

Student Learning Outcomes for Math 131--Quantitative Reasoning

University of Nevada, Reno

Numeracy, as well as literacy, is an essential part of the education needed to be a productive citizen and member of our modern society. The target audience for this course consists of the students whose majors will not require further training in mathematics and statistics. The primary goal of the course is to provide these students with the quantitative reasoning skills they will need to be successful at the university and in their lives and careers after they graduate. In providing these skills, which are articulated below, the course will contribute to the University of Nevada, Reno's mission as a land-grant university to serve the general educational needs of the state's citizens.

A secondary goal is to provide an appreciation for the role that mathematics--that is, mathematical thinking and abstraction, not simply arithmetic--plays in other areas such as science, economics, and business. Along the way, the course will strengthen students' knowledge of many important, broadly useful concepts, such as rate of change, exponential growth and power laws, and elementary probability and statistics concepts such as mean, standard deviation, and samples versus populations.

Math 131 Student Learning Outcomes

• **Model formulation and interpretation** Students will be able to frame quantitative problems and model them mathematically. More specifically, this outcome will further the Core Curriculum's objective of ensuring that students can "frame and analyze a problem, find and interpret relevant information, develop and evaluate possible solutions, [and] come to well-grounded conclusions..."

Student performance indicators

Students will translate descriptions of real world phenomena and data into mathematical models and, after working with models, will translate numerical answers into real world conclusions.

Assessment method

Student performance evaluation will include setting up and describing mathematical models of real world situations, interpreting numerical answers and writing mathematically reasoned conclusions.

• **Algebra proficiency and application** Students will be able to use algebra-based mathematical techniques and elementary statistical techniques to analyze problems from various different areas of science, economics, and other fields. This supports the Core Curriculum objective of enabling students to "Understand the modes of reasoning employed in ... social sciences, natural sciences and mathematics."

Student performance indicators

Students will apply mathematical and statistical techniques to a wide variety of contemporary real-world problems.

Assessment method

On exams, students will demonstrate the ability to apply mathematical techniques to different types of problems and correctly interpret the results.

- **Abstraction** Students will understand the role of abstraction, e.g. using variables to denote quantities in mathematical modeling, in order to (a) allow the application of algebra techniques, and (b) highlight the fact that similar mathematical models can be applied in a variety of contexts.

Student performance indicators

Students will demonstrate the ability to generalize and recognize similarities between different quantitative problems in order to apply mathematical techniques in new contexts.

Assessment method

This ability will be measured by student success at applying techniques to new real-world problems on homework and exams.

- **Appreciation of mathematics** Students will appreciate the ways that mathematical techniques and reasoning are applied to economics, business, physics, biology, and other areas. This will support the Core Curriculum objective of enhancing the students' ability to "Understand how the ... knowledge, perspectives, principles, and modes of reasoning in ... natural sciences and mathematics have contributed to human achievement."

Student performance indicators

Students will be exposed to applications of mathematical techniques to a wide variety of contemporary real-world problems.

Assessment method

On course evaluations, students will indicate (a) future situations in which they believe the techniques in the course will be useful to them, and (b) how the course affected their perspective on mathematics.

- **Key quantitative concepts** Students will understand fundamental concepts such as rates of change, proportionality, randomness and random experiments, and sample versus population.

Student performance indicators

Students will be able to interpret given information involving these concepts to set up models, and will be able to clearly state conclusions from the models involving these concepts.

Assessment method

This ability will be measured by students' success in writing clear, articulate answers to questions involving explanation and interpretation of mathematical models.

• **Spreadsheet technology for data analysis**

Students will gain facility with basic spreadsheet technology for elementary data analysis, graphing data, and calculation, that will improve their ability to use standard productivity software in future classes and later in their careers.

Student performance indicators

Through in-class labs and projects, students will master basic spreadsheet skills, such as data input and manipulation, calculation, and graphics utilities.

Assessment method

Student mastery and level of comfort with the technology will be gauged from quality of spreadsheet projects and from comments about spreadsheet use on evaluations.

Use of Results

The results of the different components of assessment described above will be used in several ways to improve future implementations of the course. Specifically, assessment results concerning model formulation and interpretation, abstraction and mathematics appreciation will guide which kinds of applications are used in the future and how the class time is allotted to the different topics and activities. The assessment of student learning of algebra techniques and key concepts will allow us to better tie these techniques in with prerequisite material. Feedback on the use of spreadsheet technology will allow us to improve the types of spreadsheet lab activities used to familiarize the students with the technology.