1. Find the number of necklaces with 6 beads if every bead can be either red, blue, or yellow and such that each color is used at least once and at most four times.

2. Find the cycle index of the group of rotations of the cube acting on the vertices of the cube.

3. Find the number of colorings of the faces of the cube in which there are 2 red, 3 yellow, 1 blue faces.

4. Find the number of colorings of the faces of the tetrahedron with three colors, red, blue, and green in which there are at least two red faces.

5. The vertices of the following figure are colored with colors red, blue, or green. Two colorings are considered equivalent if one can be obtained from another by rotating or flipping the figure.

- Find the cycle index of the group of symmetries.
- Find the number of non-equivalent colorings with 3 red, 2 blue, and 3 green vertices.

6. The edges of the figure from Problem 5 are colored with red, blue, or green. Two colorings are considered equivalent if one can be obtained from another by rotating or flipping the figure.

- Find the cycle index of the group of symmetries.
- Find the number of non-equivalent colorings of the edges with red, blue and green in which there is exactly one red edge.