

# Using Matrices to Solve Systems of Equations

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**Subject Area:** *Algebra*

- Discrete Mathematics
- Representation
- Problem Solving

**Grade Level:** 8

**Topic:** Systems of Linear Equations

**Purpose:** In this lesson, students will solve systems of linear equation using matrices

**Objectives:**

Lesson One-Students will set up a system and practice row operations

Lesson Two-Students will solve a system by pivoting (row-reduced echelon form)

Lesson Three-Student will use matrices to solve real world problems

**Student Materials:**

- Plain Paper
- pencils
- calculators - one for each student or pair of students

**Time Required:** 3 days (45 minutes per lesson)

**Lesson Procedure:**

Students should have a firm understanding of the following:

- .. Linear Equations in Two Unknowns
- .. Solutions of Linear Equations in Two Unknowns
- .. Solutions of Systems of Linear Equations in Two Unknowns
- .. Solving Systems of Linear Equations Using Graphing Method
- .. Solving Systems of Linear Equations Using Substitution Method
- .. Solving Systems of Linear Equations Using Elimination Method

Student can complete the following lessons on line through the following address  
[http://www.ohaganbooks.com/StudentSite/tutorialsf1/frames2\\_2A.html](http://www.ohaganbooks.com/StudentSite/tutorialsf1/frames2_2A.html)

### Lesson One: Setting Up a System and Doing Row Operations

Hand students Exercise 2.2 Part A: Using Matrices to Solve Systems of Equations  
*Setting Up a System and Doing Row Operations*

Review Terminology

- .. Linear Equation
- .. System
- .. Solve a System
- .. Augmented Matrix Form
- .. Augmented Matrix

Have students complete exercises

- Setting Up Matrix
- Doing Row Operations

### Lesson Two: Solving a System by Pivoting

Hand students Exercise 2.2 Part B: Using Matrices to Solve Systems of Equations  
*Solving a System by Pivoting*

Review Terminology

- .. Row-Reduced Echelon Form
- .. General Solution
- .. Particular Solutions
- .. Inconsistent (system has no solution)
- .. Consistent and Dependent (system has infinite many solutions)
- .. Consistent and Independent (system has exactly one solution)
- .. Underdetermined System
- .. Overdetermined System

Have students complete exercises

- Solutions of Systems of Equations by Row Operations

Hand students Exercise 2.2 Part C: Using Matrices to Solve Systems of Equations  
*Row-Reduced Echelon Form*

### Lesson Three: Applications of Systems of Linear Equations Using Matrices

General Strategy for Solving Applied Problems involving Systems of Linear Equations

1. *Identify and label the unknowns.*
2. *Use the information given to set up equations in the unknowns.*
3. *Solve the system to obtain the values for the unknowns.*

**Exploration and Extension:**

Students will explore the use of solving systems of equation using the TI-83 graphing calculator and other on-line resources for this topic such as:

- On-Line Pivot & Gauss-Jordan Utility.
- Excel On-Line Pivot & Gauss-Jordan Utility
- Free Mac Software (Including Gause-Jordan Helper)
- Pivot Program for the TI-82 and TI-83

**Assessment/Evaluation Tool(s) and Opportunities:**

Students will complete a TI-83 graphing calculator exercise Solving a System of Equations using a Matrix. Students will also complete a True/False Quiz on the topic of Systems of Equations and Matrices.

**Appropriate Standards and Connections:**

The *Principles and Standards for School Mathematics* (NCTM, 2000) prescribe that students:

- Solve problems that arise in mathematics and in other contexts;
- Apply and adapt a variety of appropriate strategies to solve problems;
- Relate and compare different forms of representation for a relationship;
- Model and solve contextualized problems using various representations, such as graphs, tables, and equations.
- Use mathematical models to represent and understand quantitative relationships;
- Select, apply, and translate among mathematical representations to solve problems;
- Use representations to model and interpret physical, social, and mathematical phenomenon.

**Personal Comments:**

**Date:** May 3, 2003