1. Write down five different elements $g \in S_5$ which conjugate $(12)(34)$ into $(13)(24)$. That is, find five different elements $g \in S_5$ which satisfy the equation

$$g(12)(34)g^{-1} = (13)(24)$$

2. Write down a detailed argument to show that the $(n-1)n/2$ transpositions $(pq)$ for $1 \leq p < q \leq n$ generate all of $S_n$.

3. Write down a detailed argument to show that the two elements $(12)$ and $(1 \ldots n)$ generate all of $S_n$.

4. Verify that $\{(12), (123)\}, \{(12), (23)\}$ are two generating sets for $S_3$. Also, draw the Cayley graphs of $S_3$ with respect to these two generating sets. You should draw two separate graphs.

5. Compare the Cayley graph of $S_3$ with respect to $\{(12), (123)\}$ with the Cayley graph of $\mathbb{Z}_6$ with respect to $\{2, 3\}$. Any similarities? Any differences?

6. Draw the Cayley graph of $S_4$ with respect to the generating set $\{(12), (23), (34)\}$ (also verify that this is indeed a generating set).