Note:

1. **The Ans section contains the program /coding part [which you have to write in your IDE to get the output.]**
2. **The output is written after Ans section under the heading Output**

Q1.

Write a java program to input the height of the person and check if the height of the person is greater than or equal to 6 feet then print the message "The person is tall".

Ans.

```
import java.util.Scanner;
public class A3Q01 {
	public static void main(String[] args) {
		Scanner sc=new Scanner(System.in);
		int h;
		System.out.println("Enter the height of the person");
		h=sc.nextInt();
		if(h>=6)
		System.out.println("The person is tall");
		sc.close();
	}
}
```

Output

```
Enter the height of the person
7
The person is tall
```

Q2.

Write a java program to input the mark of a student and check if the student mark is greater than or equal to 40, then it generates the following message.

"Congratulation! You have passed the exam."

Otherwise the output message is

"Sorry! You have failed the exam ."

Ans

```
public class A3Q02 {
	public static void main(String[] args) {
		Scanner sc=new Scanner(System.in);
		int mark;
		System.out.println("Enter the mark of the student");
		mark=sc.nextInt();
		if(mark>=40)
		System.out.println("Congratulations! You have passed the exam");
		else
		System.out.println("sorry! you have failed the exam");
```

```
                sc.close();
        }
}
```

Output

```
Enter the mark of the student
98
Congratulations! You have passed the exam
```

Q3

Input an integer through the keyboard. Write a java program to find out whether it is an odd number or even number.

Ans

```
import java.util.Scanner;
public class A3Q03 {
        public static void main(String[] args) {
                        Scanner sc=new Scanner(System.in);
                        int n;
                        System.out.println("Enter a number");
                        n=sc.nextInt();
                        if(n%2==0)
                        System.out.println("Even number");
                        else
                        System.out.println("Odd number");
                        sc.close();
        }
}
```

Output

```
Enter a number
45
Odd number
```

Q4

Any character is entered through the keyboard, write a java program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol. The following table shows the range of ASCII values for various characters.

Characters	ASCII Values
A – Z	65 – 90
a – z	97 – 122
0 – 9	48 – 57
special symbols	0 - 47, 58 - 64, 91 - 96, 123 – 127

Ans

```
import java.util.Scanner;
public class A3Q04 {
	public static void main(String[] args) {
		char c;
		Scanner sc=new Scanner(System.in);
		System.out.println("Enter a character");
		c=sc.next().charAt(0);
		if(c>=65 && c<=90)
		System.out.println("The entered character is an uppercase");
		else if(c>=97 && c<=122)
		System.out.println("The entered character is a lower case");
		else if(c>=48 && c<=57)
		System.out.println("It is a digit");
		else if((c>=0 && c<=47) || (c>=58 && c<=64) || (c>=91 && c<=96) || (c>=123 &&
		c<=127))
		System.out.println("It is a special Character");
		else System.out.println("Invalid Input");
		sc.close();
	}
}
```

Output

```
Enter a character
m
The entered character is a lower case
```

Q5

The two roots of a quadratic equation $ax2+bx+c=0$ can be obtained using the following formula:

$r1=\frac{-b+\sqrt{b^2-4ac}}{2a}$ and $r2=\frac{-b-\sqrt{b2-4ac}}{2a}$

*b*2 - 4*ac* is called the discriminant of the quadratic equation. If it is positive, the equation has two real roots. If it is zero, the equation has one root. If it is negative, the equation has no real roots.

