UNIVERSITY *of* SAINT MARY

MA 135 Quantitative Literacy: Math in the Real World (3)

Semester / Term / Year: Fall 2024

Class Meeting Times / Location / Delivery Modality: TF, 9:25 to 10:40 AM / Miege 105 / In-Person

Seat Time: Our seat time for this 3-credit hour lecture course is three (3) hours per week. Even more, students are strongly encouraged to spend at least six (6) hours per week reviewing their course materials, practicing problems, working on assignments, and preparing for quizzes and examinations.

Instructor Information: Dr. Dylan C. Beck, Assistant Professor of Mathematics

Contact Information:

- **Discord:** https://discord.gg/kBTCyspzcD
- **email:** Dylan.Beck@StMary.edu
- **Engage:** https://engage.stmary.edu/learn/course/view.php?id=8878
- **pronouns:** he / him / his
- **web page:** https://dylan-c-beck.github.io

Office / Office Hours / Virtual Office: Miege 102A / MR, 9:00 to 11:30 AM / Microsoft Teams

University Academic and Classroom Policies:

Refer to Engage and the USM Catalog for the University Mission, Values, and Learning Objectives, ADA Academic Accommodations, and other University Academic and Classroom Policies. Particularly, students should become familiar with the following University policies. Course-specific policies are provided below.

- Academic Catalog
  - o University Mission and Values Statements and Learning Outcomes
  - o Academic Honesty Policy
  - o University Attendance Policy
  - o Disability Services (or Academic Accommodations) Policy and Requesting Accommodations
- Academic Calendar
- Final Exam Schedule
- Student Handbook
  - o Disability and Accommodations Services
  - o Student Code of Conduct
  - o Alcohol, Drugs, and Tobacco Policies
  - o Campus Offices Information

Course Description

This course in quantitative reasoning is an introduction to the practical applications of mathematics. It is designed to give liberal arts students the skills required to understand and interpret the quantitative data they encounter in their academic studies and make quantitative-based decisions in their lives. Students will develop number sense and apply critical thinking and problem-solving strategies to connect mathematics to real-world applications. Topics include the real number system, estimation and prediction, problem-solving techniques, graphical techniques, basic statistics, elementary geometry, personal finance and budgeting, mathematics of voting, and mathematical modeling.

University Learning Outcomes

ULO 1.a Quantitative Literacy: The University of Saint Mary graduate will effectively access, evaluate, and apply information appropriately for a specific purpose.

Program Learning Outcomes

1. Develop problem solving and reasoning skills and analyze conceptual relationships. ULO 1.a

2. Apply disparate knowledge to solve complex problems in various disciplines and interpret the results in practical terms. ULO 1.a

3. Use mathematical abstraction and symbolism to create generalizations from observed patterns and develop specific examples from general statements. ULO 1.a

4. Read mathematical literature with increasing confidence, collaborate with others to solve problems, and effectively communicate mathematical concepts and processes. ULO 1.a

5. Appropriately use technological tools, such as graphing calculators and computers, as aids in solving problems, and correctly interpret the results that technology produces. ULO 1.a

6. Develop quantitative literacy by collecting, organizing and interpreting data, and create models for drawing trustworthy conclusions based on that data. ULO 1.a

Course Learning Outcomes

1. Effectively access, evaluate and apply information appropriately for real-life applications. ULO 1.a

2. Develop approaches to problem solving. MPLO 1

3. Use critical thinking to analyze arguments. MPLO 1

4. Investigate the real number system and its uses and abuses. MPLO 2

5. Learn how to manage money – savings plans, mortgages and loans, taxes, CPI, and inflation. MPLO 2, 5

6. Investigate and use statistical reasoning. MPLO 6

7. Use and apply basic probability. MPLO 1

8. Understand and use mathematical modeling – linear, exponential, and geometrical. MPLO 2, 5

Course Materials

Using & Understanding Mathematics: a Quantitative Reasoning Approach (8th Edition) by Bennett & Briggs

Costs for course materials are covered by the course fee; no student is obligated to purchase additional materials. Each student will be provided access to the publisher's online resources, including the textbook and videos. Optionally, students may purchase a physical copy of the textbook (ISBN 978-0-13-757533-6).

Course Policies

Class meetings will typically consist of an instructor-led lecture during which students will take notes, ask questions, and participate in discussion. Each student should be prepared to interact with the instructor, their classmates, and the course materials during each class meeting; the instructor may call on students to facilitate learning. Exam reviews will be hosted in class. Consult the course schedule below for dates.

