**Exercise 1: Simple If Statement**

**Task**: Write a program that checks whether a given number is positive or not. If it is positive, print "The number is positive". Otherwise, print "The number is not positive".

**Solution:**

import java.util.Scanner;

public class PositiveCheck {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number: ");

int number = scanner.nextInt();

if (number > 0) {

System.out.println("The number is positive.");

} else {

System.out.println("The number is not positive.");

}

}

}

**Exercise 2: Even or Odd**

**Task**: Write a program to check if a number is even or odd.

**Solution:**

import java.util.Scanner;

public class EvenOddCheck {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number: ");

int number = scanner.nextInt();

if (number % 2 == 0) {

System.out.println("The number is even.");

} else {

System.out.println("The number is odd.");

}

}

}

**Exercise 3: Largest of Three Numbers**

**Task**: Write a program that finds the largest of three given numbers.

**Solution:**

import java.util.Scanner;

public class LargestOfThree {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter three numbers: ");

int num1 = scanner.nextInt();

int num2 = scanner.nextInt();

int num3 = scanner.nextInt();

if (num1 >= num2 && num1 >= num3) {

System.out.println("The largest number is: " + num1);

} else if (num2 >= num1 && num2 >= num3) {

System.out.println("The largest number is: " + num2);

} else {

System.out.println("The largest number is: " + num3);

}

}

}

**Exercise 4: Grade Classification**

**Task**: Write a program that assigns a grade based on a student's score. The grading scale is as follows:

* A for scores above 90
* B for scores between 80 and 89
* C for scores between 70 and 79
* D for scores between 60 and 69
* F for scores below 60

**Solution:**

import java.util.Scanner;

public class GradeClassification {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter the score: ");

int score = scanner.nextInt();

if (score > 90) {

System.out.println("Grade: A");

} else if (score >= 80) {

System.out.println("Grade: B");

} else if (score >= 70) {

System.out.println("Grade: C");

} else if (score >= 60) {

System.out.println("Grade: D");

} else {

System.out.println("Grade: F");

}

}

}

**Exercise 5: Leap Year Checker**

**Task**: Write a program to check if a year is a leap year. A year is a leap year if:

* It is divisible by 4.
* It is not divisible by 100, unless it is also divisible by 400.

**Solution:**

import java.util.Scanner;

public class LeapYearChecker {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a year: ");

int year = scanner.nextInt();

if ((year % 4 == 0 && year % 100 != 0) || (year % 400 == 0)) {

System.out.println(year + " is a leap year.");

} else {

System.out.println(year + " is not a leap year.");

}

}

}

**Exercise 6: Ternary Operator Example**

**Task**: Write a program that checks if a number is positive or negative using the ternary operator. The program should print "Positive" if the number is positive, and "Negative" if the number is negative.

**Solution:**

import java.util.Scanner;

public class TernaryExample {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number: ");

int number = scanner.nextInt();

// Using the ternary operator

String result = (number > 0) ? "Positive" : "Negative";

System.out.println("The number is " + result);

}

}

**Exercise 7: Divisible by Both 3 and 5**

**Task**: Write a program that checks if a number is divisible by both 3 and 5. If it is, print "Divisible by both", otherwise print "Not divisible by both".

**Solution:**

import java.util.Scanner;

public class DivisibleByBoth {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number: ");

int number = scanner.nextInt();

if (number % 3 == 0 && number % 5 == 0) {

System.out.println("Divisible by both");

} else {

System.out.println("Not divisible by both");

}

}

}

**Exercise 8: Odd or Even (Advanced)**

**Task**: Write a program that determines whether a given number is odd or even. If the number is odd, additionally check whether it is positive or negative.

**Solution:**

import java.util.Scanner;

public class OddEvenAdvanced {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number: ");

int number = scanner.nextInt();

if (number % 2 == 0) {

System.out.println("The number is even.");

} else {

System.out.println("The number is odd.");

if (number > 0) {

System.out.println("The number is positive.");

} else {

System.out.println("The number is negative.");

}

}

}

}

**Exercise 9: Voting Eligibility**

**Task**: Write a program that checks if a person is eligible to vote. A person is eligible to vote if they are 18 years or older. The program should prompt the user to enter their age, then print either "You are eligible to vote" or "You are not eligible to vote".

