

This sheet contains questions for you to work through in your tutorial, singly or in a group.

It's important to work through lots of questions for practice. Remember that mathematics is not a spectator sport! If you want more questions, look at the "Extra questions" sheets on QMPlus.

1 Let $g = (1\ 5\ 6\ 10\ 4\ 9)(2\ 8\ 11\ 3)$ and $h = (1\ 10\ 3\ 9\ 7\ 6\ 11)(2\ 8)(4\ 5)$ be permutations in S_{11} .

- Write g in two-line notation.
- Calculate h^{-1} , $g \circ h$, and $h^{-1} \circ g \circ h^1$.
- What is the order of g ? What is the order of $h^{-1} \circ g \circ h$? Explain how and why these two numbers are related.

2 Does S_8 contain

- a permutation of order 14?
- a permutation of order 15?
- a permutation of order 16?

Explain why.

3 Let the operation \circ be given on a set $G = \{e, a, b, c, d\}$ by the following table.

\circ	e	a	b	c	d
e	e	a	b	c	d
a	a	e	d	b	c
b	b	c	e	d	a
c	c	d	a	e	b
d	d	b	c	a	e

Is (G, \circ) a group? Explain.

¹If you want more questions of this type, see <http://www.maths.qmul.ac.uk/fink/PermutationComputations.html>.

4 Let G be the set of integers with the operation \circ defined by

$$x \circ y = x + y + 1.$$

Prove that (G, \circ) is a group.