**Decision constructs**

Decision constructs in Java allow the program to make decisions and choose different paths of execution based on certain conditions.

There are mainly three types of decision constructs in Java:

1. **if Statement**:
   * The **if** statement is the most basic decision-making statement in Java.
   * It evaluates a boolean expression and executes a block of code if the expression evaluates to true.
   * Syntax:

if (condition) {

// code block to be executed if condition is true

}

**2. if-else Statement**:

* The **if-else** statement extends the **if** statement by providing an alternative block of code to be executed if the condition evaluates to false.
* Syntax:

if (condition) {

// code block to be executed if condition is true

} else {

// code block to be executed if condition is false

}

**3. if-else-if ladder**:

* The **if-else-if** ladder allows testing multiple conditions in sequence.
* Each condition is tested sequentially, and the block of code associated with the first condition that evaluates to true is executed.
* Syntax:

if (condition1) {

// code block to be executed if condition1 is true

}

else if (condition2) {

// code block to be executed if condition2 is true

}

else if (condition3) {

// code block to be executed if condition3 is true

}

// add more else-if blocks as needed

else {

// code block to be executed if all conditions are false

}

**4. Switch Statement**:

* The **switch** statement allows you to select one of many code blocks to be executed.
* It evaluates an expression and compares it with multiple cases.
* Syntax:

switch (expression) {

case value1:

// code block to be executed if expression equals value1

break;

case value2:

// code block to be executed if expression equals value2

break;

// add more cases as needed

default:

// code block to be executed if expression doesn't match any case

}

* + The **break** statement is used to exit the switch statement. If omitted, execution will continue into the next case.

These decision constructs provide the basic building blocks for controlling the flow of execution in Java programs based on different conditions and criteria.

**Example programs:**

**1. Simple if Statement:**

public class IfStatementExample {

public static void main(String[] args) {

int number = 10;

if (number > 0) {

System.out.println("Number is positive");

}

}

}

**2. if-else Statement:**

public class IfElseStatementExample {

public static void main(String[] args) {

int number = -5;

if (number > 0) {

System.out.println("Number is positive");

} else {

System.out.println("Number is not positive");

}

}

}

**3. if-else-if ladder:**

public class IfElseIfLadderExample {

public static void main(String[] args) {

int marks = 75;

if (marks >= 90) {

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

} else if (marks >= 80) {

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

} else if (marks >= 70) {

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

} else if (marks >= 60) {

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

} else {

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

}

}

}

**4. Switch Statement:**

public class SwitchStatementExample {

public static void main(String[] args) {

int dayOfWeek = 3;

switch (dayOfWeek) {

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 day");

}

}

}

**5. Calculator Program with Switch Statement:**

import java.util.Scanner;

public class Calculator {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

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

double num1 = scanner.nextDouble();

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

double num2 = scanner.nextDouble();

System.out.print("Enter operator (+, -, \*, /): ");

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

double result;

switch(operator) {

case '+':

result = num1 + num2;

break;

case '-':

result = num1 - num2;

break;

case '\*':

result = num1 \* num2;

break;

case '/':

result = num1 / num2;

break;

default:

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

return; // exit the program if operator is invalid

}

System.out.println("Result: " + result);

}

}

**6. Grading Program with if-else Statement:**

import java.util.Scanner;

public class GradeCalculator {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter marks: ");

int marks = scanner.nextInt();

char grade;

if (marks >= 90) {

grade = 'A';

} else if (marks >= 80) {

grade = 'B';

} else if (marks >= 70) {

grade = 'C';

} else if (marks >= 60) {

grade = 'D';

} else {

grade = 'F';

}

System.out.println("Grade: " + grade);

}

}

**7. Leap Year Checker Program:**

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();

boolean isLeapYear = false;

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

isLeapYear = true;

}

if (isLeapYear) {

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

} else {

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

}

}

}

**8. Vowel or Consonant Checker Program:**

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.");

}

}

}

**9. Temperature Converter Program:**

import java.util.Scanner;

public class TemperatureConverter {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter temperature: ");

double temperature = scanner.nextDouble();

System.out.print("Enter unit (C for Celsius, F for Fahrenheit): ");

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

double convertedTemperature;

if (unit == 'C' || unit == 'c') {

convertedTemperature = (temperature \* 9/5) + 32;

System.out.println(temperature + "°C is equal to " + convertedTemperature + "°F");

} else if (unit == 'F' || unit == 'f') {

convertedTemperature = (temperature - 32) \* 5/9;

System.out.println(temperature + "°F is equal to " + convertedTemperature + "°C");

} else {

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

}

}

}

**10. Employee Management System:**

import java.util.Scanner;

public class EmployeeManagementSystem {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.println("Employee Management System");

System.out.println("1. Add Employee");

System.out.println("2. Remove Employee");

System.out.println("3. Update Employee Details");

System.out.println("4. View Employee Details");

System.out.println("5. Exit");

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

int choice = scanner.nextInt();

switch (choice) {

case 1:

// Add employee logic

break;

case 2:

// Remove employee logic

break;

case 3:

// Update employee details logic

break;

case 4:

// View employee details logic

break;

case 5:

System.out.println("Exiting...");

break;

default:

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

}

}

}

**11. Grade Management System:**

import java.util.Scanner;

public class GradeManagementSystem {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter marks for student: ");

int marks = scanner.nextInt();

char grade;

if (marks >= 90) {

grade = 'A';

