Amarillo ISD—Advanced Quantitative Reasoning Standards

Amarillo Independent School District follows the Texas Essential Knowledge and Skills (TEKS). All of AISD curriculum and documents and resources are aligned to the TEKS.

The State of Texas State Board of Education has defined the focal points for Advanced Quantitative Reasoning in mathematics in the first paragraph of the introduction to the Texas Essential Knowledge and Skills.

In Advanced Quantitative Reasoning, students continue to build upon the K-8, Algebra I, Algebra II, and Geometry foundations as they expand their understanding through further mathematical experiences. Advanced Quantitative Reasoning includes the analysis of information using statistical methods and probability, modeling change and mathematical relationships, and spatial and geometric modeling for mathematical reasoning. Students learn to become critical consumers of real-world quantitative data, knowledgeable problem solvers who use logical reasoning and mathematical thinkers who can use their quantitative skills to solve authentic problems. Students develop critical skills for success in college and careers, including investigation, research, collaboration, and both written and oral communication of their work, as they solve problems in many types of applied situations.

Unit 1 – Analyzing Numerical Data
Unit 2 – Probability
Unit 3 – Statistical Studies
Unit 4 – Using Recursion in Models and Decision Making
Unit 5 – Using Functions in Models and Decision Making
Unit 6 – Decision Making in Finance
Unit 7 – Networks and Graphs
## Unit 1 – Analyzing Numerical Data  16 Days

**AQR.01** The student develops and applies skills used in college and careers, including reasoning, planning, and communication, to make decisions and solve problems in applied situations involving numerical reasoning, probability, statistical analysis, finance, mathematical selection, and modeling with algebra, geometry, trigonometry, and discrete mathematics. The student is expected to:

- (A) gather data, conduct investigations, and apply mathematical concepts and models to solve problems in mathematics and other disciplines;
- (B) demonstrate reasoning skills in developing, explaining, and justifying sound mathematical arguments, and analyze the soundness of mathematical arguments of others; and
- (C) communicate with mathematics orally and in writing as part of independent and collaborative work, including making accurate and clear presentations of solutions to problems.

**AQR.02** The student analyzes real-world numerical data using a variety of quantitative measures and numerical processes. The student is expected to:

- (A) apply, compare, and contrast ratios, rates, ratings, averages, weighted averages, or indices to make informed decisions;
- (B) solve problems involving large quantities that are not easily measured;
- (C) use arrays to efficiently manage large collections of data and add, subtract, and multiply matrices to solve applied problems; and
- (D) apply algorithms and identify errors in recording and transmitting identification numbers.

## Unit 2 – Probability  24 Days
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### AQR.03 The student analyzes and evaluates risk and return in the context of real-world problems. The student is expected to:

- **(A)** determine and interpret conditional probabilities and probabilities of compound events by constructing and analyzing representations, including tree diagrams, Venn diagrams, and area models, to make decisions in problem situations;
- **(B)** use probabilities to make and justify decisions about risks in everyday life; and
- **(C)** calculate expected value to analyze mathematical fairness, payoff, and risk.

### Unit 3 – Statistical Studies    29 Days

- **AQR.01** The student develops and applies skills used in college and careers, including reasoning, planning, and communication, to make decisions and solve problems in applied situations involving numerical reasoning, probability, statistical analysis, finance, mathematical selection, and modeling with algebra, geometry, trigonometry, and discrete mathematics. The student is expected to:
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- **AQR.04** The student makes decisions based on understanding, analysis, and critique of reported statistical information and statistical summaries. The student is expected to:
  - **(A)** identify limitations or lack of information in studies reporting statistical information, including when studies are reported in condensed form;
  - **(B)** interpret and compare the results of polls, given a margin of error;
  - **(C)** identify uses and misuses of statistical analyses in studies reporting statistics or using statistics to justify particular conclusions; and
### AQR.05 The student applies statistical methods to design and conduct a study that addresses one or more particular question(s).

The student is expected to:

- **(A)** determine the purpose of a statistical investigation and what type of statistical analysis can be used to answer a specific question or set of questions;
- **(B)** identify the population of interest, select an appropriate sampling technique, and collect data;
- **(C)** identify the variables to be used in a study;
- **(D)** determine possible sources of statistical bias in a study and how such bias may affect the ability to generalize the results;
- **(E)** create data displays for given data sets to investigate, compare, and estimate center, shape, spread, and unusual features; and
- **(F)** determine possible sources of variability of data, including those that can be controlled and those that cannot be controlled.

