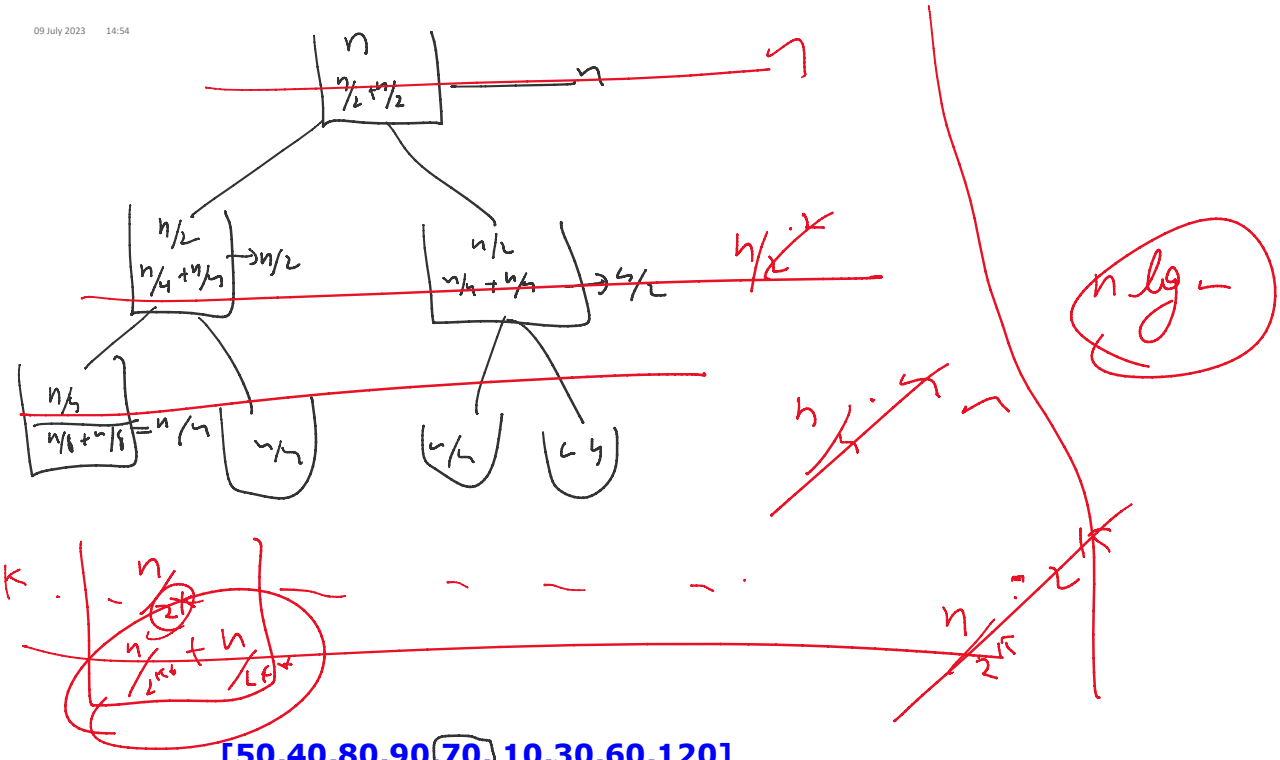
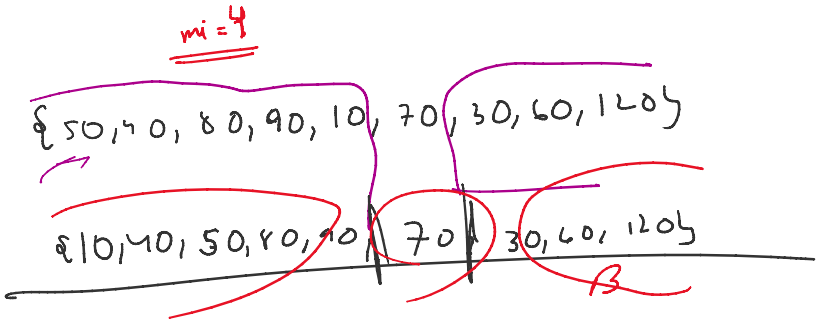
09 July 2023 14:54