Write a java program that prompts the user to enter values for *a*, *b*, and *c* and displays the result based on the discriminant. If the discriminant is positive, display two roots. If the discriminant is **0**, display one root. Otherwise, display "The equation has no real roots"

Note that you can use **Math.pow(x, 0.5)** to compute $\sqrt{x}$

Here are some sample runs.

```
Enter a, b, c: 1.0 3 1
The equation has two roots -0.381966 and -2.61803

Enter a, b, c: 1 2.0 1
The equation has one root -1

Enter a, b, c: 1 2 3
The equation has no real roots
```

Ans

```
import java.util.Scanner;
public class A3Q05 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter a, b, c: ");
		double a = sc.nextDouble();
		double b = sc.nextDouble();
		double c = sc.nextDouble();
		double discriminant = Math.pow(b, 2) - 4 * a * c;
		System.out.print("The equation has ");
		if (discriminant > 0)  {
		double root1 = (-b + Math.pow(discriminant, 0.5)) / (2 * a);
		double root2 = (-b - Math.pow(discriminant, 0.5)) / (2 * a);
		System.out.println("two roots " + root1 + " and " + root2);
		} else if (
		discriminant == 0)    {
		double root1 = (-b + Math.pow(discriminant, 0.5)) / (2 * a);
		System.out.println("one root " + root1);
		} else
		System.out.println("no real roots");
		sc.close();
	}
}
```

Output

Enter a, b, c: 1 2 1
The equation has one root -1.0

Q6

You can use Cramer's rule to solve the following 2 X 2 system of linear equation:

$ax+by=e$

$cx+dy=f$

$x= \frac{ed-bf}{ad-bc}$

$y= \frac{af-ec}{ad-bc}$

Write a java program that prompts the user to enter *a*, *b*, *c*, *d*, *e*, and *f* and displays the result. If *ad* - *bc* is **0**, report that "The equation has no solution."

```
Enter a, b, c, d, e, f: 9.0 4.0 3.0 -5.0 -6.0 -21.0
x is -2.0 and y is 3.0

Enter a, b, c, d, e, f: 1.0 2.0 2.0 4.0 4.0 5.0
The equation has no solution
```

Ans

```
import java.util.Scanner;
public class A3Q06 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter a, b, c, d, e, f: ");
		double a = sc.nextDouble();
		double b = sc.nextDouble();
		double c = sc.nextDouble();
		double d = sc.nextDouble();
		double e = sc.nextDouble();
		double f = sc.nextDouble();
		if (a * d - b * c == 0)
		System.out.println("The equation has no solution.");
		else    {
		double x = (e * d - b * f) / (a * d - b * c);
		double y = (a * f - e * c) / (a * d - b * c);
		System.out.println("x is " + x + " and y is " + y);
		sc.close();
		}
	}
}
```

Output

```
Enter a, b, c, d, e, f: 9 4 3 -5 -6 -21
x is -2.0 and y is 3.0
```

Q7

Write a java program that takes the x – y coordinates of a point in the Cartesian plane and prints a message telling either an axis on which the point lies or the quadrant in which it is found.

```
Sample lines of output:
(-1.0, -2.5) is in quadrant III
(0.0, 4.8) is on the y-axis
```

Ans

```
import java.util.Scanner;
public class A3Q07 {
	public static void main(String[] args) {
		Scanner sc=new Scanner(System.in);
		double x,y;
		System.out.print("Enter the x and y coordinate respectively: ");
		x=sc.nextDouble();
		y=sc.nextDouble();
		if(x==0)
```

```
                System.out.println("("+x+","+y+") is on the y-axis");
                else if(y==0)
                System.out.println("("+x+","+y+") is on the x-axis");
                else if(x>0 && y>0)
                System.out.println("("+x+","+y+") is on the first quadrant");
                else if(x<0 && y>0)
                System.out.println("("+x+","+y+") is on the second quadrant");
                else if(x<0 && y<0)
                System.out.println("("+x+","+y+") is on the third quadrant");
                else if(x<0 && y>0)
                System.out.println("("+x+","+y+") is on the fourth quadrant");
                else
                System.out.println("("+x+","+y+") is at center");
                sc.close();
        }
}
```

Output

```
Enter the x and y coordinate respectively: -1 -2.5
(-1.0,-2.5) is on the third quadrant
```

Q8

If the ages of Rahul, Ayush and Ajay are input through the keyboard, write a java program to determine the elder among them.

