$mx_1, \ldots, x_m n \mathcal{O}(m(\log m + \log x_{\max}))$

$\mathcal{O}(m \log m) \Delta \Delta$
$\Delta \mathcal{O}(m) \Delta = x$

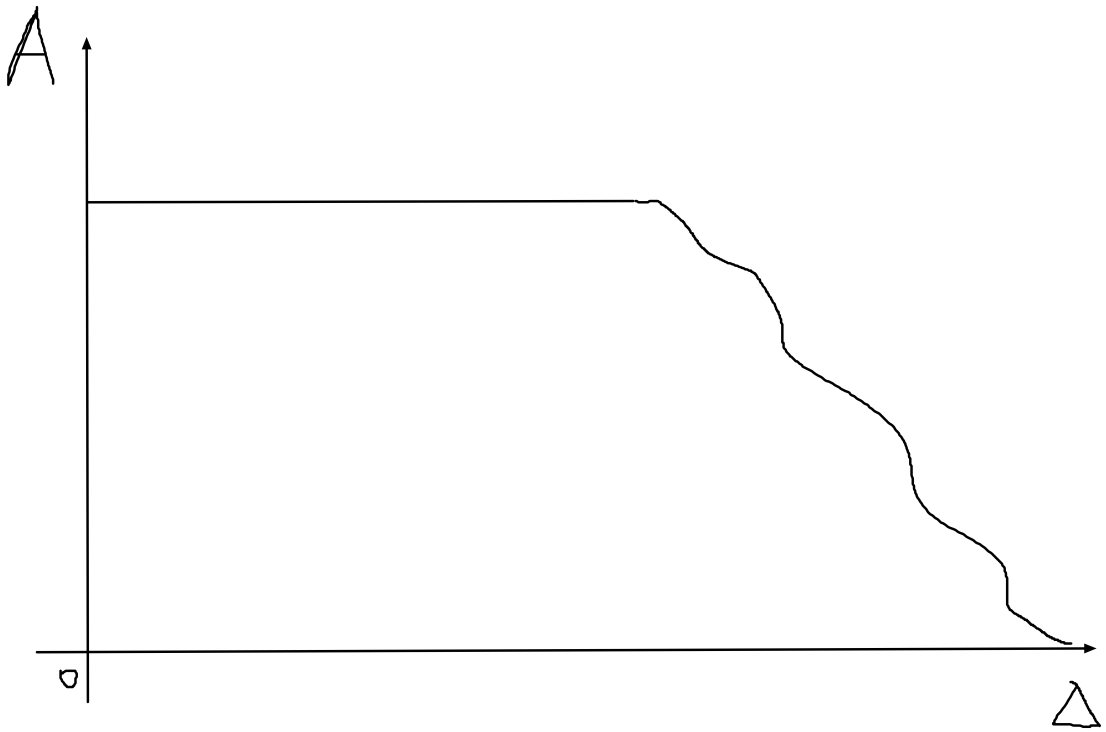
$\texttt{cowsm}$

$\{x\}_{i=1}^{n} \Delta$

$\texttt{cows}$

$\{x\}_{i=1}^{n} \texttt{cows} == 0$

$\texttt{cows} == 0 \texttt{cows}! = 0$



$A \Delta$

$\Delta \mathcal{O}(m \log x) \mathcal{O}(m \log m + m \log x)$ ■

$abna_i + b_j$

$\mathcal{O}(n^2 \log n)$

$\mathcal{O}(n^3)\mathcal{O}(n)$

$\mathcal{O}(n^2 \log n)\mathcal{O}(n)$

$\mathcal{O}(n^3)\mathcal{O}(1)$

$\mathcal{O}(\log n)$

$a_i + b_j\mathcal{O}(n^2)\mathcal{O}(n^2 \log n^2) = \mathcal{O}(n^2 \log n)\mathcal{O}(n^2 \log n)$

$a\mathcal{O}(n \log n)i = 1, \ldots, n\{c_i\} = [a] + b_i\mathcal{O}(n)$

$nc_ic_ic_in^2$

$\mathcal{O}(n^3)nc_i$

`extract_min()`$\mathcal{O}(\log n)n^2\mathcal{O}(n^2 \log n)c_i$

$\mathcal{O}(n)$

`current_min` $= a_1 + b_1$

$i = j = 1$

`current_min`

$\mathcal{O}(n^2)$

■

k

$\mathcal{O}(k \log n)$

$\mathcal{O}(k \log k)$

k`extract_min()`$\mathcal{O}(\log n)k \log n$

k`extract_min()`$\mathcal{O}(\log k)k$`extract_min()`$\mathcal{O}(k \log k)$

`extract_min()`$\mathcal{O}(h)hkk\mathcal{O} \log k$

■

$n\mathcal{O}(n \log n)x[l..r]\mathcal{O}(\log n)$

$b_i = (a_i, i)b\mathcal{O}(n \log n)$
$bxlbirbjj - i + 1\mathcal{O}(\log n)$ ■

kn

$\mathcal{O}(nk)$

$\mathcal{O}(n + I)I$

$\Omega(n \log k)$

$\mathcal{O}(n \log k)$

`InsertionSort`$\mathcal{O}(n^2)\mathcal{O}(nk)$

`InsertionSort`$\mathcal{O}(I)I\mathcal{O}(n + I)$

$k + 1$

`extract_min()`

$k + 1$

$\mathcal{O}(\log k)\mathcal{O}(n \log k)$

$kk + 1$

■