**Solution:**

import java.util.Scanner;

public class VotingEligibility {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter your age: ");

int age = scanner.nextInt();

if (age >= 18) {

System.out.println("You are eligible to vote.");

} else {

System.out.println("You are not eligible to vote.");

}

}

}

**Exercise 10: Age Group Classification**

**Task**: Write a program that classifies a person into different age groups:

* Child (0-12 years)
* Teenager (13-19 years)
* Adult (20-64 years)
* Senior (65+ years)

The program should print the appropriate age group.

**Solution:**

import java.util.Scanner;

public class AgeGroupClassification {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter your age: ");

int age = scanner.nextInt();

if (age >= 0 && age <= 12) {

System.out.println("You are a Child.");

} else if (age >= 13 && age <= 19) {

System.out.println("You are a Teenager.");

} else if (age >= 20 && age <= 64) {

System.out.println("You are an Adult.");

} else if (age >= 65) {

System.out.println("You are a Senior.");

} else {

System.out.println("Invalid age entered.");

}

}

}

**Exercise 11: Check if a Character is a Vowel or Consonant**

**Task**: Write a program that takes a single character as input and checks if it is a vowel (a, e, i, o, u) or consonant.

**Solution:**

import java.util.Scanner;

public class VowelConsonantChecker {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a character: ");

char ch = scanner.next().charAt(0);

if (ch == 'a' || ch == 'e' || ch == 'i' || ch == 'o' || ch == 'u' ||

ch == 'A' || ch == 'E' || ch == 'I' || ch == 'O' || ch == 'U') {

System.out.println(ch + " is a vowel.");

} else {

System.out.println(ch + " is a consonant.");

}

}

}

**Exercise 12: Divisibility Checker**

**Task**: Write a program that checks if a number is divisible by 3, 5, or both. The program should print:

* "Divisible by 3" if divisible by 3 only,
* "Divisible by 5" if divisible by 5 only,
* "Divisible by both" if divisible by both 3 and 5,
* "Not divisible by 3 or 5" if not divisible by either.

**Solution:**

import java.util.Scanner;

public class DivisibilityChecker {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number: ");

int number = scanner.nextInt();

if (number % 3 == 0 && number % 5 == 0) {

System.out.println("Divisible by both");

} else if (number % 3 == 0) {

System.out.println("Divisible by 3");

} else if (number % 5 == 0) {

System.out.println("Divisible by 5");

} else {

System.out.println("Not divisible by 3 or 5");

}

}

}

**Exercise 13: Calculate Discount Based on Age**

**Task**: Write a program that calculates the price of a movie ticket based on age. The ticket price is:

* $10 for people 12 years and under (child).
* $15 for people between 13 and 64 years (adult).
* $5 for people 65 years and older (senior).

The program should prompt the user to enter their age and print the ticket price.

**Solution:**

import java.util.Scanner;

public class MovieTicketDiscount {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter your age: ");

int age = scanner.nextInt();

if (age <= 12) {

System.out.println("Ticket Price: $10");

} else if (age >= 13 && age <= 64) {

System.out.println("Ticket Price: $15");

} else {

System.out.println("Ticket Price: $5");

}

}

}

**Exercise 14: Sort Numbers Using Decision Constructs**

**Task**: Write a program that takes three numbers and sorts them in ascending order using only if-else decision constructs.

