What is an array?

{

collection

D.S

↓

storage spaces

↓

data feed

```
int h1 = 175;
int h2 =
 :
 :
 :
int h50 =
```


```
int a[50];
```

Syntax and Declaration

```
int arr[5] = {2, 4, 6, 8, 1};
```


```
int b[3] = {1, 2, 3};
```

Accessing Elements of Array

```
int arr[ ] = . . . .
```

↳ arr[0], arr[1] . . .

Printing Output and Taking Input

10

Ques: Given an array of marks of students, if the mark of any student is less than 35 print its roll number. [roll number here refers to the index of the array.]

```
                    0   1   2   3   4   5   6   7   8   9
int marks[10] = {95, 90, 31, 25, 100, 50, 65, 89, 97, 30};
```

output = 2

3

9

SKILLS

Ques : Are the following array declarations correct?

`int a (25) ;` ✗ `int a[25] ;`

`int size = 10, b[size] ;` ✓→ `int size = 10;` `int b[10];`

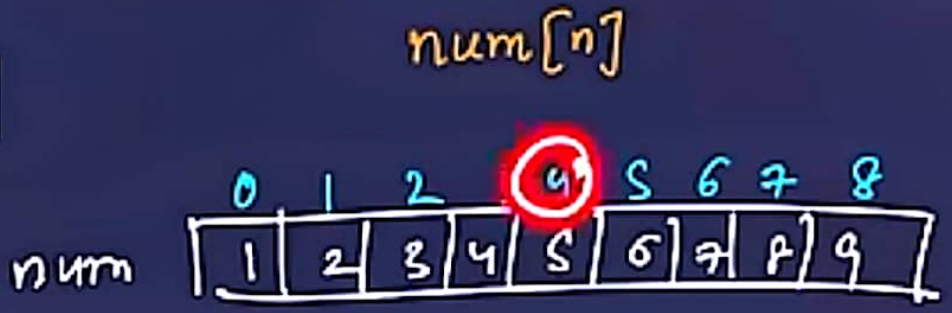
`int c = {0,1,2} ;` ✗

↓

`int c[3] = {0,1,2};`

Ques : Which element of the array does this expression reference?

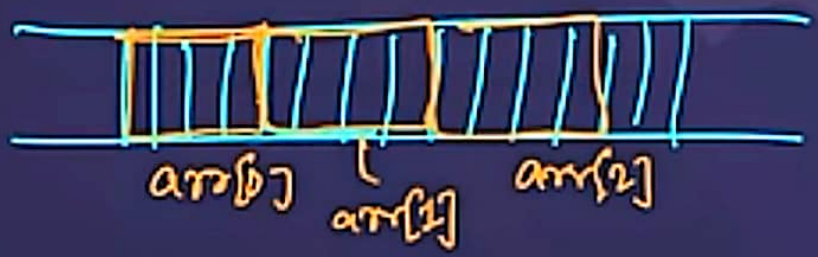
num[4]



Memory Allocation in Arrays

↓

Continuous



integer, int a = 4;

↓

4 bytes

int arr[5] =

0	1	2	3	4
91	81	71	61	51

arr[2] , arr[0] , arr[4]

Address of Array Elements

arr[0]

address of array

0 1 2 3 4 5 6 7 8 9 a b c d

SKILLS

Predict the output :

```
main( )
{
    int num[26], temp ;
    num[0] = 100 ;
    num[25] = 200 ;
    temp = num[25] ;
    num[25] = num[0] ;
    num[0] = temp ;
    printf ( "\n%d %d", num[0], num[25] ) ;
}
```

int num[26]; int temp;

temp = 200

num[25] = 100

num[0] = 200

swapping

Output

•

• 200 100

Predict the output :

```
main()
{
    int sub[50], i;
    for ( i = 0 ; i <= 48 ; i++ );
    {
        sub[i] = i;
        printf ( "\n%d", sub[i] );
    }
}
```

