Worksheet 10: Orders of Elements in Groups, continued

Math 335

Reporter:

Recorder:

Equity Manager:

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1. Let

$$\alpha = (1, 4, 3) \in S_4.$$

Calculate α^2, α^3, and so on, until you find a power of α that equals e. (In other words, calculate the order of α.)

2. Do you have any guesses about the order of the element

$$(1, 4, 3, 2) \in S_4,$$

without doing any calculation?

3. Calculating orders of elements in S_n that have more than one cycle is trickier, but it does follow a pattern. To explore this, have each person in the Breakout Room choose a different one of the following elements of S_6 and compute its order.

   - $f = (1, 2)\ (4, 5)$
   - $g = (1, 2, 3)\ (4, 5, 6)$
   - $h = (1, 4)\ (2, 3, 5, 6)$
   - $k = (1, 2, 3)\ (5, 6)$

   (This may take a fair amount of computation! Take your time, and feel free to scroll to a different area of the Limnu board if you need more space.)

4. Once each member of the Breakout Room has computed the order of an element of S_6, share your answers with one another. With all of this data, can you conjecture a formula for the order of any element of S_n? If so, try testing your conjecture on an element not in the above list.