Marshall University
Syllabus

Course Title/Number	**Math 160: Applied Mathematical Reasoning**
Semester/Year	Spring 2014
Days/Time	Monday and Wednesday 2:00pm-2:50pm; Tuesday and Thursday 2:00pm-3:15pm
Location	Morrow Library 122 (subject to change)
Instructor	Carl Mummert
Office	Smith Hall 742E
Phone	(304) 696-6156
E-Mail	mummertc@marshall.edu
Office/Hours	Monday, Wednesday, Thursday 3:00pm-4:00pm; Tuesday 3:00pm-5:00pm
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802
	Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description: From Catalog

A critical thinking course in applied mathematical reasoning.   Topics include logic, problem solving, linear modeling, beginning statistics and probability, exponential and logarithmic modeling, formula use. This is a 5 credit course.

The table below shows the following relationships: How each student learning outcomes will be practiced and assessed in the course.

Student Learning Outcomes	How students will practice each outcome in MTH 160	How student achievement of each outcome will be assessed in MTH 160
Students will demonstrate an ability to analyze arguments and identify fallacies.	Discussions, group work, board work, homework	Quizzes, exams, and projects
Students will demonstrate an ability to translate natural language arguments into propositional and syllogistic forms.	Discussions, group work, board work, homework	Quizzes, exams, and projects
Students will demonstrate a proficiency in utilizing formulas, solving equations and inequalities, and graphing the solutions.	Discussions, group work, board work, homework	Quizzes, exams, and projects
Students will create tables and graphs from statistical data.	Discussions, group work, board work, homework	Quizzes, exams, and projects

Students will analyze and interpret statistical concepts such as measures of central tendency, measures of variation, and normal distributions.	Discussions, group work, board work, homework	Quizzes, exams, and projects
Students will demonstrate a proficiency in the fundamentals of probability including expected value.	Discussions, group work, board work, homework	Quizzes, exams, and projects
Students will analyze statistical data and report results.	Discussions, group work, board work, homework	Quizzes, exams, and projects
Students will compare linear growth and exponential growth rates and their real-world applications.	Discussions, group work, board work, homework	Quizzes, exams, and projects

Required Texts, Additional Reading, and Other Materials

1. *Applied Mathematical Reasoning* by Brase, Brase, and Johnson. This is a custom text published by Cengage. It is available in the Marshall University Bookstore. ISBN 978-1-305-01187-8
2. *Algebra: Form and Function*, Preliminary Edition, by McCallum, Connally, Hughes-Hallett, et al. This is a used textbook that you can purchase from an online bookseller. Please match the ISBN exactly: 978-0-470-22666-7. A copy of this textbook will also be kept on reserve at Drinko Library.

Course Requirements / Due Dates

1. Project due dates: February 13, March 11, April 24
2. Exam dates: February 6, March 13, May 5

Grading Policy

- Quizzes: 15%
- Projects: 25%
- Exams: 60%
- The course will use a 90/80/70/60 grading scale

Attendance Policy

Unexcused absences from five days of class will result in a reduction of one letter grade for the semester; unexcused absences from six or more classes will result in an F. To obtain an excused absence, please go to the office of the Dean of Students in the MSC. Details about excused absences are on the last page of this syllabus.

Course Schedule (tentative and subject to change)

Week	Topics
1	Introduction. Argument forms, soundness, validity. Common fallacies.
2	Logical connectives, truth tables, negations. Conditionals, contrapositives, and converses. Proof tableaux for propositions.
3	Quantifies, syllogisms, existential import, the square of opposition.
4	**Exam on Unit 1.** Set operations, Venn diagrams.
5	**Project 1 due.** Review of exponents and operations with complex fractions.
6	Linear equations, linear inequalities, applications and graphs.
7	Quadratic equations, quadratic inequalities, applications and graphs.
8	**Exam on Unit 2.** Exponential equations, exponential growth and decay, graphs.
9	**Project 2 due.** Logarithmic equations, intensity of light and sound, graphs.
10	Introduction to Statistics
11	Data ethics, types of variables, graphical displays
12	Numerical measures for summarizing data.
13	Basic probability
14	**Project 3 due.** Normal distribution.
May 5	**Exam on Unit 3.**

Applied Mathematical Reasoning

Dr. Carl Mummert

January 29, 2014

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Who should take this course?

