Sparse Table

$arr = \{a_0, a_1, a_2, a_3, a_4, a_5\}$

$table[0][0] = a_0$ | $table[0][1] = min(a_0, a_1)$

$table[1][0] = a_1$ | $table[1][1] = min(a_1, a_2)$

$table[2][0] = a_2$ | $table[2][1] = min(a_2, a_3)$

$\vdots$ | $table[3][1] = min(a_3, a_4)$

$table[5][0] = a_5$ | $table[4][1] = min(a_4, a_5)$

$table[i][j]$

$[0, 14]$

$[0, 7], [8, 11], [12, 13],$

$[14, 14]$

$table[0][2] = min(a_0, a_1, a_2, a_3) = t[0][1], t[2][1]$

$table[1][2] = min(a_1, a_2, a_3, a_4) = t[1][1], t[3][4]$

$table[2][2] = min(a_2, a_3, a_4, a_5)$

$[0, 7], [7, 14]$
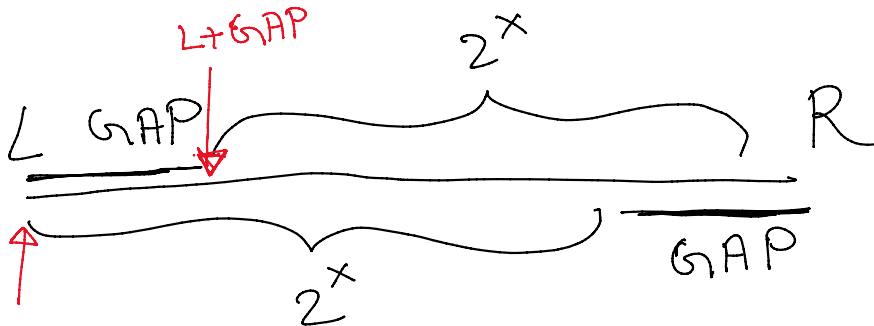
$min\left(t[L][x], t[L+GAP][x] \right);$

Dynamic Programming:

$T[0][3] = min\left(t[0][2], t[4][2] \right);$

$(0, 1, 2, 3) \quad (4$

$len = 8$ $len = 4$

$[0 \ldots \ldots 7]$ $[0 \ldots 3]$
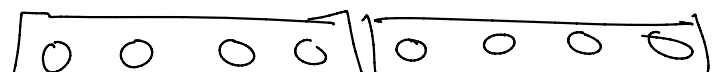
$[0 \ldots \ldots 7]$

$0,1,2,3,4,5,6,7$

$[0 \ldots 3]$

$0,1,2,3$

$$T[i][2^j] = \min\left(T[i][2^{j-1}], T[i+2^{j-1}][2^{j-1}]\right) \quad T[\text{startingIdx}][\log_2(\text{length})]$$
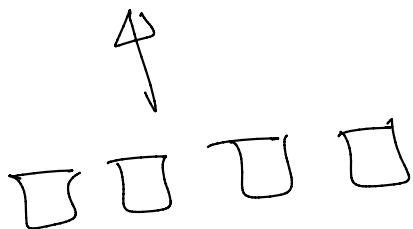
$$T[i][j] = \min\left(T[i][j-1], T[i+(1<<(j-1))][j-1]\right)$$

$2^3 \cdot 5^1 \cdot 7^0$

$a_0 \quad a_1 \quad a_2 \quad a_3 \quad a_4$

$2^2 \cdot 5^2 \cdot 7^3$

$2^2 \cdot 5^1 \cdot 7^0$

$- \circ -$

$N, Q \to U, V$

sparse table + LCA

LCA = Lowest Common Ancestore

$$\text{Gap} = L[v] \sim L[u]$$

14

$8 + 4 + 2$