

1 second

1 s = 10^8 operations

Bubble Sort

N^2

$N = \underline{10^3}$ $N = 10^5$

10^6 ✓

$$\frac{10^{10}}{10^8} = 100 \text{ seconds}$$

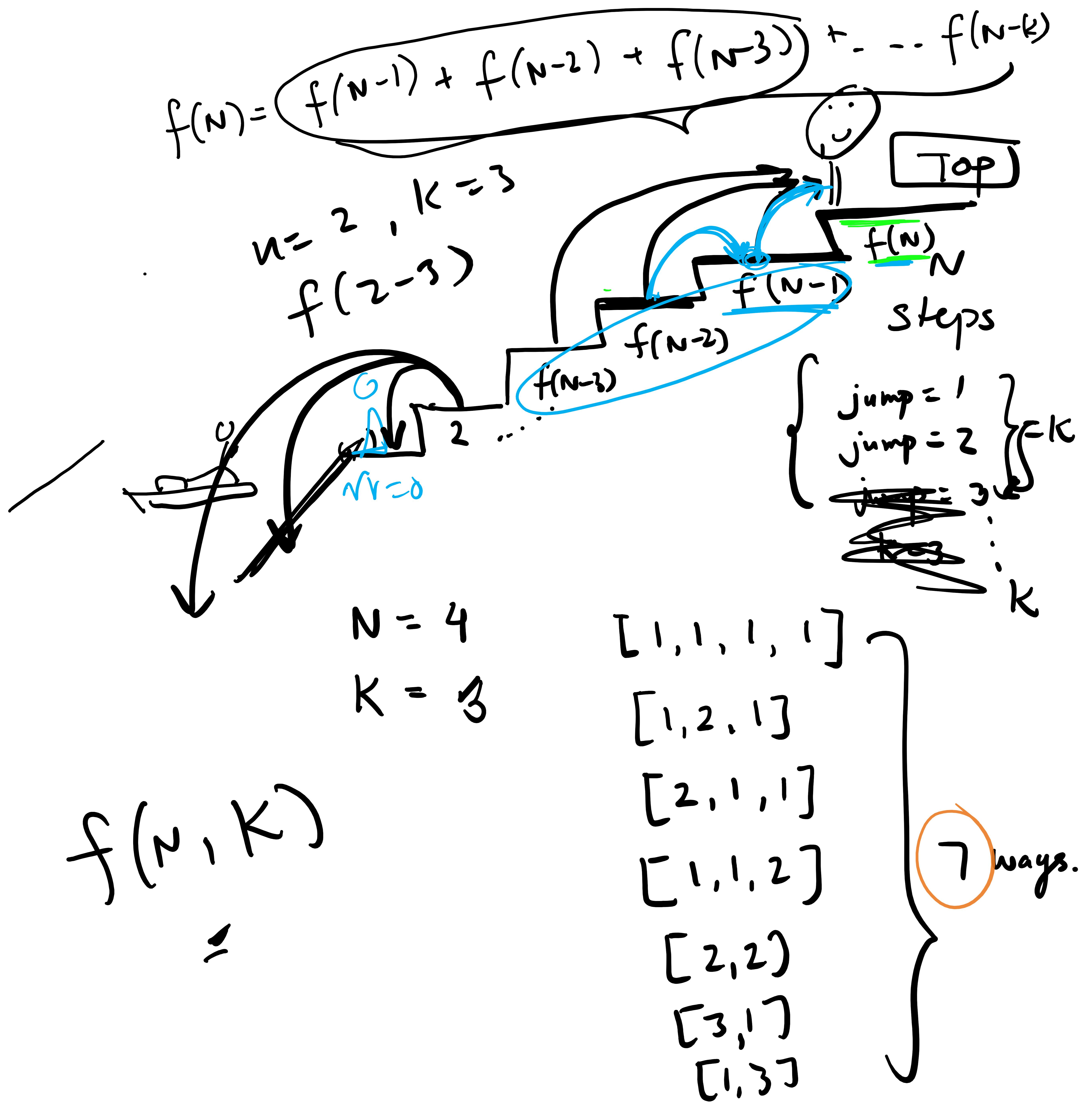
10^{10}

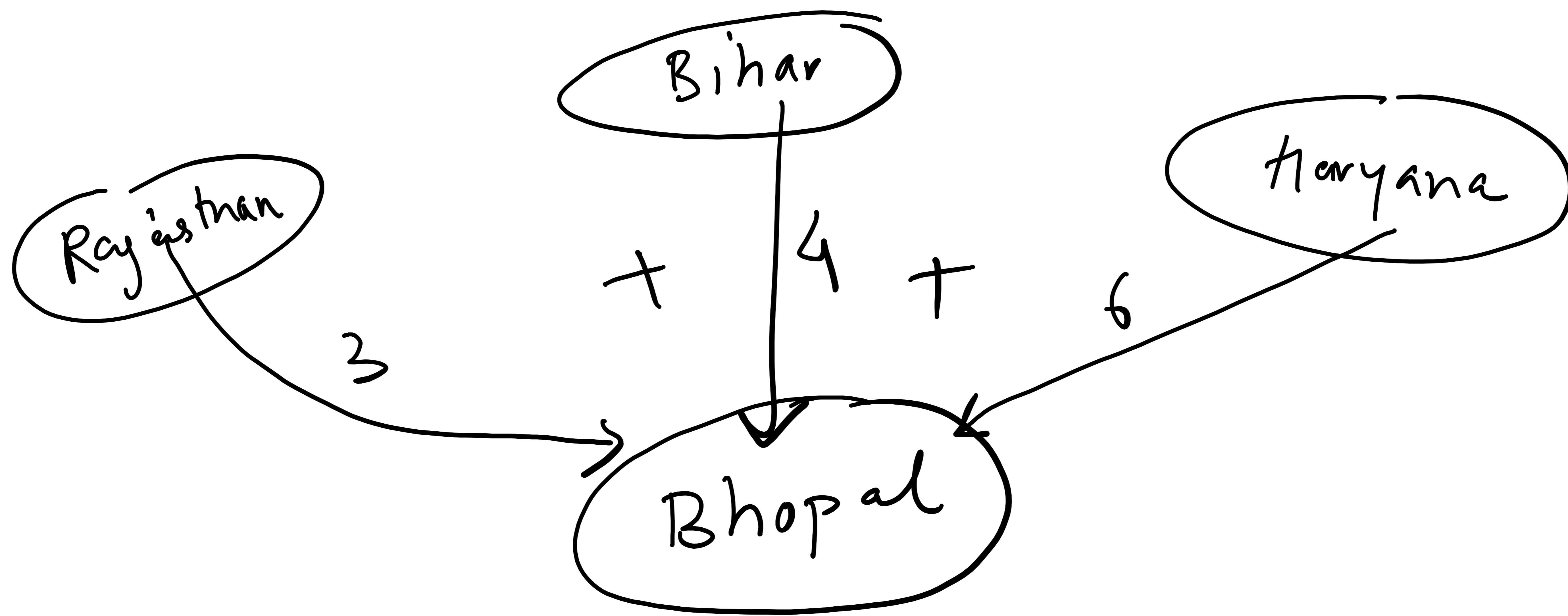
<u>N</u>	<u>Log₂ N</u>
10	4
100	7
10^3	10
10^5	20
10^{12}	40
10^{18}	60

