MATH 2103

College Mathematics

Spring 2022

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Office Hours: MW 10:50 – 12:20, 2:00 – 4:30

TR 12:20 – 1:50, 4:00-4:30

F 10:00 – 1:00 by appointment

Class Time and Location: Tuesday and Thursday 9:30 – 10:45 am, Spencer 245

Prerequisite: Grade "C" or better in MTH013 or a minimum score of 39 on the ASSET Numerical Skills Placement Exam, 42 on the Compass Pre-Algebra Placement Exam, 26 on the Compass Algebra Placement Exam, 17 on the ACT Exam, 41 on the Accuplacer Elementary Algebra, or 470 on the SAT Exam.

Resources:

Textbook: Math in Our World, Fourth Edition, by Dave Sobecki. McGraw-Hill Company, 2019. *ISBN 978-1-260-38978-4*

Required Materials:

1. Miscellaneous pens, paper, and pencils.

Course Description

Comprehensive mathematics course designed for general education core and for degrees not requiring college algebra. A strong emphasis should be placed on critical thinking, mathematical modeling, and technology. The majority of the course must include topics from general concepts of functions. Projects, group work, reading, and writing should be included.

Expected Student Learning Outcomes

The overarching goal of Quantitative Literacy is to provide students with mathematical understandings and skills to be productive workers, discerning consumers, and informed citizens. Students will solve problems using mathematical reasoning involving logic, proportions, algebra, and relations. More specifically, **student performances** will include:

1. Identifying problem-solving strategies and applying them to contemporary everyday problems, both in work and in personal lives.
2. Analyzing reports from media to determine completeness and accuracy noting assumptions both stated and unstated.
3. Critiquing public consumer and political information for better understanding, completeness, and accuracy.

In keeping with the tenets of student performance in a general education course, Quantitative Literacy is designed to deliver instruction that focuses on process, conceptual understanding, communication and problem solving. Content will be delivered following the instructional principles below.

Instructional Practices for the Course

1. Content and its presentation will be based in the context of everyday life and selected for its usefulness to the students and their current and future needs for mathematical skills.
2. Assignments should include interpreting written materials containing quantitative information and communicating results in writing.
3. Basic mathematical processes should be integrated into student work so that essential understandings and skills are developed or reinforced throughout the course.
4. Problem solving strategies should be stressed, and students should engage in mathematical thinking to develop solutions to non-routine problems, sometimes struggling productively to encourage perseverance.
5. Students should have access to appropriate technology.

The mathematics content of Quantitative Literacy may vary from campus to campus. However, the four content strands below link with content from secondary schools as defined by the Common Core State Standards. It is recommended that any course taught under these guidelines should include at least three of the four areas of study. Because of the nature of the course, some campuses may find it necessary for Quantitative Literacy to meet not only the non-STEM general education requirement, but to add additional content to meet documented mathematical needs of students in subsequent courses in a non-STEM or STEM degree program.

The defined strands include:

- Personal, state and national finance
- Statistics and probability
- Mathematical modeling
- Quantities and measurement

Content Defined

The following strand descriptions are offered as a guide for instruction and priorities for selecting class activities and projects. This is not intended to be or to become the content of a course syllabus without review and adoption at the campus level.

Personal, State and National Finance

- Explore essentials of creating a family/personal budget
  - Identify effect of trend periodic personal expenditures such as food and entertainment.
  - Compare expenses to income and analyze personal budget.
  - Explore and estimate when necessary recurring costs such as transportation, housing maintenance, and interest payments.

- Understand the difference between simple and compound interest and their effects on savings and expenditures.
  - Identify and apply formulas for computation of simple and compound interest.
  - Explore the sum resulting from periodic deposits in installment savings or periodic payments on a loan utilizing technology to calculate more complex sums.
  - Distinguish between compound interest formulas for periodic compounding and continuous compounding.
- Explore savings and investment accounts
  - Use technology to predict amount of investment for a period of time based on interest, length of investment and type of account.
  - Track stocks over time to understand market variation.
  - Use annual return and percentage of return formulas to predict investment value over time.

