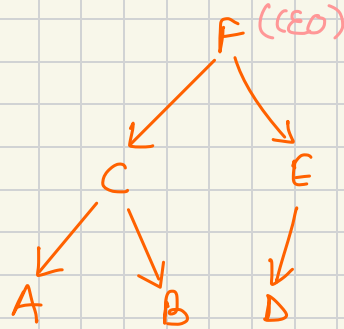




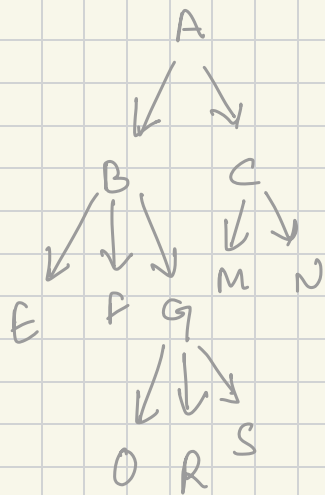
Employee and Manager

6	
Emp	mgr
✓ A	C
✓ B	C
✓ C	F
✓ D	E
✓ E	F
✓ F	F



O/P

A → 0
B → 0
C → 2
D → 0
E → 1
F → 5



~~c/p~~

~~A → A~~
~~B → A~~
~~C → A~~
~~E → B~~
~~F → B~~
~~G → B~~
~~O → G~~
~~R → G~~
~~S → G~~
~~M → C~~
~~N → C~~

~~of~~

A → 10
 B → 6
 C → 2
 E → 0
 F → 0
 G → 3
 M → 0
 N → 0
 O → 0
 R → 0
 S → 0

}

dp

6

A C

B C

C F

D E

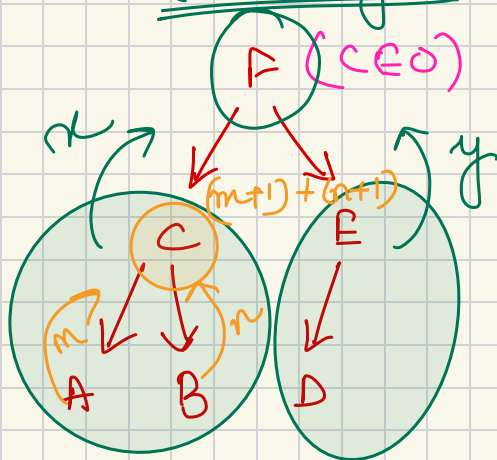
E F

F F

key
Emp.

value
Mngs.

$$\frac{(x+1) + (y+1)}{}$$



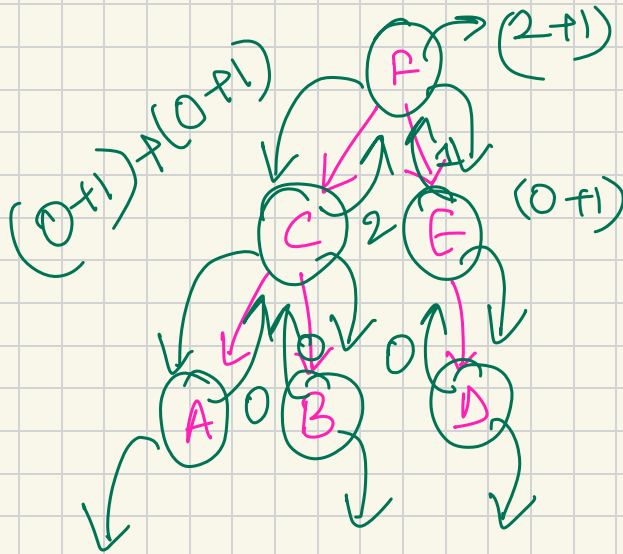
function: No. of Emp Under me

returns no. of emp. under me

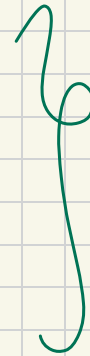
$$\text{no. of Emp under me} = \sum (\text{no. of Emp under each of my direct reportee} + 1)$$

{ for that reportee }

Recursion



A	→	0
B	→	0
C	→	2
D	→	0
E	→	1
P	→	5



6	
✓ A	C
✓ B	C
✓ C	F
✓ D	E
✓ E	F
✓ F	F

key (Mngr.)	value (list direct reports)
C	{ A, B }
F	{ C, E }
E	{ D }

✓ CEO = F

key (Mngr.)

value (list direct reportees)

C

{ A, B }

F

{ C, E }

E

{ D }

✓ CEO = F

No. of Emp under someone

fun (F)

total = 0

for (_____)

{ int no. = fun ()

total += (no + 1)

}

return total;

