

Magic Squares

This lesson is modified from

<http://illuminations.nctm.org/LessonDetail.aspx?id=L263>

With information from

http://en.wikipedia.org/wiki/Magic_square

<http://www.pballew.net/magsquar.html>

Time Alloted: 2 Class Periods

Teachers: Stewart Hengeveld and Diana Sanchez

Goals: For students to understand how magic squares work and how to construct 3x3, 4x4 and possibly higher degrees of magic squares.

Objectives: Use Operations with Integers to solve problems. Analyze and Represent Patterns with Symbolic Rules

NJCCS: 4.1.7B – Numerical Operations, 4.2.7B Transforming Shapes, 4.3.7A Patterns,

Materials:

Magic Square Worksheet

Magic Square Power Point

Procedure:

1. Assess students prior knowledge
 - a) What is mathematics? What does it do? Whats its purpose?
 - b) What is the job of a mathematician?
 - c) What is a variable?
 - d) What is a conjecture?
 - e) Do they know what magic squares are?
2. Introduce students to Magic squares.
3. Talk about the history of magic squares and how it relates to the history of mathematics
 - a) Chinese History
 - b) Indian/Arab History
 - c) European/Japanese History
 - d) Modern
4. Talk about impact on Mathematics of Magic Squares
 - a) Why is the study of Magic Squares important to mathematicians?
 - b) Math for mathematics sake or Recreational Mathematics. Why is this important?
(Mention Fermats Last Theorem)
5. Some Terminology
 - a) Order of a Magic Square
 - b) Magic Constant
 - c) Middle square
6. Methods for constructing 3x3 Magic Squares
 - a) Guess and Check
 - b) Siamese Method
 - c) Pheru's Method

7. Construct a Magic Square together with the entire class using a method listed with a magic constant of 15, and only using the integers 1 to 9. Then have the students pair up to construct more magic squares using the same rules.
 1. Do they notice any patterns?
 2. What conjectures can they make?
 3. Possibly mention Rotations/permutations of a square
8. Picking their own Magic Constant that is a multiple of 3, and using any numbers, have the class as a whole construct their own 3x3 magic squares.
9. Depending on time, meaning how far the lesson goes, assign for homework for the next class for the students to construct at least 1 5x5 magic square with middle number 13 and sum of 65.
10. Beginning of next class have 3 volunteers provide the class with their 5x5 magic square.
11. Discuss even ordered Magic Squares.
 - a) Show how to build a 4x4 magic square
 - b) Work one out with the class
 - c) Have the class create their own Magic Square
12. Assess Students Knowledge of Magic Squares by way of a worksheet.
 - a) Working in pairs construct 3x3, 4x4 and 5x5 magic squares of given Magic Sums.
 - b) Ask What they think that mathematics is given what they know about magic squares?
 - c) Ask what do they think about Mathematicians jobs given what they know about magic squares.
 - d) Ask further questions about their thoughts about mathematics.