("gold")) {
            price = 200;
        } else if (category.equals("silver")) {
            price = 150;
        }
        System.out.println("The category chosen is " + category + " and price is Rs. " + price);
    }
}
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.2.4\lib\idea_rt.jar=10399:C:\Program Files\J
The category chosen is silver and price is Rs. 150

Process finished with exit code 0
```