PROGRAM 10

QUESTION:

Write a program in java to calculate and print the maximum and minimum elements of a given matrix.

Class Name – matrix\_minimumAndMaximumElement

Insatnce Variable – int [][] arr

* Methods:

Matrix (int nn, int mm) – to initialize M with mm and N with nn.

* void input() – to take input array.
* int max() – to return the maximum element of the matrix.
* int min() – to return the minimum element of the matrix.
* void display() – Display original matrix along with the maximum and minimum elements of the matrix.

Implement the main function to create objects and call the above methods properly.

ALGORITHM

Step 1 – Start

Step 2 - Define a class

`matrix\_maximumAndMinimumElement`.

Step 3 – Declare integer instance variables `arr`, `M`, and `N` to represent the matrix and its dimensions. Step 4 - Define a constructor

`matrix\_maximumAndMinimumElement(int mm, int nn)` that initializes `M` and `N` and creates the matrix `arr`.

Algorithm for `void input()` method:

* Create a `Scanner` object `sc`.
* Print a message asking the user to enter the elements of the matrix.
* Loop over rows from 0 to `M - 1`:
  + Loop over columns from 0 to `N - 1`:
    - Read an integer from the user using `sc.nextInt()` and assign it to `arr[i][j]`.

Algorithm for `int max()` method:

* Initialize `mx` to 0.
* Loop over rows from 0 to `M - 1`:
  + Loop over columns from 0 to `N - 1`:
    - If `arr[i][j]` is greater than `mx`, update `mx` to `arr[i][j]`.
* Return `mx`.

Algorithm for `int min()` method:

* Initialize `mn` to the value of the first element `arr[0][0]`.
* Loop over rows from 0 to `M - 1`:
  + Loop over columns from 0 to `N - 1`:
    - If `arr[i][j]` is less than `mn`, update `mn` to `arr[i][j]`.
* Return `mn`.

Algorithm for `void display()` method:

* Print a message to display the original matrix.
* Loop over rows from 0 to `M - 1`:
  + Loop over columns from 0 to `N - 1`:
    - Print `arr[i][j]` followed by a space.
  + Print a newline.
* Call the `min()` method and store the result in `min`.
* Call the `max()` method and store the result in `max`.
* Print the maximum and minimum elements.

Algorithm for `main` method method:

* Create a `Scanner` object `sc`.
* Print a message asking the user to enter the number of rows.
* Read an integer and store it in `r`.
* Print a message asking the user to enter the number of columns.
* Read an integer and store it in `c`.
* Create an instance of the

`matrix\_maximumAndMinimumElement` class using `r` and `c`.

* Call the `input()` method to get matrix elements from the user.
* Call the `display()` method to display the original matrix and its maximum and minimum elements.

**VARIABLE DESCRIPTION TABLE**

|  |  |  |
| --- | --- | --- |
| Variable name | Data Type | Description |
| arr | int[][] | 2D array to store the matrix elements. |
|  |  | Size is `M` rows and `N` columns. |
| M | int | Number of rows in the matrix. |
| N | int | Number of columns in the matrix. |
| (int mm, int | Constructor | Constructor for the matrix class. |
| nn) |  | Initializes `M` and `N` and creates the |
|  |  | matrix `arr`. |
| void input() | Method | Method to input elements into the `arr` |
|  |  | matrix from the user. |
| int max() | Method | Method to find and return the |
|  |  | maximum element in the `arr` matrix. |
| int min() | Method | Method to find and return the |
|  |  | minimum element in the `arr` matrix. |
| void display() | Method | Method to display the original matrix |
|  |  | and its maximum and minimum |
|  |  | elements. |
| main | Method | Entry point of the program. Reads row |
|  |  | and column numbers, creates an |
|  |  | instance, and calls methods. |
| Scanner sc | Scanner | Scanner object used for user input. |
| int i, int j | int | Loop control variables for iterating over |
|  |  | rows and columns of the matrix. |
| int r, int c | int | Variables to store user input for the |
|  |  | number of rows and columns. |
| int mx | int | Variable to store the maximum element |
|  |  | found during the `max()` method. |
| int mn | int | Variable to store the minimum element |
|  |  | found during the `min()` method. |
| obj | matrix\_max | Instance of the |
|  | imumAndM | `matrix\_maximumAndMinimumElemen |
|  | inimumEle | t` class. Used to call methods and |
|  | ment | display results. |