**EXPERIMENT NO. 02**

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| --- | --- |
| **DATE OF PERFORMANCE:** | **GRADE:** |
| **DATE OF ASSESSMENT:** | **SIGNATURE OF LECTURER/ TTA:** |

**AIM: Implementation of ARRAY.**

**THEORY:**

**ARRAY: An array is a sequence of data item of homogeneous value (same type).**

**Arrays are of two types:**

* **One-dimensional arrays**
* **Multi-dimensional Arrays**

**Declaration of one-dimensional array**

**data\_type array\_name[array\_size];**

**For example:**

**int age[5];**

**Here, the name of array is age. The size of array is 5,i.e., there are 5 items(elements) of array age. All elements in an array are of the same type (int, in this case).**

**ARRAY ELEMENTS:**

**Size of array defines the number of elements in an array. Each element of array can be accessed and used by user according to the need of program. For example:**

**int age[5];**



**Note that, the first element is numbered 0 and so on.**

**Here, the size of array age is 5 times the size of int because there are 5 elements.**

**Suppose, the starting address of age[0] is 2120d and the size of int be 4 bytes. Then, the next address (address of a[1]) will be 2124d, address of a[2] will be 2128d and so on.**

**INITIALIZATION OF ONE-DIMENSIONAL ARRAY:**

**Arrays can be initialized at declaration time in  this source code as:**

**int age[5]={2,4,34,3,4};**

**It is not necessary to define the size of arrays during initialization.**

**int age[]={2,4,34,3,4};**

**In this case, the compiler determines the size of array by calculating the number of elements of an array.**



**ACCESSING ARRAY ELEMENTS:**

**For example:**

**scanf("%d",&age[2]);**

**/\* statement to insert value in the third element of array age[]. \*/**

**scanf("%d",&age[i]);**

**/\* Statement to insert value in (i+1)th element of array age[]. \*/**

**/\* Because, the first element of array is age[0], second is age[1], ith is age[i-1] and (i+1)th is age[i]. \*/**

**printf("%d",age[0]);**

**/\* statement to print first element of an array. \*/**

**printf("%d",age[i]);**

**/\* statement to print (i+1)th element of an array. \*/**

**MULTIDIMENSIONAL ARRAYS:**

**For example:**

**float a[2][6];**

**Here, a is an array of two dimension, which is an example of multidimensional array.**

**For better understanding of multidimensional arrays, array elements of above example can be thinked of as below:**



**INITIALIZATION OF MULTIDIMENSIONAL ARRAYS:**

**In C, multidimensional arrays can be initialized in different number of ways.**

**int c[2][3]={{1,3,0}, {-1,5,9}};**

**OR**

**int c[][3]={{1,3,0}, {-1,5,9}};**

**OR**

**int c[2][3]={1,3,0,-1,5,9};**

**INITIALIZATION OF THREE-DIMENSIONAL ARRAY:**

**double cprogram[3][2][4]={**

**{{-0.1, 0.22, 0.3, 4.3}, {2.3, 4.7, -0.9, 2}},**

**{{0.9, 3.6, 4.5, 4}, {1.2, 2.4, 0.22, -1}},**

**{{8.2, 3.12, 34.2, 0.1}, {2.1, 3.2, 4.3, -2.0}}**

**};**

**Suppose there is a multidimensional array arr[i][j][k][m]. Then this array can hold i\*j\*k\*m numbers of data.**

**Similarly, the array of any dimension can be initialized in C programming.**

**PROGRAM-1: C PROGRAM TO FIND THE SUM MARKS OF N STUDENTS USING ARRAYS.**

**#include<stdio.h>**

**int main() {**

**int marks[10], i, n, sum = 0;**

**float avg; // Added variable to store the average**

**printf("Enter number of students: ");**

**scanf("%d", &n);**

**if (n <= 0 || n > 10) {**

**printf("Invalid number of students. Please enter a number between 1 and 10.\n");**

**return 1;**

**}**

**for (i = 0; i < n; ++i) {**

**printf("Enter marks of student %d: ", i + 1);**

**scanf("%d", &marks[i]);**

**sum += marks[i];**

**}**

**avg = (float)sum / n; // Calculating the average**

**printf("Sum = %d\n", sum);**

**printf("Average = %.2f\n", avg);**

**return 0;**

**}**

**OUTPUT:**

**Enter number of students: 5**

**Enter marks of student 1: 85**

**Enter marks of student 2: 78**

**Enter marks of student 3: 92**

**Enter marks of student 4: 68**

**Enter marks of student 5: 75**

**Sum = 398**

**Average = 79.60**

**PROGRAM-2: WRITE A C PROGRAM TO FIND SUM OF TWO MATRIX OF ORDER 2\*2 USING MULTIDIMENSIONAL ARRAYS WHERE, ELEMENTS OF MATRIX ARE ENTERED BY USER.**