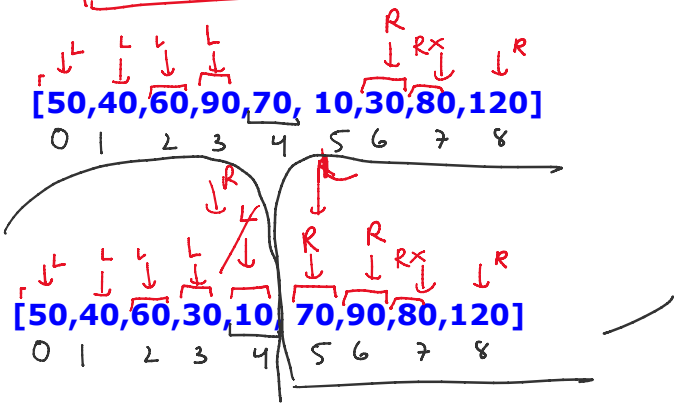


[50,40,80,90,70, 10,30,60,120]
0 1 2 3 4 5 6 7 8



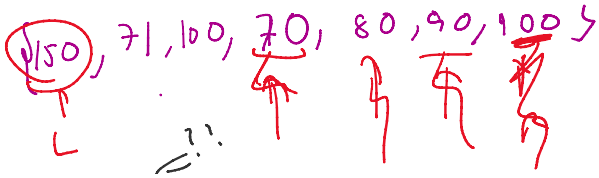
[50,40,80,90,70, 10,30,60,120]
0 1 2 3 4 5 6 7 8

