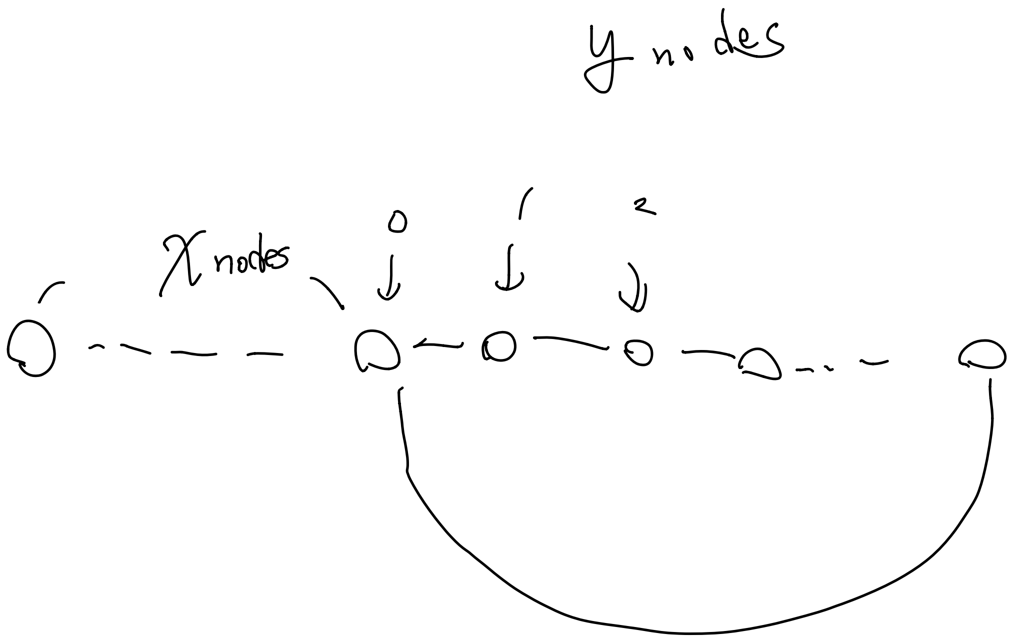


$H = 2T$

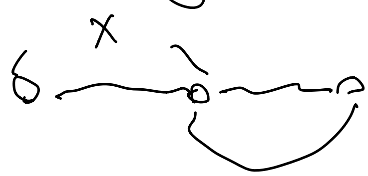
$(2T - x) \bmod y$

$(T - x) \bmod y$

Proof: There must exist $T \geq x$ s.t.

$$(2T - x) \bmod y = (T - x) \bmod y$$

$$\Rightarrow T \bmod y = 0$$



When $T = x$

$\underset{T-x}{\text{tortise}}$: 0, 1, 2, 3, ...

$\underset{2T-x}{\text{hare}}$: $x \bmod y$, $x+2 \bmod y$ ...

We claim: They meet at k-th node in the cycle

$$(x + 2k) \bmod y = k \bmod y$$

$$\Rightarrow (\underbrace{x}_{\text{fixed}} + k) \bmod y = 0$$

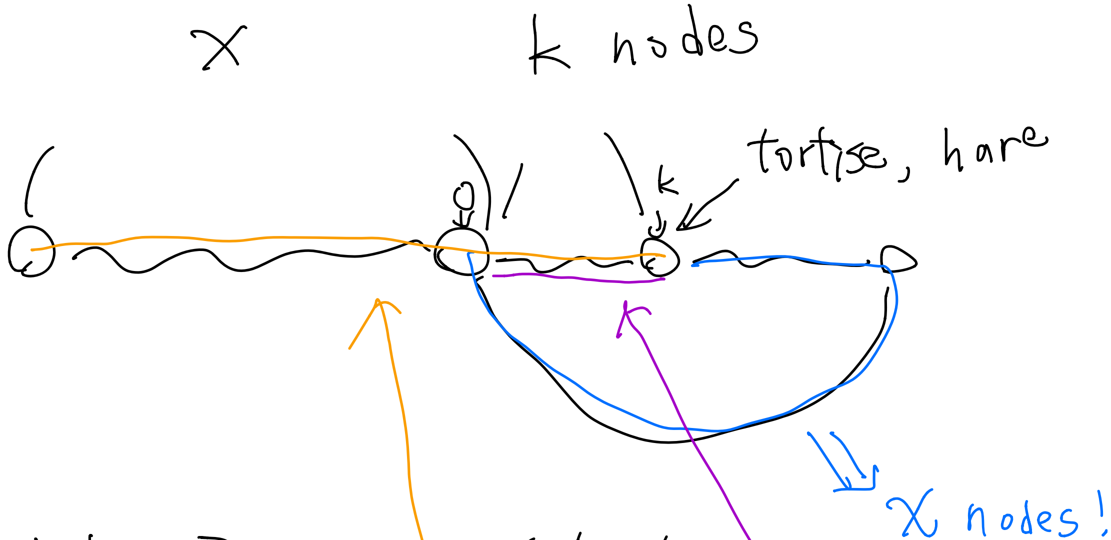
(note: $x > y$ is possible

within $[0, y-1]$ must contain

a k s.t. $(x+k) \bmod y = 0$

$\Rightarrow$ Before tortise finish the first cycle

$$\Rightarrow T = x + k$$



$$\Rightarrow H = 2T = 2x + 2k$$

$$= (x+k) + (x+k)$$

⇒ We fix tortise to the original node and move hare to the beginning.

Move, tortise and hare at same speed until they meet.