

The *order* of an element  $g$  in a group  $G$  is the least natural number  $n$  such that  $g^n = e$ , if such a number exists (otherwise we say the order of  $g$  is infinite).

1. Find the orders of the elements of  $S_5$  below:

$$\alpha = (12)$$

$$\alpha = (123)$$

$$\alpha = (1234)$$

$$\alpha = (12345)$$

2. Find an element of  $S_5$  that has an order different from those found above.

3. Let  $\alpha$  be an element of  $S_5$ . What is  $\alpha^{120}$ ?

4. Is there an element in  $S_5$  that has order 120?

5. What is the largest order of any element in  $S_5$ ?