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Crystals: Geometry and Groups

Guide for Curriculum Unit 89.06.05
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Crystals are fascinating to people. Crystals are an opportunity to apply math to real life objects. Crystals make us ask questions. Finding the answers to some of the questions is the purpose of this unit. The unit discusses growing crystals, the history and theory of crystals, group theory, Miller indices, and mechanical drawing.

The symmetries of the equilateral triangle and the square are developed. The symmetries of the square are used to solve a chess problem. A system of naming groups is introduced with a small discussion. The system is called Hermann-Mauguin.

Miller indices are a technique for showing the slope of a plane in three-space. They are used here to allow us to saw a dodecahedron out of a solid block.

Mechanical drawing in the math classes is introduced as a chance for students to practice visualizing three-dimensional objects.

The unit may be thought of as propaganda for the math teacher, sidelights to mention when teaching the standard curriculum. It may be used as an overview and introduction to crystallography. It may be divided into parts for students to read independently, namely, the groups, Miller indices, and mechanical drawing.

Lastly, the bibliography contains some great books with great illustrations.

(Recommended for Geometry classes, grade 10; Algebra II classes, grade 11; Algebra III or Trigonometry classes, grade 12; and Independent Study classes, grades 10-12.)

Key Words

Mechanical Drawing Industrial Arts Geometry Three Dimensional Mathematics Crystals Geology Earth Science