

First, we reproduce the Cayley table of  $A_4$ .

	(1)	(12)(34)	(13)(24)	(14)(23)	(123)	(243)	(142)	(134)	(132)	(143)	(234)	(124)
(1)	(1)	(12)(34)	(13)(24)	(14)(23)	(123)	(243)	(142)	(134)	(132)	(143)	(234)	(124)
(12)(34)	(12)(34)	(1)	(14)(23)	(13)(24)	(243)	(123)	(134)	(142)	(143)	(132)	(124)	(234)
(13)(24)	(13)(24)	(14)(23)	(1)	(12)(34)	(142)	(134)	(123)	(243)	(234)	(124)	(132)	(143)
(14)(23)	(14)(23)	(13)(24)	(12)(34)	(1)	(134)	(142)	(243)	(123)	(124)	(234)	(143)	(132)
(123)	(123)	(134)	(243)	(142)	(132)	(124)	(143)	(234)	(1)	(14)(23)	(12)(34)	(13)(24)
(243)	(243)	(142)	(123)	(134)	(143)	(234)	(132)	(124)	(12)(34)	(13)(24)	(1)	(14)(23)
(142)	(142)	(243)	(134)	(123)	(234)	(143)	(124)	(132)	(13)(24)	(12)(34)	(14)(23)	(1)
(134)	(134)	(123)	(142)	(243)	(124)	(132)	(234)	(143)	(14)(23)	(1)	(13)(24)	(12)(34)
(132)	(132)	(234)	(124)	(143)	(1)	(13)(24)	(14)(23)	(12)(34)	(123)	(142)	(134)	(243)
(143)	(143)	(124)	(234)	(132)	(12)(34)	(14)(23)	(13)(24)	(1)	(243)	(134)	(142)	(123)
(234)	(234)	(132)	(143)	(124)	(13)(24)	(1)	(12)(34)	(14)(23)	(142)	(123)	(243)	(134)
(124)	(124)	(143)	(132)	(234)	(14)(23)	(12)(34)	(1)	(13)(24)	(134)	(243)	(123)	(142)

Consider the (normal) subgroup  $H = \{(1), (12)(34), (13)(24), (14)(23)\}$ .

We have the following cosets of  $H$ :

- $H = (1)H = (12)(34)H = (13)(24)H = (14)(23)H = \{(1), (12)(34), (13)(24), (14)(23)\}$
- $(123)H = (134)H = (243)H = (142)H = \{(123), (134), (243), (142)\}$
- $(132)H = (234)H = (124)H = (143)H = \{(132), (234), (124), (143)\}$

**Example:** Let's multiply cosets.

$$(243)H \times (124)H = (243)(124)H = (14)(23)H = H$$

Therefore,  $((243)H)^{-1} = (124)H$ .

We have the Cayley table for  $A_4/H$ :

	H	(123)H	(132)H
H	H	(123)H	(132)H
(123)H	(123)H	(132)H	H
(132)H	(132)H	H	(123)H

Notice that since we ordered the elements in the original Cayley table according to cosets of  $H$ , we have  $4 \times 4$  "blocks" of the original table corresponding to the entries of the quotient group's table.

Finally, we notice that  $A_4/H \cong \mathbb{Z}_3$ .