Advanced Mathematical Decision Making (AMDM)

Unit title	Unit 1: Using the Power of Mathematical Reasoning to Make Decisions	Unit duration (hours)	*18.75 hours*

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

GA DoE Standards

Standards

AMDM.QPR.2: Make decisions and solve problems using ratios, rates, and percents in a variety of real world applications.
    AMDM.QPR.2.1 Apply proportions, ratios, rates, and percentages to various settings, including business, media, and consumerism.
    AMDM.QPR.2.2 Solve problems involving ratios in mechanical and agricultural contexts.
    AMDM.QPR.2.3 Use proportions to solve problems involving large quantities that are not easily measured.
AMDM.QPR.3: Make predictions by analyzing averages and indices of large data sets through investigations of real-world contexts.
    AMDM.QPR.3.1 Use averages and weighted averages to make decisions.
    AMDM.QPR.3.2 Calculate and interpret indices.
AMDM.PAR.4: Develop methods or algorithms to analyze discrete situations.
    AMDM.PAR.4.1 Create and verify identification numbers.
    AMDM.PAR.4.2 Analyze and evaluate the mathematics behind various methods of voting and selection.
    AMDM.PAR.4.3 Evaluate various voting and selection processes to determine an appropriate method for a given situation.
    AMDM.PAR.4.4 Apply various ranking algorithms to determine an appropriate method for a given situation.
AMDM.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

Concepts/Skills to support mastery of standards

- Use averages and weighted averages
- Calculate and interpret indices
- Create and verify ID numbers
- Analyze and evaluate methods of voting and selection
- Evaluate voting and selection processes to determine appropriate methods
- Apply ranking algorithms to determine appropriate methods

- Apply proportions, ratios, and rates, and percentages to various settings
- Solve problems involving ratios
- Use proportions to solve problems involving large quantities.

Vocabulary

Plurality	Ranking Algorithm	Pairwise Comparisons	Rank Voting	Borda Count	UPC Codes
Ratios (aspect ratios)	Rates	Percents	Proportions (area and volume)	Averages	Fan Cost Index

Notation:

$$\frac{People}{Area} = \frac{People}{Area}$$ **Estimating Large Crowds**

$$\frac{Volume\ of\ object}{Volume\ of\ Container}$$ **Filling a Room**

Not Enough Numbers: **Tire Ratios:**

Key	L	N
Possibilities	A-Z	0-9
# of Possibilities	26	10

	TIRE CODE (OLD)	TIRE CODE (NEW)
Width of tire (mm)		
Aspect Ratio %		
Height of tire (in)		
Diameter of tire (in)		
Circumference (in)		

$$(TV\ Size)^2 = (Width)^2 x\ (Height)^2$$

Essential Questions

- What are effective strategies to estimate large numbers?
- How do telecommunications and transportation agencies not run out of numbers?
- What are real world applications of ratios? (focus on tires and media)
- How are weighted averages calculated?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s):

     o   **Unit 1 Quiz:** estimating large numbers, tennis balls, not enough numbers, tires, and aspect ratios

Summative Assessment(s):

- **Unit 1 Test:** all skills from this unit.

Learning Experiences
Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
QPR.2.3: Use proportions to solve problems involving large quantities that are easily measured. **MM.1.1:** Explain contextual, mathematical problems using a mathematical model. **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. **MM.1.3:** Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation. **MM.1.4:** Use various mathematical representations and structures with this information to represent and solve real-life problems.	**Too Many to Count** In this learning plan, students will examine the use of mathematical reasoning to solve estimable problems involving large quantities. **Learning Goals:** 1. I can solve problems involving large quantities that are not easily measured.	Students will be able to work at their own pace in collaborative groups where additional scaffolding is available.

• **QPR.2.1:** Apply proportions, ratios, rates, and percentages to various settings, including business, media, and consumerism. • **QPR.2.2:** Solve problems involving ratios in mechanical and agricultural contexts.	**Ratios in the Media** In this learning plan, students will use their knowledge of ratios and the Pythagorean Theorem to calculate the sizes of televisions. They will also use prior knowledge to investigate the aspect ratio of movies. **Learning Goals:** 1. I can use ratios, proportions, and the Pythagorean Theorem to determine the size of televisions. 2. I can use ratios and proportions to determine the size of movies based on their aspect ratio.	Practice the set-up of ratios in small groups as this is usually the area of concern.
• **QPR.3.1:** Use averages and weighted averages to make decisions.	**Weighted Averages in Sports (Engage: Real World Hook/Introduction)** In this learning plan, students will use grade breakdown averages for different classes to determine what the final grade average would be given different grading scales. **Learning Goals:** 1. I can use weighted averages to calculate final grades in my classes.	Students will work at their own pace and compare strategies with peers.
Content Resources		