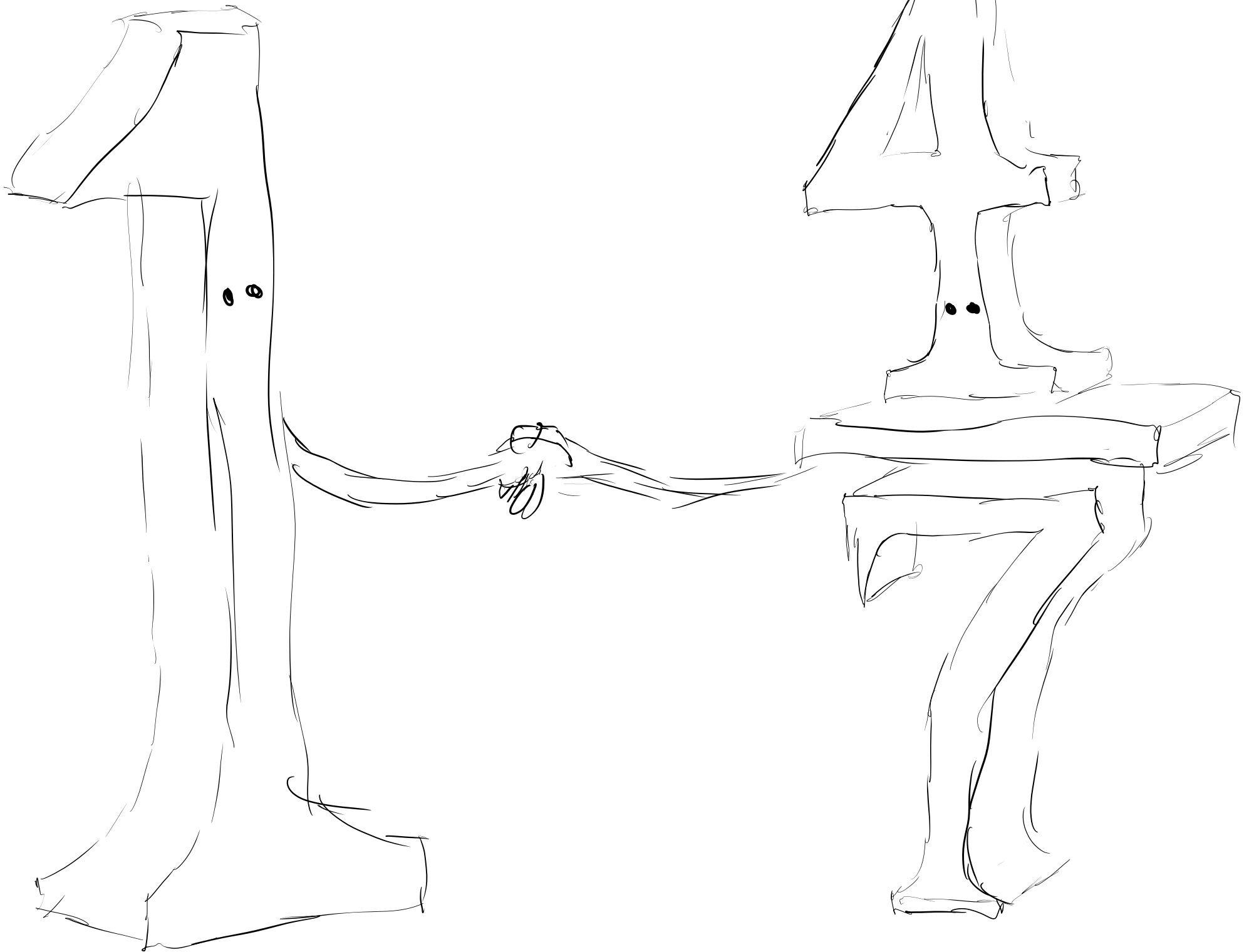


Problem

Balancing

Trees

∞



$$\mathbb{Z}^+ \text{ bij } \mathbb{Q}^+$$

$$1 \mapsto \frac{1}{1}$$

$$2 \mapsto \frac{1}{2}$$

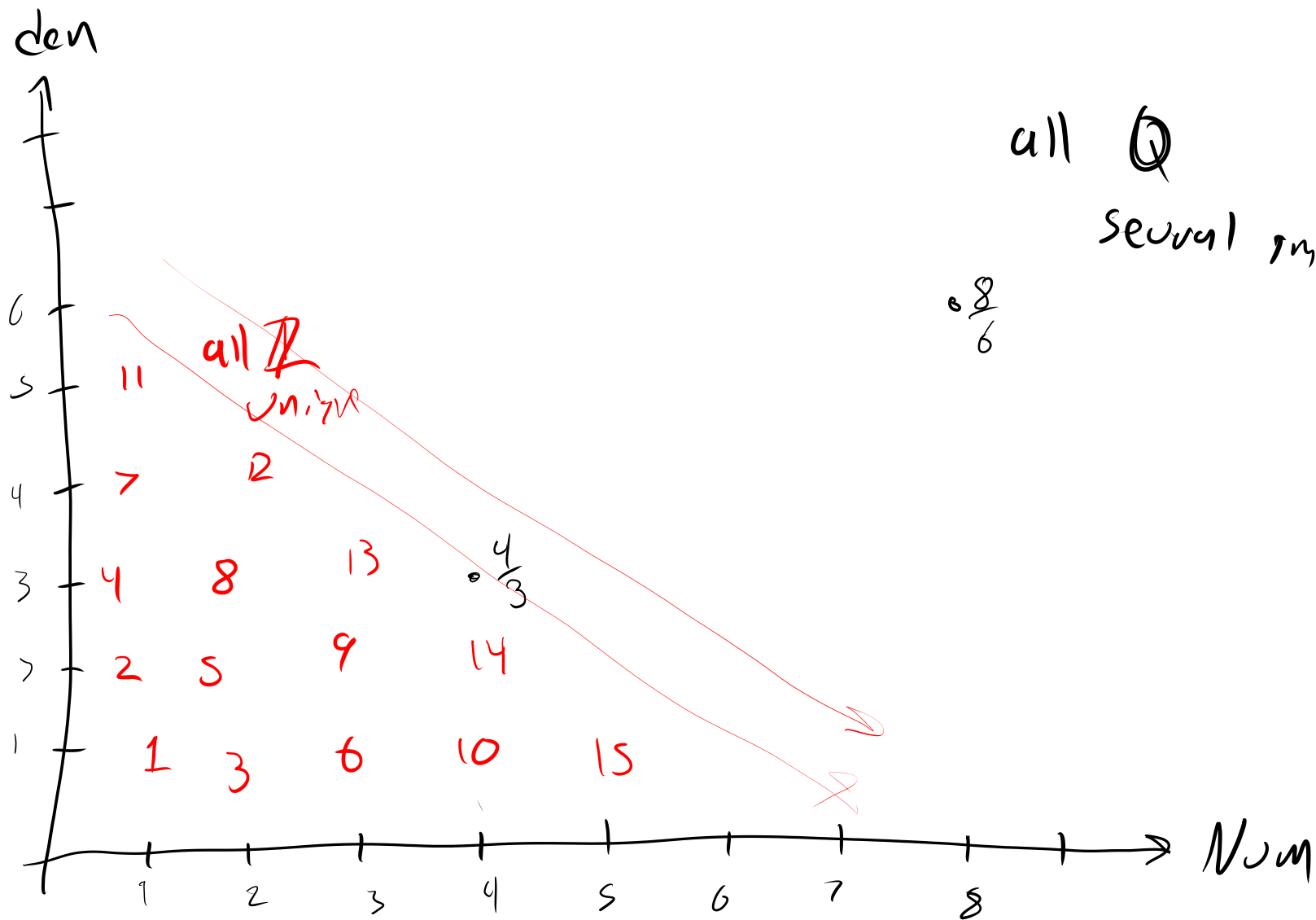
$$3 \mapsto \frac{1}{3}$$

⋮

$$x \mapsto \frac{1}{x}$$

$$|\mathbb{Z}^+| \leq |\mathbb{Q}^+|$$

$$|\mathbb{Z}| \approx |\mathbb{Q}|$$



$$f: \mathbb{Z} \rightarrow \mathbb{Z}^+$$

$$\mathbb{Z}^+$$

h/y_0

$$f(x) = \begin{cases} 2x & \text{if } x \geq 0 \\ -2x-1 & \text{if } x < 0 \end{cases}$$

$$f^{-1}(x) = \begin{cases} \frac{x}{2} & \text{if } x \text{ is even} \\ \frac{x+1}{-2} & \text{if } x \text{ is odd} \end{cases}$$

