# College Mathematics MATH2103 (Lecture) (ACTS: MATH1113)
# University of Arkansas Rich Mountain
# Spring 2021

**Class Time and Location: TR** 9:30 – 10:45, **Room**: M115

**Instructor Name:** Ron Webb --- B.S. Mathematics, Sam Houston State University;
ME, Southeastern Oklahoma State University

**Instructor Email:** rwebb@uarichmountain.edu;
ronwebb55@att.net;
ronaldpatrickwebb@gmail.com

**Cell Phone:** 479-234-2267

**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: College Mathematics, by Dave Sobecki. McGraw-Hill Company, 2019.
*ISBN 978-1-307-52795-7*

Required Materials:

1. Miscellaneous pens, paper, and pencils.

**Face Mask Policy:** As per the Executive Order from the governor of Arkansas, 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. Students will clean their workstation upon arriving to class and again before they depart.

**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.

**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.

**Course Requirements / Evaluation (Grading):**

**Tests** are 40% of your final grade. Five chapter tests are scheduled.

**Homework** is 40% of your final grade.

**Final Exam** is 20% of your final grade. The final exam is comprehensive. Problems are similar to chapter test problems.

**Grades** are assigned on the basis of the following percentage scale:

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

**Supplies Needed for daily work:** TI-83/84 Calculator supplied by UA Rich Mountain as needed, 3-ring notebook, college rule 3 hole paper, graph paper, cardboard folder, mechanical pencils with extra erasers, yellow highlighter, small pack colored pencils, small ruler or straight edge.

**Criteria for Credit:** Homework must be neat and complete. Each problem assigned has three parts: 1) Q: the original problem complete with figures drawn, 2) W: <u>all steps or an explanation</u> of how to arrive at the correct answer, and 3) A: the final answer. ***Answers alone are not acceptable***. Use pencils and straight edge paper; ***no ink or ruffles please***. Write the lesson topic at the top of the first page. Label each page with your name and lesson number in the top right hand corner. Work in two columns if possible. Box final answers with a yellow highlighter. Leave at least one blank line between problems. All

graphs are to be accurately sketched on graph paper with all parts properly labeled and all work for the problem shown on the **same page** as the graph. For immediate feedback, you may check your answers for most assigned problems in the back of the book. *You will not receive credit for any problems not meeting the criteria for credit described above.*

All assignments are due by the **next class** or **midnight** on their due date as assigned.

All homework can be emailed or texted To Mr. Webb at any of the three email addresses or phone number given above. I welcome any questions at any time via the same email or texts.

**UA Rich Mountain Credit Hour Calculator:** Success in this class demands good attendance, good listening and note-taking skills, practicing by doing assigned homework problems daily, sufficient practice in and out of class to become very proficient with your graphing calculator, and concentrated study before tests and final exam. 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 completing homework, seeking help from instructor or tutors, preparing for upcoming quizzes/tests/exam, reviewing material, problem solving, and organizing your notebook. For a three-hour course, a typical student should expect to spend at least nine hours per week dedicated to this course. This includes the time spent in class. Please see credit hour calculator attached to end of syllabus.

**Attendance / Make-up Policy**: No make-up exams will be given. If you miss an exam, the missing grade will be replaced by the final exam score at the end of the course. Deliberately missing an exam is not advised due to the comprehensive nature of the final exam and the possibility of missing a future exam. The student is responsible for instruction missed during class by studying the material in the book, seeking help from the teacher and/or student support services, and by getting class notes from the teacher or another student.

**Cell Phones:** The use of cell phones in the classroom is prohibited. Turn cell phones off during school hours. All cell phones will be taken up during exams.

**Computer and On-Campus Resources:** Computer labs with printers are available in several places on campus including the Johnson Learning Commons. UA Rich Mountain offers students assistance with quality tutors available in the Student Support Services (SSS) and Learning Enrichment and Counseling Center (LEAC) in the Johnson Learning Commons. You may access www.tutor.com/uarichmountain nights and weekends when SSS is not available.

**Academic Dishonesty**: Any suspicion of academic dishonesty will result in no credit for the paper in question.

**UA RICH MOUNTAIN Mission:** The University of Arkansas Rich Mountain exists to provide exemplary educational and enrichment opportunities to improve the quality of life and standard of living.

**ADA Statement**: It is the policy of UA Rich Mountain to accommodate students with disabilities, pursuant to federal law, state law, and the college's commitment to equal educational opportunities. Any student with a disability who needs accommodations, (ex: seating placement, examinations, or access to information on the web), should inform the Vice President of Student Affairs at the beginning of the semester. The Vice President of Student Affairs will contact the faculty member as to the accommodations needed for the course. To contact the Vice President of Student Affairs, students seeking accommodation should go to the Tower Room, located in the Maddox Building or call the College at 479-394-7622, ext. 1400.