Ans

```
import java.util.Scanner;
public class A3Q08 {
        public static void main(String[] args) {
                Scanner sc=new Scanner(System.in);
                int rahul, ayush, ajay;
                System.out.println("Enter the ages of Rahul, Ayush, Ajay respectively");
                rahul=sc.nextInt();
                ayush=sc.nextInt();
                ajay=sc.nextInt();
                if(rahul>ayush && rahul>ajay)
                System.out.println("Rahul is the eldest among them");
                else if(ayush>rahul && ayush>ajay)
                System.out.println("Ayush is the eldest among them");
                else
                System.out.println("Ajay is the eldest among them");
                sc.close();
        }
}
```

Output

Enter the ages of Rahul, Ayush, Ajay respectively
23 45 20
Ayush is the eldest among them

Q9

Write a java program that randomly generates an integer between 1 and 12 and displays the English month name January, February… December for the number 1, 2… 12, accordingly.

Ans

```
public class A3Q09 {
	public static void main(String[] args) {
		int month = (int)((Math.random() * 12) + 1);
		switch (month)	{
		case 1: System.out.println("January"); break;
		case 2: System.out.println("February"); break;
		case 3: System.out.println("March"); break;
		case 4: System.out.println("April"); break;
		case 5: System.out.println("May"); break;
		case 6: System.out.println("June"); break;
		case 7: System.out.println("July"); break;
		case 8: System.out.println("August"); break;
		case 9: System.out.println("September"); break;
		case 10: System.out.println("October"); break;
		case 11: System.out.println("November"); break;
		case 12: System.out.println("December");
		}
	}
}
```

Output

June

Q10

Write a java program that prompts the user to enter an integer for today's day of the week (Sunday is 0, Monday is 1… and Saturday is 6). Also prompt the user to enter the number of days after today for a future day and display the future day of the week.

Here is a sample run:

```
Enter today's day: 1
Enter the number of days elapsed since today: 3
Today is Monday and the future day is Thursday

Enter today's day: 0
Enter the number of days elapsed since today: 31
Today is Sunday and the future day is Wednesday
```

Ans

```
import java.util.Scanner;
public class A3Q10 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter today's day: ");
		int tday = sc.nextInt();
		System.out.print("Enter the number of days elapsed since today: ");
		int daysElapsed = sc.nextInt();
		int futureDay = (tday + daysElapsed) % 7;
		System.out.print("Today is ");
		switch (tday) {
		case 0: System.out.print("Sunday"); break;
		case 1: System.out.print("Monday"); break;
		case 2: System.out.print("Tuesday"); break;
		case 3: System.out.print("Wednesday"); break;
		case 4: System.out.print("Thursday"); break;
		case 5: System.out.print("Friday"); break;
		case 6: System.out.print("Saturday");
		}
		System.out.print(" and the future day is ");
		switch (futureDay)  {
		case 0: System.out.println("Sunday"); break;
		case 1: System.out.println("Monday"); break;
		case 2: System.out.println("Tuesday"); break;
		case 3: System.out.println("Wednesday"); break;
		case 4: System.out.println("Thursday"); break;
		case 5: System.out.println("Friday"); break;
		case 6: System.out.println("Saturday");
		sc.close();
		}
	}
}
```

Output

```
Enter today's day: 1
Enter the number of days elapsed since today: 3
Today is Monday and the future day is Thursday
```

Q11

The body mass index (BMI) is commonly used by health and nutrition professionals to estimate human body fat in populations. It is computed by taking the individual's weight (mass) in kilograms and dividing it by the square of their height in meters. i.e.

$Metric{:}BMI = \frac{\text{Weight (kg)}}{(\text{Height(m)})^2}$

Write a java program by using some if statements to show the category for a given BMI.

