Suffix Array:

$$S_1 = \overset{0\ 1\ 2\ 3\ 4\ 5}{BANANA}$$

A BANAN

~~ANABAN~~

5	A	→ (-)
3	ANA	→ 1
1	ANANA	↔ 3
0	BAN ANA	→ 0
4	NA	→ 0
2	N A NA	→ 2

$O(N^2 \log N)$

$\boxed{O(N (\log N)^2)}$

$O(N \cdot \log N)$

$\boxed{O(N)}$

$SA[\ ] \rightarrow \{5, 3, 1, 0, 4, 2\}$

$LCP[\ ] \rightarrow \{0, 1, 3, 0, 0, 2\}$

$LCP[i] = LCP$ of (suf_i, suf_{i-1})

— o —

P1:

Given a string S, find the minimum cyclic shift. that represents the lex... smallest string.

$S_1 = \overset{\frown}{\textcircled{B}}ANANA$
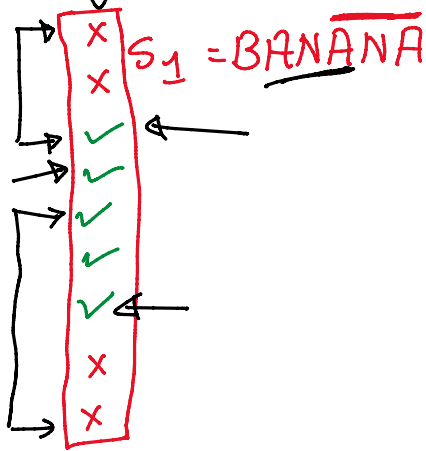
↳ ANANAB ✓

↳ NANABA ✓

↳ ANA BAN ✓

↳ NA BANA ✓

↳ ABANAN ✓

— o —

P2

Given a string S of length N, and some query ... O find out whether Q. exists in S as a

P2 Given a string ... U ...
strings Q_i, find out whether Q_i exists in S as a substring.

$S_1 = BANANA$

- A
- ✓ ANA
- ✓ ANANA
- ✗ BANANA
- ✗ NA
- ✗ NANA

$|Q_i| \log |S|$

$\sum len(Q_i) \le N$

$len(S) \le N$

$1 \le N \le 10^6$

$Q_i = ANA$

$$|Q_a| \log |S|$$

$\Rightarrow \log |S| \left(|Q_0| + |Q_1| + |Q_2| \cdots + |Q_a| \right)$

$\Rightarrow N \log N$

$2^0 \quad 2^1 \quad 2^2 \quad 2^3 \quad 2^4$

— ∘ —
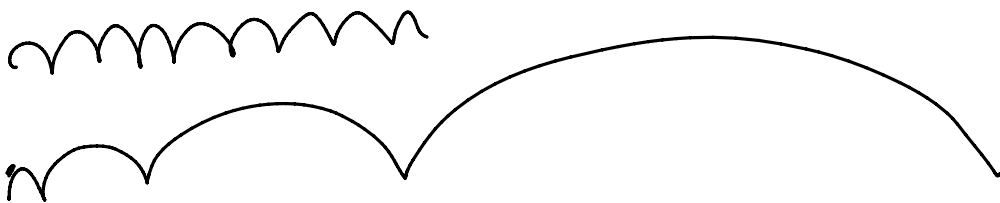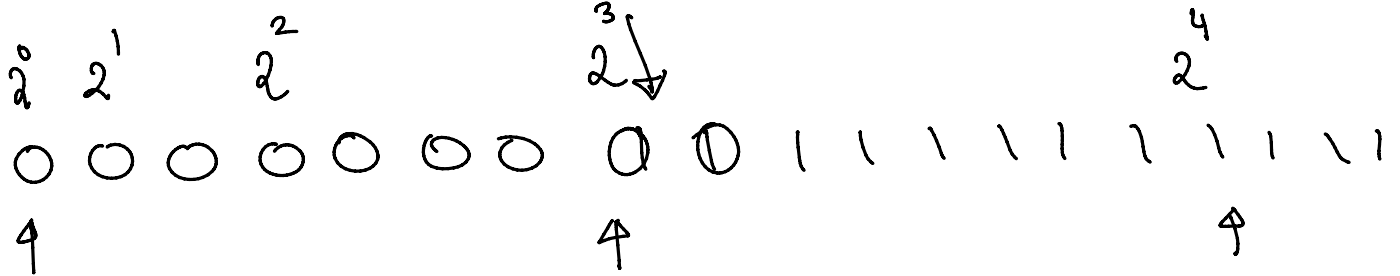
P3

Find longest substring that occurs $\ge K$ times.

$S \to \boxed{ABC}$

$S \to BANANA$

B
A
...

AN
NA

$K = 3$

LCP

S→(ABC)
0
0
0

S→ $\overline{\text{BANANA}}$ (circled in red)

$\frac{6 \times 7}{2} = 21 - (1+3+2)$

$= 21 - 6$

$= 1\tilde{5}$

K=3

A
A NA
A NA NA
BANANA
NA
NA NA

Lcp
0
1
3
0
0
2

K-1

Monotonic Deque

$-o-$

p4

ab c ab

a   ab
b   be
c   ca

1~2

x
z
ad
yy
p
ap

$26^1 + 26^2 - \boxed{6} = 696$

L   R
$26 + \cdots + 26 - x =$

$\left(a^{x_1} + a^{x_2} + \cdots + a^{x_p}\right) \left(a^{y_1} + a^{y_2} + \cdots + a^{y_q}\right)$

q

$$\frac{(u + \ldots}{p}$$

$$\frac{\quad}{q}$$

$$O(pq) \rightarrow O(p \log q)$$