Section 8, p83 # 11-17, 23-26

$$\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 1 & 4 & 5 & 6 & 2 \end{pmatrix} \qquad \tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 1 & 3 & 6 & 5 \end{pmatrix} \qquad \mu = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 5 & 2 & 4 & 3 & 1 & 6 \end{pmatrix}$$

Let A be a set and let $\sigma \in S_A$. For a fixed $a \in A$, the set

$$\mathcal{O}_{a.\sigma} = \{\sigma^n(a) : n \in \mathbb{Z}\}$$

is the **orbit** of a **under** σ. In Exercises 11 through 13, find the orbit of 1 under the permutation defined prior to Exercise 1.

11. σ

$1 \mapsto 3 \mapsto 4 \mapsto 5 \mapsto 6 \mapsto 2 \mapsto 1$

12. τ

$1 \mapsto 2 \mapsto 4 \mapsto 3 \mapsto 1$

13. μ

$1 \mapsto 5 \mapsto 1$

14. In Table 8.8 (not shown), we used $\rho_0, \rho_1, \rho_2, \mu_1, \mu_2, \mu_3$ as the names of the 6 elements of S_3. Some authors use the notations $\epsilon, \rho, \rho^2, \phi, \rho\phi, \rho^2\phi$ for these elements. Verify *geometrically* that their six expression do give all of S_3.

answer

15. With reference to Exercise 14, give a similar alternative labeling for the 8 elements of D_4 in Table 8.12 (not shown)

answer

16. Find the number of elements in the set $\{\rho \in S_4 : \rho(3) = 3\}$.

answer

17. Find the number of elements in the set $\{\rho \in S_5 : \rho(2) = 5\}$.

answer

In this section we discussed the group of symmetries of an equilateral triangle and of a square. In Exercises 23 through 26, give a group that we have discussed in the text that is isomorphic to the group of symmetries of the indicated figure. You may want to label some special points on the figure, write some permutations corresponding to symmetries, and compute some products of permutations.

23. The figure in Fig. 8.21 (a)

answer

24. The figure in Fig. 8.21 (b)

answer

25. The figure in Fig. 8.21 (b)

answer

26. The figure in Fig. 8.21 (b)

answer