Computer Programming 1 Lab

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Outline

- Array
- Two-dimensional array
- Example
- Exercise

Array

Array

consider the following condition

What if I want to record all student's attendance in the class ?

Array

solution ?

~~int studentA, studentB, studentC ...~~

~~int studentAA, studentAB ...~~

...

Array

solution

int students[100];

Array

Declaration

```
T arr[N];
```

- Declares arr as an array object that consists of N contiguously allocated objects of type T.
- `T` : data type
- `N` : amount of elements
- `arr` : variable name

Array

Examples

```c
#include <stdio.h>

int main(void){
    int students[100];
    double coordinateX[200];
    double coordinateY[200];
}
```

Array

- For a N elements array, index is from **0 ot N-1**

```
int arr[10];
// arr[0], arr[1], arr[2] ... arr[9]
```

Array

Initialization

```
int arr1[5];
// we dont know which value is in any index
int arr2[5] = {1, 2, 3, 4, 5};
// arr[0] = 1, arr[1] = 2, arr[2] = 3, arr[3] = 4, arr[4] = 5
int arr3[5] = {1, 2, 3}
// arr[0] = 1, arr[1] = 2, arr[2] = 3, arr[3] = 0, arr[4] = 0
int arr3[5] = {}
// arr[0] = 0, arr[1] = 0, arr[2] = 0, arr[3] = 0, arr[4] = 0
```

Array

Initialization

```
int arr[] {1, 2, 3};
int size = sizeof(arr)/sizeof(int); // 3
```

Array

char array

- for all string in c, you must presever a space for '\0'

  '\0' is a terminating null character

```
char str[] = "abc"; // 'a', 'b', 'c', '\0'
```

Array

Traversal

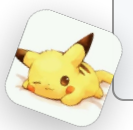
```c
#define N 10

int arr[N] = {};

for(int i=0;i<N;i++){
    arr[i] = i;
}

for(int i=0;i<N;i++){
    scanf("%d ", &arr[i]);
}

for(int i=0;i<N;i++){
    printf("%d ", arr[i]);
}
```