} else if (marks >= 80) {

grade = 'B';

} else if (marks >= 70) {

grade = 'C';

} else if (marks >= 60) {

grade = 'D';

} else {

grade = 'F';

}

System.out.println("Grade: " + grade);

}

}

**12. Online Shopping System:**

import java.util.Scanner;

public class OnlineShoppingSystem {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter username: ");

String username = scanner.nextLine();

System.out.print("Enter password: ");

String password = scanner.nextLine();

// Logic to validate username and password

if (username.equals("admin") && password.equals("password")) {

System.out.println("Welcome to the Online Shopping System!");

// Add shopping functionality here

} else {

System.out.println("Invalid username or password.");

}

}

}

**More examples**

**1. Triangle Type Identifier**

**Problem:**  
Take three integer inputs representing the lengths of the sides of a triangle. Determine and display if the triangle is:

* **Equilateral** (all sides equal)
* **Isosceles** (two sides equal)
* **Scalene** (all sides different)
* **Invalid Triangle** (if the sides do not form a triangle)

**Solution:**

import java.util.Scanner;

public class TriangleType {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

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

int a = scanner.nextInt();

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

int b = scanner.nextInt();

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

int c = scanner.nextInt();

if (a + b > c && b + c > a && c + a > b) {

if (a == b && b == c) {

System.out.println("Equilateral Triangle");

} else if (a == b || b == c || a == c) {

System.out.println("Isosceles Triangle");

} else {

System.out.println("Scalene Triangle");

}

} else {

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

}

}

}

**2. Leap Year Checker**

**Problem:**  
Take a year as input and determine if it is a **leap year**.

* A year is a leap year if it is divisible by 4 **and** (not divisible by 100 **or** 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");

}

}

}

**3. Grade Calculator**

**Problem:**  
Take marks for three subjects as input. Calculate the total and average, then assign a grade based on the following conditions:

* **A** if average ≥ 90
* **B** if average ≥ 75
* **C** if average ≥ 60
* **D** if average ≥ 50
* **F** if average < 50

**Solution:**

import java.util.Scanner;

public class GradeCalculator {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

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

int sub1 = scanner.nextInt();

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

int sub2 = scanner.nextInt();

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

int sub3 = scanner.nextInt();

int total = sub1 + sub2 + sub3;

double average = total / 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 if (average >= 50) {

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

} else {

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

}

}

}

**4. Profit or Loss Calculator**

**Problem:**  
Take **Cost Price (CP)** and **Selling Price (SP)** as inputs. Determine if there is a **profit**, **loss**, or **no profit/loss**, and display the corresponding amount.

**Solution:**

import java.util.Scanner;

public class ProfitLossCalculator {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter Cost Price (CP): ");

double cp = scanner.nextDouble();

System.out.print("Enter Selling Price (SP): ");

double sp = scanner.nextDouble();

if (sp > cp) {

System.out.println("Profit: " + (sp - cp));

} else if (cp > sp) {

System.out.println("Loss: " + (cp - sp));

} else {

System.out.println("No Profit, No Loss");

}

}

}

**5. Quadrant Finder**

**Problem:**  
Take two integer inputs representing the **X** and **Y** coordinates of a point. Determine which **quadrant** the point lies in:

* **Quadrant I** if x>0 and y>0
* **Quadrant II** if x<0 and y>0
* **Quadrant III** if x<0 and y<0
* **Quadrant IV** if x>0 and y<0
* On the **origin** if x=0 and y=0
* On the **axes** if either x=0 or y=0

**Solution:**

import java.util.Scanner;

public class QuadrantFinder {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter X coordinate: ");

int x = scanner.nextInt();

System.out.print("Enter Y coordinate: ");

int y = scanner.nextInt();

if (x > 0 && y > 0) {

System.out.println("Point lies in Quadrant I");

} else if (x < 0 && y > 0) {

System.out.println("Point lies in Quadrant II");

} else if (x < 0 && y < 0) {

System.out.println("Point lies in Quadrant III");

} else if (x > 0 && y < 0) {

System.out.println("Point lies in Quadrant IV");

} else if (x == 0 && y == 0) {

System.out.println("Point is at the Origin");

} else if (x == 0) {

System.out.println("Point lies on the Y-axis");

} else {

System.out.println("Point lies on the X-axis");

}

}

}

**6. Simple Interest Calculator**

**Problem:**  
Take **Principal (P)**, **Rate of Interest (R)**, and **Time (T)** as inputs. Calculate the **Simple Interest** using:  
Simple Interest=(P×R×T)/100  
Display the interest and classify it as:

* **Low Interest** if SI < 500
* **Moderate Interest** if SI ≥ 500 and SI < 1000
* **High Interest** if SI ≥ 1000

**Solution:**

import java.util.Scanner;

public class SimpleInterestCalculator {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter Principal (P): ");

double principal = scanner.nextDouble();

System.out.print("Enter Rate of Interest (R): ");

double rate = scanner.nextDouble();

System.out.print("Enter Time in years (T): ");

double time = scanner.nextDouble();

double simpleInterest = (principal \* rate \* time) / 100;

System.out.println("Simple Interest: " + simpleInterest);

if (simpleInterest < 500) {

System.out.println("Low Interest");

} else if (simpleInterest < 1000) {

System.out.println("Moderate Interest");

} else {

System.out.println("High Interest");

}

}

}