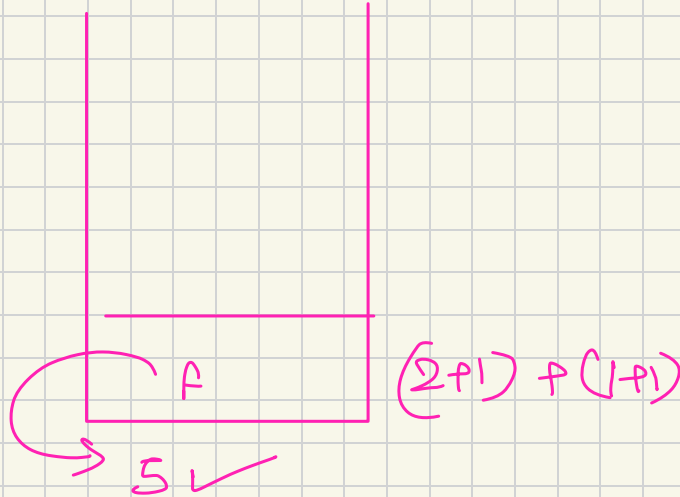
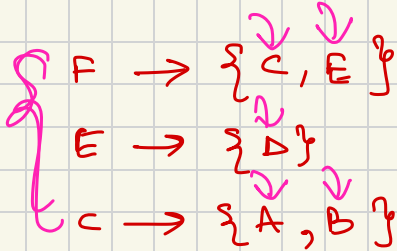
```

public int getNumberOfEmployeesUnderMe(String employee, HashMap<String, ArrayList<String>> directReportees) {
    if (directReportees.containsKey(employee) == false) {
        return 0;
    }

    int totalEmployeesUnderMe = 0;
    for (String directs : directReportees.get(employee)) {
        int employeesUnderDirect = getNumberOfEmployeesUnderMe(direct, directReportees);
        totalEmployeesUnderMe += (employeesUnderDirect + 1);
    }

    return totalEmployeesUnderMe;
}

```



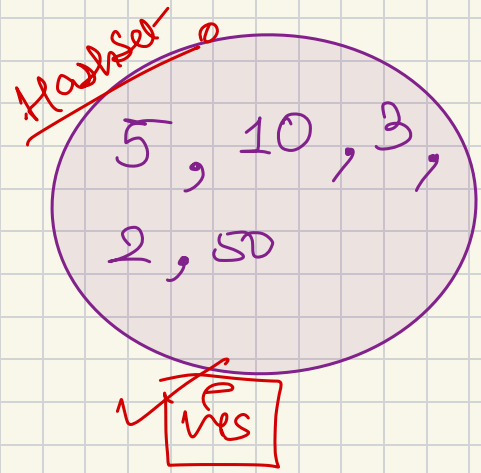
Problem with a given difference.

int[] arr = {5, 10, 3, 2, 50, 80} B = 78

Brute Force

```
for (int i = 0; i < n; i++)  
{  
    for (int j = i + 1; j < n; j++)  
    {  
        if (arr[i] - arr[j] == B || arr[j] - arr[i] == B)  
            return true;  
    }  
}  
return false;
```

TC: $O(N^2)$
SC: $O(1)$



$y = 5$
 $x = 83$
 $x = -73$

$y = 10$
 $x = 88$
 $x = -68$

$y = 3$
 $x = 81$
 $x = -75$

$y = 2$
 $x = 80$
 $x = -76$

$y = 50$
 $x = 128$
 $x = -28$

$y = 80$
 $x = 158$
 $x = \underline{5}$

$\{ \text{true} \}$

\checkmark $2, 80$

$$\text{arr}[1] = \{5, 10, 3, 2, 50, 80\} \quad B = 45$$

Try with sorting
 \rightarrow it will fail

Can't be done
with sorting!

Array Pair divisible by k

$arr[] = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ $k=5$

even size array!

$(N/2)$ such pairs, where sum of each pair is divisible by k .

$(9, 1), (8, 2), (7, 3), (6, 4), (5, 10)$

↓ ↓ ↓ ↓ ↓
10 10 10 10 15

→ is it possible or not?

Brute force

$\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

i j

TC: $O(N^2)$
SC: $O(1)$

$$\text{arr}[i] = \left\{ \overset{0}{1}, \overset{1}{2}, \overset{2}{3}, \overset{3}{4}, \overset{4}{5}, \overset{5}{6}, \overset{6}{7}, \overset{7}{8}, \overset{8}{9}, \overset{9}{10} \right\} \quad K=5$$

$$\text{pair}(x, y)$$

$$x + y = x \cdot K \quad \left\{ \text{some 'x' multiple of } K \right\}$$

$$\begin{array}{r} B \overline{) A} \quad a \\ \hline r \end{array}$$

$$A = B \times q + r$$

$$(q_1 \times K + r_1) + (q_2 \times K + r_2) = \alpha K$$

$$(q_1 + q_2) \times K + (r_1 + r_2) = \alpha K$$

divisible by K

should be divisible by K / equal to zero

$$\frac{(x+y)}{\quad} \rightarrow (r_1 + r_2)$$

divisible by K } equal to K
 equal to 0 }

$$\text{arr}[] = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\} \quad K=5$$

rem

1 2 3 4 0 1 2 3 4 0

$$r_1 + r_2 = K \quad \text{or} \quad r_1 + r_2 = 0$$

	rem	freq
→	1	2
	2	2
	3	2
	4	2
	0	2

Largest Subarray with sum equal to zero

$$\text{arr}[] = \left\{ \overset{0}{15}, \overset{1}{-2}, \overset{2}{2}, \overset{3}{-8}, \overset{4}{1}, \overset{5}{7}, \overset{6}{10}, \overset{7}{23} \right\}$$