BMI	Category
less than 18.5	underweight
18.5 to 24.9	normal weight
25.0 to 29.9	overweight
30.0 or more	obese

Ans

```
import java.util.Scanner;
public class A3Q11 {
	public static void main(String[] args) {
		Scanner sc=new Scanner(System.in);
		System.out.print("Enter the weight of a person in kg and height in meter: ");
		double wt=sc.nextDouble();
		double ht=sc.nextDouble();
		double BMI=wt/(ht*ht);
		System.out.println("BMI= "+BMI);
		if(BMI<18.5)
		System.out.println("Under weight");
		else if(BMI>=18.5 && BMI<25)
		System.out.println("Normal weight");
		else if(BMI>=25 && BMI<30)
		System.out.println("Over weight");
		else
		System.out.println("Obese");
		sc.close();
	}
}
```

Output

```
Enter the weight of a person in kg and height in meter: 60 1.6
BMI= 23.437499999999996
Normal weight
```

Q12

Write a java program that prompts the user to enter three integers and display the integers in non-decreasing order. Here is a sample run:

```
Enter three integers: 2 4 3
Display the integers in non-decreasing order:
2 3 4
```

Ans

```
import java.util.Scanner;
public class A3Q12 {
	public static void main(String[] args) {
		int n1,n2,n3;
      Scanner sc = new Scanner(System.in);
 System.out.print("Enter three Integers : ");
```

```
		n1 = sc.nextInt();
		n2 = sc.nextInt();
		n3 = sc.nextInt();
		int temp;
	if ((n2<n1)||(n3<n1)); {
		if (n2<n1) {
			temp = n1;
		   n1=n2;
		   n2=temp;
		}
		if (n3<n1) {
			temp = n1;
		   n1=n3;
		   n3=temp;
		}
		if (n3<n2) {
			temp = n2;
		   n2=n3;
		   n3=temp;
		}
	}
		System.out.println("Integers in non-decreasing order: "+n1+ " " +n2+ " " +n3);
	sc.close();
	}
}
```

Output

Enter three Integers : 2 4 3
Integers in non-decreasing order: 2 3 4

Q13

Write a java program that prompts the user to enter the month and year and displays the number of days in the month. For example, if the user entered month **2** and year **2012**, the program should display that February 2012 had 29 days. If the user entered month **3** and year **2015**, the program should display that March 2015 had 31 days.

Ans

```
import java.util.Scanner;
public class A3Q13 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter the month as integer: ");
		int month = sc.nextInt();
		System.out.print("Enter the year as integer: ");
		int year = sc.nextInt();
		boolean leapYear = (year % 4 == 0 && year % 100 != 0) || (year % 400 == 0);
		switch (month)	{
```

```
                case 1: System.out.println(
                "January " + year + " had 31 days"); break;
                case 2: System.out.println("February " + year + " had" +
                ((leapYear) ? " 29 days" : " 28 days")); break;
                case 3: System.out.println(
                "March " + year + " had 31 days"); break;
                case 4: System.out.println(
                "April " + year + " had 30 days"); break;
                case 5: System.out.println(
                "May " + year + " had 31 days"); break;
                case 6: System.out.println(
                "June " + year + " had 30 days"); break;
                case 7: System.out.println(
                "July " + year + " had 31 days"); break;
                case 8: System.out.println(
                "August " + year + " had 31 days"); break;
                case 9: System.out.println(
                "September " + year + " had 30 days"); break;
                case 10: System.out.println(
                "October " + year + " had 31 days"); break;
                case 11: System.out.println(
                "November " + year + " had 30 days"); break;
                case 12: System.out.println(
                "December " + year + " had 31 days");
                sc.close();
                }
        }
}
```

Output

Enter the month as integer: 2
Enter the year as integer: 2020
February 2020 had 29 days

Q14

Write a java program that plays the popular scissor-rock-paper game. (A scissor can cut a paper, a rock can knock a scissor, and a paper can wrap a rock.) The program randomly generates a number **0**, **1**, or **2** representing scissor, rock, and paper. The program prompts the user to enter a number **0**, **1**, or **2** and displays a message indicating whether the user or the computer wins, loses, or draws.

