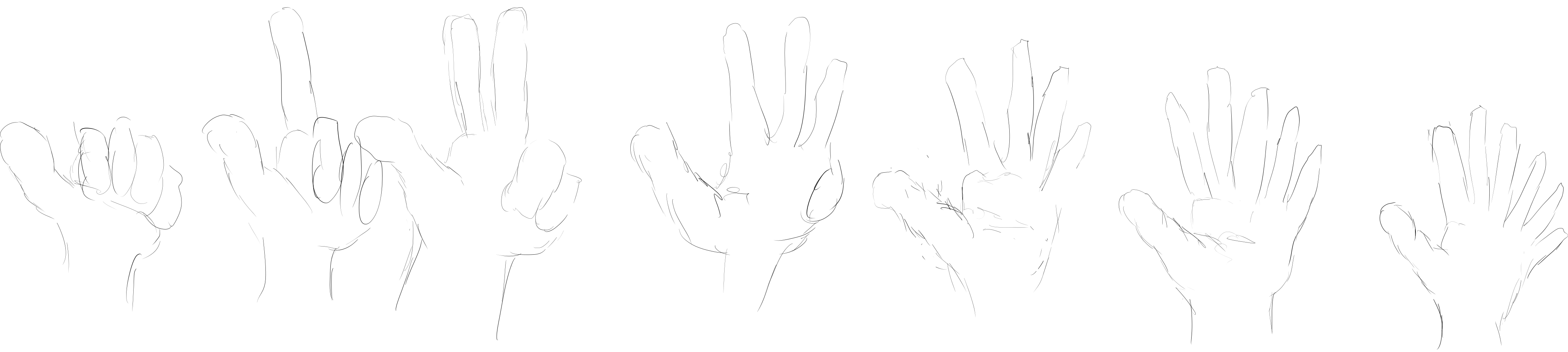

Set X closed under operation $\odot$

$\equiv$

$\forall x, y \in X, \; x \odot y \in X$

a

ab

aaa

aaba

aaaaa

aaaaba

print("hello")

reduced "hello Word" to print

$HW \leq_{python} print$

$$6\sum_{i=0}^{n} i^3 - i = \binom{n+2}{4}$$

Proof: assume $\exists n.\ 6\sum_{i=0}^{n} i^3 - i \neq \binom{n+2}{4}$. Consider the smallest such n; call it n_0. Either n_0 is 0 or >0.

Case $n_0 = 0$: We have $6\sum_{i=0}^{0} i^3 - i \neq \binom{0+2}{4}$. The LHS is 0 becaus it is the sum of 0 numbers. $\binom{2}{4}$ has no option $= 0$ is nonsense but that means $0 \neq 0$, which is a contradiction

Case $n_0 > 0$: consider $x = n_0 - 1$. becaus $n_0 \in \mathbb{N}$ and $n_0 > 0$, $x \in \mathbb{N}$. then $6\sum_{i=0}^{x} i^3 - i = \binom{x+2}{4}$ because n_0 was the smallest where that was not true. add $6(n_0^3 - n_0)$ to both sides to get

$$\underbrace{6\left(n_0^3 - n_0 + \sum_{i=0}^{n_0-1} i^3 - i\right)}_{6\sum_{i=0}^{n_0} i^3 - i} = \underbrace{\binom{n_0-1+2}{4} + 6(n_0^3 + n_0)}_{\frac{(n_0+1)(n_0+0)(n_0-1)(n_0-2)}{24} + 6(n_0^3+n_0)}$$

$\vdots$ math

$$\frac{(n_0+2)(n_0+1)(n_0)(n_0-1)}{24}$$

$$\binom{n_0+2}{4}$$