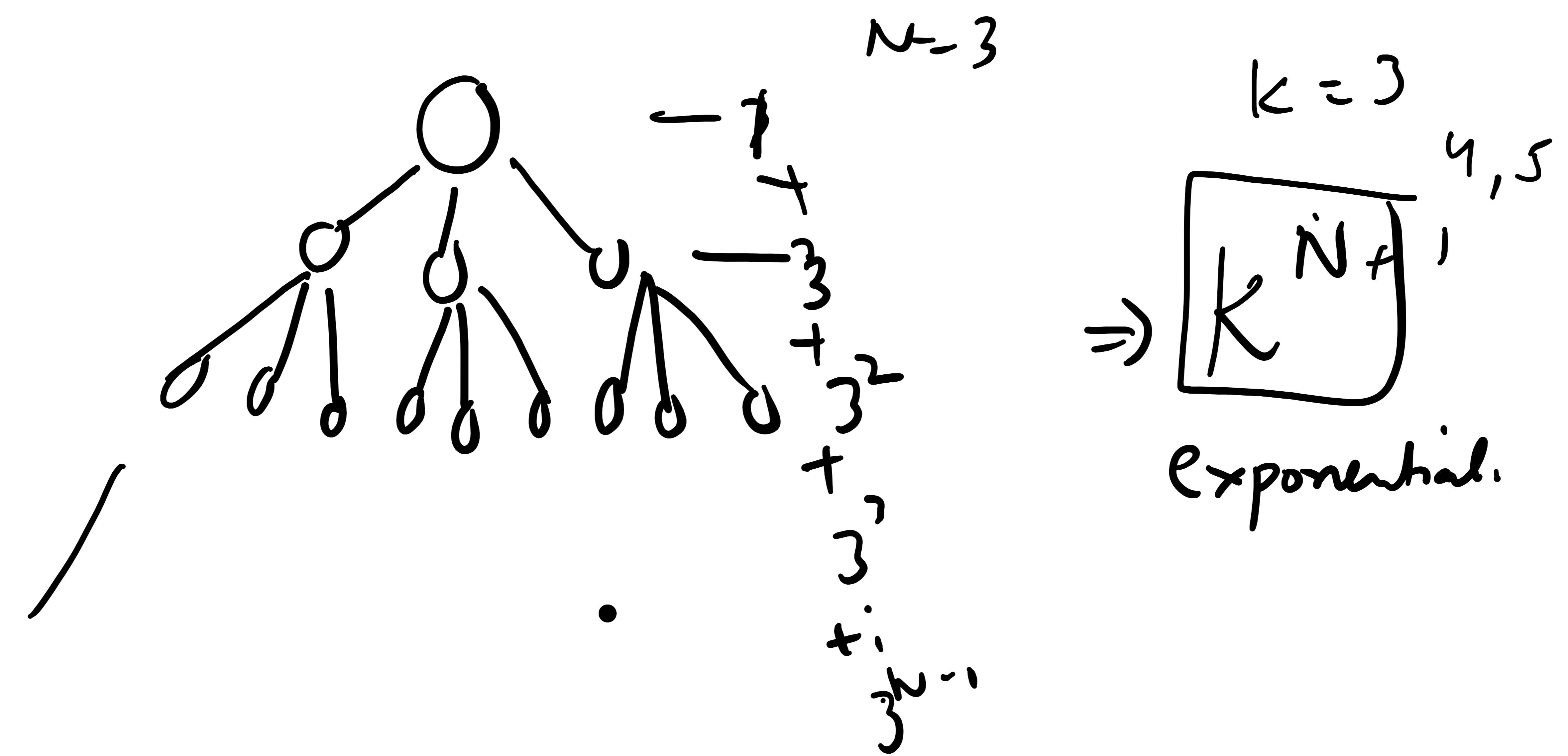
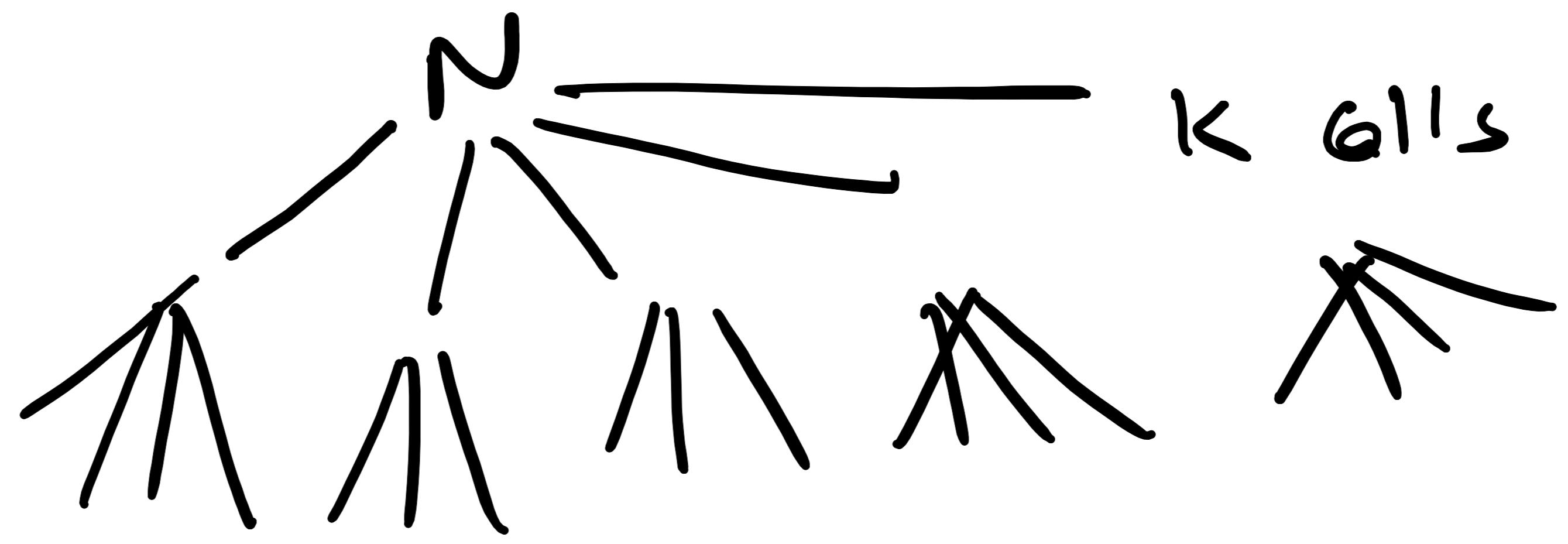
$$\frac{10^{18}}{10^8} = 10^{10} \text{ seconds}$$

