

9/9/23 Class \rightarrow Array Level \rightarrow

APCO
Date: 13u

int main
{
 int a = 5;
 solve(a);
 cout << a;
}

void solve(int a)
{
 a++;
 cout << a;
}

Call by value

Call by Reference \rightarrow

int main()
{
 int a = 5;
 solve(a);
 cout << a;
}

void solve(int &a)
{
 a++;
 cout << a;
}

O/p \rightarrow 6
6

+ Array \rightarrow By Default Pass By Reference
in Function

9/9/23

APCO

Date: 13A

int main() n/3

int n = 3; arr [30] = {10, 20, 30};

→ solve (arr, n);

// print array

for (i=0; i<n; i++)
 cout << arr[i] << " ";

Implementation of class template

Questions - 5

① → find Unique Element

Every element twice but one element unique

IP → 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25

OP → 11

Ans → XOR

9/9/16

XOR

a	b	c/p
0	0	0
0	1	1
1	0	1
1	1	0

★ → Not Optimal Soln Now; But in future
will write optimal soln

arr → | 10 | 2 | 11 | 10 | 2 | 13 | 15 | 13 | 15 |
0 1 2 3 4 5 6 7 8

ans = $0^{\wedge} 10^{\wedge} 2^{\wedge} 11^{\wedge} 10^{\wedge} 2^{\wedge} 13^{\wedge} 15^{\wedge} 13^{\wedge} 15$

$$\text{ans} = 0^{\wedge} 11 = 11$$

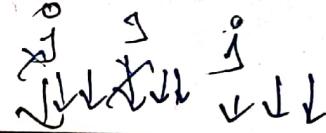
② → Print all Pairs

o/p → array → [] → { 10, 20, 30 }

o/p → (10, 10) (20, 10) (30, 10)
(10, 20) (20, 20) (30, 20)
(10, 30) (20, 30) (30, 30)

→ use Nested Loop

9/9/23



APCO
Date: 13/7

DRY Run ->

arr
 $i = 10, j = 10, k = 1 \rightarrow (10, 10)$

$i = 0, j = 0 \rightarrow arr[i], arr[j] \rightarrow (0, 0)$

$i = 0, j = 0 \rightarrow arr[i], arr[j] \rightarrow (10, 20)$

$j = 2 \rightarrow (10, 30)$

$i = 1, j = 0 \rightarrow (20, 10)$

$j = 1 \rightarrow (20, 20)$

$j = 2 \rightarrow (20, 30)$

$i = 2, j = 0 \rightarrow (30, 10)$

$j = 1 \rightarrow (30, 20)$

$j = 2 \rightarrow (30, 30)$

row 0

row 1

row 2

H/w -> Pair Sum or Two Sum

③ Print Triplets

$i/b \rightarrow \text{array} \rightarrow [1, 2, 3, 4]$

\hookrightarrow print all triplets ex: $(1, 1, 1)$
 $(1, 1, 2)$

3 Nested Loops

for ($i = 0; i < n; i++$)

for ($j = 0; j < n; j++$)

for ($k = 0; k < n; k++$)

cout << arr[i] << arr[j] << arr[k];

9/9/23

APCO
Date: 13B

* → page-2 Nested Loop ↑ To C ↑ Rakh

Sort's Oⁿ & Oⁿ

(1)

Input → [0 1 0 1 1 0 0 0 0]
0 1 2 3 4 5 6 7 8

O/p → [0 1 0 0 1 0 1 0 1 1]
0 1 2 3 4 5 6 7 8

⇒ [0 1 1 0 1 1 1 0 0 0]

Methods → 1) Count zeros & one then position B
to solve Rakh Do
2) 2 pointer approach → UIW
3) sort() → Inbuilt function

zeros → 6 → Shuru ke dabba NE
ones → 3 → Then 1 daal do

Logic → Count 0 & 1
→ Then place 0
→ Then place 1

while (count--){
 →
 y}

while (3)
 ↓
 while (2)
 ↓
 while (1) false
 while (0) true
 Goto loop

9/9/23

APCO
Date 1/30

→ while loop iteration = value of count

(S-1) →

Counting

int zeroCount = 0;
int oneCount = 0;

for ($i=0; i < n; i++$)

 if ($arr[i] == 0$)

 zeroCount++; → ex - 6

 if ($arr[i] == 1$)

 oneCount++; → ex - 3

(S-2) →

int index = 0

while (zeroCount - → 6)

 if ($arr[index] == 0$)

 index++;

