

MATH 40A: QUANTITATIVE REASONING

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2024
Units:	5
Hours:	5 lecture per week (60 total per quarter)
Prerequisite:	Intermediate Algebra or equivalent.
Corequisite:	For students who do not meet the prerequisite requirement, concurrent enrollment in MATH 240A or NCBS 440A is required.
Advisory:	Demonstrated proficiency in English by placement via multiple measures OR through an equivalent placement process OR completion of ESLL 125 & ESLL 249; not open to students with credit in MATH 80.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Area V: Communication & Analytical Thinking
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable
Formerly:	MATH 80

Student Learning Outcomes

- Students will solve application problems (drawn from business, economics, medicine, engineering, education, psychology, sociology, social sciences, life science, and health science) through the application of quantitative reasoning strategies, including but not limited to investigation, modeling, analysis, multiple representations of numbers and functions, estimation, dimensional analysis, and probabilistic reasoning.
- Students will write about and discuss solutions to contextualized, quantitative problems using notation and statements that are correct and complete.

Description

This course is designed for any student, in any major, who is interested in exploring the connections between math concepts and the quantitative skills we use in everyday life. The course focuses on problem solving using mathematical methods and modeling and quantitative investigation strategies. Applications include linear and exponential models, multivariable relationships, conversions, estimation, elementary probability, and descriptive statistics. Students will learn individually and collaboratively to analyze quantitative information and apply quantitative skills in a variety of real life contexts and express their findings verbally and in writing.

Course Objectives

The student will be able to:

- Create, apply, and interpret linear and exponential models to solve problems in contextualized, culturally relevant settings.
- Calculate, compare, and interpret measures of center to make decisions.
- Apply quantitative reasoning strategies to culturally relevant applications drawn from business, economics, medicine, engineering, education, psychology, sociology, social sciences, life science, and health science.
- Use estimation and investigation of multiple representations of numbers and functions to assess claims from a variety of fields, such as environmental, health and wellness.
- Analyze personal finance options.
- Use graphs to describe, interpret, synthesize, and predict.
- Analyze multivariable relationships and investigate what variables contribute to the formula.
- Practice mathematical habits of mind.
- Select appropriate mathematical tools to solve problems and make decisions.
- Discuss mathematical problems and write solutions in accurate mathematical language and notation.

Course Content

- Create, apply, and interpret linear and exponential models to solve problems in contextualized, culturally relevant settings
 - Connections between four representations of a function
 - Equation
 - Graph
 - Table
 - Contextual situations
 - Units
 - Intercepts
 - Limitations of models based on data
 - Interpolation
 - Extrapolation
 - Linear models
 - Rate of change as slope
 - Interpretations of slopes and intercepts
 - Exponential models
 - Percentage change
 - Interpretation of percent change in context
 - Growth and decay
- Calculate, compare, and interpret measures of center to make decisions
 - Median
 - Mean
 - Mode
 - Formulas in a spreadsheet
- Apply quantitative reasoning strategies to culturally relevant applications drawn from business, economics, medicine, engineering, education, psychology, sociology, social sciences, life science, and health science

- a. Culturally relevant issues, such as:
 - i. Population
 1. Population growth
 2. Population density
 - ii. Allocation of resources
 1. Natural
 2. Human
 3. Per capita measures
 - b. Proportional reasoning
 - c. Doubling times
 - d. Absolute change vs. relative change
4. Use estimation and investigation of multiple representations of numbers and functions to assess claims from a variety of fields, such as environmental, health and wellness
 - a. Large numbers
 - b. Mental math
 - i. Predictions
 - ii. Assessment of media claims
 - c. Scientific notation
 - d. Tables, graphs, formulas, contexts
 5. Analyze personal finance options, such as:
 - a. Credit cards
 - b. Tax forms
 - c. Savings plans
 - i. Simple interest
 - ii. Compound interest
 - d. Consumer Price Index
 - i. Base year
 - ii. Comparisons over time
 - iii. Purchasing power
 - iv. Interpretations
 - v. Calculations
 - e. Cost of Living Index
 - i. Buying power
 - ii. Comparisons across location
 6. Use graphs to describe, interpret, synthesize, and predict
 - a. Pie chart
 - b. Line graph
 - c. Bar chart
 - d. Pictographs
 - e. Scatterplots
 - f. Misleading graphs
 7. Analyze multivariable relationships and investigate what variables contribute to the formula
 - a. Units and dimensional analysis
 - b. Role of each variable
 - c. Relationship between two variables in a multi-variable formula
 - d. Solving for an unknown variable or quantity
 - e. Inequalities
 - f. Decision making using formulas
 8. Practice mathematical habits of mind
 - a. Consumer and media skepticism
 - b. Justify and interpret solutions
 - i. Correctness
 - ii. Applicability
 - iii. Significance
 - c. Predicting solutions
 - d. Analyzing different ideas
 - e. Revising thinking and solutions
 9. Select appropriate mathematical tools to solve problems and make decisions
 - a. Estimation
 - b. Diagrams and graphs
 - c. Measures of central tendency
 - d. Probability
 - e. Mathematical models and formulas
 - f. Dimensional analysis
 - g. Technology tools
 - i. Calculator/computer utilities for creating graphical displays
 - ii. Spreadsheet utilities for generating and exploring data
 - iii. Calculator/computer utilities for finding and verifying solutions
 10. Discuss mathematical problems and write solutions in accurate mathematical language and notation
 - a. Application problems from other disciplines
 - b. Proper notation

Lab Content

Not applicable.

Special Facilities and/or Equipment

1. Scientific calculator.
2. Computer with internet access.
3. When taught via Foothill Global Access, on-going access to computer with email software and hardware; email address.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Ongoing, formative classroom assessments
 Participation in group and class discussions
 Checkpoint quizzes
 Mathematical exercises
 Essays
 Written analysis
 Module tests
 Final exam
 Projects
 Presentations
 Portfolio development

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Students will be engaged in small group discussion of contextualized culturally relevant problems followed by wrap-up discussions of group findings and important mathematical ideas related to contextualized problems

Students will reflect on their thinking and on problem ideas individually and in groups
Students will address mathematical sticking points through discussion and short, targeted, small group or whole class discussions
Short directed lecture

Representative Text(s) and Other Materials

WestEd, Carnegie Math Pathways. [Quantway College](#). 2021.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Deliberate practice: daily homework designed to extend concept and skill development
2. Preparatory homework designed to prepare students for the next lesson
3. Reading about application
4. Mini quizzes
5. Portfolio development
6. Review and preparation for quizzes and exams
7. 1-2 page analysis papers

Discipline(s)

Mathematics