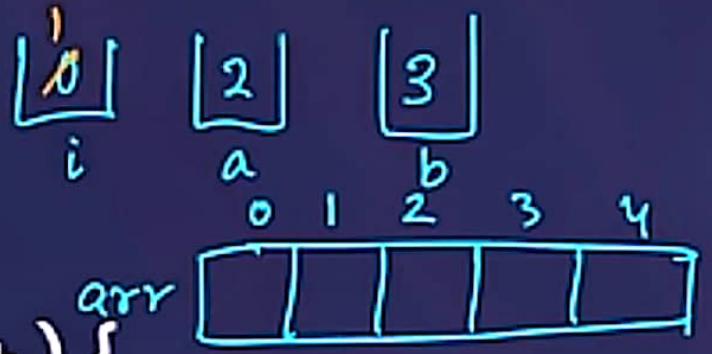
Output

0

i = 0

Point out the errors(if any) in the following code:

```
main( ) {
    int i, a = 2, b = 3 ;
    int arr[ 2 + 3 ] ;
     for ( i = 0 ; i < a+b ; i++ ) {
          scanf ( "%d", &arr[i] ) ;
           printf ( "\n%d", arr[i] ) ;
    }
}
```



Output

- 1
- 1
- 2
- 2
- 3
- 3
- 4
- 4
- 5
- 5

Point out the errors(if any) in the following code:


```
main( ) {
    int size ;
     scanf ( "%d", &size ) ;
     int arr[size] ;
     for ( i = 1 ; i <= size ; i++ ) {
          scanf ( "%d", arr[i] ) ;
          printf ( "%d", arr[i] ) ;
     }
}
```

Output

• 2

Ques : Calculate the sum of all the elements in the given array.

```
arr[5] = {1, 3, 5, 7, 10};
```

Homework : Calculate the product of all the elements in the given array.

arr →

0	1	2	3	4	5
1	2	5	3	8	9

SKILLS

Ques : Find the maximum value out of all the elements in the array.

Searching the max^m element

arr →

9	2	11	13	3	4	8	7
0	1	2	3	4	5	6	7

int max = -∞ 11 13

```
if (max < arr[i]){
    max = arr[i]
}
```

Ques : Find the maximum value out of all the elements in the array.

Searching the max^m element

arr →

9	2	11	13	3	4	8	7
0	1	2	3	4	5	6	7

~~int max = 1 4 11 13~~

```
max = arr[0]; → 11
for(int i=1 ; i<=7 ; i++){
    if (max < arr[i]){
        max = arr[i]
    }
}
```

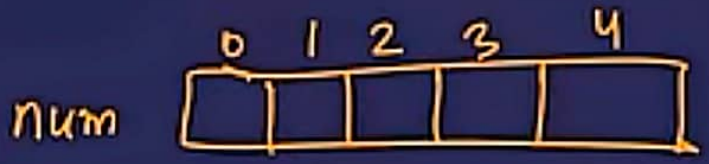
int → 4 byte → 4x8 bits 32 bits

int → -2^{32} to $2^{32}-1$

SKILLS

MCQ : What is the difference between the 5's in these two expressions?

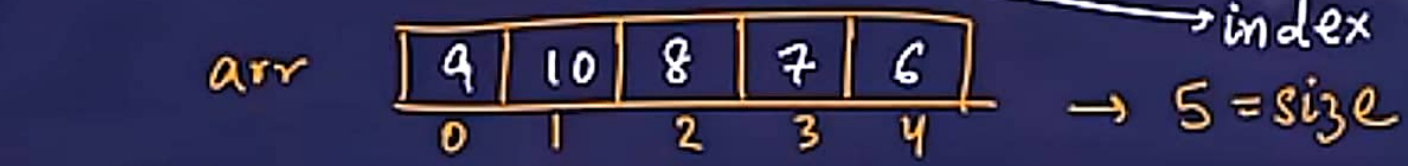
```
int num[5];
num[5] = 11;
```



1. first is particular element, second is type
2. first is array size, second is particular element
3. first is particular element, second is array size
4. both specify array size

SKILLS

MCQ : What would happen if you assign a value to an element of an array whose subscript exceeds the size of the array?



1. the element will be set to 0
2. nothing, it's done all the time
3. other data may be overwritten
4. error message from the compiler

index out of bound

0 to n-1 (n size)

Passing Array to Functions

fun (int a)

Baad

~~pass by value~~ / reference

C , C++ , Java

SKILLS

MCQ : When you pass an array as an argument to a function, what actually gets passed?