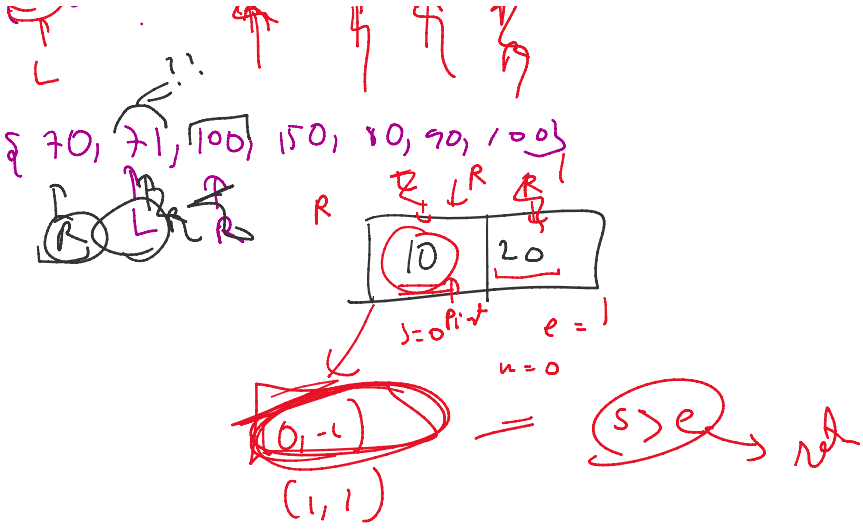
Pivot = 70



[50,40,60,90,70, 10,30,80,120]
0 1 2 3 4 5 6 7 8

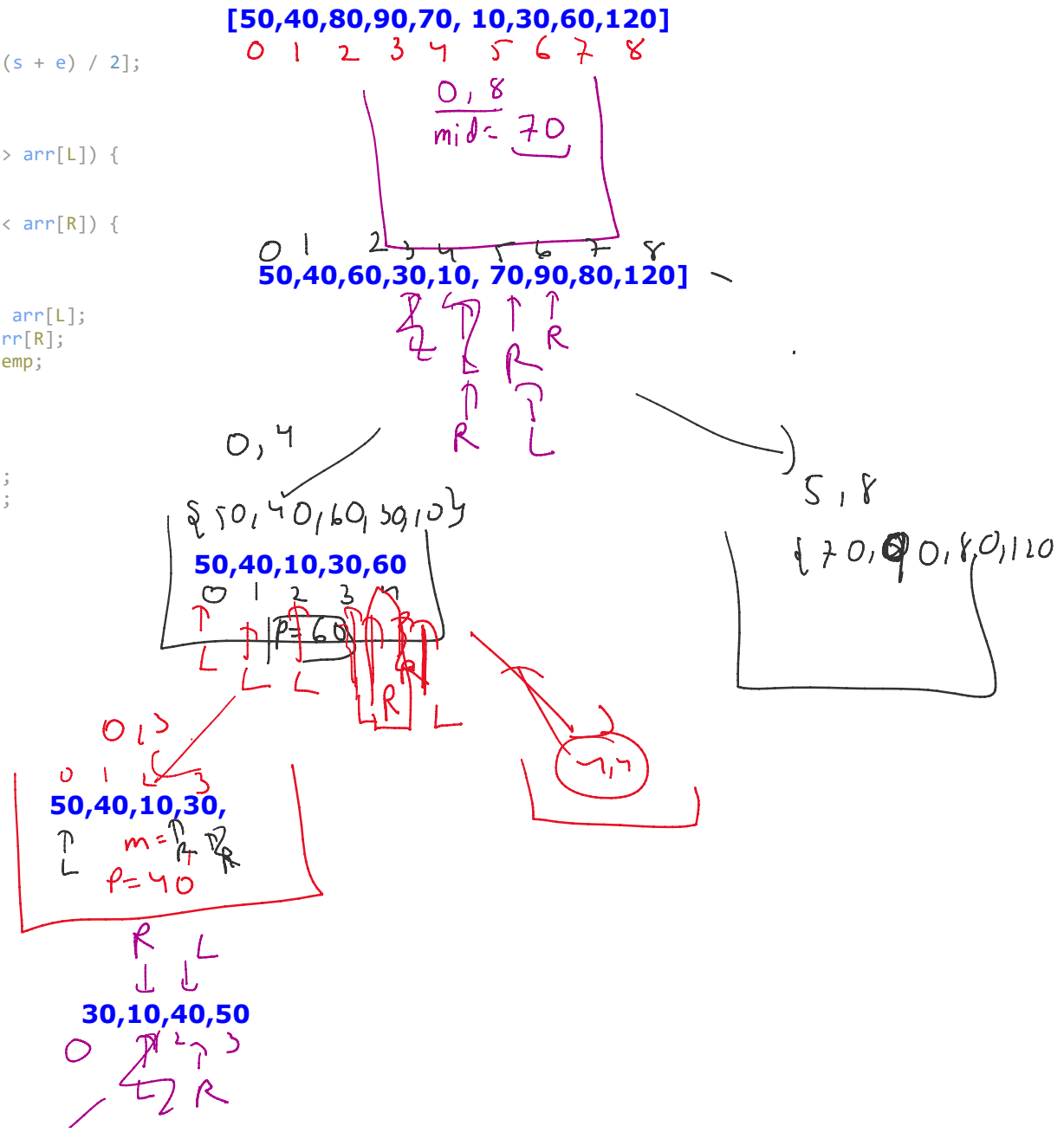
[50,40,60,30,10, 70,90,80,120]
0 1 2 3 4 5 6 7 8

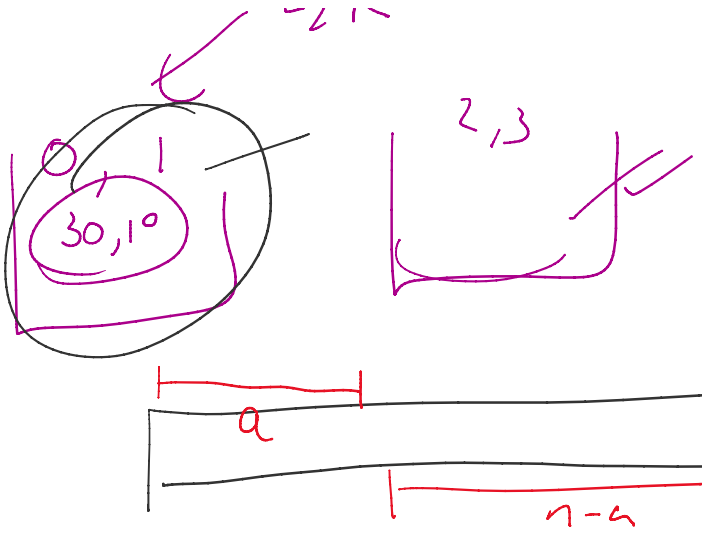




```java
public static void quick(int[] arr, int s, int e) {
      if(s==e) {
         return;
      }
      int pivot = arr[(s + e) / 2];
      int L = s;
      int R = e;
      while (L <= R) {
         while (pivot > arr[L]) {
            L++;
         }
         while (pivot < arr[R]) {
            R--;
         }
         if (L <= R) {
            int temp = arr[L];
            arr[L] = arr[R];
            arr[R] = temp;
            L++;
            R--;
         }
      }
      quick(arr, s, R);
      quick(arr, L, e);

   }
```