y

while (oneCount - → 3) {

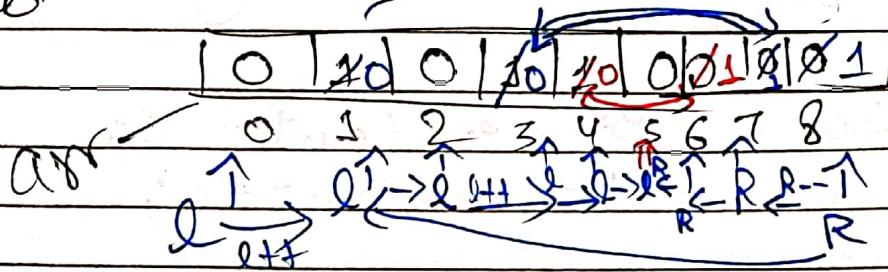
 if ($arr[index] == 1$)

 index++;

y

9/9/23

(H/W) (ii) Two Pointers Approach



if $\text{arr}[l] > \text{arr}[R]$
 $\text{swap}(\text{arr}[l], \text{arr}[R])$

$l++$
 $r--$

else $\rightarrow l++$

TRY Runs - i) $l = 0$, $r = 8$
 $\text{arr}[l] = 0$, $\text{arr}[R] = 0$
 else Condⁿ $\rightarrow l++ \rightarrow 1$

ii) $l = 1$, $r = 8$
 $\text{arr}[l] = 1 > \text{arr}[R] = 0$
 If Condⁿ \rightarrow swap, $l++$, $r--$

iii) $l = 2$, $r = 7$, $\text{arr}[2] = 0$, $\text{arr}[7] = 0$
 else Condⁿ $\rightarrow l++ \rightarrow 3$

iv) $l = 3$, $\text{arr}[l] = 1$, $r = 7$, $\text{arr}[R] = 0$

If Condⁿ $\rightarrow l > 0$
 Swap, $l++ \rightarrow 4$
 $r-- \rightarrow 6$

9/9/23

APCO
Date: 1/4/1

v) $l = 4, r = 6, arr[l] = 1, arr[r] = 0$

$I \neq Cond^n \rightarrow Swap$

$l++ \rightarrow B$

$r-- \rightarrow B$

vi) $l = 5, r = 5$

$arr[l] = arr[R] = 0$

else $Cond^n \rightarrow l++^o, \rightarrow 6$

vii) $l = 6, r = 5$

$l > r \rightarrow \text{Loop stop}$

$0 \mapsto | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1$
 $0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8$

(viii) $Sort() \rightarrow$

include <bits/stdc++.h>

$Sort(arr, arr + size)$

↳ length already

But fail when 1 at $i = 0$ (Pg 145)

* Corrected

if ($arr[l] > arr[R]$) {

swap($arr[l], arr[R]$)

$l++^o, r--^o$

else if ($arr[l] < arr[R]$) {

$l++^o,$
 $r--^o$ else if

$arr[l] == 1$ {

$l++^o \quad }$

Condition

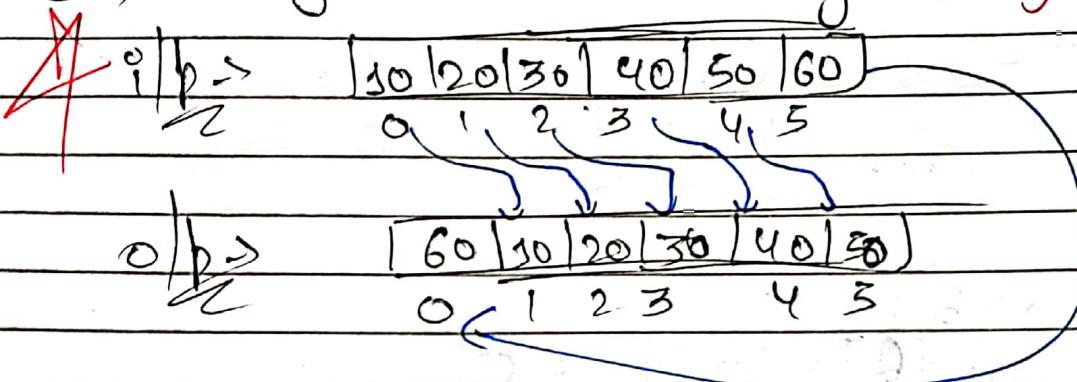
Corrected
arr
versus

Scanned with CamScanner

9/9/23 ~~A~~

APSC
Date: 4/4/23

(5) → Shift arr element by 1 (Right shift)