.....

$$\frac{60}{10^8} = \underline{\text{milliseconds}}$$

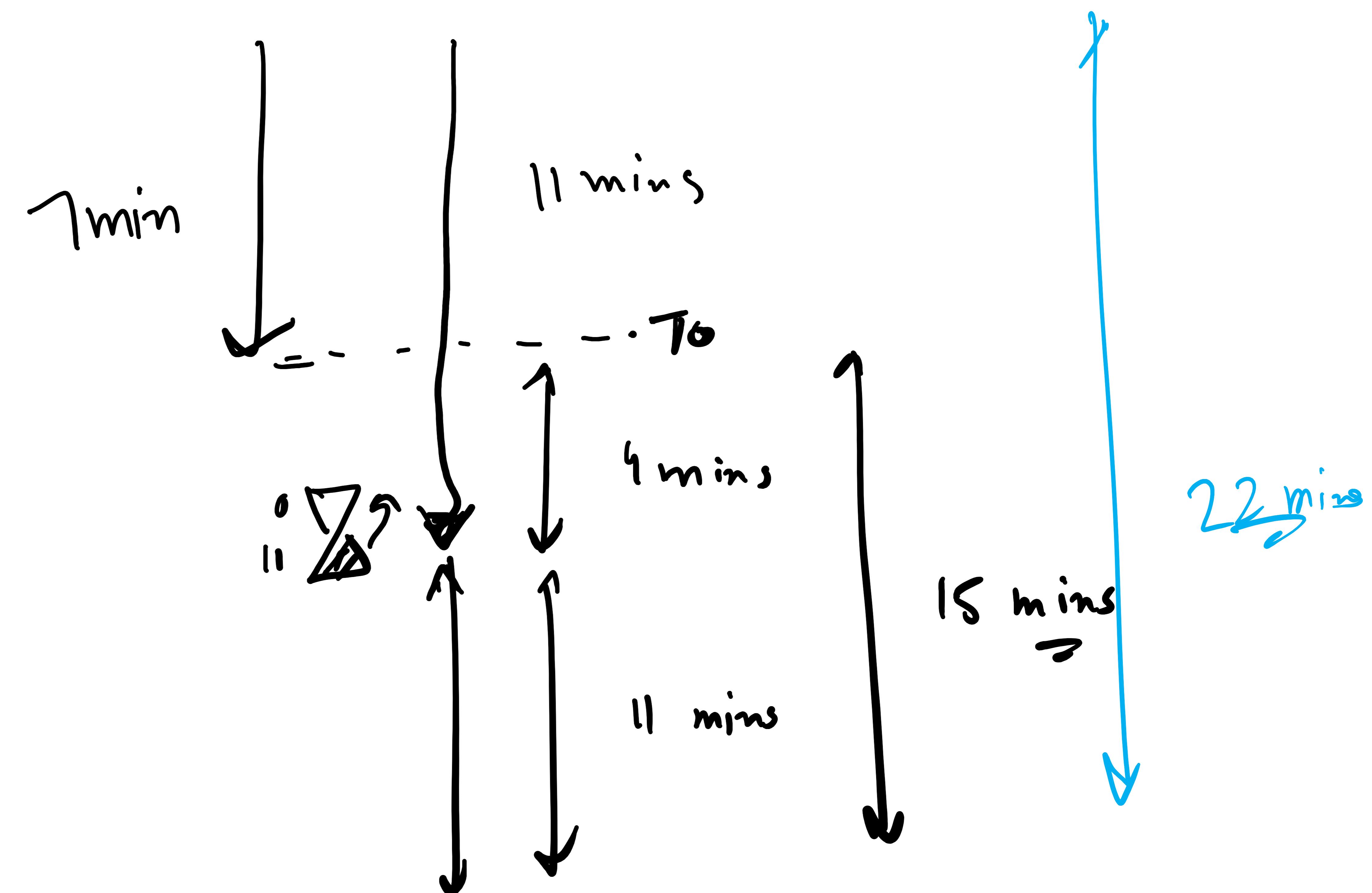
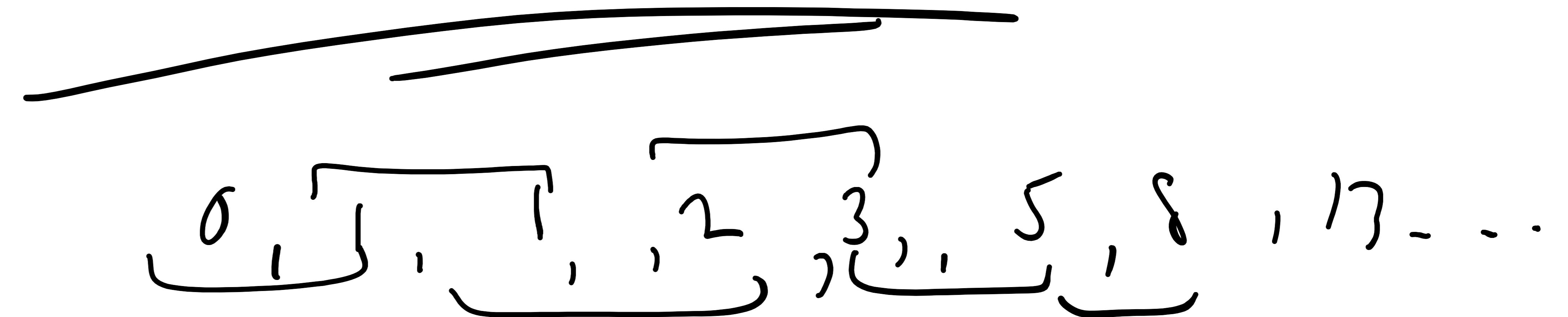


