Q1. Write a program to calculate tax, given the following conditions:

a. If income is less than 150000 then no tax
b. If taxable income is in the range 150001 to 300000 then charge 10% tax
c. If taxable income is in the range 300001 to 500000 then charge 20% tax
d. If taxable income is above 500001 then charge 30% tax

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter your income: ");
      double income = sc.nextDouble();
      double taxRate;

      if (income > 500000) {
         taxRate = income * 0.3;
      } else if (income > 300000) {
         taxRate = income * 0.2;
      } else if (income > 150000) {
         taxRate = income * 0.1;
      } else {
         taxRate = 0;
      }
      System.out.println("Your calculated tax on the income is " + taxRate);
   }
}
```

Out put : income =400000

Your calculated tax on the income is 80000

Q2. Write a program to enter the marks of a student in 4 different subjects. Then display the grade of the student as per the following conditions:

a. If the average mark is greater than or equal to 90 then grade is O
b. If the average mark is greater than equal to 80 but less than 90 then grade is E
c. If the average mark is greater than equal to 70 but less than 80 then grade is A
d. If the average mark is greater than equal to 60 but less than 70 then grade is B
e. If the average mark is greater than equal to 50 but less than 60 then grade is C
f. If the average mark is less than 50 then grade is F

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter your marks in English: ");
      double english = sc.nextDouble();
      System.out.print("Enter your marks in Maths: ");
```

```
      double maths = sc.nextDouble();
      System.out.print("Enter your marks in Science: ");
      double science = sc.nextDouble();
      System.out.print("Enter your marks in Odia: ");
      double computer = sc.nextDouble();
      double average = (English + Maths + Science + Odia) / 4;
      String grade;

      if (average > 90) {
         grade = "O";
      } else if (average > 80) {
         grade = "E";
      } else if (average > 70) {
         grade = "A";
      } else if (average > 60) {
         grade = "B";
      } else if (average > 50) {
         grade = "C";
      } else {
         grade = "F";
      }
      System.out.println("  Your average  mark is “ +  average + “ and Your grade is " + grade);
   }
}
```

Out put : English : 85
Maths : 90
Science : 78
Odia : 92
Your average mark is 86.25 and Your grade is E

Q3. Write a program to calculate the roots of a quadratic equation.

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the 3 coefficients of the quadratic equation: ");
      double a = sc.nextDouble();
      double b = sc.nextDouble();
      double c = sc.nextDouble();
      double det = b * b - 4 * a * c;

      if (det < 0) {
         System.out.println("No real roots exists");
      } else {
         det = Math.sqrt(det);
         double root1 = (-b + det) / 2 * a;
```

```
        if (det == 0) {
            System.out.println("The real and equal root is " + root1);
        } else {
            double root2 = (-b - det) / 2 * a;
            System.out.println("The real and distinct roots are " + root1 + " and " + root2);
        }
    }
  }
}
```

Out put : a: 1 ,b: -3 , c : 2
The real and distinct roots are 2.0 and 1.0

Q4. Write a program to enter a number from 1 to 7 and display the corresponding day of the week using switch statement.

```
import java.util.Scanner;

class Main {
  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter the day number: ");
    int num = sc.nextInt();
    String day;

    switch (num) {
      case 1:
        day = "Monday";
        break;
      case 2:
        day = "Tuesday";
        break;
      case 3:
        day = "Wednesday";
        break;
      case 4:
        day = "Thursday";
        break;
      case 5:
        day = "Friday";
        break;
      case 6:
        day = "Saturday";
        break;
      case 7:
        day = "Sunday";
        break;
      default:
        System.out.println("Invalid day number");
        return;
    }
```

```
      System.out.println("The corresponding day is  : " + day);
   }
}
```
Out put : Enter the day number : 4
The corresponding day is : Thusrday

Q5. Write a program to find out the factorial of any inputted number.

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int num = sc.nextInt();
      int fact = 1;

      for (int i = 2; i <= num; i++) {
         fact *= i;
      }
      System.out.println("The factorial is : " + num + " is " + fact);
   }
}
```
Out put : Enter a number : 5
The factorial is : 120

Q6. Write a program to check whether an inputted number is prime or not.

