

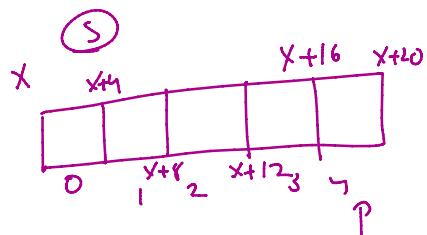
✓  $\text{int}[j] \text{ arr} \geq \text{new int}[5]$ ;

$X[2]$

$X+8 \rightarrow X+12$

$X[4]$

$X+16 \rightarrow X+20$



0  $\rightarrow X+0 \rightarrow X+4$

1  $\rightarrow X+4 \rightarrow X+8$

2  $\rightarrow X+8 \rightarrow X+12$

3  $\rightarrow X+12 \rightarrow X+16$

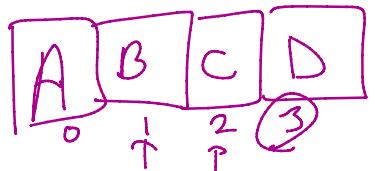
4  $\rightarrow X+16 \rightarrow X+20$

$\{ 2, 4, 6, 8, 10, 12, 14 \}$

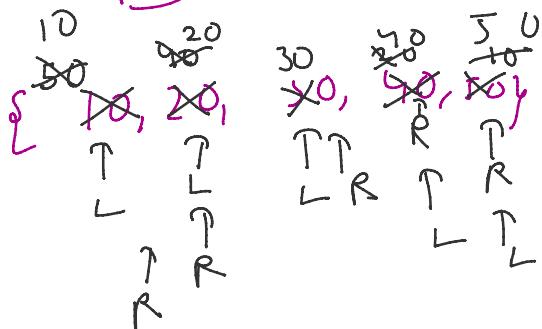
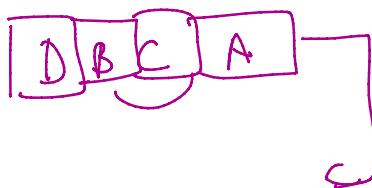
~~10~~  $\{ 10, 20, 30, 40, 50 \}$

↳ Rev

$10 \{ 50, 40, 30, 20, 10 \}$



$\rightarrow$



```
public static void Rev(int[] arr) {
    int R = arr.length - 1;
    int L = 0;
    while (L < arr.length) {
        int temp = arr[L];
        arr[L] = arr[R];
        arr[R] = temp;
        L++;
        R--;
    }
}
```

Rotate  
on  
array

$\{ 10, 20, 30, 40, 50 \}$

$\text{rot} = 1 \quad \{ 50, 10, 20, 30, 40 \}$

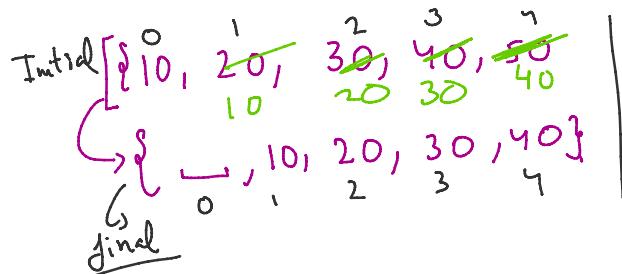
$-13.5 \rightarrow -3$

$\text{rot} = 1 \quad \{ 20, 30, 40, 50, 10 \}$

array

- $r_{dt=1} \{ 50, 10, 20, 30, 40 \}$
- $r_{dt=2} \{ 40, 50, 10, 20, 30 \}$
- $r_{dt=3} \{ 30, 40, 50, 10, 20 \}$
- $r_{dt=4} \{ 20, 30, 40, 50, 10 \}$
- $r_{dt=5} \{ 10, 20, 30, 40, 50 \}$