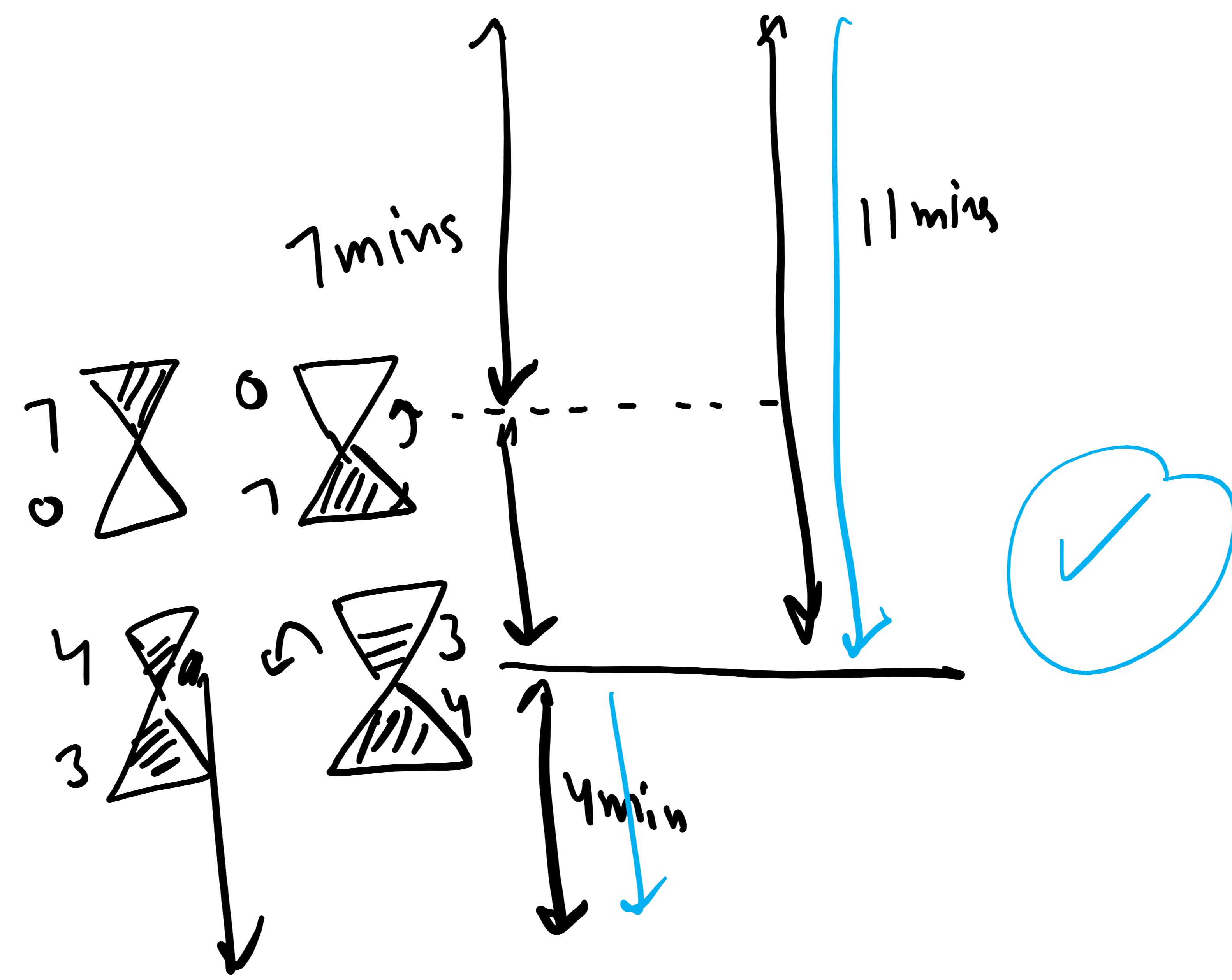


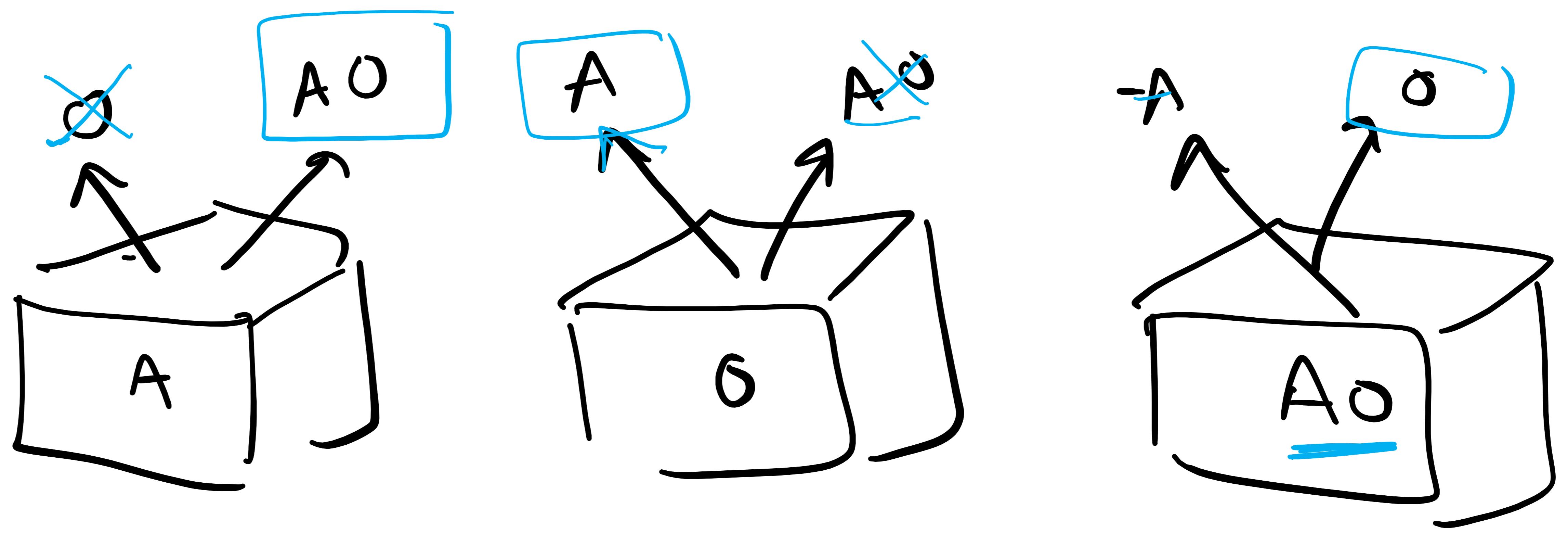


