**JAVA practice programming questions:**

**Topics covered : Java Data Types, Type Casting, String and Math Functions, Operators, Loops, Conditional Statements, Arrays, and Java Methods.**

**Basic Questions**

1. Data Types and Type Casting

- Write a Java program to declare and initialize variables of different data types (`int`, `double`, `char`, `boolean`, `String`).

- Write a program to demonstrate implicit and explicit type casting in Java.

2. String and Math Functions

- Write a program to concatenate two strings and print the result.

- Write a program to find the length of a string using the `length()` method.

- Write a program to calculate the square root of a number using the `Math.sqrt()` function.

3. Operators

- Write a program to demonstrate the use of arithmetic operators (`+`, `-`, `\*`, `/`, `%`).

- Write a program to compare two numbers using relational operators (`>`, `<`, `==`, `!=`).

4. Loops

- Write a program to print numbers from 1 to 10 using a `for` loop.

- Write a program to print the multiplication table of a number using a `while` loop.

5. Conditional Statements

- Write a program to check if a number is even or odd using an `if-else` statement.

- Write a program to find the largest of three numbers using nested `if-else` statements.

6. Arrays

- Write a program to declare and initialize an array of integers and print all its elements.

- Write a program to find the sum of all elements in an array.

7. Java Methods

- Write a method to add two numbers and return the result.

- Write a method to check if a number is prime.

**Intermediate Questions**

1. Data Types and Type Casting

- Write a program to convert a `double` value to an `int` and handle potential data loss.

- Write a program to demonstrate the use of wrapper classes (`Integer`, `Double`, etc.) for type conversion.

2. String and Math Functions

- Write a program to reverse a string without using the `reverse()` method.

- Write a program to check if a string is a palindrome.

- Write a program to generate a random number between 1 and 100 using `Math.random()`.

3. Operators

- Write a program to demonstrate the use of logical operators (`&&`, `||`, `!`).

- Write a program to swap two numbers without using a temporary variable.

4. Loops

- Write a program to print the Fibonacci series up to a given number using a `for` loop.

- Write a program to find the factorial of a number using a `while` loop.

5. Conditional Statements

- Write a program to check if a year is a leap year using `if-else` statements.

- Write a program to implement a simple calculator using `switch-case`.

6. Arrays

- Write a program to find the second-largest element in an array.

- Write a program to sort an array of integers in ascending order.

7. Java Methods

- Write a method to calculate the factorial of a number recursively.

- Write a method to find the GCD (Greatest Common Divisor) of two numbers.

**Advanced Questions**

1. Data Types and Type Casting

- Write a program to handle overflow and underflow scenarios with integer data types.

- Write a program to convert a binary string to a decimal number.

2. String and Math Functions

- Write a program to count the occurrences of each character in a string.

- Write a program to implement a custom function to calculate the power of a number (e.g., `pow(int base, int exponent)`).

3. Operators

- Write a program to demonstrate the use of bitwise operators (`&`, `|`, `^`, `~`, `<<`, `>>`).

- Write a program to check if a number is a power of 2 using bitwise operators.

4. Loops

- Write a program to print a pyramid pattern using nested loops.

- Write a program to find all prime numbers up to a given number using the Sieve of Eratosthenes algorithm.

5. Conditional Statements

- Write a program to implement a grading system using `if-else-if` ladder.

- Write a program to simulate a simple vending machine using `switch-case`.

6. Arrays

- Write a program to find the intersection of two arrays.

- Write a program to rotate an array by a given number of positions.

7. Java Methods

- Write a method to check if two strings are anagrams of each other.

- Write a method to find the maximum and minimum values in an array and return them as an array.

**Challenge Questions**

1. String and Math Functions

- Write a program to implement your own version of the `substring()` method without using the built-in function.

- Write a program to calculate the value of `e` (Euler's number) using a series expansion.

2. Arrays

- Write a program to find the longest increasing subsequence in an array.

- Write a program to merge two sorted arrays into a single sorted array.

3. Java Methods

- Write a recursive method to solve the Tower of Hanoi problem.

- Write a method to implement binary search on a sorted array.

4. Combined Concepts

- Write a program to simulate a simple banking system using methods, loops, and conditional statements.

- Write a program to implement a tic-tac-toe game using arrays and loops.