1. address of the array
2. values of the elements of the array
3. address of the first element of the array
4. number of elements of the array

SKILLS

State TRUE or FALSE :

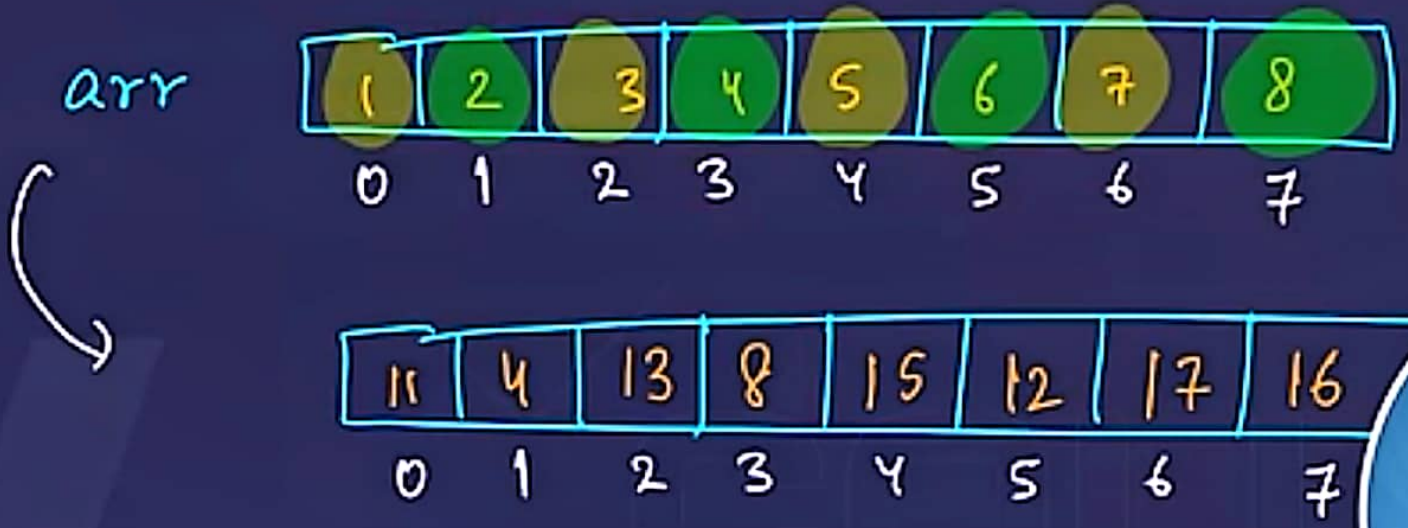
1. The array int num[26] has twenty-six elements. T
2. The expression num[1] designates the first element in the array F
3. It is necessary to initialize the array at the time of declaration. F
4. The expression num[27] designates the twenty-eighth element in the array. T

num[0] → 1st element

num[n] → n+1 th element

SKILLS

Ques : Given an array of integers, change the value of all odd indexed elements to its second multiple and increment all even indexed value by 10.



H.W.

Ques : Count the number of elements in given array greater than a given number x.

arr[7] =

1	2	3	4	5	6	7

```
int x = 4;
```

loop, `int count = 0;`

```
if (arr[i] > x)  count ++;
```

SKILLS

Ques : Find the difference between the sum of elements at even indices to the sum of elements at odd indices.

Arr[6] =

1	3	5	7	9	11
0	1	2	3	4	5

SumEven = 1+5+9 = 15

Sum Odd = 3+7+11 = 21

SumEven - Sum Odd = ?

SKILLS

Ques : Find the total number of pairs in the Array whose sum is equal to the given value

arr

0	1	2	3	4	5	6	7
1	2	3	4	5	6	7	8

int x = 12;

int count = 0;

(1,2) (1,3) (1,4) (1,5) (1,6) (1,7) (1,8)

(2,3) (2,4) (2,5) (2,6) (2,7) (2,8).

(3,4) (3,5) (3,6) (3,7) (3,8).

(4,5) (4,6) (4,7) (4,8).

(5,6) (5,7) (5,8).

