

Target Element

To get Prefix

Sum (3,3)

Contains
accumulate
of element

	1	2	3	4	5
1					
2					
3			.		
4					
5					

(1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3)

(3,3) → Target element

↓

Assume you can
calculate prefix
sum of other
rectangles
previously

	1	2	3	4	5
1					
2					
3			.		
4					
5					

$$\text{Sum Till}(3,3) = \left. \begin{array}{l} \text{Sum Till}(2,3) + \text{Element}(3,1) \\ \quad + \text{Element}(3,2) \\ \quad + \text{Element}(3,3) \end{array} \right\}$$

pf = prefix sum array

$$\text{pf}[3][3] = a[3][3] + \text{pf}[2][3] + \text{pf}[3][2] - \text{pf}[2][2]$$

$$\text{pf}[i][j] = a[i][j] + \text{pf}[i-1][j] + \text{pf}[i][j-1] - \text{pf}[i-1][j-1]$$

Target Sum till (3,3)

classmate

① Sum till (2,3)



1	2	3
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② Sum till (3,2)

1	
2	
3	

Sum till (3,3)

$$\{ \text{Sum till } (2,3) + \text{Element } (3,1) + \text{Element } (3,2) + \text{Element } (3,3) \}$$

(a-1, b-1)	
	(a-1, d)
	(a, b)
	(c, d)
(c, b-1)	

$$pf(c, d) - pf(a-1, d)$$

$$- pf(c, b-1)$$

$$+ pf(a-1, b-1)$$

Two times subtract from (a-1, d) and (c, b-1)