Advanced Mathematics Decision Making

Unit 01: Analyzing Numerical Data

Time Allotted: 15 Days

Georgia Performance Standard:

MAMDMN1. Students will extend the understanding of proportional reasoning, ratios, rates and percents by applying them to various settings to include business, media and consumerism

a.) Use proportional reasoning to solve problems involving ratios.

b.) Understand and use averages, weighted averages, and indices.

c.) Solve problems involving large quantities that are not easily measured.

d.) Understand how identification numbers, such as UPC’s, are created and verified.

Key Terms:

**Student Activity Sheets 1 – 3**

estimate, ratio, proportion

**Student Activity Sheets 4 & 5**

aspect ratio, letterbox, pillarbox

**Student Activity Sheets 6 – 11**

index (indices), paradox, weighted average, weighted sum

**Student Activity Sheets 12 & 13**

check digit, identification number, single-digit error, transposition error

Essential Questions:

- How can we estimate large number quantities?
- Are we limited to just one estimate?
- Do you think we will ever run out of telephone numbers?
- How are today’s televisions different from older models?
- If we change the size of the tires on a car, how are the odometer and speedometer readings affected?
- What ways can we use to calculate a student’s final average in a course?
- How do we compare different baseball players? What statistics might we look at?
- How do we compare different quarterbacks? What statistics might we look at?
- What costs are associated with attending a sporting event?
- What makes a passage of text *easy* to read?
- Is the statement, “I always lie” a paradox?
- How can we recognize an error in a Universal Product Code (UPC)?
- How can we recognize and invalid credit card number?
### Activities:
- Activity I.A (Sheet 01): Estimating Crowds
- Activity I.A (Sheet 02): Filling Your Classroom with Tennis Balls
- Activity I.A (Sheet 03): Not Enough Numbers
- Activity I.B (Sheet 04): Ratios in the Media
- Activity I.B (Sheet 05): Changing Tires
- Activity I.C (Sheet 06): Final Grade Averages
- Activity I.C (Sheet 07): Slugging Averages
- Activity I.C (Sheet 08): Quarterback Ratings
- Activity I.C (Sheet 09): Fan Cost Index
- Activity I.C (Sheet 10): Readability Indices
- Activity I.C (Sheet 11): Simpson’s Paradox
- Activity I.D (Sheet 12): Universal Product Codes
- Activity I.D (Sheet 13): Credit Card Numbers

### Assessment:
- Formative Assessment 01a (Activities A – B)
- Formative Assessment 01b (Activities C – D)

### Objectives:
1. Students use various numerical techniques to estimate large numbers in situations such as assessing the size of the crowd at a political rally and calculating the number of possible telephone numbers in the United States to see when the numbers will run out. Students also investigate various Fermi questions that ask them to estimate physical quantities.

2. Students apply proportional reasoning with ratios, rates, and percents to real-world problems involving aspect ratios in movies shown on television, tires, and other applications.

3. Students use averages and indices as a tool for thinking about which grading system is better for a hypothetical student, slugging averages in baseball and NFL quarterback ratings, Fan Cost Indices for attending a sporting event, and the Gunning Fog Index for measuring the readability of a piece of writing.

4. Students learn how identification numbers such as Universal Product Codes (UPCs) and credit card numbers are created and how check digits are used to detect errors and prevent fraud.

### Resources:
Advanced Mathematical Decision Making (A.K.A. Advanced Quantitative Reasoning); 2010 Edition; A project of the Charles A. Dana Center at The University of Texas at Austin and the Texas Association of Supervisors of Mathematics