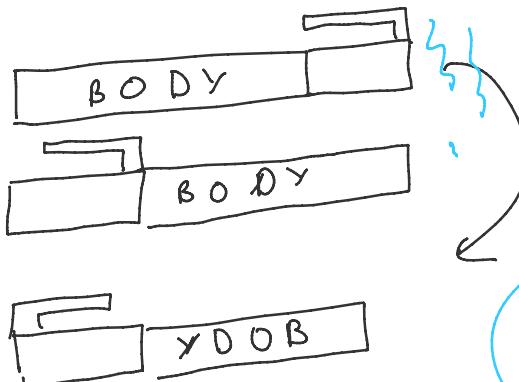
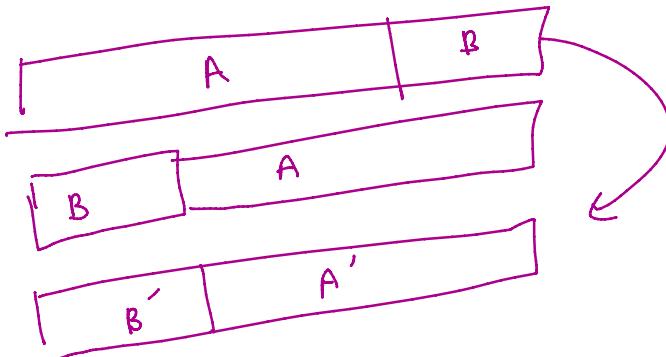
- $r_{dt=1} \{ 20, 30, 40, 50, 10 \}$
- $r_{dt=2} \{ 30, 40, 50, 10, 20 \}$
- $r_{dt=3} \{ 40, 50, 10, 20, 30 \}$
- $r_{dt=4} \{ 50, 10, 20, 30, 40 \}$
- $r_{dt=5} \{ 10, 20, 30, 40, 50 \}$



$$\begin{aligned} arr[1] &= arr[0] \\ arr[2] &= arr[1] \\ arr[3] &= arr[2] \\ arr[4] &= arr[3] \end{aligned}$$

1 to  $dt$  | 0 to  $dt-1$

$$arr[L] = arr[L-1]$$



$$\begin{aligned} &\{ 10, 20, 30, 40, 50 \} \\ &\{ 10, 50 \} \quad \{ 10, 20, 30 \} \\ &\{ 50, 40 \} \quad \{ 30, 20, 10 \} \end{aligned}$$

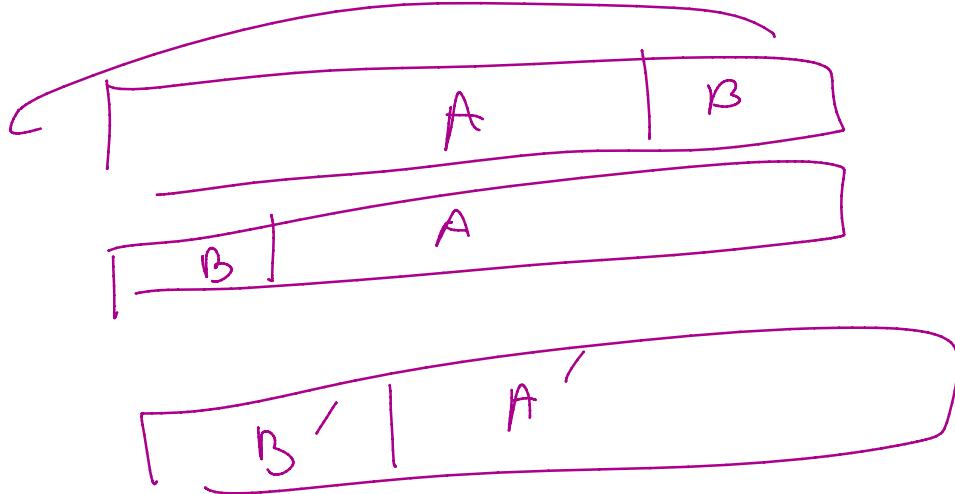
$$\begin{matrix} O, n-1 \\ O, r_{dt} \\ r_{dt}, n-1 \end{matrix}$$