Code

→
Compiler

in memory

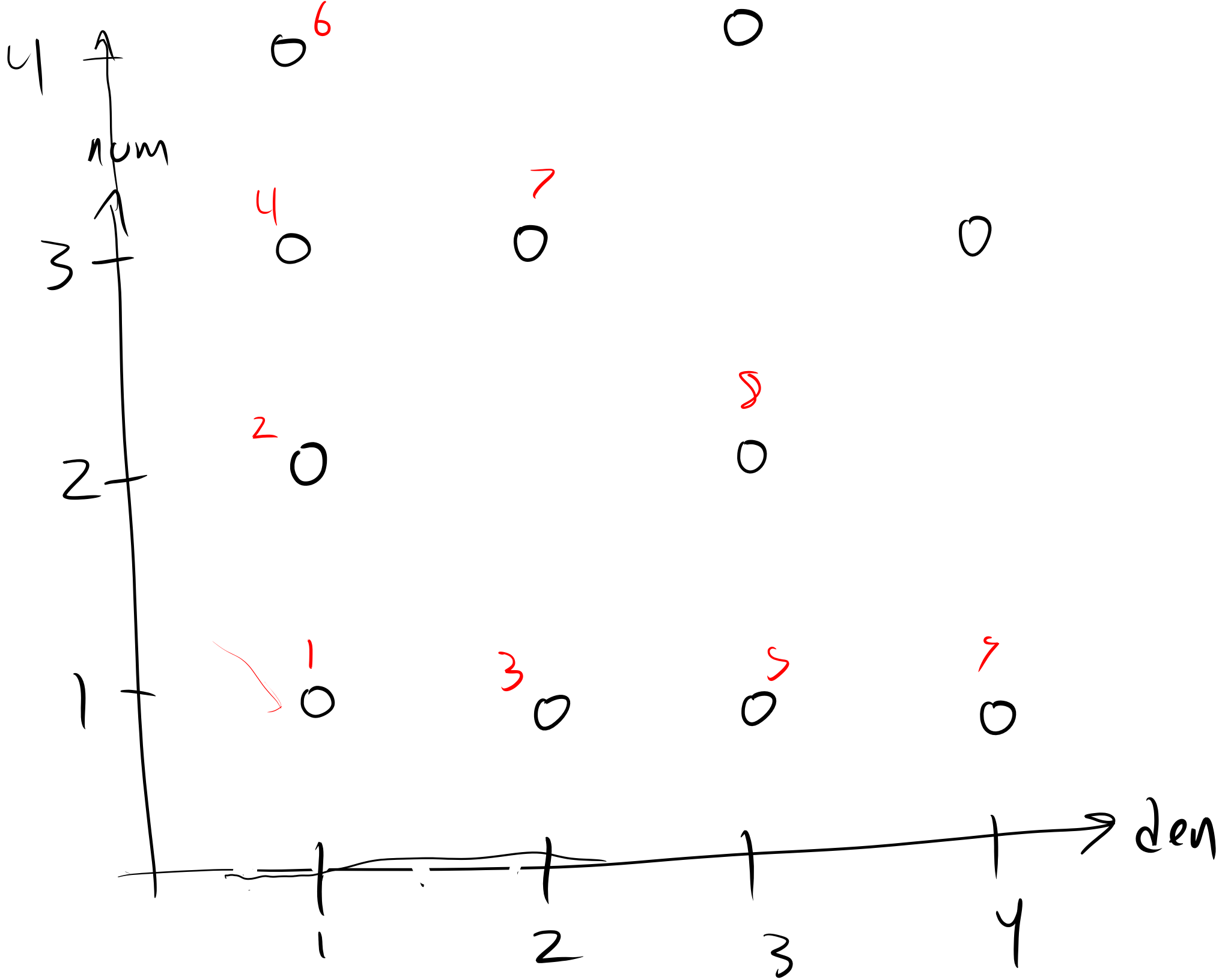
→ behavior
Processor

$\frac{n}{d}$

178320103
000006017

010708030200011073

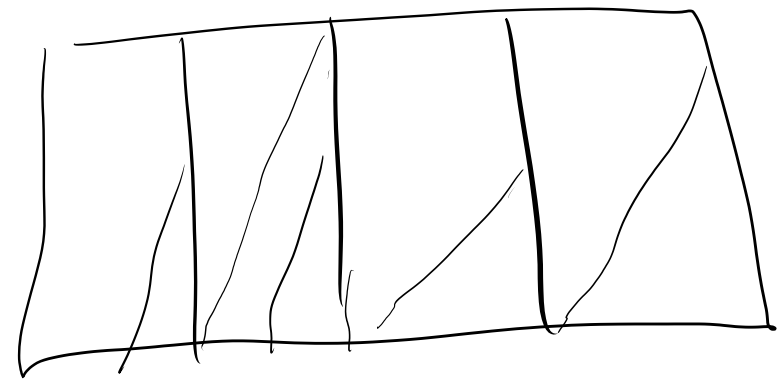
(4853, 11, 7070, 2) 0704 0008 07192013



$$|\text{seats}| > |\text{students}|$$

Pigeonhole principle

all students sit
 ≤ 1 student / seat



Somebody has to share

hair $\leq 200,000$

123,456

\rightarrow | posish hair camp | $<$ | POP. of VA |

Sets A, B

$$|A| = |B|$$

iff



bijection

$$R: A \rightarrow B$$

district

python

programs

Java