Each student must place their phone screen-side down on their desk at the beginning of each class period, and the device must be left in that position for the duration of the course meeting (barring extenuating circumstances that merit phone usage and must be communicated to the instructor). Each failure to comply with this policy will result in a deduction of one percentage point from the student's overall grade.

Regular and punctual attendance is vital to understanding the information presented in this course; however, in the event of an unavoidable absence, it is the responsibility of the student to inform the instructor by filling out the Excused Absence Request Form and to make arrangements with the instructor to make up any materials or assignments missed during class. Particularly, student-athletes should take care to maintain proactive and timely communication with the instructor to remain in good academic standing.

Even more, in view of the instructor's obligation to provide timely feedback on assignments, unless granted explicit permission from the instructor, students may not submit work more than 72 hours (or one class period) past the due date; toward this end, the instructor reserves the right to deny any student of comments or credit on any assignment submitted 72 hours (or one class period) past the due date or any assignment submitted after the rubric is posted. Crucially, unless granted explicit permission from the instructor, it is the responsibility of any student that misses class (due to athletics, illness, or other extenuating circumstances) to submit their own homework on time; it is strictly prohibited for students to submit work that is not their own. Exam make-ups must be completed within one week (or five business days) of the original exam date.

Conversely, the instructor reserves the right to deny any student comments or feedback on any assignment submitted in advance of the due date. Explicitly, the instructor may refuse to review, revise, or otherwise provide feedback on an assignment that has not been submitted to be graded by the instructor.

Communication between students and the instructor will occur primarily in the classroom and during the instructor's (virtual) office hours; however, each student should check their university email and Engage regularly for class announcements and supplementary materials. Even more, students are encouraged to join the MA 135 Discord for homework assistance and to discuss course materials, policies, and due dates with their classmates and the instructor. Crucially, engagement on Discord is optional: concretely,

- participation on Discord is not required as part of the MA 135 coursework;

- interactions on Discord will not influence a student's grade in the course; and

- Discord should not be viewed as an official medium of communication between the instructor and the students at the University of Saint Mary. Explicitly, Saint Mary email remains the official mode of communication between the students at the University of Saint Mary and their instructor.

Even more, students are forbidden from directly messaging the instructor via Discord, and any comments made by students on the MA 135 Discord may be viewed by their classmates. Bearing this in mind, confidential information must not be shared on Discord. Critically, the instructor is obligated to report any illegal, unethical, or improper activities on the Discord server to the appropriate authorities.

Generally, the instructor will adhere to the University of Saint Mary's [Hours of Operation](#) as it pertains to attending office hours, conducting make-up exams, and responding to emails or other correspondence from students; therefore, students should be conscientious and cognizant of this time frame when seeking assistance with assignments or scheduling appointments with the instructor. Even more, the instructor reserves the right to at least 48 hours (or two business days) to respond to any correspondence sent during the business week (Monday through Friday, excluding holidays) and more time on weekends.

Collaboration with classmates on homework is encouraged; however, each student is expected to submit their own work on all assignments, and each student will be graded on their work as it appears. Consequently, for students working together, it is critical that no party completes any work on behalf of another party and that each party determines their own solutions. Explicitly, students should write original solutions rather than copy from one another; however, students may discuss relevant techniques or strategies for their work. Ultimately, students must clearly indicate their collaborators for each assignment.

Outside of class, students should expect to spend at least two hours preparing materials and studying for every hour spent in class. Unlike in high school, students that do not understand coursework should not assume the instructor will repeat material until it is mastered; rather, each student is expected and encouraged to ask questions as they arise. Each student should certainly devote time to studying course materials outside of class, but in the event of confusion or difficulty, students should consider visiting the instructor during his office hours. **Do not hesitate to ask questions, as this course is cumulative.**

Crucially, it should be noted that the instructor reserves the right to refuse any accommodations requested by the student after the last day of classes of the semester, especially if these arrangements are negotiated to improve the student's course average or to achieve a desired letter grade in the class. Consequently, **it is imperative that students communicate early and often any difficulty or concern to the instructor.**

Course Prerequisites

Enrolled students must have either a minimum score of 23 on the ACT math exam or a score between 250 and 265 on the Next Generation Accuplacer math placement exam within the last three (3) years.