$$\frac{-17}{\text{dividend}} = -\left(\frac{5 \times 3}{Q} + 2\right)$$

$$-17 = 5 \times (-3) - 2$$

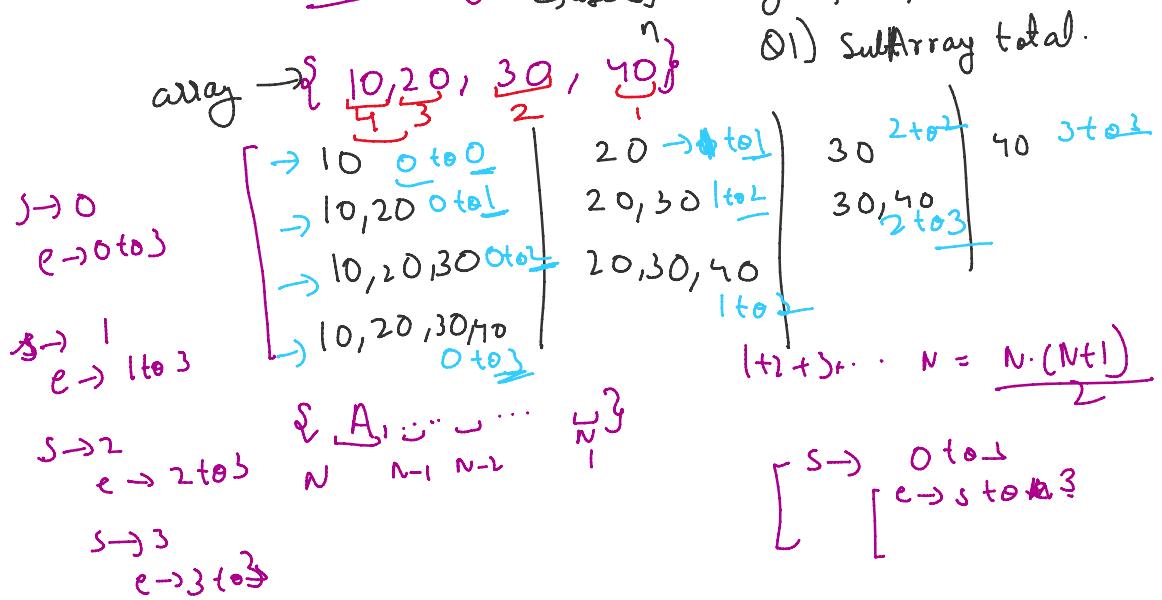
divisor | dividend

R



Sub Array Subsets, contiguous, seq.

Q1) SubArray total.



$$\{ -\infty, 1, 2, 5, 4, -\infty \}$$

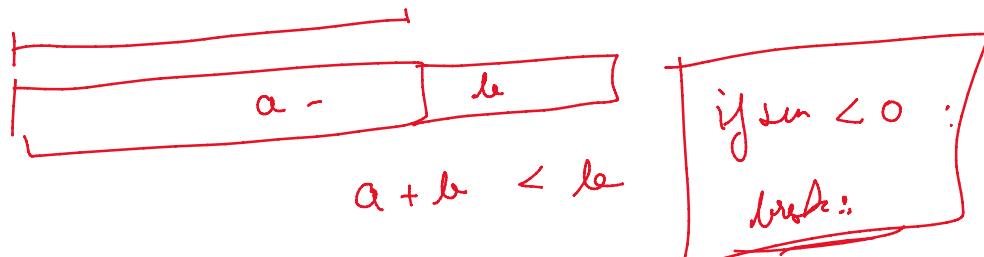
$$\{ 2, 5, -1, 6, -100 \} \rightarrow \{ 40, 2, 25 \}$$

~~(-988)~~

~~4000, -2, 25~~

~~$\frac{99}{-12}$~~

~~$\frac{988}{988}$~~



$$a + b < k \quad | \quad \text{break!}$$

$$\left\{ \underline{2}, \underline{5}, -1, \underline{6}, \underline{-100}, 40, -2, 25 \right\} \quad \begin{array}{l} \text{if } s < 0: \\ s = e + 1; \end{array}$$

$2 \Rightarrow 2$   
 $2, 5 \Rightarrow 7$   
 $\underline{2, 5, -1} \Rightarrow 6$   
 $\underline{2, 5, -1, 6} \Rightarrow 12$   
 $\underline{2, 5, -1, 6, 1000} \Rightarrow -988$

$5 \Rightarrow 5$   
 $5, 1 \Rightarrow 4$   
 $5, -1, 6 \Rightarrow 10$   
 $5, -1, 6, -100 \Rightarrow -990$

$-1 \Rightarrow -1$   
 $6 \Rightarrow 6$   
 $6, -100 \Rightarrow 6$

$$\left\{ \underline{2}, \underline{5}, -1, \underline{6}, \underline{-100}, 1, 2 \right\}$$

$2 \Rightarrow 2$   
 $2, 5 \Rightarrow 7, 7$   
 $\cancel{2, 5, -1, 6, 7}$   
 $2, 5, -1, 6 \Rightarrow 12, 12$