(6,7) (6,8)

(7,8)

count++ pair

Hint : Pattern Printing →

SKILLS

Ques : Count the number of triplets whose sum is equal to the given value x.

arr

1	2	3	4	5	6	7	8
0	1	2	3	4	5	6	7

int x = 12;

(1, 3, 8) ,(1, 4, 7) , (1, 5, 6)

(2, 3, 7) , (2, 4, 6) ,

(3, 4, 5),

totaltriplets = 6

SKILLS

Ques : Find the second largest element in the given Array.

arr	1	2	3	4	5	6	7	8
	0	1	2	3	4	5	6	7

```
max = arr[0] &

for(int i=1; i<=7; i++){
    if (max < arr[i])
        max = arr[i];
}
```

```
Smax = INT_MIN;

if (Smax < arr[i] && arr[i] != max ){
    Smax = arr[i]
}
```

Ques : Find the second largest element in the given Array.

int max = INT_MIN ; 1

int smax = INT_MIN ;

arr[7] = {1, 2, 3, 4, 5, 6, 7} ;

```
for(int i=0;i<=6;i++){
    if(max<arr[i]){
        max = arr[i];
    }
    if(smax<arr[i] && max!=arr[i]){
        smax = arr[i];
    }
}
```

SKILLS

Ques : Find the second largest element in the given Array.

arr = {5, 4, 3, 2, 1}
0 1 2 3 4

```
for(int i=0;i<=4;i++){
    if(max<arr[i]){
        smax = max; // smax is now previous max
        max = arr[i]; // max is now a new max
    }
}
```

i = 0 1 2

max = ~~int min~~ 5

Smax = ~~int min~~ int min

0 1 2 3 4 5 6

```
int arr[7] = {1,2,3,4,4,2,1};
int max = INT_MIN; // sabse chhota number
int smax = INT_MIN;
```

```
for(int i=0;i<=6;i++){
    if(max<arr[i]){
        smax = max; // smax is now previous max
        max = arr[i]; // max is now a new max
    }
    else if(smax<arr[i]){ // max > arr[i]
        smax = arr[i];
    }
}
```

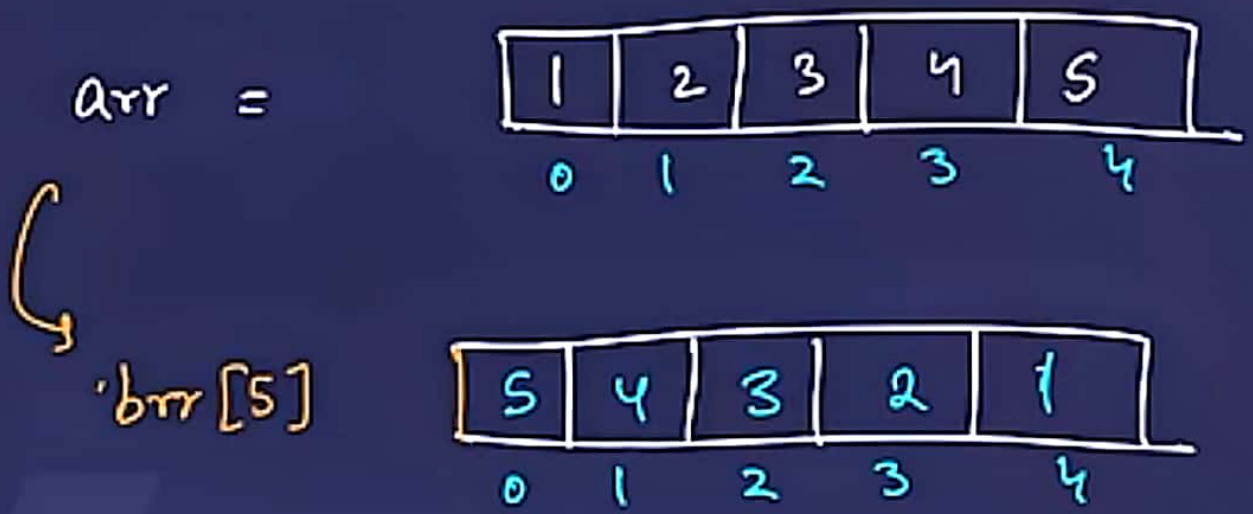
max <= arr[i]

i = 0 1 2 3 4

smax = ~~INT_MIN~~ ~~INT_MIN~~ 1 2 3

max = ~~INT_MIN~~ 1 2 3 4

Ques : Write a program to copy the contents of one array into another in the reverse order.



Ques : Write a program to reverse the array without using any extra array.