**Solution:**

import java.util.Scanner;

public class SortNumbersAlternative {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

// Input: Three numbers

System.out.print("Enter first number: ");

int num1 = scanner.nextInt();

System.out.print("Enter second number: ");

int num2 = scanner.nextInt();

System.out.print("Enter third number: ");

int num3 = scanner.nextInt();

// Sorting using decision constructs (if-else)

if (num1 > num2) {

int temp = num1;

num1 = num2;

num2 = temp;

}

if (num1 > num3) {

int temp = num1;

num1 = num3;

num3 = temp;

}

if (num2 > num3) {

int temp = num2;

num2 = num3;

num3 = temp;

}

System.out.println("Sorted Order: " + num1 + ", " + num2 + ", " + num3);

}

}

**Exercise 15: Day of the Week**

**Task**: Write a program that prints the day of the week based on a given number (1-7). The program should print:

* 1 = Monday
* 2 = Tuesday
* 3 = Wednesday
* 4 = Thursday
* 5 = Friday
* 6 = Saturday
* 7 = Sunday

**Solution:**

import java.util.Scanner;

public class DayOfTheWeek {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number (1-7): ");

int day = scanner.nextInt();

if (day == 1) {

System.out.println("Monday");

} else if (day == 2) {

System.out.println("Tuesday");

} else if (day == 3) {

System.out.println("Wednesday");

} else if (day == 4) {

System.out.println("Thursday");

} else if (day == 5) {

System.out.println("Friday");

} else if (day == 6) {

System.out.println("Saturday");

} else if (day == 7) {

System.out.println("Sunday");

} else {

System.out.println("Invalid input.");

}

}

}

**Exercise 16: Check Whether a Year is a Century Year**

**Task**: Write a program that checks whether a year is a century year. A century year is a year that is divisible by 100. The program should print "Century Year" if the year is divisible by 100, and "Not a Century Year" otherwise.

**Solution:**

import java.util.Scanner;

public class CenturyYearChecker {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a year: ");

int year = scanner.nextInt();

if (year % 100 == 0) {

System.out.println("Century Year");

} else {

System.out.println("Not a Century Year");

}

}

}

**Exercise 17: Maximum of Three Numbers**

**Task**: Write a program that takes three numbers as input and determines the largest of the three.

**Solution:**

import java.util.Scanner;

public class MaxOfThree {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter the first number: ");

int num1 = scanner.nextInt();

System.out.print("Enter the second number: ");

int num2 = scanner.nextInt();

System.out.print("Enter the third number: ");

int num3 = scanner.nextInt();

if (num1 >= num2 && num1 >= num3) {

System.out.println(num1 + " is the largest number.");

} else if (num2 >= num1 && num2 >= num3) {

System.out.println(num2 + " is the largest number.");

} else {

System.out.println(num3 + " is the largest number.");

}

}

}

**Exercise 18: Leap Year Checker**

**Task**: Write a program that checks if a given year is a leap year. A year is a leap year if:

* It is divisible by 4, but not divisible by 100, or
* It is divisible by 400.

The program should print "Leap year" or "Not a leap year" based on the condition.

**Solution:**

import java.util.Scanner;

public class LeapYearChecker {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a year: ");

int year = scanner.nextInt();

if ((year % 4 == 0 && year % 100 != 0) || (year % 400 == 0)) {

System.out.println(year + " is a leap year.");

} else {

System.out.println(year + " is not a leap year.");

}

}

}

**Exercise 19: Calculate Grade**

**Task**: Write a program that calculates the grade based on the score:

* 90 or above: A
* 80-89: B
* 70-79: C
* 60-69: D
* Below 60: F

The program should print the grade corresponding to the score.

**Solution:**

import java.util.Scanner;

public class GradeCalculator {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter the score: ");

int score = scanner.nextInt();

if (score >= 90) {

System.out.println("Grade: A");

} else if (score >= 80) {

System.out.println("Grade: B");

} else if (score >= 70) {

System.out.println("Grade: C");

} else if (score >= 60) {

System.out.println("Grade: D");

} else {

System.out.println("Grade: F");

}

}

}

**Exercise 20: Positive, Negative, or Zero**

**Task**: Write a program that checks whether a number is positive, negative, or zero.

**Solution:**

import java.util.Scanner;

public class NumberSignChecker {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number: ");

int num = scanner.nextInt();

if (num > 0) {

System.out.println(num + " is positive.");