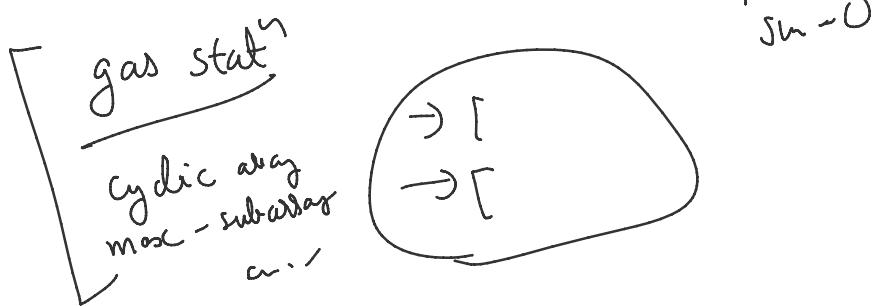
$2, 5, -1, 6 \Rightarrow 12, 12$   
 $\cancel{2, 5, -1, 6} \Rightarrow 12, 12$

$$\left\{ \underline{2}, \underline{5}, -8, \underline{40}, \underline{2}, \underline{-41}, \underline{70}, \underline{5}, \underline{-6}, \underline{-50}, \underline{1}, \underline{2}, \underline{\infty} \right\} \quad \times$$

$2, 2$   
 $7, 7$   
 $-1, 7$   
 $40, 40$   
 $42, 42$   
 $1, 42$   
 $71, 71$   
 $76, 76$   
 $= \cancel{-2} - 1$

$$\left\{ \underline{-2}, \underline{-20}, \underline{-6}, \underline{-1} \right\}$$

$\{ -2, -20, -6, -1 \}$



## B.S Binary Search

$\{ 1, 2, 3, 4, 5 \}$



$\{ 1, 20, 21, 25 \}$



I.C

$\{ 50, 49, -6, -7, -\infty \}$



De

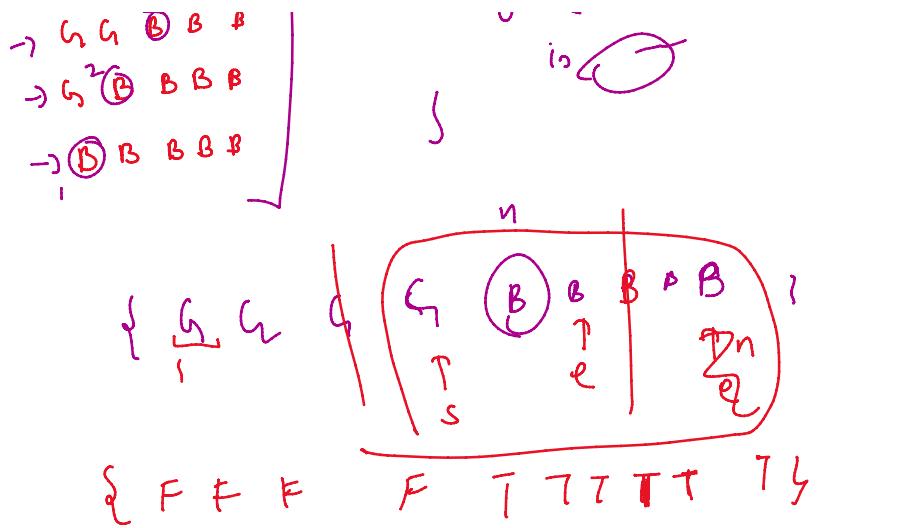
Arr = {5, 7, 11, 12, 15, 20, 31, 33, 35, 40, 45, 55, 58, 66, 71}

$s=0, e=14$ $\frac{s+e}{2} = 7$ $e = 6$ $arr[7] > mid$	$at=20$ $s=0, e=6$ $mid=3$ $arr[3] < mid$ $s=4$	$s=7, e=14$ $mid=5$ $arr[5] = mid$ $s=5$
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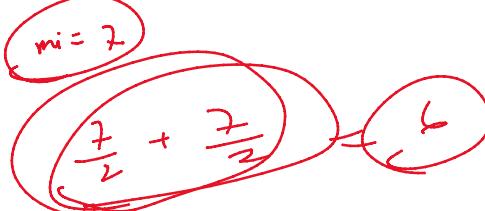
$n=5$   
 $\rightarrow G G G G B$   
 $\rightarrow G G G B B$   
 $\rightarrow G G B B B$   
 $\rightarrow G B B B B$