Here are sample runs:

```
scissor (0), rock (1), paper (2): 1
The computer is scissor. You are rock. You won

scissor (0), rock (1), paper (2): 2
The computer is paper. You are paper too. It is a draw
```

Ans

```
import java.util.Scanner;
public class A3Q14 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		int computer = (int)(Math.random() * 3);
		System.out.print("scissor (0), rock (1), paper (2): ");
		int user = sc.nextInt();
		System.out.print("The computer is ");
		switch (computer)    {
		case 0: System.out.print("scissor."); break;
		case 1: System.out.print("rock."); break;
		case 2: System.out.print("paper.");
		}
		System.out.print(" You are ");
		switch (user) {
		case 0: System.out.print("scissor"); break;
		case 1: System.out.print("rock"); break;
		case 2: System.out.print("paper ");
		} if (
		computer == user)
		System.out.println(" too. It is a draw");
		else if (
		(user == 0 && computer == 2) || (user == 1 && computer == 0) ||
		(user == 2 && computer == 1))
		{System.out.println(". You won");}
		else
		System.out.println(". You lose");
		sc.close();
		}
	}
```

Output

```
scissor (0), rock (1), paper (2): 1
The computer is scissor. You are rock. You won
```

Q15

Write a java program that prompts the user to enter a point (**x**, **y**) and checks whether the point is within the circle centered at (**0**, **0**) with radius **10**. For example, (**4**, **5**) is inside the circle and (**9**, **9**) is outside the circle, (*Hint*: A point is in the circle if its distance to (**0**, **0**) is less than or equal to **10**. The formula for computing the distance is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ .Test your program to cover all cases.

Two sample runs are shown below.

```
Enter a point with two coordinates: 4 5
Point (4.0, 5.0) is in the circle

Enter a point with two coordinates: 9 9
Point (9.0, 9.0) is not in the circle
```

Ans

```
import java.util.Scanner;
public class A3Q15 {
	public static void main(String[] args) {
		Scanner sc = new Scanner(System.in);
		System.out.print("Enter a point with two coordinates: ");
		double x = sc.nextDouble();
		double y = sc.nextDouble();
		double distance = Math.pow(Math.pow(x, 2) + Math.pow(y, 2), 0.5);
		if (distance <= 10)
			System.out.println("Point lies in the circle");
		else
			System.out.println("Point does not lie in the circle");
		sc.close();
	}
}
```

Output

```
Enter a point with two coordinates: 4 5
Point lies in the circle
```

Q16

A University conducts a 100 mark exam for its student and grades them as follows. Assigns a grade based on the value of the marks. Write a java program to print the grade according to the mark secured by the student. [**Use switch-case**]

Mark Range	**Letter Grade**
>=90	O
>=80 AND <90	A
>=70 AND <80	B
>=60 AND <70	C
>=50 AND <60	D
>=40 AND <50	E
<40	F

Ans

```
import java.util.Scanner;
public class A3Q16 {
	public static void main(String[] args) {
		Scanner sc=new Scanner(System.in);
		System.out.println("Enter the marks of a student out of 100 full mark");
		int mark=sc.nextInt();
		switch(mark/10)	{
		case 0: case 1: case 2: case 3:
		System.out.println("F");break;
		case 4:
		System.out.println("E");break;
```

```
                case 5:
                System.out.println("D");break;
                case 6:
                System.out.println("C");break;
                case 7:
                System.out.println("B");break;
                case 8:
                System.out.println("A");break;
                case 9: case 10:
                System.out.println("O");break;
                default:
                System.out.println("Invalid Input");break;
                }
                sc.close();
        }
}
```

Output

```
Enter the marks of a student out of 100 full mark
89
A
```

Q17

Write a java program that prompts the user to enter an integer and determines whether it is divisible by 5 and 6, whether it is divisible by 5 or 6, and whether it is divisible by 5 or 6, but not both.

