Math 0309 – Foundations of Mathematical Reasoning

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Fountdations of Mathematical Reasoning, Texas Version 1/e

Dana Center

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**Catalog Description:**

3 Credits (3 hrs. lec., 1 hr. lab) This course surveys a variety of mathematical topics needed to prepare students for college level statistics or quantitative reasoning courses. Topics include: numeracy with an emphasis on estimation and fluency with large numbers; evaluating expressions and formulas; rates, ratios and proportions; percentages; solving equations; linear models; data interpretations including graphs and tables; verbal, algebraic and graphical representations of functions; exponential models. This course carries institutional credit but will not transfer and will not be used to meet degree requirements. (3201045219) Prerequisite: [MATH 0306](http://catalog.lonestar.edu/content.php?filter%5B27%5D=MATH&filter%5B29%5D=&filter%5Bcourse_type%5D=-1&filter%5Bkeyword%5D=&filter%5B32%5D=1&filter%5Bcpage%5D=1&cur_cat_oid=22&expand=&navoid=8470&search_database=Filter#tt7067) or placement by testing.

**Student Learning Outcomes:**

Upon successful completion of this course, the student will:

* Students will develop number sense and the ability to apply concepts of numeracy to investigate and describe quantitative relationships and solve real-world problems in a variety of contexts.
* Students will use proportional reasoning to solve problems that require ratios, rates, proportions, and scaling.
* Students will transition from specific and numeric reasoning to general and abstract reasoning using the language and structure of algebra to investigate, represent, and solve problems.
* Students will understand and critically evaluate statements that appear in the popular media (especially in presenting medical information) involving risk and arguments based on probability.
* Students will understand, interpret, and make decisions based on financial information commonly presented to consumers.
* Students will understand that quantitative information presented in the media and by other entities can sometimes be useful and sometimes be misleading.

**Learning Goals** - This course is a quantitative reasoning course. This means you will learn to use, understand, and communicate about quantitative information. The course has five goals:

* **Communication goal**: You will interpret and communicate quantitative information and mathematical and statistical concepts using language appropriate to the context and intended audience.
* **Problem Solving goal**: You will make sense of problems, develop strategies to find solutions, and persevere in solving them.
* **Reasoning goal**: You will reason, model and make decisions with mathematical, statistical, and quantitative information.
* **Evaluation goal**: You will critique and evaluate quantitative arguments that utilize mathematical, statistical, and quantitative information.
* **Technology goal**: You will use appropriate technology in a given context.

**Overarching Content-based Mathematics and Quantitative Literacy Learning Outcomes**

* **Numeracy**: Students will develop number sense and the ability to apply concepts of numeracy to investigate and describe quantitative relationships and solve real-world problems in a variety of contexts.
* **Proportional Reasoning**: Students will use proportional reasoning to solve problems that require ratios, rates, proportions, and scaling.
* **Algebraic Competence, Reasoning, Modeling**: Students will transition from specific and numeric to general and abstract reasoning using the language and structure of algebra to investigate, represent, and solve problems.
* **Assessing Risk (Probabilistic Reasoning):** Students will understand and critically evaluate statements involving risk and arguments based on probability that appear in the popular media, especially in presenting medical information.
* **Personal Finance**: Students will understand, interpret and make decisions based on financial information that is commonly presented to consumers.
* **Civic Life**: Students will understand that quantitative information presented in the media and by other entities can sometimes be useful and sometimes be misleading.

**Constructive Perseverance:** Activities in this class are designed with the recognition that solving mathematics and understanding mathematics require a certain amount of tenacity, persistence, perseverance, and challenge on the part of the student. *Healthy productive struggle and constructive perseverance are vital to student success in the course!!* Constructive perseverance levels for each lesson vary based both on the development of the student and the demands of the content.