for ( int n ) {

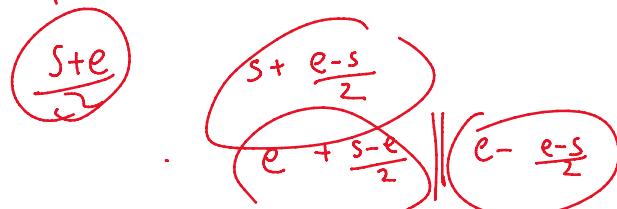
if ( v )  
 is ( o )



$$s \rightarrow \frac{1}{2}, e \rightarrow \frac{1}{2}$$

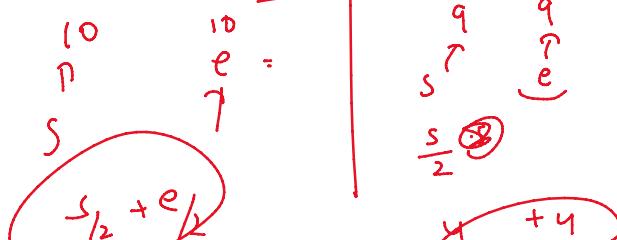


$$X s \xleftarrow{\text{mid}} e$$



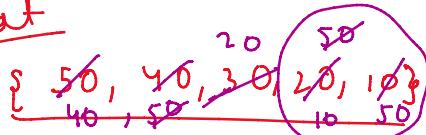
$\frac{Q}{R}$   
 divisor) dividend  
 $\quad\quad\quad R$

$$\text{dividend} = Q \times \text{div} + R$$



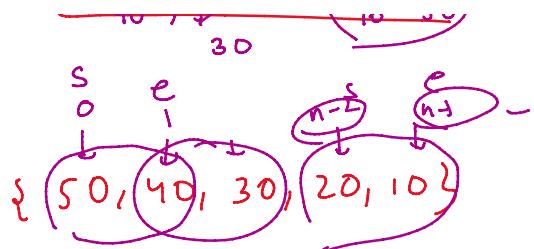
Goal: Inc

Bubble sort



$s$   
 $n$

$e$   
 $n$



$\delta, \delta + 1$

$s, s - 1$

L.S V.S B.S

Search sp comp, l

n	x
$n/2$	1
$n/2^2$	2
$n/2^3$	3
$n/2^4$	4
$n/2^k$	k

$$\frac{n}{2^k} = 1$$

$$n = 2^k$$

$$n = 2^?$$

$$16 = 2^?$$

$$32 = 2^?$$

$$64 = 2^?$$

$$2^? = 10$$

$$2^? = 10$$

$$? = \underline{10 - 2 = 8}$$

$$\log_2 n = ?$$

$$n = 2^k \quad || \quad n = 2^?$$

$$k = \log_2 n$$

$$4 = \log_2 16$$

$$\log_{10} 1000 = 3$$

$$\frac{10}{2}$$

$$\log_a^n = \frac{\log n}{\log a}$$

Selectn → Real life selectn??  
 → minimum no. of swappin

$\{ 50, 40, 30, 20, 10 \}$   
 0 1 2 3 4

$0-4 \rightarrow 4$

$\{ 10, 40, 30, 20, 50 \}$   
 0 1 2 3 4  
 $0-3 \rightarrow 3$

$\{ 10, 20, 30, 40, 50 \}$   
 0 1 2 3 4  
 $0-2 \rightarrow 2$

$0-1 \rightarrow 1$   
 ~~$0-(n-1) \leftarrow (n-1)$~~   
 $0-4 \rightarrow 4$   
 $0-3 \rightarrow 3$   
 $0-2 \rightarrow 2$   
 $0-1 \rightarrow 1$

Insertn sort

$\downarrow$  idsc       $\downarrow$  to In  
 $\{ 10, 20, 30, 40, 23 \}$

Ult. bubble

2) Rev.

3) Rotatn

$\Rightarrow \{ 10, 20, 23, 30, 40 \}$

$\{ 50 \} 40, 30, 20, 10$

$\{ 40, 50 \} 30, 20, 10$

$\{ 30, 40, 50 \} 20, 10$

$\{ 20, 30, 40, 50, 10 \}$

< - - - > ... n -

10, 20, 30, 40, 50