$i \rightarrow i + 1$ kardo
 $\text{arr}[i+1] = \text{arr}[i]$
 $\text{arr}[1] = 10$

→ But after this every box will take 10

How →

$\text{arr}[1] = 10$

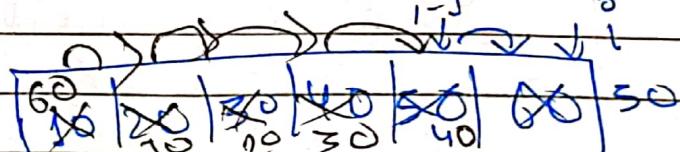
$\text{arr}[2] = \text{arr}[1]$

$\text{arr}[3] = \text{arr}[2]$

⇒ How to Solve it - S

we know, $\text{int last value} = \text{arr}[n-1];$

loop No → $\text{arr}[i-1] = \text{arr}[i];$



$\text{arr}[0] = \text{last value};$

9/9/23

APCO
Date: 1/1/23

0	1	2	3	4
30	20	30	40	50
50	→ 10 → 20 → 30 → 40			

(A) $\rightarrow \text{temp} = 50$

(B) $\rightarrow i = n - 1 \rightarrow i = 4$

$$\text{arr}[i] = arr[i-1]$$

(C) $\rightarrow \text{arr}[0] = \text{temp}$

(ii) **H/W**

~~Left Shift~~

i/p \rightarrow	50 20 30 40 50
	0 1 2 3 4

o/p \rightarrow	20 30 40 50 10
	0 1 2 3 4

(A) $\rightarrow \text{Temp} = 50;$

(B) $\rightarrow i = 0 \rightarrow i \leq n - 1$

$$\text{arr}[i] = \text{arr}[i+1]$$

(C) $\rightarrow \text{arr}[n-1] = \text{Temp};$

H/W

~~shift by 2~~ 0 1 2 3 4

50	60	50	20	30
30	20	10	40	50

① $\rightarrow \text{temp}[] = \{50, 60\}$

② $\rightarrow \text{arr}[i] = \text{arr}[i-2]$

③ $\rightarrow \text{arr}[0] = \text{temp}[0];$

$$\text{arr}[1] = \text{temp}[1];$$

9/9/23

(H/W) \rightarrow Q) Pair Sum

```
int sum = 0;
for (int i = 0; i < n; i++)
```

```
    for (j = 0; j < n; j++) {
```

```
        cout << arr[i] + arr[j] << endl;
```

Individual
Sum

```
        sum += arr[i] + arr[j];
```

```
    }
```

```
    cout << sum;  $\rightarrow$  Total Sum
```

(ii) Pair Sum Triplet

```
int sum = 0;
```

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

```
    for (j = 0; j < n; j++) {
```

```
        for (k = 0; k < n; k++) {
```

Individual

Sum

```
        cout << arr[i] + arr[j] + arr[k];
```

```
        sum += arr[i] + arr[j] + arr[k];
```

}

cout << sum \rightarrow Total Sum

9/9/25

AP60
Date: 145

(i-w)

(iii) Sort 0's & 1's by Pointer

→ I am doing a serious mistake in prev code

If ($\text{arr}[l] < \text{arr}[x]$)
 $l++;$

else if

~~swap ($\text{arr}[l], \text{arr}[x]$)~~

$l++;$

$x--;$

~~X~~

Let take a Case

0	1	2	3	4	5
1	0	1	1	0	1
2	-	3	4	5	8

→ $l=0, x=5$

$\text{arr}[l]=1, \text{arr}[x]=1$

failed

$1 < 1 \rightarrow \text{false}$

Cond^m → else → swap

$l++, x--$

{ $(\text{arr}[l] > \text{arr}[x])$

swap (l, x)

$l++;$

$x--;$

else if ($\text{arr}[l] < \text{arr}[x]$)

$l++$

Right

else ↳ if ($\text{arr}[l] == 1$), if $\text{arr}[x] == 0$)
 $l++;$

9b/23

APCO
Date: 14/6

Shortest Version

```
while (l <= r) {  
    if (arr[l] > arr[r]) {  
        swap(arr[l], arr[r])  
        l++;  
        r--;  
    } else if (arr[l] == 1 & arr[r] == 1) {  
        r--;  
    } else {  
        l++;  
    }  
}
```

$l = 0$

$r = n - 1$

length of
array