} else if (num < 0) {

System.out.println(num + " is negative.");

} else {

System.out.println("The number is zero.");

}

}

}

**Exercise 21: Grade Point Average (GPA)**

**Task**: Write a program that takes the GPA as input and prints the letter grade:

* GPA >= 3.5: A
* GPA >= 3.0 and < 3.5: B
* GPA >= 2.0 and < 3.0: C
* GPA < 2.0: F

**Solution:**

import java.util.Scanner;

public class GPACalculator {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter your GPA: ");

double gpa = scanner.nextDouble();

if (gpa >= 3.5) {

System.out.println("Grade: A");

} else if (gpa >= 3.0) {

System.out.println("Grade: B");

} else if (gpa >= 2.0) {

System.out.println("Grade: C");

} else {

System.out.println("Grade: F");

}

}

}

**Exercise 22: Even or Odd**

**Task**: Write a program that checks if a number is even or odd.

**Solution:**

import java.util.Scanner;

public class EvenOddChecker {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number: ");

int num = scanner.nextInt();

if (num % 2 == 0) {

System.out.println(num + " is even.");

} else {

System.out.println(num + " is odd.");

}

}

}

**Exercise 23: Calculate Discount for Shopping**

**Task**: Write a program that calculates a discount for a shopping cart based on the total amount:

* If the amount is greater than or equal to 100, apply a 20% discount.
* If the amount is between 50 and 99, apply a 10% discount.
* If the amount is below 50, apply no discount.

The program should print the discount and the total after the discount.

**Solution:**

import java.util.Scanner;

public class ShoppingDiscount {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter the total amount: ");

double amount = scanner.nextDouble();

double discount = 0;

if (amount >= 100) {

discount = 0.20 \* amount;

} else if (amount >= 50) {

discount = 0.10 \* amount;

}

double totalAfterDiscount = amount - discount;

System.out.println("Discount: $" + discount);

System.out.println("Total after discount: $" + totalAfterDiscount);

}

}

**Exercise 24: Check if a Number is Divisible by Both 3 and 5**

**Task**: Write a program that checks if a given number is divisible by both 3 and 5.

**Solution:**

import java.util.Scanner;

public class DivisibleByThreeAndFive {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number: ");

int num = scanner.nextInt();

if (num % 3 == 0 && num % 5 == 0) {

System.out.println(num + " is divisible by both 3 and 5.");

} else {

System.out.println(num + " is not divisible by both 3 and 5.");

}

}

}

**Exercise 25: Find Largest of Four Numbers**

**Task**: Write a program that finds the largest number among four given numbers.

**Solution:**

import java.util.Scanner;

public class LargestOfFour {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter the first number: ");

int num1 = scanner.nextInt();

System.out.print("Enter the second number: ");

int num2 = scanner.nextInt();

System.out.print("Enter the third number: ");

int num3 = scanner.nextInt();

System.out.print("Enter the fourth number: ");

int num4 = scanner.nextInt();

int largest = num1;

if (num2 > largest) {

largest = num2;

}

if (num3 > largest) {

largest = num3;

}

if (num4 > largest) {

largest = num4;

}

System.out.println("The largest number is: " + largest);

}

}

**Exercise 26: Quadratic Equation Solver**

**Task**: Write a program that solves a quadratic equation of the form ax^2 + bx + c = 0 for real values of x, given the values of a, b, and c. The program should handle cases where the equation has no real solutions (discriminant < 0), one real solution (discriminant = 0), or two real solutions (discriminant > 0).

