21 September 2023 11:27 AM

find ideal splitting condition.

n1 = 4

nums 1 = | 2 | 3 | 6 | 15 | (0 1 2 3)

n2 = 6

nums 2 = | 1 | 3 | 4 | 7 | 10 | 12 | (0 1 2 3 4 5)

combined = n = 10

| 1 | 2 | 3 | 3 | 4 | 6 | 7 | 10 | 12 | 15 | (0 1 2 3 4 5 6 7 8 9)

find split such that: each half forms accordingly

nums 1 = | 2 | 3 | 6 | 15 | (0 1 2 3)

nums 2 = | 1 | 3 | 4 | 7 | 10 | 12 | (0 1 2 3 4 5)

	left	right
in	2 3	6 15
half	1 3 4	7 10 12
	n = 5	n = 5

Ideal splitting.

how to find the ideal splitting?

cut 1

nums 1 = | 2 | 3 | 6 | 15 | (0 1 2 3)

nums 2 = | 1 | 3 | 4 | 7 | 10 | 12 | (0 1 2 3 4 5)

cut 2.

Median = $\frac{\max(\text{left}) + \min(\text{right})}{2}$

arr1: 2 3 6 15

arr2: 1 3 4 7 10 12

3 < 7 & 4 < 6 → valid

Reason:

① | 2 | 3 | < | 6 | 15 | sorted

similarly | 1 | 3 | 4 | < | 7 | 10 | 12 | sorted

② 3 < 6 & if 4 < 6 ↘

4 < 7 & if 3 < 7 ↗

all elements on the left < all on the right

n<7 4 ...

<

all on the right

hence valid

algo?

n = 4

nums 1 = | 2 | 3 | 6 | 15 |

nums 2 = | 1 | 3 | 4 | 7 | 10 | 12 |

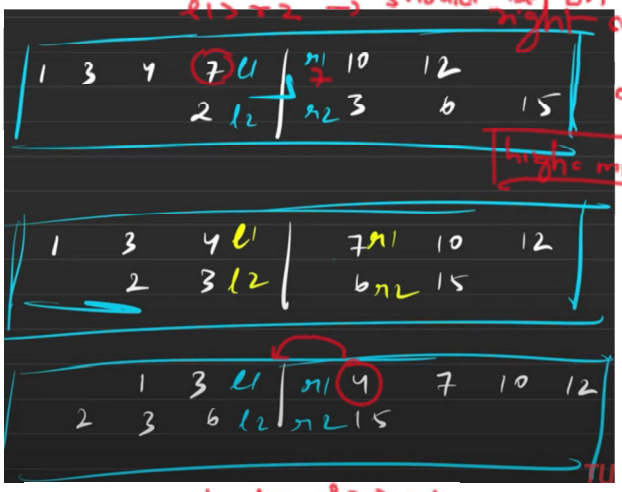
n = 6

Range = ?

Take len of smaller array (possible)

Here range = 0 to 5

why binary search?



① ② ③

$l_1 < r_2$ but $l_2 > r_1$.

so 6 < 7 if cut moves to right

low = mid + 1

DRY RUN: ①

n = 4

arr1 = | 7 | 12 | 14 | 15 |

arr2 = | 1 | 2 | 3 | 4 | 9 | 11 |

n = 6

so equal ⇒ n = 5

Range of cut for arr1

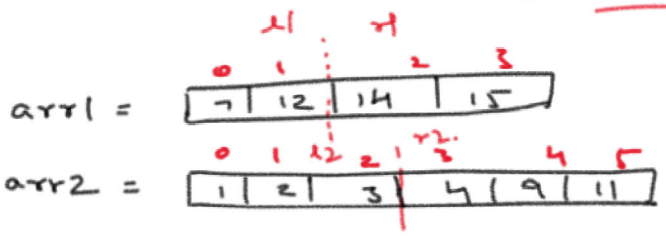
complexity: $\log_2 n$

⇒ performing binary search on how many numbers do we need in array 1 (or smaller array) → [0 to n1]

low high mid

0 4 2

picking 2 elem. → 3 elements from array 2.



