Problems for the Toy Version

1. **Write RC^2 in permutation notation.**
2. **From our set of elements (the naming config we chose), which one is the same as RC^2?**
3. Show that $CR(C^2) = C(RC^2)$ by drawing out the numbered boards and transforming them. (This will require 4 drawings for each side of the equals sign.)
4. Show that $CR(C^2) = C(RC^2)$ using permutation composition.
5. Show that the Toy version group is not commutative (non-abelian) over composition. You can show this by showing that $CR \neq RC$. What does this result mean in terms of our moves?
6. Find the inverses of C^2R, C^3, C^3R
7. Try to find another Hamiltonian cycle using either Cayley graph presented.
8. Observe by way of Cayley graph that without the Up transformation the God's number of the Toy version is 3. Start with the Identity element and find the element that takes no less than 3 transformations to reach. Then repeat this process for the remaining 7 elements.
9. If we remove the Up transformation the graph becomes a *3-regular graph* is this graph *strongly regular*? Why or why not?
10. With the previous exercise in mind, is it possible to contain every element of the graph into only two disjoint sets of non-adjacent vertices?

Problems for the 4x4 Easy Version

1. **Write $\boldsymbol{RC^2}$ and $\boldsymbol{C^2R}$ in cycle notation.**
2. Is this group commutative? Why or why not?
3. **Show that $\boldsymbol{CR(C^2) = C(RC^2)}$ using permutation composition.**
4. Write RU^2 and U^2R in cycle notation.
5. Write CR^2U^3 and CU^3R^2 in cycle notation.
6. **Choose 3 elements in subgroup $\boldsymbol{H}$ and determine which element they connect to by way of a $\boldsymbol{C}$ transformation.**
7. Certain groupings of elements in this group are commutative, can you describe when two elements are commutative?
8. Find all of the elements whose inverse is itself.
9. Confirm that $(CU)^3 = I$ [relevant to Hamilton cycle on slide 92]
10. Observe by way of Cayley graph that without the Up transformation the God's number of the Toy version is 3. Start with the Identity element and find the element that takes no less than 3 transformations to reach. Then repeat this process for the remaining 7 elements.
11. If we remove the Up transformation the graph becomes a *3-regular graph* is this graph *strongly regular*? Why or why not?
12. With the previous exercise in mind, is it possible to contain every element of the graph into only two disjoint sets of non-adjacent vertices?
13. Create the adjacency matrix for the Easy version of the4×4. Use Matlab or Maple to find its God's Number.