- Explore loan payments, credit card accounts and mortgages
  - Use technology to compute loan payments, credit card interest (payments) and house payments given principal, interest, and length of loan.
  - Use technology to solve problems related to "best deal," payment strategies, closing costs, and other factors that determine car loans or mortgage payments.

- Understand concepts and practices utilized in describing state and national revenues, expenditures, and deficits.

Statistics and Probability

- Represent data graphically (dot plots, histograms, and box plots).
- Use statistics appropriate to the shape of data distributions to compare center (mean, median, and mode) and spread (interquartile range, standard deviation).
- Interpret differences in shape, center and spread in the context of the data sets, accounting for possible extreme data points (outliers).
- When appropriate, use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages.
- Represent bivariate quantitative data on a scatter plot and describe how the variables are related.
  - Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
  - Use technology to determine the line of best fit for data that appear to follow a linear pattern.
- Compute (using technology) and interpret correlation of bivariate data.
- Distinguish between correlation and causation and between conspiracy and coincidence.
- Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
- Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
- Evaluate reports or print media articles based on statistical data.

- Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events.
- Understand and determine probabilities of independent and dependent events.
- Understand and determine conditional probabilities, applying in cases such as the false positive paradox.
- Use permutations and combinations to compute probabilities of compound events and solve problems.
- Find the expected payoff for a game of chance (e.g. Arkansas Scholarship Lottery instant win games).
- Analyze risk in health situations and understand the difference between absolute changes in risk and relative changes in risk.

Functions and Modeling

- Use function notation, understand functions as processes, and interpret statements that use function notation in terms of a context.
- Construct graphs and tables that model changing quantities and interpret key features in terms of the quantities.
- Interpret the slope and the intercept of a linear model in the context of the data.
- Graph linear and exponential functions and identify critical points.
- Compute (using technology) and interpret the correlation coefficient of a linear fit.
- Distinguish between situations that can be modeled with linear functions and those modeled with exponential functions.
    - Demonstrate that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
    - Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
- Use linear and exponential functions to model contextual situations such as costs (e.g. initial cost plus time dependent additions) and growth (reductions) of savings accounts (mortgage balances).

Quantities and Measurement

Understand large and small quantities through use of personal quantitative units, e. g. understanding the size of the national debt or the distance to the moon.

- Understand the use of units, thinking of numbers as adjectives.
- Study multiple ways of comparing quantities including the use of indices, e. g. the consumer price index and its relationship to the changing value of the dollar.

Investigate ways of finding exact and approximate areas and volumes of geometric and irregular shapes.

Course Description: Course content includes the fundamental processes of mathematics with emphasis on problem-solving techniques. Included is a review of arithmetic, introductory algebra, and rudiments of analytic geometry. A project of student's choice will be created to encompass class content with hands-on experience.

Program Outcomes: The knowledge and critical thinking skills acquired in the general education component enable students to analyze problems, to arrive at intelligent conclusions, and to make reasoned choices in their professional and personal lives. Many general education courses are designed to deal primarily with processes rather than simply with facts, to help students to develop individually and as members of a group and instill in students the desire to develop intellectual and emotional skills through lifelong learning.

- Use computational mathematics to solve problems which they encounter at home and the workplace.
- Apply algebraic operations and their practical applications to problems.

Rationale: An objective of post-secondary education is to provide a core of knowledge that is shared with most educated people. By studying and developing a deeper understanding of mathematical computations, students can better analyze, problem solve and prepare critical thinking strategies for real world scenarios.

