$$\pi = \overset{\text{odd}}{(1\ 4)}\overset{\text{odd}}{(2\ 3)}\overset{\text{even}}{(5)} = \text{even}.$$

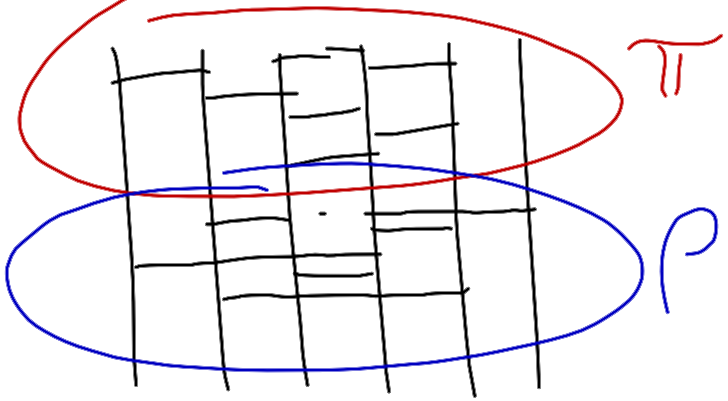
$$\rho = \overset{\text{odd}}{(1\ 3\ 5\ 4)}\overset{\text{even}}{(2)} = \text{odd}$$

$$\rho \circ \pi = \overset{\text{even}}{(1)}\overset{\text{odd}}{(2\ 5\ 4\ 3)} = \text{odd}$$

$$\boxed{\begin{array}{l} \text{odd} + \text{odd} = \text{even} \\ \text{odd} + \text{even} = \text{odd} \\ \text{even} + \text{odd} = \text{odd} \\ \text{even} + \text{even} = \text{even} \end{array}}$$

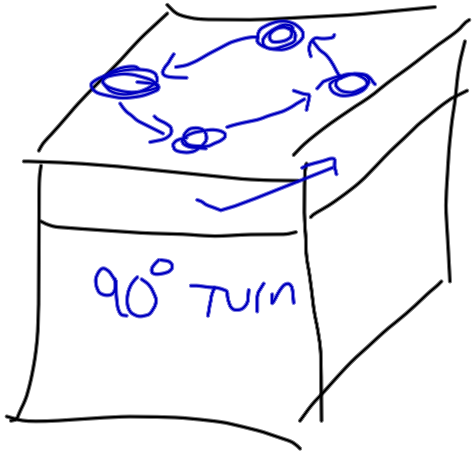
Theorem: the parity of the composition of two permutations is the sum of their parities.

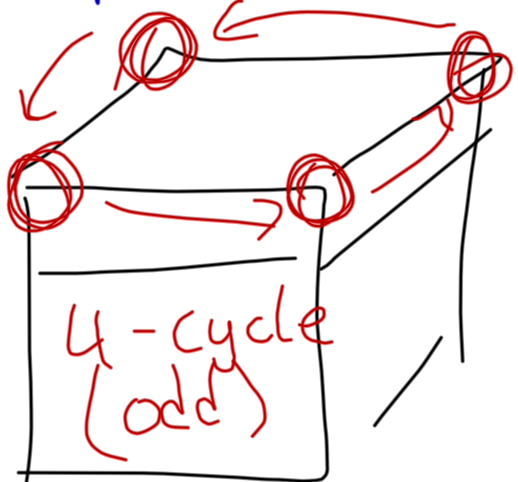
$\rho \circ \pi$



Rubik's Cube

odd parity 4-cycle.
edge pieces

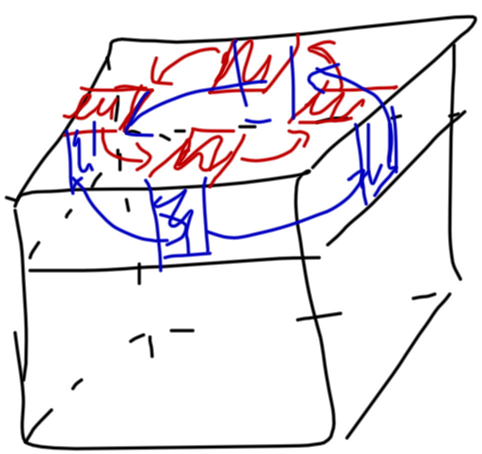




<u>Thm</u>: you can't swap 2 corners on Rubik's cube, unless you also swap some edges.

Stickers on the cube. 9 per face.

Edge stickers 4 per face, 24 per cube.



4-cycle odd

4-cycle odd

even