$l1 = arr1[cut1-1]$	$r1 = arr1[cut1]$
$l2 = arr2[cut2-1]$	$r2 = arr[cut2]$

observations

$cut1 = mid$, $cut2 = n1+n2-cut1$

$l1 > r2$

→ $l1$ be on right cut to left

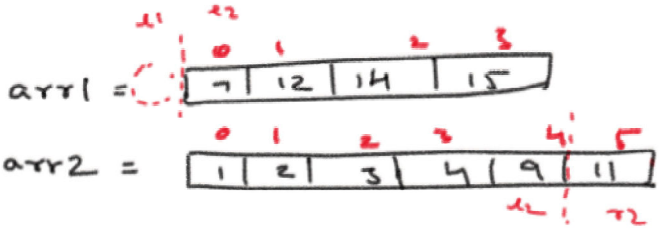
high = mid - 1

---

low high mid

0 1 0

elements from arr1



cut1 = 0

cut2 = 5

$l1 = INT\_MIN$ $r1 = 5$

$l2 = 9$ $r2 = 11$

⇒ $l1 < r2$ but

$l2 < r1$ ✗ breaking

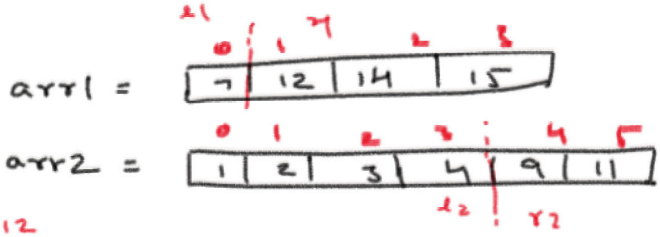
⇒ l2 should be on left → cut to the right side.

low = mid + 1

---

low high mid

1 1 1 elements



cut1 = 1

cut2 = 4

$l1 = 0$

$l2 = 4$

$r1 = 12$

$r2 = 9$

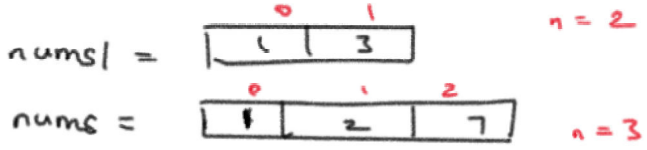
$l1 < r2$ & $l2 < r1$

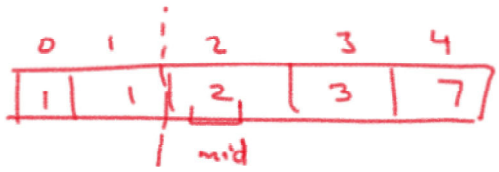
(valid index.

Median = ? $\frac{\max(l_1, l_2) + \min(r_1, r_2)}{2}$ (valid index.)

$\Rightarrow \frac{4+9}{2} = \frac{13}{2} = 6.5$

ODD LENGTH DRY RUN:



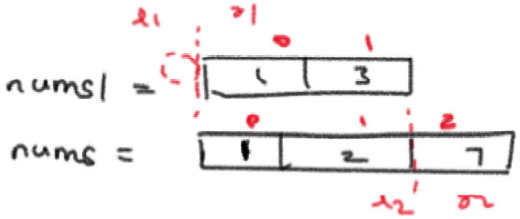


$5/2 = 2$

proceed normally.

low = 0, high = 1, mid = 0

0 elements from nums1



cut1 = 0, cut2 = 2

l1 = MIN, r1 = 1

l2 = 2, r2 = 7

l2 > r1.

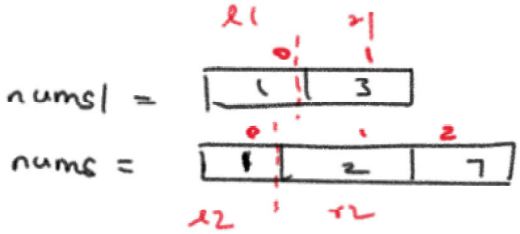
cut2 should move left

cut1 → right

low = mid + 1

low = 1, high = 1, mid = 1

1 elements



cut1 = 1, cut2 = 1

l1 = 1, r1 = 3

l2 = 1, r2 = 2

VALID

l1 < r2 & l2 < r1

Median = min(r1, r2)