Proposed Schedule:

Start Date	Week		Topic
01/11	1-3		Chapter 6: Topics in Algebra
		6.1	Applications of Linear Equations
		6.2	Ratio, Proportion and Variation
		6.3	Rectangular Coordinate System and Linear equations in two variables.
		6.4	Functions
		6.5	Solving Quadratic Equations
	4-7		Chapter 7: Consumer Mathematics
		7.1	Precent
		7.2	Personal Budgeting
		7.3	Simple Interest
		7.4	Compound Interest
		7.5	Installment Buying
		7.6	Student Loans and Home Buying
		7.7	Investing in Stocks and Bonds
	8-11		Chapter 10: Probability and Counting
		10.1	Basic Concepts of Probability
		10.2	The Fundamental Counting Principle and Permutations
		10.3	Combinations
		10.4	Tree Diagrams, Tables and Sample Spaces
		10.5	Probability using Permutations and Combinations
		10.6	Odds and Expectations

		10.7	Addition Rules of Probability
		10.8	The Multiplication Rules and Conditional Probability
		10.9	The Binomial Distribution
	12-15		Chapter 11: Statistics
		11.1	Gathering and Organizing Data
		11.2	Picturing Data
		11.3	Measures of Average
		11.4	Measures of Variation
		11.5	Measures of Position
		11.6	The Normal Distribution
		11.7	Applications of the Normal Distribution
		11.8	Correlation and Regression Analysis.

January 10	M	Classes begin.
January 21	F	Last day to drop with a refund
February 14	M	Winter Break (no classes, offices open)
February 28-March 4	M-F	Priority Registration for Summer & Fall
March 7	M	Mid-semester/first 8-week classes final grades due
March 21-25	M-F	Spring holidays begin (no classes, offices open)
April 29	F	Classes end/Last day to drop a class with a W
May 2-5 May 5	M-R R	Final exams Grades due

Course Conduct:

<u>Methods of Instruction</u>: The lecture approach, question and answer techniques, cooperative learning environments, calculator and computer usage, the overhead projector, and the smartboard are primarily the methods of instruction employed in this course.

<u>Oral Reports</u>: Occasionally a student may be asked to work a problem at the whiteboard and present an explanation to the class.

Term Assignments: Homework assignments are given for each session. Students are expected to maintain an up-to-date mathematics notebook, marking any problems that are found to be too difficult to complete. During the next class session those problems shall be fully explained by the instructor. Occasionally special problems (to be worked on a separate sheet) are assigned and submitted for a grade. Periodically homework is asked to be handed in. Homework, quizzes, and tests are all graded according correctness, clarity of work, whether directions in showing work have been followed as demonstrated by the instructor, and punctuality in handing work in on time. If you must miss class for any reason it is the responsibility of the student to call or email the instructor within 24 hours of the absence. Failure to do this will result in reduced and/or no credit for the assigned homework that was asked to be handed in. Exceptions to this rule will be considered in only extreme emergencies.

UA Rich Mountain Credit Hour Calculator: For every course credit hour, you should expect to spend at least three clock hours per week of concentrated attention on course-related work, including but not limited to time attending class, as well as out-of-class time spent reading, reviewing, organizing notes, preparing for upcoming quizzes/exams, problem solving, developing and completing homework, and other activities that enhance learning. For a three hour course, a typical student should expect to spend at least nine hours per week dedicated to the course. This includes the time spent in class.

Course Requirements / Evaluation (Grading):

Tests are 30% of your final grade. Three tests are scheduled.
Class Attendance & Participation 10%
Homework Assignments 25%
Research & Presentations 15%
Final Exam 20%

The final exam is comprehensive and will include problems from the chapters we have covered in class.

90 – 100 = A **80 – 89 = B** **70 – 79 = C** **60 – 69 = D** **0 – 59 = F**

Covid-19 Protocols

Face Mask Policy: As per the direction of the University of Arkansas Board of Trustees, all students are required to wear a proper face covering that completely covers the nose and mouth while on campus and in class. Masks with holes or masks that do not completely cover nose and mouth are not acceptable. Any student that does not have a proper mask will leave class and be referred to the Vice Chancellor for Student Affairs for possible disciplinary action.

Food and Drink: Food and drinks, including water are not allowed in the classroom at any time.

