f: A ~~-> B => f-~~image of a = f(a)
g: B-> C

g.f: A -> C provided that range.f = dom.g

g.f(a) = g[f(a)], for all a in A.

(a1, a2, ..., ar)

f(a1) = a2
f(a2) = a3 => f(f(a1)) = a3 => f^2(a1) = a3.....
f(a3) = a4 => f^3(a1) = a4....
....
f^r-1(a1) = ar
f(ar) = a1 => f^r(a1) = a1.

f^m = f.f......f (m times)

f^m.g^m = f.f.....f.g.g....g
= f.f......(f.g).g....g
=h1
(fg)^m = fg.fg.....fg
= f.(g.f).g....fg = h2
= f.f.g.g....

(1 6) (1 4) (1 2) = (1 2 4 6)

LHS = (1 2 3 4 5 6) -> f
6 2 3 4 5 1
. (1 2 3 4 5 6) -> g
4 2 3 1 5 6
. (1 2 3 4 5 6)
2 1 3 4 5 6
= (1 2 3 4 5 6) -> f[g(ai)] a1 = 1, g(a1) = g(1) = 4 => f[g(1)] = f(4) = 4
4 2 3 6 5 1
. (1 2 3 4 5 6)
2 1 3 4 5 6
= (1 2 3 4 5 6)
2 4 3 6 5 1
= (1 2 4 6). (3). (5)
2 4 6 1 3 5
= (1 2 4 6) = RHS

p = (1 2 3 4 6) = (1 6) (1 4) (1 3) (1 2) = even permutation -> An
q0.p = (2 3). (1 6) (1 4) (1 3) (1 2) = odd permutation -> Bn

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f(x) = x
g(x) = x+1 , x is real

g.f: R -> R

$g.f(x) = g[f(x)] = g(x) = x+1$
$f.g(x) = f[g(x)] = f(x+1) = x+1$

$$(1\ 2\ 4\ 6) = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 3 & 6 & 5 & 1 \end{pmatrix}$$

$$(1).(2) = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 4 & 5 \end{pmatrix} . \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 4 & 5 \end{pmatrix} = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 4 & 5 \end{pmatrix}$$

$$f = (1\ 2\ 3) = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{pmatrix}$$

$$f^{-1}.g = \begin{pmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \end{pmatrix} . \begin{pmatrix} 1 & 3 & 2 \\ 3 & 2 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{pmatrix} = (1\ 2\ 3)$$