S15 Exam 2 Problem 1
Combinatorics, Dave Bayer

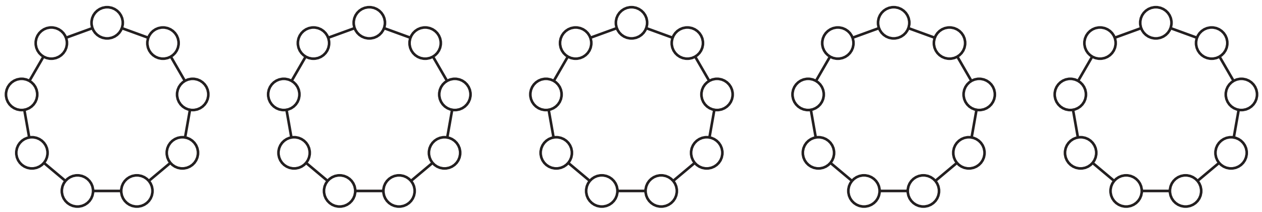
exam01a2p1

[Reserved for Score]

Exam 01

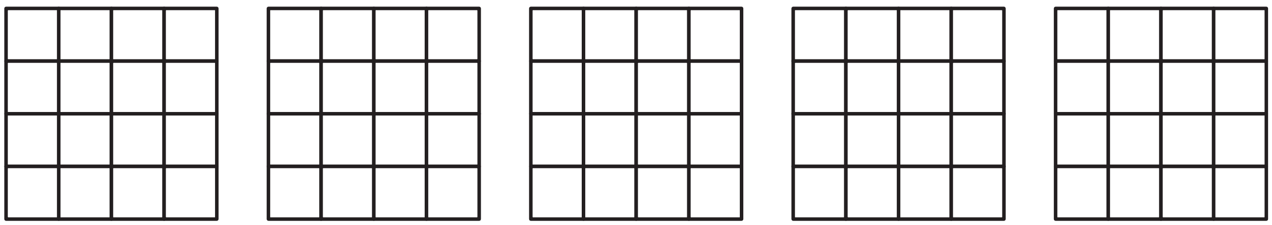
Name ______________________________ Uni ______________

[1] Up to rotational symmetry, how many nine bead necklaces have three red beads and six blue beads?



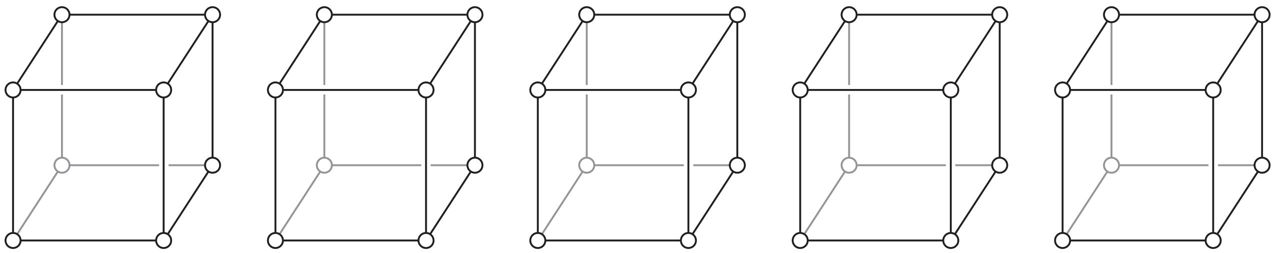
Exam 01

[2] Up to symmetry (rotations and flips), how many ways can the squares of a 4 by 4 checkerboard be colored using n colors?



Exam 01

[3] Up to rotational symmetry, how many ways can the eight corners of a cube be colored using n colors?



Exam 01

[4] Give a proof of Burnside's Lemma: If a group G acts on a set of patterns X, then the number of distinct patterns up to symmetry is equal to the average number of patterns fixed by an element of the group:

$$\frac{1}{|G|} \sum_{g \in G} |X^g|$$

S15 Exam 2 Problem 5
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exam01a2p5

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Exam 01

[5] Up to symmetry (rotations and flips), how many ways can one mark six out of the 24 triangles of the following figure?