

Advanced Quantitative Reasoning is a fourth-year math course that tasks students with the development of mathematical skills that are necessary for success in college, career, and in life.

Topics in this course include solving geometric problems; describing and modeling data; statistics and probability with applications; matrices; real world algorithmic exercises; and financial mathematics.

This course supports students as they develop computational fluency, deepen conceptual understanding, and apply mathematical practice skills. Students discover new concepts through guided instruction and confirm their understanding in an interactive, feedback-rich environment.

A variety of activities allow for students to think mathematically in a variety of scenarios. In Discussions, students exchange and explain their mathematical ideas. Modeling activities ask them to analyze real-world scenarios and mathematical concepts. Journaling activities have students reason abstractly and quantitatively, construct arguments, critique reasoning, and communicate precisely.

This course is aligned to the Texas Essential Knowledge and Skills standards for mathematics.

Length: Two Semesters

### Unit 1: Solving Geometric Problems

- Right Triangles
- Similar Right Triangles
- Performance Task: The Parallax Problem
- Law of Cosines and Proofs
- Law of Sines and Proofs
- Graphs of Trigonometric Functions
- Transformations of Sinusoids
- Wrap-Up: Solving Geometric Problems

### Unit 2: Describing Data

- Numerical Data
- Measures of Center and Spread
- Project: Designing and Completing a Survey
- Describing Distributions
- Comparing Distributions
- Wrap-Up: Describing Data

### Unit 3: Modeling Data

- Linear Models in Data

- Correlation
- Regression Methods
- Assessing Data Models
- Nonlinear Models
- Transforming Bivariate Data
- Wrap-Up: Modeling Data

#### **Unit 4: Introduction to Statistics**

- What Is Statistics?
- Collecting Data
- Random Sampling
- Experimental Design
- Margin of Error and Confidence Intervals
- Evaluating Statistical Studies
- Wrap-Up: Introduction to Statistics

#### **Unit 5: Probability**

- Probability
- Permutations and Combinations
- Independent and Dependent Events
- Conditional Probability
- Wrap-Up: Introduction to Probability

#### **Unit 6: Probability Applications**

- Logic and Truth Tables
- Using Two-Way Frequency Tables
- Using Probability to Make Decisions
- Discrete Random Variables
- Binomial Probability
- Wrap-Up: Probability Applications

#### **Unit 7: Semester Wrap-Up**

- Semester Wrap-Up

#### **Unit 8: Matrices**

- Matrix Addition and Scalar Multiplication
- Matrix Multiplication
- Transformations and Matrices
- Applications of Matrices
- Matrices Wrap-Up

#### **Unit 9: Algorithms in the Real World**

- Selection and Ranking Algorithms
- Graph Theory
- Project
- Algorithms in the Real World Wrap-Up

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**Unit 10: Earning and Spending**

- Wages
- Compensation Packages
- Linear Equations and Wages
- Percentages and Commission
- Sales Tax
- Coupons, Rebates, and Sales
- Earning and Spending Wrap-Up

**Unit 11: Saving and Borrowing Money**

- Growth Models
- Compound Interest
- Credit Cards
- Tracking Payments and Purchases
- Comparing Credit Cards
- Saving and Borrowing Money Wrap-up

**Unit 12: Loans**

- Single Payment Loans and Payday Loans
- Installment Loans and Layaway
- Monthly Payment
- Loan Pre-Approvals
- Deferred Payments
- Paying Off
- Prepayment
- Loans Wrap-Up

**Unit 13: Investments**

- CDs
- Annuities
- Bonds
- Stocks
- The Stock Market
- Prediction
- Investments Wrap-Up

**Unit 14: Semester Wrap-Up**

- Semester Wrap-Up