Here is a sample run of this program:

```
Enter an integer: 10
Is 10 divisible by 5 and 6? false
Is 10 divisible by 5 or 6? true
Is 10 divisible by 5 or 6, but not both? True
```

Ans

```
import java.util.Scanner;
public class A3Q17 {
        public static void main(String[] args) {
                Scanner sc = new Scanner(System.in);
                System.out.print("Enter an integer: ");
                int num1 = sc.nextInt();
                boolean x = ((num1 % 5 == 0) && (num1 % 6 == 0));
                boolean y = ((num1 % 5 == 0) || (num1 % 6 == 0));
          boolean z = ((num1 % 5 == 0) ^ (num1 % 6 == 0));
                System.out.println("Is " + num1 + " divisible by 5 and 6? " + x);
                System.out.println("Is " + num1 + " divisible by 5 or 6? " + y);
                System.out.println("Is " + num1 + " divisible by 5 or 6, but not both? " + z);
                sc.close();
```

```
	}
}
```

Output

```
Enter an integer: 10
Is 10 divisible by 5 and 6? false
Is 10 divisible by 5 or 6? true
Is 10 divisible by 5 or 6, but not both? true
```

Q18

Write a java program which displays an appropriate name for a person, using a combination of nested ifs and compound conditions. Ask the user for a gender, first name, last name and age. If the person is female and 20 or over, ask if she is married. If so, display "Mrs." in front of her name. If not, display "Ms." in front of her name. If the female is under 20, display her first and last name. If the person is male and 20 or over, display "Mr." in front of his name. Otherwise, display his first and last name. Note that asking a person if they are married should *only* be done if they are female and 20 or older, which means you will have a single if and else nested inside one of your if statements. Also, did you know that with an if statements (or else), the curly braces are optional when there is only one statement inside?

```
What is your gender (M or F): F
First name: Gita
Last name: Pattanayak
Age: 32
Are you married, Gita (y or n)? y
Then I shall call you Mrs. Gita Pattanayak.
What is your gender (M or F): F
First name: Anjali
Last name: Mishra
Age: 48
Are you married, Anjali(y or n)? n
Then I shall call you Ms. Anjali.
What is your gender (M or F): M
First name: Ashok
Last name: Mohanty
Age: 23
Then I shall call you Mr. Ashok.
What is your gender (M or F): M
First name: Rahul
Last name: Pati
Age: 15
Then I shall call you Rahul Pati
```

Ans

```
import java.util.Scanner;
public class A3Q18 {
	public static void main(String[] args) {
		Scanner sc=new Scanner(System.in);
		System.out.print("What is your gender (M or F): ");
		char g=sc.next().charAt(0);
		System.out.print("First Name: ");
		String fn=sc.next();
		System.out.print("Last Name: ");
		String ln=sc.next();
		System.out.print("Age: ");
```

```
                int age=sc.nextInt();
                if(g=='F')       {
                if(age>=20)    {
                System.out.print("Are you married, "+fn+" (y or n)? ");
                char m=sc.next().charAt(0);
                if(m=='y')
                System.out.println("Then I shall call you Mrs. "+ fn+" "+ln);
                else
                System.out.println("Then I shall call you Ms. "+ fn+" "+ln);
                }
                else    {
                System.out.println("Then I shall call you "+ fn+" "+ln);
                }
                }
                else    {
                if(g=='M')
                {
                if(age>=20)  {
                System.out.println("Then I shall call you Mr. "+ fn+" "+ln);
                } else  {
                System.out.println("Then I shall call you "+ fn+" "+ln);
                sc.close();
            }
          }
      }
   }
}
```

Output

What is your gender (M or F): M
First Name: Jack
Last Name: Sparrow
Age: 32
Then I shall call you Mr. Jack Sparrow

Credit – Abel

The End