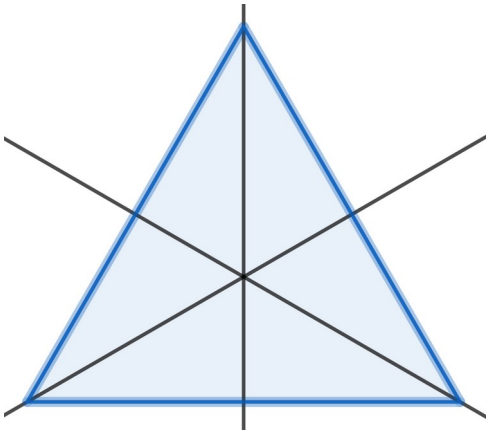
Symmetries of a Triangle



The symmetries of the equilateral triangle are:

e	do nothing
a	rotate 120° about the centre (anticlockwise)
b	rotate 240° about the centre (anticlockwise)
p	rotate 180° about the line through the bottom left-hand corner
q	rotate 180° about the line through the bottom right-hand corner
r	rotate 180° about the line through the top corner

We can combine symmetries.

$a*p$ means you do p and then you do a This means you do p first.

Take a piece of card, in the shape of an equilateral triangle.

If you do p and then do a it will end up in the same position as if you had just done r

Try it.

So $a*p$ is the same as r So $a*p=r$

Show that $p*a=q$ So $a*p$ and $p*a$ are not the same.

* is not commutative.

Here is the combination table. You should check some of these.

*	e	p	q	r	a	b
e	e	p	q	r	a	b
p	p	e	a	b	q	r
q	q	b	e	a	r	p
r	r	a	b	e	p	q
a	a	r	p	q	b	e
b	b	q	r	p	e	a

Note $a*p$ goes in the a row and the p column.

And $p*a$ goes in the p row and the a column.

The set $\{e, p, q, r, a, b\}$ with the binary operation * forms a group.