**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.

**Topical Course Outline:**

Chapter 5: <u>The Real Number System</u>

1. The Natural Numbers
2. The Integers
3. The Rational Numbers
4. The Irrational Numbers
5. The Real Numbers
6. Exponents and Scientific Notation

Chapter 6: <u>Topics in Algebra</u>

1. Applications of Linear Equations
2. Ratio, Proportion, and Variation
3. The Rectangular Coordinate System
4. Functions
5. Quadratic, Exponential, and Logarithmic Functions

Chapter 7: <u>Consumer Math</u>

1. Percents
2. Personal Budgeting
3. Simple Interest
4. Compound Interest
5. Installment Buying
7. Investing in Stocks and Bonds

Chapter 8: <u>Measurement</u>

1. Measurements of Length
2. Measurements of Area, Volume, and Capacity
3. Measurements of Weight and Temperature

Chapter 9: <u>Geometry</u>

1. Points, Lines, Planes, and Angles
2. Triangles
3. Polygons and Perimeter
4. Area of Polygons and Circles
5. Volume and Surface Area

# 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 |

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

**Proposed Schedule**: **College Mathematics Spring 2021**

| Week | Begin Date | Section | Page | Assignment | # Prob |
|---|---|---|---|---|---|
| 1 | 1/12 | 5.1 | 221 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85, 89, 93, 97 | 23 |
| | 1/14 | 5.2 | 235 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85, 89, 91 | 22 |
| 2 | 1/19 | 5.3 | 249 | #11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67, 71, 75, 79, 85, 89 | 20 |
| | 1/21 | 5.4 | 260 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 83 | 20 |
| 3 | 1/26 | 5.5 | 268 | #9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 49 | 17 |
| | 1/28 | 5.6 | 277 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85, 89 | 21 |
| 4 | 2/2 | | | **EXAM CHAPTER 5** | |
| | | | | | |
| | 2/3 | 6.1 | 302 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61 | 14 |
| 5 | 2/9 | 6.2 | 313 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 49, 53, 57 | 12 |
| | 2/11 | 6.3 | 327 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69 | 16 |
| 6 | 2/16 | 6.4 | 336 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 67 | 13 |
| | 2/18 | 6.5 | 351 | #13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 65 | 18 |
| 7 | 2/23 | | | **EXAM CHAPTER 6** | 25 |
| | | | | | |
| | 2/25 | 7.1 | 369 | #7-31 ODD, #35, 39, 43, 47, 53, 59 | 19 |
| 8 | 3/2 | 7.2 | 375 | #7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 33, 35 | 13 |
| | 3/4 | 7.3 | 384 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 55 | 13 |
| 9 | 3/9 | 7.4 | 396 | #7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29 | 12 |
| | 3/11 | 7.5 | 410 | #11, 15, 19, 23, 27, 35, 39, 53 | 8 |
| 10 | 3/16 | 7.7 | 436 | #11- 41 ODD, 45, 49, 57, 59 | 20 |
| | 3/18 | | | **EXAM CHAPTER 7** | 25 |
| | | | | | |
| 11 | 3/30 | 8.1 | 457 | #9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85 | 20 |
| | 4/1 | 8.2 | 466 | #7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67, 71 | 17 |
| 12 | 4/6 | 8.3 | 473 | #7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67 | 16 |
| | 4/8 | | | **EXAM CHAPTER 8** | 25 |
| | | | | | |
| 13 | 4/13 | 9.1 | 488 | #7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67 | 16 |
| | 4/15 | 9.2 | 498 | #11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 49 | 17 |
| 14 | 4/20 | 9.3 | 506 | #7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 41 | 14 |
| | 4/22 | 9.4 | 516 | #7, 9, 11, 13, 15, 21, 27, 29, 31, 43, 47, 51, 53 | 13 |
| 15 | 4/27 | 9.5 | 525 | # 9, 11, 13, 15, 17, 21, 25, 27, 29, 31, 33, 35, 37 | 13 |
| | 4/29 | | | **EXAM CHAPTER 9** | 25 |
| | | | | | |
| 16 | 5/4 | | | **FINAL EXAM** | 25 |
| | | | | | |

**Important Dates:**

| | |
|---|---|
| January 12 (T) | Classes start |
| March 8 (M) | Mid-semester grades due |
| March 22-26 | Spring Break (No classes, campus closed) |
| May 4 (T) | Final Exam |