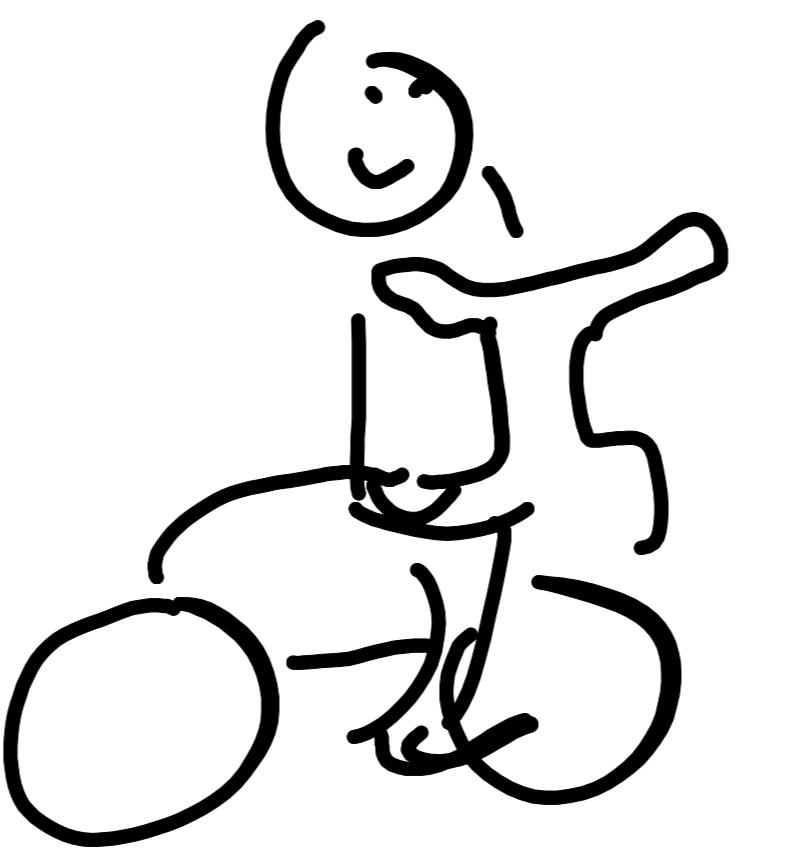
(K=2)

