Question four

(i) Arrays

Arrays are the basic structure of data in Java that stores a fixed-size sequence, which is homogeneous. That is, elements of the same data type, and thus help in storing and accessing elements efficiently, which in turn prove very useful in several kinds of programming tasks.

Deploying It in a Program :

Declaration and Initialization : One can declare and initialize an array on one statement or do each separately. For instance, `int[] numbers = new int[5];` declares an array to hold five integers.

Array Element Access : In an array, elements are accessed via their indices, starting from zero. For example, `numbers` access the first element.

Iteration : Arrays are used much with loops, for example, `for` loops, for processing or manipulation of all elements. It allows operations like summation of values or transformations.

Storage of Homogeneous Data : Arrays may be helpful in storing a collection of homogeneous data. For example, lists of scores, names, or other related information.

(ii) Multi-dimensional Arrays

Multi-dimensional arrays are arrays of arrays, which allow more complicated data structures, such as matrices or grids. The most often used is the two-dimensional array. It can be easily pictured as a table or matrix of rows and columns. Two-dimensional arrays are the most frequently used.

Use in a Program

Declaration and Initialisation : Declaration will be done as in one dimensional array. For example, `int[][] matrix = new int[3][3];` declares a 3x3 matrix.

Element Access : Elements in a multi-dimensional array have multiple indices. For instance, `matrix[1]` return the element in the first row and in the second column.

Iteration : Two nested loops may be used to iterate over multi-dimensional arrays. This is often needed to do tasks like filling up a matrix with values or making calculations on rows or columns.

Applications : The role of multi-dimensional arrays is very important in many such diverse applications as image processing, where every image can be realized as a 2D array of pixels; in game development for grid-based games; and in scientific computations.