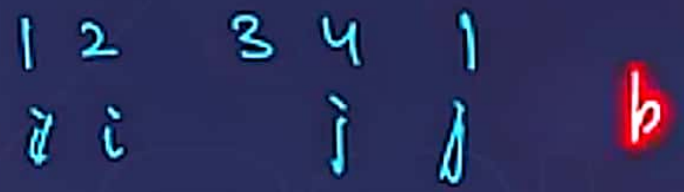
```
          0  1  2  3  4  5  6
arr  =   {1, 2, 3, 4, 5, 6, 7}
          i                 j
      ↳  {7, 6, 5, 4, 3, 2, 1}
```

for(i

Hint → Swap 2 numbers

SKILLS

Homework : If an array arr contains n elements, then check if the given array is a palindrome or not.



Ques : Rotate the given array 'a' by k steps, where k is non-negative.

Note : k can be greater than n as well where n is the size of array 'a'.

arr = {5, 6, 7, 1, 2, 3, 4}

if k > n → k = k % n

a = {1, 2, 3, 4} → k = 6

3 4 1 2

k = 2

{3, 4, 1, 2}

7 6 5 3 2 1
{1, 2, 3, 4, 5, 6, 7}
i j

arr → n

i = 0;

j = n-1;

Reverse part of array.

0 1 2 3 4 5 6
arr = {1, 2, 3, 4, 5, 6, 7} → i = 2, j = 5

↳ {1, 2, 6, 5, 4, 3, 7}

	0	1	2	3	4	5	6
arr	1	2	3	4	5	6	7

$n = 7$
$K = 3$

SKILLS

$K = 3$

5	6	7	1	2	3	4

reverse(arr, 0, 6)

7	6	5	4	3	2	1

reverse (arr, 0, 2)

5	6	7	4	3	2	1

reverse (arr, 3, 6)

5	6	7	1	2	3	4

Steps

1) $K = K \% n$
2) reverse (arr, 0, n-1)
3) reverse (arr, 0, K-1)
4) reverse (arr, K, n-1)

Q// Given array, & a number 'x'. Find out if 'x' lies in the array or not, if yes then print the index.

```
int x = 1;
```

data type

bool flag = true

Linear Search

SKILLS

Ques : Given an array containing elements from 1 to 100 except one element in this range is missing. Find the missing element.

99 elements

$S_n = \frac{n(n+1)}{2}$

n

arr[99] = {

};

int sum2 = $\frac{100*(100+1)}{2}$

1, 2, 3 100

sum2 - sum → 'x'

Algo →

```
int sum = 0;
for(int i= 0; i<=98 ; i++){
    sum = sum + arr[i];
}
```

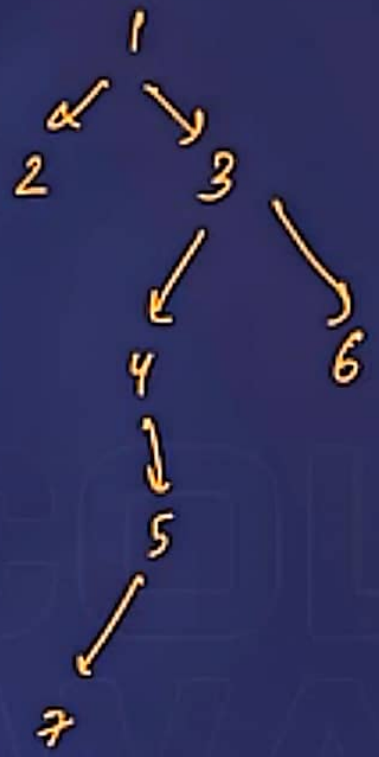
SKILLS

Ques: WAP to find a duplicate element from a given array of integers.

$arr = \{1, 2, 7, 4, 5, 6, 7\}$

SKILLS

Ques : Find the unique number in a given Array where all the elements are being repeated twice with one value being unique.



S=13

SKILLS

Ques : Find the unique number in a given Array where all the elements are being repeated twice with one value being unique.

```
arr = {1, 3, 2, 4, 1, 2, 3}

for (int i = 0; i <= 6; i++){
    for (int j = i+1; j <= 6; j++){
        if (arr[i] == arr[j]){
            i++;
            j = i+1;
        }
    }
}
```

SKILLS

Ques : Find the unique number in a given Array where all the elements are being repeated twice with one value being unique.

```
int arr[7] = {1,3,6,1,1,2,3};
for(int i=0;i<=6;i++){
    bool flag = false;
    for(int j=i+1;j<=6;j++){
        if(arr[i]==arr[j]){
            flag = true;
        }
    }
    if(flag==false){
        printf("%d",arr[i]);
        break;
    }
}
```