Unit 6: Matrices and Determinants

Content Area: **Mathematics**
Course(s): **Algebra 2H**
Time Period: **March**
Length: **3 weeks**
Status: **Published**

Unit Overview

- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathmatical arguemnts about geometric relationships
- Understand meanings of operations and how they relate to one another

Enduring Understandings

- • Matrices can be used to solve systems of equations.
- Matrices are arrays of numbers that can be added, subtracted, and multiplied together.

Essential Questions

- How can matrices be used to solve systems of equations with 2 or more unknowns?
- What criteria needs to be met in order to add, subtract, or multiply matrices?
- What is a matrix?

Student Learning Objectives

- SWBAT evaluate third-order determinants using expansion of minors
- SWBAT find sums and differences of matrices and products of a scalar and a matrix
- SWBAT find the determinant of a 2x2 or 3x3 matrix
- SWBAT find the product of two matrices
- SWBAT learn and apply matrix terminology
- SWBAT solve problems using matrices
- SWBAT solve systems of equations byusing determinants
- SWBAT solve systems of equations using inverses of matrices
- SWBAT use the properties of determinants to simply the expansion of determinants by minors

Lesson Titles

- Addition, Subtraction, and Scalar Multiplication of Matrices
- Cramer's Rule
- Matrix Multiplication

- Solving Word Problems Using Matrices
- The Determinant
- The Inverse of a Matrix

Standards

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.N-VM.C	Perform operations on matrices and use matrices in applications.
MA.A-REI.C	Solve systems of equations

Indicators

MA.N-VM.C.6	Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
MA.N-VM.C.7	Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
MA.N-VM.C.8	Add, subtract, and multiply matrices of appropriate dimensions.
MA.N-VM.C.9	Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
MA.N-VM.C.10	Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
MA.N-VM.C.11	Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.
MA.N-VM.C.12	Work with 2 × 2 matrices as a transformations of the plane, and interpret the absolute value of the determinant in terms of area.
MA.A-REI.C.8	Represent a system of linear equations as a single matrix equation in a vector variable.
MA.A-REI.C.9	Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

Career Readiness, Life Literacies & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.DC.3	Explain how to be safe online and follow safe practices when using the internet (e.g., 8.1.2.NI.3, 8.1.2.NI.4).

TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LA.W.9-10.6	Use technology, including the Internet, to produce, share, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
9-12.HS-ETS1-4.5	Using Mathematics and Computational Thinking

Instructional Strategies/Learning Activities/Levels of Blooms

- intro. finding determinants of 3x3 matrices
- Intro. Finding inverses of matrices
- Intro. Finding missing values within matrices
- Intro. Matrices and Matrix terminology
- Intro. Problem solving with matrices
- Intro. scalar multiplication
- Review quiz
- Review test
- Assessment
- Intro. addition of matrices
- Intro. Determinants
- Intro. determining if a matrix has an inverse
- intro. finding determinants of 2x2 matrices
- Intro. how to solve equations using matrices
- Intro. how to solve systems of equations using matrices.
- Intro. Inverses of matrices
- Intro. multiplying matrices
- Intro. Rules for multiplying matrices
- Review Anticipatory Set
- review game
- review hmwk

Modifications

ELL Modifications

- Assess ELL students continuously using formative assessment methods
- Be flexible with time frames and deadlines
- During Delsea One - one on one with a student who speaks the same language
- Intentional scheduling/grouping with student/teacher who speaks the same language if possible
- Khan Academy offers lesson in several languages https://es.khanacademy.org/
- Offer resources for specific topics in primary language (Youtube web resources)
- Repeat, reword, clarify
- Use google translator, especially for application problems
- Using technology, such as but not limited to: graphing calculator and desmos

IEP & 504 Modifications

- Allowing co-teaching with general education and special education teachers in the same classroom so that the special education teacher can re-teach students with special needs in a different way in a smaller group (pulled to the side)
- For assessments - allowing student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- For assessments - rewording questions so that there are not higher level vocabulary within the question (you are testing for understanding of the content not the ability to understand the question)
- For assessments - students could use calculator and/or other math tools (x grids, chips, ect)
- If not in a co-teaching setting allowing time in the schedule for a special education teacher to consult with general education teachers on what specifically can be modified or how to paraphrase things in a different way specific to that lesson
- Khan Academy offers extra practice and examples in all areas. https://www.khanacademy.org/
- Modeling and showing lots of examples
- Non-verbal redirection of behaviors
- Providing study guides that don't lead the student to study too much extraneous information (less unnecessary details)/scaffolded study guides
- Scaffolded notes
- Videos that offer extra practice and examples in all areas are posted on google classroom and taken from: mathispower4u

G & T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
- Determine where students' interests lie and capitalize on their inquisitiveness. (Is there a Invite students to explore different points of view on a topic of study and compare the two. Specific career they are interested in? How would this apply to their interest?)
- Employ differentiated curriculum to keep interest high.

- Encourage students to explore concepts in depth and encourage independent studies or investigations.
- Encourage students to make transformations- use a common task or item in a different way.
- Invite students to explore different points of view on a topic of study and compare the two.
- Khan Academy offers extra practice and examples in all areas. https://www.khanacademy.org/
- Provide additional rigorous challenge problems for advanced students
- Refrain from having them complete more work in the same manner.
- Videos that offer extra practice and examples in all areas are posted on google classroom and taken from: mathispower4u

At Risk Modifications

- Keep Contact with Parents/Guardians and Guidance Counselor on progress
- Refer to Organizational Management
- Require Delsea One Tutoring

Formative Assessment

- Anticipatory Set
- Closure
- Partner activity
- Pass out of class
- Quiz on Cramer's Rule
- Quiz on Matrix Operations and Determinants
- Warm Up

Summative Assessment

- Benchmark Assessment
- Marking Period Assessment
- Unit Test on Matrices

Resources & Materials

- Algebra and Trigonometry Book 2
- Establish a set of general strategies for student independence and self-evaluation
- Evoke student participation from their seats and at the board
- Independent/Cooperative learning explorations
- Mathispower4u math videos

- Powerpoint lessons
- Smartboard lessons
- Teacher Generated Worksheets
- Use youtube videos to introduce/demonstrate concepts in real-life situations.

Technology

- Chromebooks
- Desmos
- Equatio
- Graphing Calculators
- Mathxlforschool.com

TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.2.12.A.CS3	The relationships among technologies and the connections between technology and other fields of study.