$$f(n) = f(n-1) + f(n-2)$$

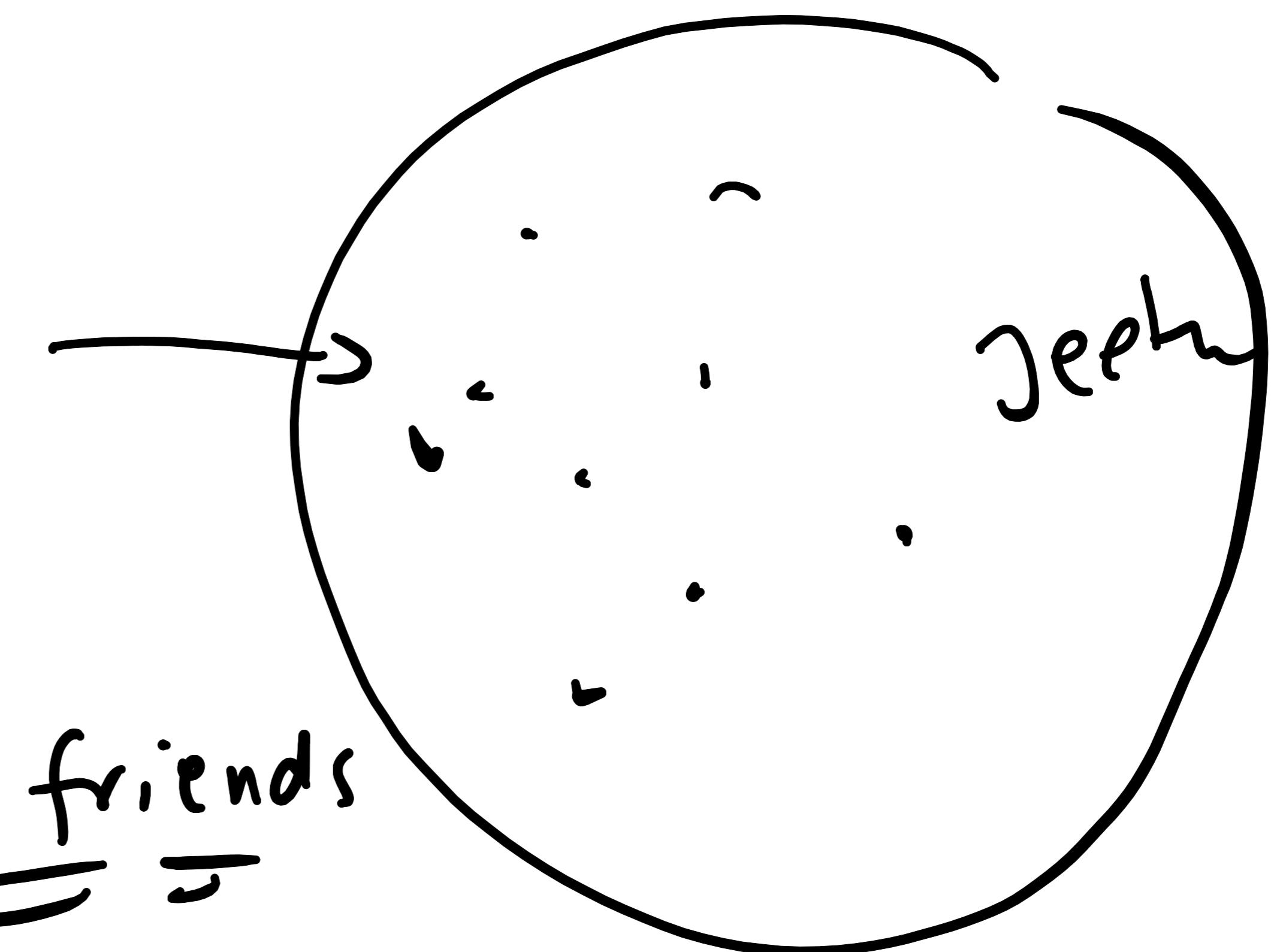








$$\frac{1}{F_1} + \frac{2}{F_2} + \frac{3}{F_3} = \frac{n}{N_{\text{friends}}}$$



$n=3$

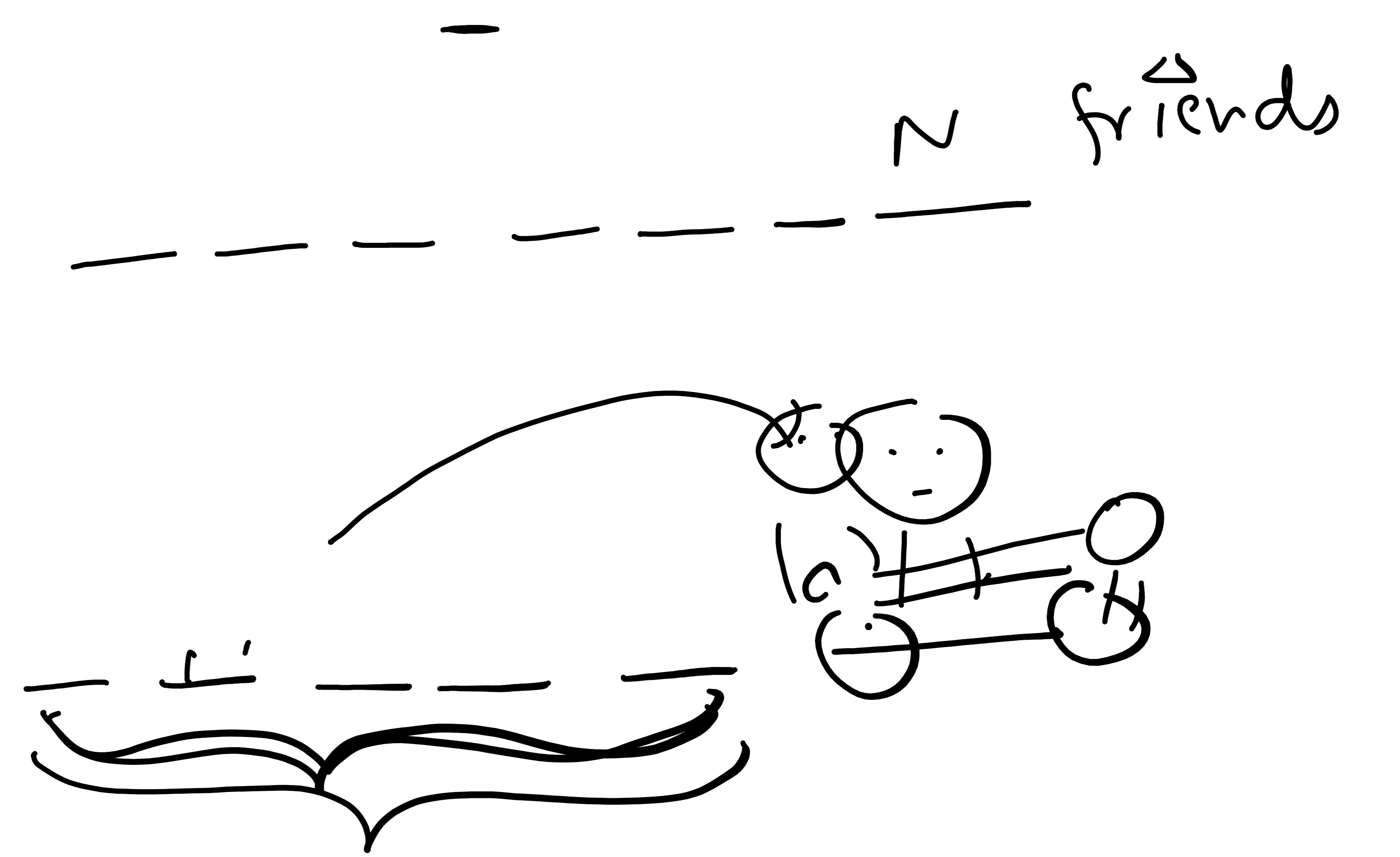
$$2^2^n$$

(1, 2, 3)

$n=3$

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

} $\Rightarrow 4$ ways



$${}^{N-1}c_1 f(N-2)$$

$$+ f(N-1)$$

$$f(N)$$

$$f(N-1) + {}^{N-1}c_1 f(N-2)$$