**Book Sections:**

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| Section Titles |
| Lesson 1.A, “How Big is a Billion?” Lesson 1.B, “Building a Learning Community”Lesson 1.C, “How Big is a Billion?” (continued) |
| Lesson 1.D, “Building a Learning Community” (continued)Lesson 2.A, “Doubling Population” Lesson 2.B, “Scientific Notation” |
| Lesson 2.C, “Ratios in Water Use” Lesson 2.D, “Analyzing Water Footprints”Lesson 3.A “Large Numbers in the Media” (or Alternate) |
| Lesson 3.B, “Seeking Help” Lesson 3.C, “Estimating Sale Prices”Lesson 3.D, “Calculating sale prices”  |
| Lesson 3.E, “Developing Self-Regulation”Lesson 4.A, “Budgeting Operations” Lesson 4.B, “Budgeting with Spreadsheets”Lesson 4.C, “Graph Analysis”  |
| Lesson 4.D, “Using Graphs to Understand Change” Lesson 5.A, “Displaying Table Data” Lesson 5.B, “Relative Frequency Tables”  |
| Lesson 5.C, “Displaying Data: Histograms” Lesson 5.D, “Shapes of Distributions” Lesson 6.A, “Measures of Central Tendency” |
| Lesson 6.B, “Brain Power” Lesson 6.C, “Making Decisions with Data” Lesson 6.D, “Boxplots” |
| Lesson 7.A, “The Credit Crunch” Lesson 7.B, “More Credit Crunch” Lesson 7.C, “A Taxing Situation”  |
| Lesson 7.D,“A Taxing Situation” (continued)Lesson 8.A, “What’s the Risk?” Lesson 8.B, “An Apple a Day” |
| Lesson 8.C, “Reducing the Risk” Lesson 8.D, “Is Reducing the Risk Worth It?”Lesson 9.A, “Comparing Categorical Data”  |
| Lesson 9.B, “Interpreting Percentages”Lesson 9.C “Do You Trust the Test?”Lesson 9.D, “Do you trust the test?” (continued) |
| Lesson 10.A, “Population Density” Lesson 10.B, “Density Proportions”Lesson 10.C, “State Population Densities” (optional) |
| Lesson 10.D, “Apportionment” Lesson 11.A, “Formulating a Plan” Lesson 11.B, “The Costs of Geometry”  |
| Lesson 11.C, “Modifying and Combining Formulas” Lesson 12.A, “Texting Distance” Lesson 12.B, “The Cost of Driving”  |
| Lesson 12.C, “The True Cost of Driving” Lesson 12.D, “Can the True Cost Vary?” Lesson 13.A, “Algebra Reaction” (optional) |
| Lesson 13.B, “Breaking Down a Formula” Lesson 13.C, “Analyzing Change in Variables” Lesson 13.D, “Analyzing Change in Variables” (optional) |
| Lesson 14.A, “Body Mass Index” Lesson 14.B, “Target Weight”Lesson 14.C, “Blood Alcohol Content”  |
| Lesson 14.D, “Balancing Blood Alcohol” Lesson 15.A, “Proportional Reasoning in Art” Lesson 15.B, “Proportion Solutions”  |
| Lesson 15.C, “Solving Equations” Lesson 15.D, “More Work with Equations” (Optional) Lesson 15.E, “Proportional Viewing” (Optional)Lesson 16.A, “Describing Rates” Lesson 16.B “Comparing Rates”  |
| Lesson 16.C “Interpreting Change” Lesson 16.D “Where Do We Start?”Lesson 16.E “Predicting Costs”Lesson 17.A “Expressing Linear Relationships” |
| Lesson 17.B “Making the Call”Lesson 17.C, “Close Enough”Lesson 17.D, “Predicting Budget Increases” (optional)Lesson 18.A, “Pricing Your Product”Lesson 18.B, “Backing Out the Sales Tax” |
| Lesson 18.C, “Compound Interest Makes Cents”Lesson 18.D, “Long-Term Growth”Lesson 19.A, “More Compounding” |
| Lesson 19.B, “Depreciation”Lesson 19.C, “Payday Loans”Lesson 19.D, “Neither a Borrower…”Lesson 19.E, “Credit Card Repayment” (optional) |