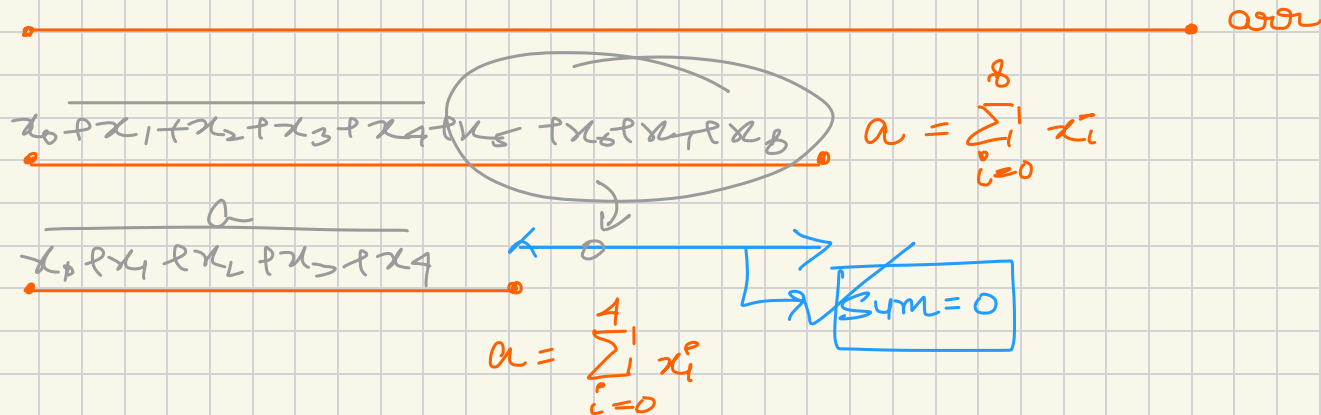
Brute force

↳ Calc. sum of each subarray,
store largest with zero sum }

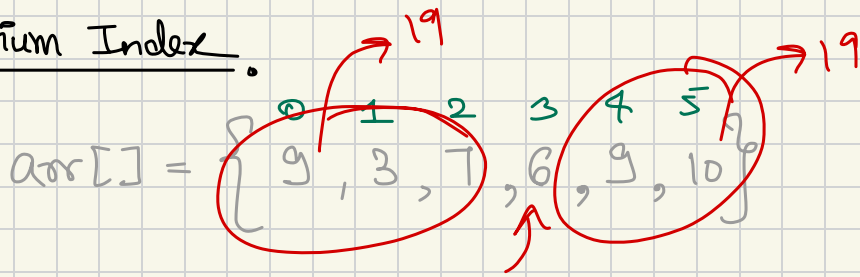
TC: $O(N^2)$

SC: $O(1)$

$$\text{arr}[] = \left\{ \overset{0}{15}, \overset{1}{-2}, \overset{2}{2}, \overset{3}{-8}, \overset{4}{1}, \overset{5}{7}, \overset{6}{10}, \overset{7}{23} \right\}$$

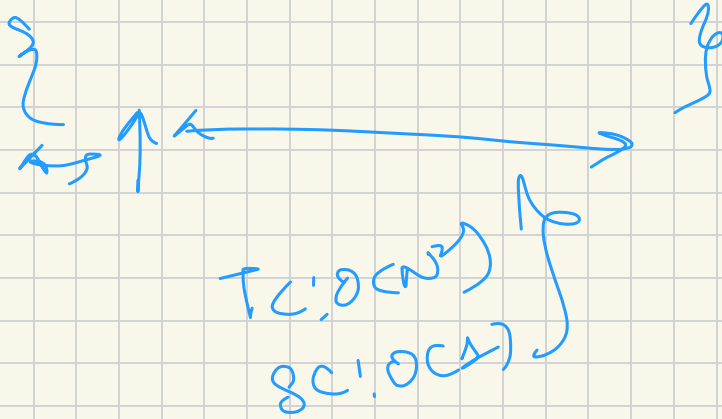


Equilibrium Index.



equilibrium index is an index, where sum of people on the left
= sum of people of right.

Bouté Force



$$\text{arr}[] = \{ \overset{0}{9}, \overset{1}{3}, \overset{2}{7}, \overset{3}{6}, \overset{4}{8}, \overset{5}{1}, \overset{6}{10} \}$$

$$\text{sum}[] = \{ 0, 9, 12, 19, 25, 33, 34 \}$$

$$\text{rsum}[] = \{ 35, 32, 25, 19, 11, 10, 0 \}$$

$$\left\{ \begin{array}{l} T < ! 0 < N \\ S < ! 0 < N \end{array} \right\}$$



$$\checkmark \text{ sum} = \text{total} - \text{sum} - a[i]$$

