



Marietta City Schools
2023–2024 District Unit Planner

Advanced Mathematical Decision Making (AMDM)

Unit title	Unit 5: Using Vectors and Matrices to Make Decisions	Unit duration (hours)	15 hours
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Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

GA DoE Standards

Standards

AMDM.PAR.11: Use functions to model problem situations in both discrete and continuous relationships.

AMDM.PAR.11.1 Represent situations and solve problems using vectors in areas such as transportation, computer graphics, and the physics of force and motion.

AMDM.PAR.11.2 Represent geometric transformations and solve problems using matrices.

AMDM.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

AMDM.MM.1.1 Explain contextual, mathematical problems using a mathematical model.

AMDM.MM.1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.

AMDM.MM.1.3 Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.

AMDM.MM.1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems.

Concepts/Skills to support mastery of standards

- Applications of pythagorean theorem
- Right triangle trig and distance formula
- Understanding bearings
- Calculating speed and direction
- Geometric transformations using matrices

Vocabulary

bearing	geometric transformations	resultant
cardinal directions	identity	rigid motion
Cartesian coordinates	image	rotation
column	intermediate directions	row
compass	magnitude	sine
cosine	matrix	tangent
degree	origin	translation
dilation	position	quadrant
direction	Pythagorean Theorem	vector
displacement	reflection	vector representation

Notation

Magnitude: $|a| \quad |a| = \sqrt{x^2 + y^2}$

Direction Formula: $\theta_R = \tan^{-1} \frac{y_R}{x_R}$

Essential Questions

- How can students calculate the ground speed and direction of an airplane or boat that has encountered air or water current conditions?
- How can students determine the correct bearings of an airplane or boat from the information provided in terms of cardinal directions?
- How can students describe reflections, rotations, and translations?
- How can students identify whether a figure has been reflected, rotated, or translated?
- What is the impact of a specific matrix on a transformed shape?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s): Mid-Unit Quiz

Summative Assessment(s): Unit 5 Test

Learning Experiences

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
<p>AMDM.PAR.11 Use functions to model problem situations in both discrete and continuous relationships.</p> <ul style="list-style-type: none"> AMDM.PAR.11.1 Represent situations and solve problems using vectors in areas such as transportation, computer graphics, and the physics of force and motion. <p>AMDM.MM.1 Apply mathematics to real-life situations; model real-life phenomena using mathematics.</p> <ul style="list-style-type: none"> AMDM.MM.1.3 Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation. AMDM.MM.1.4 Use relevant information to create various mathematical representations and 	<p>Leaving on a Jet Plane</p> <p>In this learning plan, students will explore the importance of vectors. Other mathematical classes may have emphasized right triangle trigonometry and the application of the distance formula, but in the real-world, most situations are governed by the combination of these concepts. Students will analyze the magnitude (length) and direction of a vector in navigation and nautical situations that are influenced by the external forces of nature.</p> <p>Learning Goals:</p> <ol style="list-style-type: none"> I can calculate the ground speed and direction of an airplane or boat that has encountered air or water current conditions. I can determine the correct bearings of an airplane or boat from the information provided in terms of cardinal directions. 	<ul style="list-style-type: none"> Scaffold the task to include review of previous material

structures to solve real-life problems.		
Content Resources		