

Assignment – 2

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

- If income is less than 150000 then no tax.
- If taxable income is in the range 150001 to 300000 then charge 10% tax.
- If taxable income is in the range 300001 to 500000 then charge 20% tax.
- 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);
    }
}
```

Output:

Enter your income: 400000
 Your calculated tax on the income is 80000.0

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:

- If the average mark is greater than or equal to 90 then grade is O.
- If the average mark is greater than equal to 80 but less than 90 then grade is E.
- If the average mark is greater than equal to 70 but less than 80 then grade is A.
- If the average mark is greater than equal to 60 but less than 70 then grade is B.
- If the average mark is greater than equal to 50 but less than 60 then grade is C.
- 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 Computer: ");
        double computer = sc.nextDouble();
        double average = (english + maths + science + computer) / 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 grade is " + grade);
    }
}
```

Output:

```
Enter your marks in English: 91
Enter your marks in Maths: 98
Enter your marks in Science: 93
Enter your marks in Computer: 100
Your grade is O
```

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);
            }
        }
    }
}

```

Output:

Enter the 3 coefficients of the quadratic equation: 1 0 -9

The real and distinct roots are 3.0 and -3.0

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);
}
}

```

Output:

Enter the day number: 1
 The corresponding day is Monday

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 of " + num + " is " + fact);  
}
```

Output:

Enter a number: 7
The factorial of 7 is 5040

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");  
    }  
}
```

Output:

Enter a number: 7
7 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;
```

```
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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");
}
}
```

Output:

Enter a number: 12321

12321 is 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);
    }
}
```

Output:

Enter a number: 19

The binary equivalent is 10011

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();
}
}

```

Output:

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);
    }
}

```

Output:

Enter two numbers: 9 11
 The largest between 9 and 11 is 11

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);
    }
}
```

Output:

Enter three numbers: 9 11 13
 The largest between 9, 11 and 13 is 13

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);
    }
}
```

Output:

Enter a number: 19
 The sum of first 19 natural numbers is 190

Q18. 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);  
    }  
}
```

Output:

Enter two number: 18 24

The gcd of 18 and 24 is 6