

Colorings of Objects

How many ways are there to paint the faces of a cube, if each face is red or blue? Since there are 8 faces and 2 choices of color for each face, there are $2^8 = 256$ ways to apply one color to each face. However, due to the symmetry of the cube, many of these colorings are really the same.

1. How many ways are there to make a necklace for your mother with black and white pearls, if there is/are ...
 - (a) 1 pearl
 - (b) 2 pearls
 - (c) 3 pearls
 - (d) 4 pearls
 - (e) 5 pearls
 - (f) 6 pearls
2. For each object and number, try to find: How many ways are there to paint the faces of a (blank) with (blank) colors? (For a challenge, try to find a formula for n colors, in terms of n .)
 - (a) Tetrahedron – 2, 3, 4, 5, ...
 - (b) Cube – 2, 3, 4, ...
 - (c) Dodecahedron – 2, 3, ...

Symmetry

Colorings Fixed by Symmetry

Identity

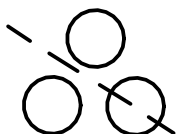
Rotate 120°



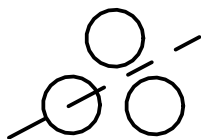
Rotate 240°



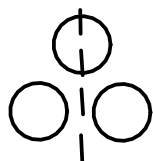
Reflect



Reflect



Reflect



Coloring

Symmetries Which Fix Coloring