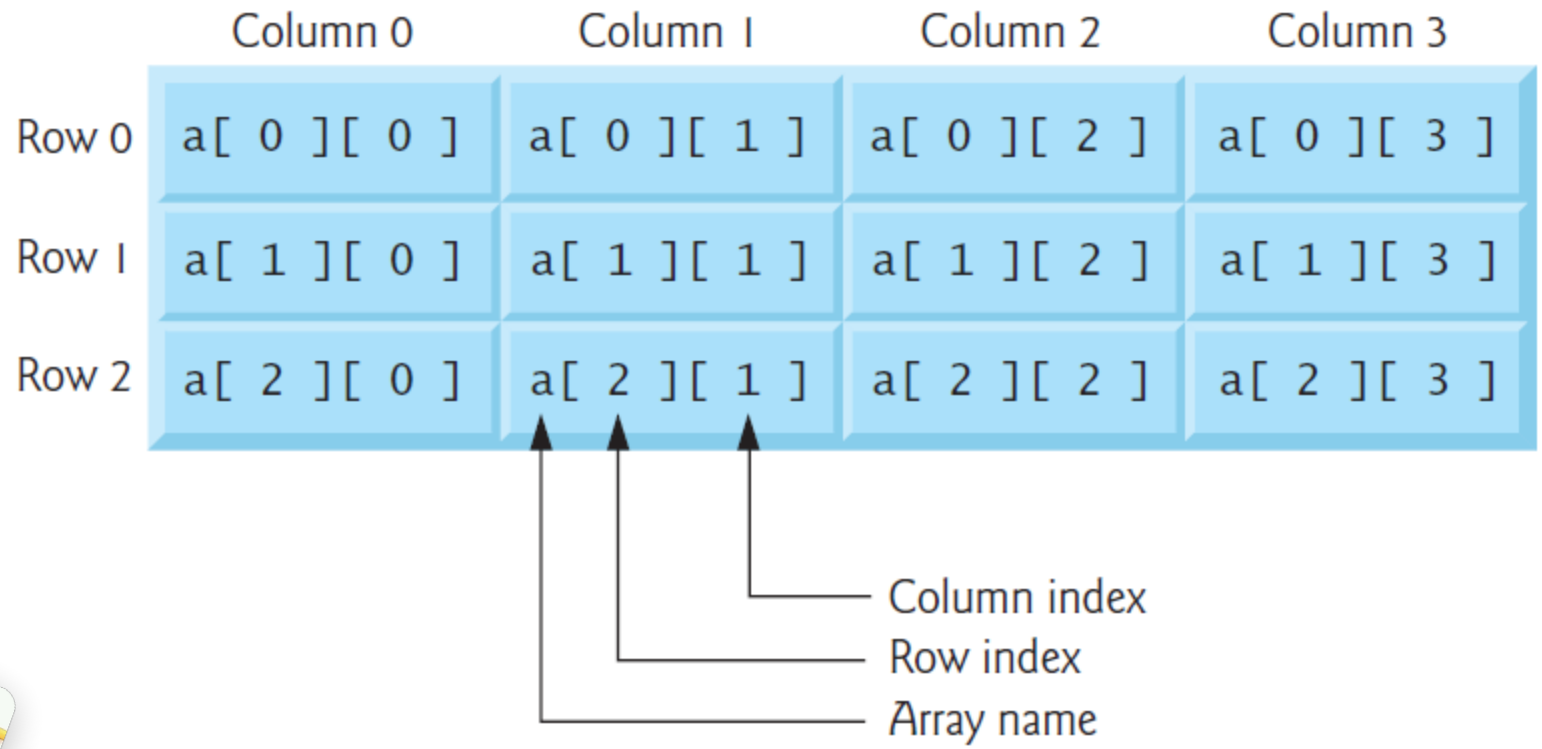


Two-dimensional array

Two-dimensional array

Declaration

```
T arr[rowSize][columnSize];
```



Two-dimensional array

Initialization

```
int arr1[3][2] = {1, 2, 3, 4, 5, 6};
// arr1 = [1, 2]
//        [3, 4]
//        [5, 6]
```

Two-dimensional array

Initialization

```
int arr2[3][2] = { {1, 2}, {3, 4}, {5, 6} };
int arr3[3][2] = {
    {1, 2},
    {3, 4},
    {5, 6}
};
```

Two-dimensional array

Initialization

```
int arr[3][2] = {};
// arr = [0, 0]
//       [0, 0]
//       [0, 0]
```

Two-dimensional array

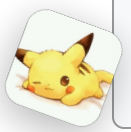
Traversal

```c
#define N 10
#define M 20

int arr[N][M] = {};

for(int i=0;i<N;i++){
    for(int j=0;j<M;j++){
        scanf("%d ", &arr[i][j]);
    }
}

for(int i=0;i<N;i++){
    for(int j=0;j<M;j++){
        printf("%d ", arr[i][j]);
    }
}
```



Example

Example 1

給你一群數字，將數字倒過來，並輸出結果

- input sample

```
5
9 5 1 3 3
```

- output sample

```
3 3 1 5 9
```

Example 1

給你一群數字，將數字倒過來，並輸出結果

```
int n, arr[1000];
scanf("%d",&n);
for(int i=0;i<n;i++){
    scanf("%d", &arr[i]);
}
for(int i=n-1;i>=0;i--){
    printf("%d ", arr[i]);
}
```

Example 2

給你一群數字，希望任兩個人的成績能夠交換，並輸出結果

- input sample

```
5
100 98 95 100 60
4
1 4
2 5
2 4
1 5
```

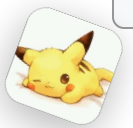
- output sample

```
98 100 95 60 100
```

Example 2

```
int n, nums[100];
scanf("%d", &n);
for(int i=0;i<n;i++){
    scanf("%d", &nums[i]);
}

int q;
scanf("%d",&q);
for(int i=0;i<q;i++){
    int a, b;
    scanf("%d %d", &a, &b);
    swap(nums[a], nums[b]);
}
for(int i=0;i<n;i++){
    printf("%d ", nums[i]);
}
```



Exercise

Exercise

There are many rectangles in plane coordinates. You are given all the imformation of rectangles. Please calculate the intersection area of these rectangles.

- Input:
  First line, you are given a integer N. The following N lines contains four numbers, which are $x_1\ y_1\ x_2\ y_2$, standing for the upper-left and bottom-right respectively.
- Output:
  The intersection area of the rectangle.

Any Questions?