Exercise 1. Let $G = S_3$ and let $H = \{e, (12)\}$.

(a) Find all left cosets of H in G.

(b) Find all right cosets of H in G.

Exercise 2. Let $\mathbf{R}^2$ be the group $\mathbf{R} \times \mathbf{R}$. This is the set of pairs (a, b) where a and b are real numbers. The group operation is

$$(a, b) + (a', b') + (a + a', b + b')$$

(a) Let $G \subset \mathbf{R}^2$ be the set of all multiples of the vector $(2, 1)$. Show that G is a subgroup of $\mathbf{R}^2$.

(b) Draw a picture illustrating the (left) cosets of G in $\mathbf{R}^2$.