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int num = sc.nextInt();

      for (int i = 2; i <= num / 2; i++) {
         if (num % i == 0) {
            System.out.println(num + " is not a prime number");
            return;
         }
      }
      System.out.println(num + " is a prime number");
   }
}
```
Out put : Enter a number : 5
5 is a prime number

Q7. Write a program to check whether an inputted number is palindrome or not.

```
import java.util.Scanner;
```

```
class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int num = sc.nextInt();
      int temp = num, reversed = 0;

      while (temp != 0) {
         reversed = reversed * 10 + temp % 10;
         temp /= 10;
      }
      if (num == reversed) {
         System.out.println(num + " is a palindrome");
      } else {
         System.out.println(num + " is not a palindrome");
      }
   }
}
```

Out put : Enter a number :1267
1267 is not a palindrome

Q8. Write a program to find out the binary equivalent of any inputted decimal number.

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int num = sc.nextInt();
      int bin = 0, mul = 1;

      while (num != 0) {
         bin = bin + (num % 2) * mul;
         num /= 2;
         mul *= 10;
      }
      System.out.println("The binary equivalent is : " + bin);
   }
}
```

Out put : Enter a number : 5
The binary equivalent is : 101

Q9. Write a program to display all Armstrong numbers from 1 to 10000.

```
class Main {
   public static void main(String[] args) {
      System.out.println("The armstrong numbers between 1 and 10000 are ");

      for (int num = 1; num <= 10000; num++) {
         int pow = (int) Math.log10(num) + 1;
```

```
        int temp = num, armstrong = 0;

        while (temp != 0) {
          armstrong += (int) Math.pow(temp % 10, pow);
          temp /= 10;
        }
        if (armstrong == num) {
          System.out.print(num + " ");
        }
      }
      System.out.println();
   }
}
```

Out put : The Armstrong numbers between 1 and 10000 are
1 2 3 4 5 6 7 8 9 153 370 371 407 1634 8208 9474

Q10. Write a program to find out the largest between two numbers using a conditional operator.

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter two numbers: ");
      int num1 = sc.nextInt();
      int num2 = sc.nextInt();
      int max = num1 > num2 ? num1 : num2;
      System.out.println("The largest between " + num1 + " and " + num2 + " is " + max);
   }
}
```

Out put: Enter two numbers: 10 20
The largest between 10 and 20 is 20

Q11. Write a program to find out the largest between three numbers using the conditional operator.

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter three numbers: ");
      int num1 = sc.nextInt();
      int num2 = sc.nextInt();
      int num3 = sc.nextInt();
      int max = num1 > num2 ? (num1 > num3 ? num1 : num3) : (num2 > num3 ? num2 : num3);
      System.out.println("The largest between " + num1 + ", " + num2 + " and " + num3 + " is " + max);
   }
}
```

Out put : Enter three numbers: 40 67 19

The largest between 40 67 19 is 67

Q12. Write a recursive program to find the sum of n natural numbers. [n is user input]

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int n = sc.nextInt();
      System.out.println("The sum of first " + n + " natural numbers is " + sum(n));
   }

   private static int sum(int n) {
      if (n == 0) {
         return n;
      }
      return n + sum(n - 1);
   }
}
```

Out put : Enter a number :10
The sum of first 5 natural numbers is 5 5

Q13. Write a recursive program to find the GCD of two inputted numbers.

```
import java.util.Scanner;

class Main {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter two number: ");
      int num1 = sc.nextInt();
      int num2 = sc.nextInt();
      System.out.println("The gcd of " + num1 + " and " + num2 + " is " + gcd(num1, num2));
   }

   private static int gcd(int num1, int num2) {
      if (num2 == 0) {
         return num1;
      }
      return gcd(num2, num1 % num2);
   }
}
```

Out put : Enter two number : 48 18
The gcd of 48 and 18 is 6