**Assignment – 2**

**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);  
 }  
}

**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:  
 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 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;  
  
 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

**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);  
 }  
}

**Output:**

Enter two number: 18 24  
The gcd of 18 and 24 is 6