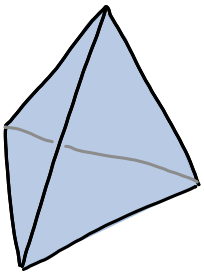
Exam 2

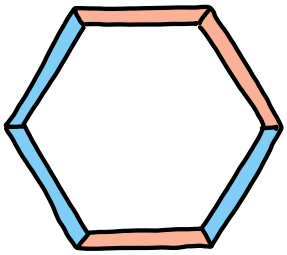
Combinatorics, Dave Bayer, March 18-21, 2021

To receive full credit for correct answers, please show all work.

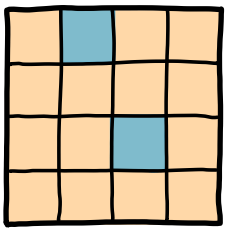
[1] How many ways can we choose three edges of a regular tetrahedron, up to rotational symmetry? Confirm your answer by finding all patterns up to symmetry.



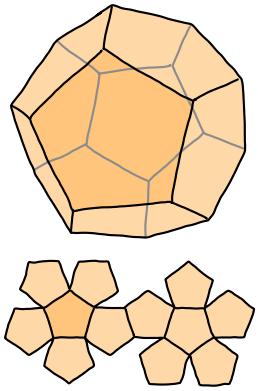
[2] How many ways can we k-color the six sides of a regular hexagon, up to rotational and flip symmetries? Confirm your answer for $k = 2$, by finding all patterns up to symmetry.



[3] How many ways can we choose two squares of a 4×4 board, up to rotational and flip symmetries? Confirm your answer by finding all patterns up to symmetry.



[4] How many ways can we choose 2 or 3 faces of a regular dodecahedron up to rotational symmetry? Confirm your answers by finding all patterns up to symmetry.



[5] How many ways can we choose two cubes from a $3 \times 3 \times 3$ array of 27 cubes, up to rotational symmetry? (This is not a *Rubik's Cube*. The symmetries are the 24 rotations we have studied of a solid cube.)