### Unit 4 – Using Recursion in Models and Decision Making  21 Days

### AQR.01 The student develops and applies skills used in college and careers, including reasoning, planning, and communication, to make decisions and solve problems in applied situations involving numerical reasoning, probability, statistical analysis, finance, mathematical selection, and modeling with algebra, geometry, trigonometry, and discrete mathematics. The student is expected to:

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- **(C)** communicate with mathematics orally and in writing as part of independent and collaborative work, including making accurate and clear presentations of solutions to problems for given contexts.

### AQR.08 The student models data, makes predictions, and judges the validity of a prediction. The student is expected to:

- **(A)** determine if there is a linear relationship in a set of bivariate data by finding the correlation coefficient for the data, and interpret the coefficient as a measure of the strength and direction of the linear relationship;
- **(B)** collect numerical bivariate data; use the data to create a scatterplot; and select a function such as linear, exponential, logistic, or trigonometric to model the data.
## AQR.09 The student uses mathematical models to represent, analyze, and solve real-world problems involving change. The student is expected to:

- (A) analyze and determine appropriate growth or decay models, including linear, exponential, and logistic functions;
- (B) analyze and determine an appropriate cyclical model that can be modeled with trigonometric functions;
- (D) solve problems using recursion or iteration.

### Unit 5 – Using Functions in Models and Decision Making 20 Days

### AQR.01 The student develops and applies skills used in college and careers, including reasoning, planning, and communication, to make decisions and solve problems in applied situations involving numerical reasoning, probability, statistical analysis, finance, mathematical selection, and modeling with algebra, geometry, trigonometry, and discrete mathematics. The student is expected to:

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- (C) analyze and determine an appropriate piecewise model;

### Unit 6 – Decision Making in Finance 27 Days

### AQR.01 The student develops and applies skills used in college and careers, including

- (A) gather data, conduct investigations, and apply mathematical concepts and models to solve problems in mathematics and other disciplines;
reasoning, planning, and communication, to make decisions and solve problems in applied situations involving numerical reasoning, probability, statistical analysis, finance, mathematical selection, and modeling with algebra, geometry, trigonometry, and discrete mathematics. The student is expected to:

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### AQR.10 The student creates and analyzes mathematical models to make decisions related to earning, investing, spending, and borrowing money to evaluate real-world situations. The student is expected to:

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<td>(B) determine, represent, and analyze mathematical models for expenditures, including those involving credit; and</td>
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### Unit 7 – Networks and Graphs  28 Days

AQR.01 The student develops and applies skills used in college and careers, including reasoning, planning, and communication, to make decisions and solve problems in applied situations involving numerical reasoning, probability, statistical analysis, finance, mathematical selection, and modeling with algebra, geometry, trigonometry, and discrete mathematics. The student is expected to:

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To ensure that every student has an opportunity to learn, understand and demonstrate the Texas Essential Knowledge and Skills. Amarillo Independent has adopted the following protocols for teachers, curriculum and others to use in reference to Curriculum, Instruction and Assessment.

**Curriculum**
1) Prioritize essential learning based on AISD written curriculum and adhere to the scope and sequence.
2) Develop deep understandings of the AISD written curriculum with an emphasis on the essential learning outcomes.
3) Create relevant learning environments in every classroom using the AISD written curriculum.
4) Analyze vertical and horizontal alignment to ensure grade level curriculum is being taught.

**Instruction**
1) Common lessons are developed based on strategically selected grade level TEKS and include learning opportunities for students that:
   - are at the expected level of thinking and rigor
   - utilize research based instructional strategies
   - are actively engaging
   - have real world applications
2) Collaboratively align instruction to assessment.
3) Individual student instructional needs are considered and addressed in the lessons.
4) Strategic re-teaching when students do not understand.
5) Common lessons are analyzed and strengthened through a continuous improvement process such as the Professional Teaching Model, Lesson Study or other method for collaborative study and sharing.

**Assessment**
1) Collaboratively align all assessment to the AISD written curriculum and reflect appropriate rigor.
2) Collaboratively engage in purposeful dialogue about assessment tied to clearly defined essential learning outcomes.
3) Continuously improve and adjust instruction based on common assessment results and student work.
4) Provide feedback to the annual curriculum feedback and revision process.