Course Assignment Points and Percentages

type	quantity	weight	total
exam	4	12.5%	50%
homework	35	1%	35%
project	3	5%	15%

Once during the semester, students can earn up to one percent toward their overall grade by completing the MA 135 Syllabus Quiz. Each student that completes all homework assignments with an average homework score of 67% may drop their lowest five homework scores. Each student that passes all exams and all projects with both an average exam and average project score of 67% may drop their lowest exam score.

Course Grade

A	90%	100%
B	80%	89.99%
C	70%	79.99%
D	60%	69.99%
F	0%	59.99%

Our final examination will be administered on Monday, December 9 from 1 to 2:50 PM in Miege 102. We will reserve this time for presentations in fulfillment of the third Problem-Based Learning Project. Completion of each of the four unit exams is required in addition to the three problem-based learning projects. Explicitly, any student that fails to complete any unit exam or any problem-based learning project fails the course. Even more, **any student that fails to attend the final exam period automatically fails the course**.

Coursework, Examinations, and Projects

Each week, at the instructor's discretion, relevant written homework will be issued to be completed outside of class. Consult the course schedule below for specific due dates regarding assignments. Late work may not be accepted unless proper documentation is provided. Even more, late work that is accepted may be subject to a deduction of one letter grade for each class period beyond the due date; however, if the student anticipates and communicates an issue to the instructor at least one calendar week prior to the assignment due date, the student may be allowed to submit their work after the due date with no deduction in points.

Exams will be administered four times during the semester. On exams, students will use definitions and formulas to evaluate true-false and multiple-choice questions and compute examples. Credit for true-false and multiple-choice questions is awarded on an all-or-nothing basis. Credit for computations is earned primarily by citing relevant definitions and theorems, demonstrating a command of appropriate techniques, and showing work: when the relevant work is provided and a problem is answered correctly, full credit will be awarded. Partial credit may be awarded if some pertinent details are supplied; in this case, the instructor will typically mark the student's work with the phrase "work follows." Rubrics will typically be provided for the students' convenience. Each student must comply with the following exam regulations and guidelines.

- Each student is allowed a writing utensil and a non-graphing, non-programmable scientific calculator without computer algebra capabilities during exams. Graphing calculators are prohibited.

- Other papers and electronic devices must be stored in the student's backpack and placed under or next to their desk. Cell phones, smart watches, notes, and textbooks are prohibited during exams.

Once all students have cleared their workspaces, the assessment will begin. Each student will then have the full duration of the scheduled course meeting to complete the examination. Once the student has finished the assessment (or time has expired), the check-out procedure must be initiated by the student submitting their work to the instructor; the student may then be dismissed with the instructor's permission.

Below is a brief list of authorized handheld calculators for use on quizzes and exams.

TI-30XIIS	TI-34
TI-30XA	Casio fx-300ESPLUS

Calculators other than those listed above may be used with the instructor's explicit permission.

Problem-Based Learning will be facilitated through the completion of three projects over the course of the semester. Concretely, students will collaborate in small groups (of no more than three individuals) to apply course concepts to solve sophisticated problems that arise naturally in the real world. Example topics may include analysis and comparison of investment portfolios for retirement; analysis, interpretation, prediction, and visualization of data using statistical methods; or construction of appropriate mathematical models to compare insurance policies or investment plans or to predict population growth, etc. Ultimately, students must present their findings to the class. Further instructions and rubrics will be provided separately.

Update Clause

Ultimately, the instructor reserves the right at any point in the semester to alter this syllabus to reflect changes in policy or schedule due to extenuating or unforeseen circumstances. Consequently, it is the responsibility of the students to remain up to date with this syllabus; however, the instructor will inform students of any such changes to this document, and the syllabus will be maintained and updated.

Course Schedule

Week 1: Understanding Mathematical Language and Unit Analysis

date	section	topic(s)
Tuesday, August 27	Chapter 0: Getting Started 2A: Understand, Solve, Explain	• mathematical keywords • unit conversion • Understand-Solve-Explain (USE)
Friday, August 30	2B: Extending Unit Analysis	• standardized unit systems • units of density and concentration • units of energy and power

Week 2: Numerical Perspectives, Percentages, and Problem-Solving

date	section	topic(s)
Tuesday, September 3	2C: Problem-Solving Hints 3A: Uses / Abuses of Percentages	• approximation • comparison • mathematical keywords • methodology • solving percentage problems
Friday, September 6	3B: Numbers in Perspective 3C: Dealing with Uncertainty	• error • order of magnitude • scientific notation • significant digits