(1) $f(n) = n + f(a) + f(n-a)$

If $a = 1$ or $a = n-1$

$f(n) = n + f(1) + f(n-1)$

$f(n) = n + f(n-1)$ → n^2

$f(n) = n + f(n-1)$

$f(n-1) = n + f(n-2)$

$f(n-2) = n + f(n-3)$

$= n \times n = n^2$

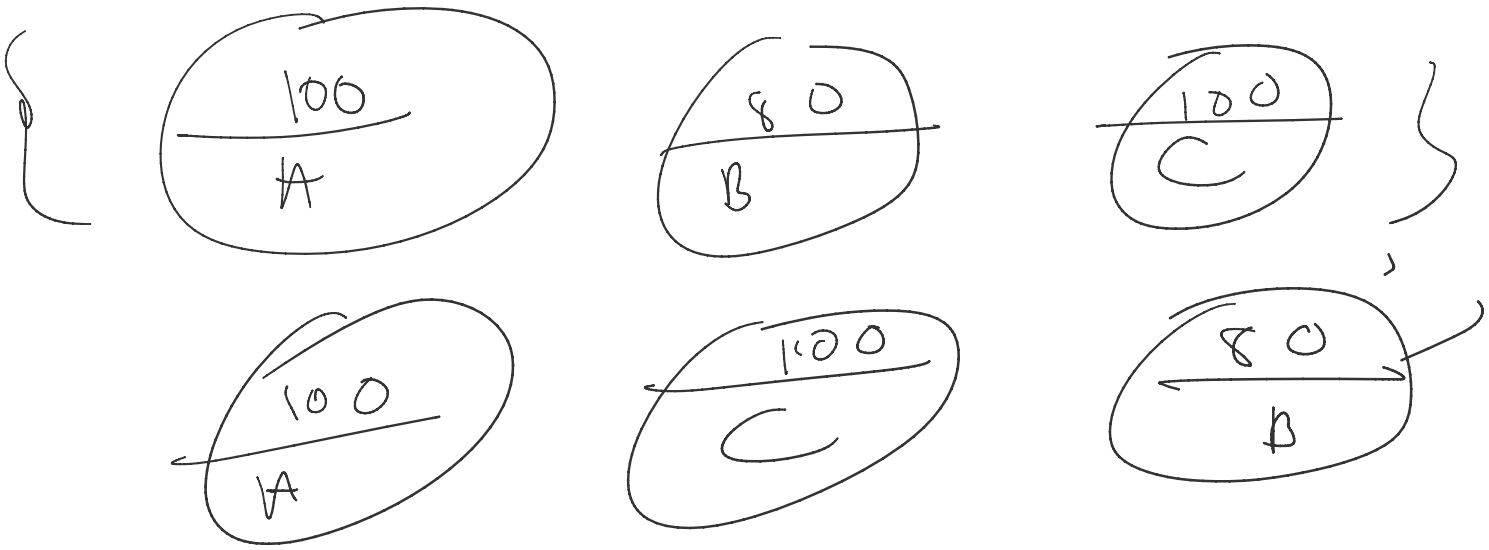
{ ~~100~~, 110, 120, ~~70~~, 90, 100, 110 }
70 100

(2) pivot = $n/2 = a$

$f(n) = f(n/2) + f(n - n/2) + n$

$f(n/2)$

$f(n) = 2f(n/2) + n$ → $n \log n$



	Best	Worst
Bubble	$O(n^2) \to O(n)$	$O(n^2$
Select^n	$O(n^2)$	$O(n^2)$
Ins.	$O(n)$	$O(n^2$
Quick	$n \lg n$	$n^2 \to n \lg n$
Merge	$n \lg n$	$n \lg n$

min swap

dual pivot