PROBLEMS FROM DAY 1

Problem 1. Using the Counting Formula, determine the order of the rotation group of the cube. Try to do this in multiple ways (for example by considering the action of the group on vertices, edges, faces, opposite pairs of faces, diagonal lines, etc...).

Problem 2. Let G be a group of order 10. Rule out all but one of the following class equations, and explain your reasoning.
(a) $1 + 1 + 1 + 2 + 5$
(b) $1 + 2 + 2 + 5$
(c) $1 + 2 + 3 + 4$
(d) $1 + 1 + 2 + 2 + 2 + 2$

Problem 3. Determine the class equation for the following groups:
(a) the Quaternion group Q_8
(b) the Klein four group K_4
(c) D_5
(d) D_6
(e) D_n
(f) S_3
(g) S_4

Problem 4. Determine the class equation for:
(a) the rotation group of the regular tetrahedron, and
(b) the rotation group of the cube.

Problem 5. Describe the conjugacy classes of the group M of rigid motions of the the plane $\mathbb{R}^2$.