Week 3: CPI, Index Numbers, and Exam 1 Review

date	section	topic(s)
Tuesday, September 10	3D: Index Numbers and CPI 3E: Numerical Surprises	• Consumer Price Index (CPI) • false negatives / positives • inflation • understanding tabular data
Friday, September 13	Exam 1 Review	

Week 4: Exam 1 and Introduction to Finances and Interest

date	section	topic(s)
Tuesday, September 17	Exam 1	
Friday, September 20	4A: Taking Control of Finances 4B: the Power of Compounding	• budgeting basics • Compound Interest Formula • insurance basics • interest basics

Week 5: Credit, Investments, Loans, Savings, and Taxes

Monday, September 23 — Last Day to Drop a Course with 50% Refund

date	section	topic(s)
Tuesday, September 24	4C: Saving Plans and Investments	• Savings Plan Formula • total and annual return • types of investments
Friday, September 27	4D: Loans, Credit, and Mortgages 4E: Income Taxes	• income tax basics • Loan Payment Formula • types of mortgages

Week 6: Exam 2 Review, Problem-Based Learning Project 1, and Exam 2

date	section	topic(s)
Tuesday, October 1	Exam 2 Review Problem-Based Learning Project 1	
Friday, October 4	Exam 2	

Week 7: Fundamentals of Statistics and Understanding Statistical Data

Monday, October 7 — Graduation Application Deadline for Spring or Summer 2025 Graduates

date	section	topic(s)
Tuesday, October 8	5A: Fundamentals of Statistics 5B: Believing a Statistical Study	• populations parameters • sample statistics • sampling bias • sampling methods • statistical methods
Friday, October 11	5C: Statistical Tables and Graphs 5D: Graphics in the Media 5E: Correlation and Causality	• causation • charts, graphs, and histograms • correlation • frequency table • scatterplot • types of data

Week 8: Characterizing Data

date	section	topic(s)
Tuesday, October 15	6A: Characterizing Data	• mean • median • mode • outliers • shape and spread of data

Week 9: Measures of Variation, Normal Distribution, and Statistical Inference

date	section	topic(s)
Tuesday, October 22	6B: Measures of Variation 6C: the Normal Distribution	• 68-95-99.7 Rule • Five-Number Summary • percentile • quartile • range • standard deviation • standard score
Friday, October 25	6D: Statistical Inference	• confidence interval • hypothesis test • margin of error • statistical significance

Week 10: Probability

date	section	topic(s)
Tuesday, October 29	7A: Fundamentals of Probability	• counting principles • events and outcomes • odds • probability distribution • relative frequency
Friday, November 1	7B: Combining Probabilities	• And Rule • At-Least-Once Rule • conditional probability • Either-Or Rule • independence • mutual exclusivity

Week 11: Problem-Based Learning Project 2 and Exam 3 Review

date	section	topic(s)
Tuesday, November 5	Problem-Based Learning Project 2	
Friday, November 8	Exam 3 Review	

Week 12: Exam 3 and Exponential and Linear Growth

date	section	topic(s)
Tuesday, November 12	Exam 3	
Friday, November 15	8A: Linear vs. Exponential Growth 8B: Doubling Time and Half-Life	• doubling time • exponential decay • exponential growth • half-life • linear growth

Week 13: Functions, Logarithmic Scale, and Population Growth

date	section	topic(s)
Tuesday, November 19	8C: Real Population Growth 8D: Logarithmic Scales	• carrying capacity • Decibel Scale • logistic growth • Magnitude Scale • pH Scale • population growth rate
Friday, November 22	9A: Functions	• domain • range • representation of functions • variables

Week 14: Exponential and Linear Mathematical Models

date	section	topic(s)
Tuesday, November 26	9B: Linear Modeling 9C: Exponential Modeling	• linear function • exponential function • fractional growth rate • rate of change • Slope-Intercept Form

Week 15: Exam 4 Review and Exam 4

Monday, December 2 — Last Day to Withdraw and Receive a Grade of WP or WF

date	section	topic(s)
Tuesday, December 3	Exam 4 Review	
Friday, December 6	Exam 4	

Week 16: Finals Week

Wednesday, December 11 — MA 135 Final Examination (8:00 to 9:50 AM), Miege 105
Thursday, December 12 — Last Day of Fall 2024 Semester
Friday, December 13 — Final Grades Due to Registrar by 5:00 PM
Saturday, December 14 — Fall 2024 Commencement

date	section	topic(s)
Wednesday, December 11	Final Examination Problem-Based Learning Project 3	