Class Procedures/Student Requirements:

Attendance Policy: Regular attendance and punctuality are expected. It is the responsibility of the student to initiate arrangements for all missed activities. If an absence is a planned absence the student is expected to make arrangements for making up work prior to the absence. More than three absences will be considered excessive and, along with work not made up, may adversely affect the grade for the course. Under no circumstances will the student receive credit for the course if more than a fourth of the classes are missed (13 classes). In case of extended illness, or other circumstances, the student must contact the instructor if a WP is desired. If the instructor is not notified a failing grade will be assigned for the course. Laboratory work is scheduled for a specific time and day. However, if it can be done safely (guidelines provided in class), students may do the missed laboratory works at another time if course schedule conflicts dictate. Each student is expected to participate in the required laboratory time in order to receive credit for the laboratory activity.

Assignment Due Dates: Students are expected to submit the assignments and other works on or before the assigned due dates. You will be penalized for the late works depending on the number of days and full point and importance of the works assigned.

Make-up Work Policy**:** Make up work should be competed promptly after the absence. A maximum of one week will be the guideline. Make-up exams are given only in instances of the most unavoidable, serious circumstances. Prior notice of absence from an exam is required. Upon return after an absence the student is expected to be prepared for the days' class activities. It will be the student's responsibility to obtain the assignment for that day. Missed labs can present a make-up problem. However, one make up period is available at the end of the semester.

Cell Phone Policy**:** Turn off your cell phone prior to class. If you work for an emergency service such as a fire department, put it on vibrate. It is a sign of disrespect as well as a disruption if non-emergency calls are taken during class. If you chose to take a call anyway, leave the room and take your supplies with you. You are expected not to return that session.

UA Rich Mountain Mission: UA Rich Mountain provides transformative education to all learners.

Academic Dishonesty: It is expected that each student shall do his/her own work on class works, quizzes, exams, and lab reports. Cheating, copying other's answers, writing other's statement without citing their reference are all considered plagiarism and are penalized from allowing no point

in that particular unit up to dismissal from the whole course, depending on the severity of the offense.

Disability Policy: It is the policy of UA Rich Mountain to accommodate students with disabilities, pursuant to state and federal law. Any student with a disability who needs accommodations should contact the Associate Vice President for Student Affairs Office, 394-7622, ext. 1460.

Arkansas Clean Air Act: In compliance with the Arkansas Clean Air Act, UA Rich Mountain is a smoke and tobacco free facility. Students and guests are to refrain from the use of all tobacco products while on campus.

Student Misconduct: Students committing misconduct are subject to disciplinary sanction(s) and/or restrictions. Misconduct or prohibited behavior includes, but is not limited to endangerment, harassment, disruption, sexual misconduct, illegal drugs and/or alcohol, fire or safety issues, gambling, property violations, computer violations or other violations as listed in the UA Rich Mountain catalog.

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Campus Security: UA Rich Mountain strives to provide a safe learning environment; therefore, students who know of any security risk are to contact a college official. For more information follow this link and look under the title Health and Safety: http://www.uarichmountain.edu/at-a-glance/disclosures

Credit Hour Requirement Calculator

Course Information			
Department, Course Number	Department of Math & Science		
Course Title	College Mathematics	MTH 2103	
Credit Hours	3		
Mode of Delivery	Traditional		
Weeks in Part of Term	15		
Level of Reading Material	General/Easy/Non-Technical (1)		1
Reading Level of Students	Remedial Student or Slow Reader (3)		3
Average Pages per Hour	11		

Enter either week or term, not both

Contact Hours	**Hours/Week**	**Hours/Term**	**Total Hours**
CLASS CONTACT HOURS	3		45

Syllabus Items	**Pages Asg'd**	**Hours/Week**	**Hours/Term**

Assigned Homework	4	60
GROUP ACTIVITIES	1	15
Lecture	2	30
		0
		0
		0
		0
		0
		0
		0
Total Hours		150
Required Hours		112.5
Difference		Ok + 37.5