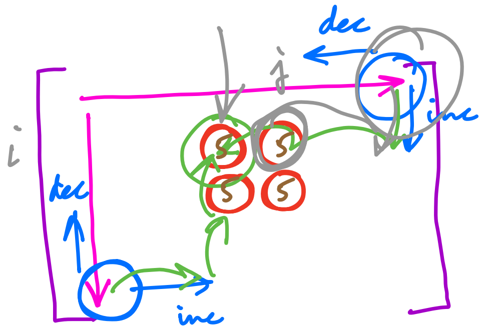
"Conquer yourself rather than the world"

— René Descarte

$1, 2, \dots, n+1$ $\qquad$ $[1, n+1]$

At max, an → 1 to n, ∃ n+1



$(i*1009 + j)$

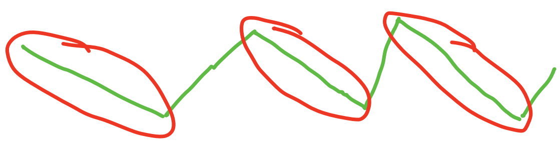
target → $1009*i + j$

least i ∃ least j for tie-breaker.

Decreasing dishes

Max possible sum of a subarray with decreasing elements.

7	5	2	6	8	3	1	15	14	2	6
7	12	14	6	8	11	12	15	29	31	6



Benjamin and AND

$B[k] \ni \#(i,j) \rightarrow \underbrace{(a[i]\ \&\ a[j])}_{\text{both should have } k^{th} \text{ bit set.}}$ has k^{th} bit set.

$count[k] \rightarrow$ Nr. of elements in $a[\,]$ whose k^{th} bit is set.
$((a[i]\ \&\ (1<<k)) > 0)$

$$\left(\frac{count[k] * (count[k]-1)}{2}\right)$$

m elements $\rightarrow$ nr. of pairs using these elements.

$(0,1)$	$(1,2)$	$(2,3)$	...	$(m-2, m-1)$
$(0,2)$	$(1,3)$	$(2,4)$		
$(0,3)$	$(1,4)$	$(2,5)$		
$\vdots$	$\vdots$	$\vdots$		
$(0, m-1)$	$(1, m-1)$	$(2, m-1)$		
$m-1$	$m-2$	$m-3$	....	1

$$(m-1) + (m-2) + (m-3) + \dots + 2 + 1$$

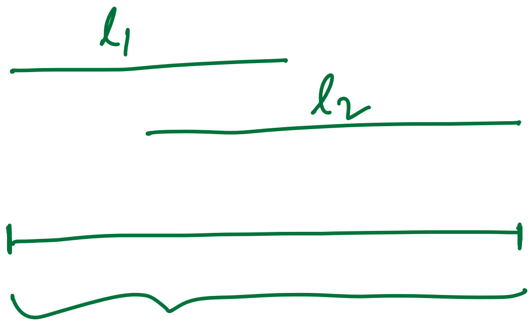
$$= \frac{(m-1) * (m-1+1)}{2}$$

$$= \frac{m(m-1)}{2}.$$

$$\frac{m * (m-1)}{2}$$

$$^mC_2 \rightarrow \frac{m!}{(m-2)! \cdot 2!} = \frac{m(m-1)}{2}$$

$$^nC_r = \frac{n!}{(n-r)! \cdot r!}$$



$$n \,\&\, (1 << i) > 0$$

$$(n >> i) \,\&\, 1$$

$x = 17 \longrightarrow 10001$

$x = x >> 2 \longrightarrow 100$

$x = x << 2 \longrightarrow (10000)_2 \longrightarrow (16)_{10}.$

$x = 40 \longrightarrow 101000$

$x = x/2 \longrightarrow 20 \rightarrow 10100$

$x = x/2 \longrightarrow 10 \rightarrow 1010$

$x = x << 2 \longrightarrow (101000)_2 \longrightarrow (40)_{10}$

$x = 21 \longrightarrow 10101 \longrightarrow 21$

$x = x << 1 \longrightarrow 101010 \longrightarrow 42$

$x = x >> 2 \longrightarrow 1010 \longrightarrow 10$

$x = x << 1 \longrightarrow 10100 \longrightarrow 20.$

$$\boxed{foo(x,y) = x * foo(x, y-1)} = \underbrace{x * x * \dots x}_{y}$$

$$= x^y.$$

```
foo(x, y)
    if (y==0) ret 1
    ret bar(x, foo(x, y-1))
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```
bar(x, y)
    if (y==0) ret 0
    ret (x+ bar(x,y-1))
```

$bar(x, y) \longrightarrow x * y.$