**Solution:**

import java.util.Scanner;

public class QuadraticEquationSolver {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter coefficient a: ");

double a = scanner.nextDouble();

System.out.print("Enter coefficient b: ");

double b = scanner.nextDouble();

System.out.print("Enter coefficient c: ");

double c = scanner.nextDouble();

double discriminant = b \* b - 4 \* a \* c;

if (discriminant > 0) {

double root1 = (-b + Math.sqrt(discriminant)) / (2 \* a);

double root2 = (-b - Math.sqrt(discriminant)) / (2 \* a);

System.out.println("The equation has two real solutions: " + root1 + " and " + root2);

} else if (discriminant == 0) {

double root = -b / (2 \* a);

System.out.println("The equation has one real solution: " + root);

} else {

System.out.println("The equation has no real solutions.");

}

}

}

**Exercise 27: Validate Email Format**

**Task**: Write a program that validates whether an email address is in a correct format. The program should check for the following conditions:

* The email must contain exactly one "@" symbol.
* The email must contain at least one dot (".") after the "@" symbol.
* The email must not start or end with a dot.

**Solution:**

import java.util.Scanner;

public class EmailValidator {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter an email address: ");

String email = scanner.nextLine();

if (email.contains("@") && email.indexOf("@") != email.lastIndexOf("@")) {

int atIndex = email.indexOf("@");

int dotIndex = email.indexOf(".", atIndex);

if (dotIndex > atIndex && email.charAt(0) != '.' && email.charAt(email.length() - 1) != '.') {

System.out.println("The email address is valid.");

} else {

System.out.println("The email address is invalid.");

}

} else {

System.out.println("The email address is invalid.");

}

}

}

**Exercise 28: Determine if a Year is a Leap Year**

**Task**: Write a program that takes a year as input and checks whether it is a leap year or not using decision constructs (if-else).

**Solution:**

import java.util.Scanner;

public class LeapYearChecker {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

// Input: A year

System.out.print("Enter a year: ");

int year = scanner.nextInt();

// Decision constructs to check if the year is a leap year

if ((year % 4 == 0 && year % 100 != 0) || (year % 400 == 0)) {

System.out.println(year + " is a leap year.");

} else {

System.out.println(year + " is not a leap year.");

}

}

}

**Exercise 29: Age Category**

**Task**: Write a program that asks for the age of a person and then categorizes the person into one of the following groups:

* "Child" (age <= 12)
* "Teenager" (age between 13 and 19)
* "Adult" (age between 20 and 64)
* "Senior" (age >= 65)

**Solution:**

import java.util.Scanner;

public class AgeCategory {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter your age: ");

int age = scanner.nextInt();

if (age <= 12) {

System.out.println("You are a Child.");

} else if (age >= 13 && age <= 19) {

System.out.println("You are a Teenager.");

} else if (age >= 20 && age <= 64) {

System.out.println("You are an Adult.");

} else {

System.out.println("You are a Senior.");

}

}

}

**Exercise 30: Day of the Week**

**Task**: Write a program that asks the user to enter a number between 1 and 7 and then prints the corresponding day of the week (1 for Monday, 7 for Sunday). Handle invalid input properly.

**Solution:**

import java.util.Scanner;

public class DayOfWeek {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter a number between 1 and 7: ");

int day = scanner.nextInt();

switch (day) {

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");

break;

case 7:

System.out.println("Sunday");

break;

default:

System.out.println("Invalid input. Please enter a number between 1 and 7.");

}

}

}

**Exercise 31: Grade Based on Marks in Multiple Subjects**

**Task**: Write a program that takes the marks of three subjects as input and calculates the average. The program should then print the grade based on the average:

* Average >= 90: A
* Average >= 75 and < 90: B
* Average >= 60 and < 75: C
* Average < 60: D

**Solution:**

import java.util.Scanner;

public class GradeBasedOnMarks {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter the marks for Subject 1: ");

int subject1 = scanner.nextInt();

System.out.print("Enter the marks for Subject 2: ");

int subject2 = scanner.nextInt();

System.out.print("Enter the marks for Subject 3: ");

int subject3 = scanner.nextInt();

double average = (subject1 + subject2 + subject3) / 3.0;

if (average >= 90) {

System.out.println("Grade: A");

} else if (average >= 75) {

System.out.println("Grade: B");

} else if (average >= 60) {

System.out.println("Grade: C");

} else {

System.out.println("Grade: D");

}

}

}