**#include <stdio.h>**

**int main()**

**{**

**float a[2][2], b[2][2], c[2][2];**

**int i, j;**

**printf("Enter the elements of the 1st matrix\n");**

**for (i = 0; i < 2; ++i) {**

**for (j = 0; j < 2; ++j) {**

**printf("Enter a%d%d: ", i + 1, j + 1);**

**scanf("%f", &a[i][j]);**

**}**

**}**

**printf("Enter the elements of the 2nd matrix\n");**

**for (i = 0; i < 2; ++i) {**

**for (j = 0; j < 2; ++j) {**

**printf("Enter b%d%d: ", i + 1, j + 1);**

**scanf("%f", &b[i][j]);**

**}**

**}**

**for (i = 0; i < 2; ++i) {**

**for (j = 0; j < 2; ++j) {**

**c[i][j] = a[i][j] + b[i][j]; // Sum of corresponding elements of two arrays.**

**}**

**}**

**printf("\nSum Of Matrix:\n");**

**for (i = 0; i < 2; ++i) {**

**for (j = 0; j < 2; ++j) {**

**printf("%.1f\t", c[i][j]);**

**if (j == 1)**

**printf("\n");**

**}**

**}**

**return 0;**

**}**

**OUTPUT:**

**Enter the elements of the 1st matrix**

**Enter a11: 1**

**Enter a12: 2**

**Enter a21: 3**

**Enter a22: 4**

**Enter the elements of the 2nd matrix**

**Enter b11: 5**

**Enter b12: 6**

**Enter b21: 7**

**Enter b22: 8**

**Sum Of Matrix:**

**6.0 8.0**

**10.0 12.0**

**PROGRAM-3: C PROGRAM TO CALCULATE AVERAGE USING ARRAYS**

**#include <stdio.h>**

**int main() {**

**int n, i;**

**float num[100], sum = 0.0, average;**

**printf("Enter the number of data: ");**

**scanf("%d", &n);**

**// Validate the input to ensure it is within the range (1 to 100)**

**while (n > 100 || n <= 0) {**

**printf("Error! The number should be in the range of (1 to 100).\n");**

**printf("Enter the number again: ");**

**scanf("%d", &n);**

**}**

**// Input the numbers and calculate the sum**

**for (i = 0; i < n; ++i) {**

**printf("%d. Enter number: ", i + 1);**

**scanf("%f", &num[i]);**

**sum += num[i];**

**}**

**average = sum / n;**

**printf("Average = %.2f", average);**

**return 0;**

**}**

**OUTPUT:**

**Enter the number of data: 6**

**1. Enter number: 10**

**2. Enter number: 20**

**3. Enter number: 30**

**4. Enter number: 40**

**5. Enter number: 50**

**6. Enter number: 60**

**Average = 35.00**

**PROGRAM-4: C PROGRAM TO PASS A SINGLE ELEMENT OF AN ARRAY TO FUNCTION**

**#include <stdio.h>**

**void display(int a)**

**{**

**printf("%d",a);**

**}**

**int main(){**

**int c[]={2,3,4};**

**display(c[2]); //Passing array element c[2] only.**

**return 0;**

**}**

**OUTPUT:**

**4**

**PROGRAM-5: C PROGRAM TO DISPLAY LARGEST ELEMENT OF AN ARRAY**

**#include <stdio.h>**

**int main( )**

**{**

**int i,n;**

**float arr[100];**

**printf("Enter total number of elements(1 to 100): ");**

**scanf("%d",&n);**

**printf("\n");**

**for(i=0;i<n;++i) /\* Stores number entered by user. \*/**

**{**

**printf("Enter Number %d: ",i+1);**

**scanf("%f",&arr[i]);**

**}**

**for(i=1;i<n;++i) /\* Loop to store largest number to arr[0] \*/**

**{**

**if(arr[0]<arr[i]) /\* Change < to > if you want to find smallest element\*/**

**arr[0]=arr[i];**

**}**

**printf("Largest element = %.2f",arr[0]);**

**return 0;**

**}**

**OUTPUT:**

**Enter total number of elements(1 to 100): 5**

**Enter Number 1: 45.6**

**Enter Number 2: 12.3**

**Enter Number 3: 78.9**

**Enter Number 4: 34.2**

**Enter Number 5: 56.7**

**Largest element = 78.90**

**PROGRAM-6: WRITE A C PROGRAM TO PASS AN ARRAY CONTAINING AGE OF PERSON TO A FUNCTION. THIS FUNCTION SHOULD FIND AVERAGE AGE AND DISPLAY THE AVERAGE AGE IN MAIN FUNCTION.**

**#include <stdio.h>**

**float average(float a[]);**

**int main(){**

**float avg, c[]={23.4, 55, 22.6, 3, 40.5, 18};**

**avg=average(c); /\* Only name of array is passed as argument. \*/**

**printf("Average age=%.2f",avg);**

**return 0;**

**}**

**float average(float a[]){**

**int i;**

**float avg, sum=0.0;**

**for(i=0;i<6;++i){**

**sum+=a[i];**

**}**

**avg =(sum/6);**

**return avg;**

**}**

**OUTPUT:**

**Average age = 26.42**

**PROGRAM-7: C PROGRAM TO PASS TWO-DIMENSIONAL ARRAYS TO FUNCTION**

**#include<stdio.h>**

**void Function(int c[][2]); // Corrected function prototype**

**int main() {**

**int c[2][2], i, j;**

**printf("Enter 4 numbers:\n");**

**for (i = 0; i < 2; ++i) {**

**for (j = 0; j < 2; ++j) {**

**scanf("%d", &c[i][j]);**

**}**

**}**

**Function(c); /\* passing multi-dimensional array to function \*/**

**return 0;**

**}**

**void Function(int c[][2]) { // Corrected function definition**

**int i, j;**

**printf("Displaying:\n");**

**for (i = 0; i < 2; ++i) {**

**for (j = 0; j < 2; ++j) {**

**printf("%d ", c[i][j]); // Printing elements in one line with space separation**

**}**

**printf("\n"); // Move to the next line after each row**

**}**

**}**

**OUTPUT:**

**Displaying:**

**1 2**

**3 4**