

MATH-1190: ALGEBRAIC AND QUANTITATIVE REASONING

Cuyahoga Community College

Viewing: MATH-1190 : Algebraic and Quantitative Reasoning

Board of Trustees:

June 2022

Academic Term:

Fall 2022

Subject Code

MATH - Mathematics

Course Number:

1190

Title:

Algebraic and Quantitative Reasoning

Catalog Description:

Applications and appreciation of quantitative literacy. Interpreting information from real-world sources to solve problems using numerical, algebraic, and graphical knowledge. Various uses of mathematical models are explored, and statistical thinking is developed. Contexts include financial, environmental, social, and public and personal health.

Credit Hour(s):

3

Lecture Hour(s):

3

Requisites

Prerequisite and Corequisite

MATH-0955 Beginning Algebra; or MATH-0990 Math Literacy for College Students; or qualified Math placement; or departmental approval.

Outcomes

Course Outcome(s):

Apply quantitative reasoning abilities to critical reading, verbal and written communication and visual, graphical, and technological literacy.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Information Literacy: Acquire, evaluate, and use information from credible sources in order to meet information needs for a specific research purpose.

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Demonstrate an appreciation for quantitative literacy by reading about and discussing the importance of quantitative literacy in the world both globally and in everyday life.
2. Read, interpret, and make decisions based on visual displays of quantitative information including line graphs, bar graphs, scatter plots, histograms, and maps with multiple parameters.
3. Use technology appropriately as a tool including: determining when and how to use calculators appropriately; using computers and the Internet to gather, research and analyze quantitative information; and questioning and evaluating the output from a computer application.
4. Use spreadsheets to create and/or investigate mathematical models, beyond linear and exponential models, in various contexts including personal finance.
5. Apply spatial reasoning to solve geometric problems involving area, perimeter, and volume of basic shapes including using and translating between different units of measurement.

6. Show confidence in quantitative reasoning by: formulating estimation strategies to solve problems, employing various strategies to persevere in quantitative thinking, and applying prior knowledge from one context to the next.
7. Check the reasonableness of quantities that have been presented, as well as numbers that are calculated or estimated.
8. Use correct units when using numbers based on the context.
9. Read and interpret quantitative information from a variety of real-world sources.
10. Recognize and evaluate quantitative assumptions.
11. Explain quantitative results both in writing and orally using appropriate language, symbolism, data and graphs.
12. Analyze and use quantitative information to support an argument.
13. Evaluate sources of information, locate reliable quantitative data, and evaluate their appropriateness.

Course Outcome(s):

Apply the concepts of numeracy to investigate and describe quantitative relationships and solve problems in a variety of contexts.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Demonstrate measurement sense including units, precision, accuracy and error.
2. Use and distinguish between statements involving absolute change and relative change.
3. Use and interpret percentages in a variety of contexts: parts to whole comparisons, decimal representations of percentages, quantifying risks and other probabilities, rates, change, and margins of error.

Course Outcome(s):

Reason using the language and structure of mathematics to investigate, represent, and solve problems.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Create and use tables, graphs, equations, patterns, and words to model authentic contextual situations, including using multiple variables to represent quantities or attributes. Describe limitations present in these models and why these tools are a useful strategy for understanding the world.
2. Demonstrate an extensive understanding of linear models by: creating and using linear models of real-world situations; describing the behavior of linear models using words, algebraic symbols, graphs, and tables; and using appropriate terms and units to describe rate of change.
3. Demonstrate an understanding of exponential models by: creating and using exponential models for a variety of real-world situations; and describing the behavior of exponential models using words, algebraic symbols, graphs, and tables.
4. Analyze the conditions, or domain, in which linear and exponential models for real-world contexts are reasonable.
5. Identify when a linear and/or exponential model is not reasonable for a given real-world context, and describe characteristics of alternate models (e.g., increasing/decreasing, varying rates of change, periodic/cyclic, piecewise, etc.).
6. Grasp and express that abstract mathematical models used to characterize real-world scenarios or physical relationships are not always exact and may be subject to error from many sources, including variability.

Course Outcome(s):

Reason using the language and structure of statistics to investigate, represent, and solve problems.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Information Literacy: Acquire, evaluate, and use information from credible sources in order to meet information needs for a specific research purpose.

Objective(s):

1. Examine the structure of scientific studies and strategies for sampling data.
 2. Critically evaluate statistics being presented in a media report including: identifying the reference value for a reported percentage, proposing sources of bias, and recognizing confounding variables.
 3. Describe the difference between correlation and causation.
 4. Use the language of probability to describe and evaluate statements involving risk.
 5. Calculate and interpret measures of center including mean, median, expected value, and weighted average.
 6. Use and interpret measures of spread including standard deviation, quartiles, percentiles, and range.
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Methods of Evaluation:

1. Exams
2. Quizzes
3. Homework
4. In class collaborative work
5. Comprehensive final exam
6. Online coursework
7. Class participation

Course Content Outline:

1. Quantitative reasoning and numeracy
 - a. Estimation with large numbers
 - b. Scaling factors
 - c. Dimensional analysis
 - d. Interest rates and applied percentages
 - e. Absolute and relative change
 - f. Graphical and visual displays
 - g. Spreadsheets
 - h. Measurements, precision, accuracy, and error
2. Mathematical modeling
 - a. Linear models
 - b. Exponential models
 - c. Financial models
 - d. Non-linear models
 - e. Limitations and variability
3. Statistical thinking
 - a. Evaluating sources of data
 - b. Sampling strategy and bias
 - c. Correlation vs. causation
 - d. Confounding variables
 - e. Evaluating risk
 - f. Measures of center
 - g. Measures of spread

Resources

Carnegie Math Pathways. *Quantway College version 2.8*. Carnegie Math Pathways, WestEd; XanEdu Publishing, 2021.

Eric Gaze. *Thinking Quantitatively: Communicating with Numbers*. 2nd ed. Pearson, 2020.

Eric Zaslow. *Quantitative Reasoning: Thinking in Numbers*. 1st ed. Cambridge University Press, 2020.

Instructional Services**OAN Number:**

Ohio Transfer 36 TMM011

Top of page

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