Math 160 meets your *core curriculum* requirement for mathematics.

Math 160 is a *critical thinking* (CT) course. You will receive 5 hours of CT credit towards your core curriculum. Every section of Math 160 is a CT course.

For majors in Criminal Justice, Math 160 also meets the mathematics requirement for your major.

From the course catalog

Math 160 is a critical thinking course in applied mathematical reasoning. Topics include logic, problem solving, linear modeling, beginning statistics and probability, exponential and logarithmic modeling, formula use.
5 credit hours.

Prerequisite

Math ACT 19, Math SAT 460, MTH 099, or equivalent. The prerequisites for this course are the same as for MTH 127.

About the professor

Dr. Carl Mummert
Office: Smith Hall 742E
Phone: (304) 696-6156
E-mail: mummertc@marshall.edu

Office hours

I am in my office most of the time, and I have an open door policy: you are welcome to stop by any time I am there. My weekly schedule is posted on my door, along with my cell phone number (to find me between 9am and 5pm, or for urgent matters only outside working hours).

The following times are my "scheduled office hours":

Monday	3:00pm − 4:00pm
Tuesday	3:00pm − 5:00pm
Wednesday	3:00pm − 4:00pm
Thursday	3:00pm − 4:00pm

The main goal of this course

The main goal of this course is to help you learn ways of thinking and mathematical techniques that will help you in your college studies, your career, and the rest of your life.

Topics – what does the course include?

The course has three main parts, each of which will fill about one third of the semester. Because Math 160 is a five credit hour course, this means that you will receive the equivalent of 1.5 credit hours in each of the three topics.

Part 1: Logic and fallacies

You will be able to make your own arguments stronger, and understand when you are being misled, by understanding the general patterns behind logical arguments and the common errors. A solid understanding of logic will also help you interpret written documents precisely. For those who go on to graduate school or law school, logical reasoning is a component of entrance exams such as the GRE and LSAT.

Part 2: Algebra and modeling

How far will a car skid on pavement, under maximum braking, if it was traveling 40mph? How long will it take for a person's body to process a given amount of an ingested chemical? Problems like these, which ask for numerical answers, are best solved through algebraic methods. In this class, we will focus on *modeling* – the application of algebraic techniques to real-world problems. We will sometimes discuss techniques on their own, but only when we expect you will need those techniques later.

Part 3: Statistics and probability

From the lottery to the newspaper, statistics are unavoidable, but they can be deceptive. You need to know what they mean and how they can be misused. This class will introduce you to the basics of statistics and probability. By the end, you will be able to compute simple probabilities and statistics on your own; equally importantly, you will be able to interpret statistics that others give to you. We will also discuss topics such as the reliability of DNA testing, which turns out to be closely related to conditional probability.

Requirements – what do you need to have?

Textbooks

Applied Mathematical Reasoning by Brase, Brase, and Johnson.
This is a custom text published by Cengage. It is available in the Marshall
University Bookstore. ISBN 978-1-305-01187-8

Algebra: Form and Function, Preliminary Edition, by McCallum,
Connally, Hughes-Hallett, *et al.* This is a used textbook that you can
purchase from an online bookseller. Please match the ISBN exactly:
978-0-470-22666-7. A copy of this textbook will also be kept on reserve at
Drinko Library.

Computer and Excel access

You must have internet access at your residence. Check your official MU
email account daily. Course handouts, announcements, and grades will be
posted on MU Online. You will submit projects on MU Online.

This course will use Microsoft Excel. This software is available to you on
all university computer labs. You will probably find it more convenient if
you have Excel on your own computer. Student licenses are inexpensive at
the Marshall University Bookstore.

Calculators

You need to have a scientific or graphing calculator during the course. The
calculator must be able to perform powers (x^y) and logarithms. Phones,
tablets, laptops, and cellular or networked devices are not permitted on
quizzes.

Paper

You should bring your calculator, paper, and a pen or pencil to every class
meeting.

Schedule – where and when do we meet?

Class meetings will be in Morrow Library 122 from 2:00pm to 2:50pm on
Monday and Wednesday, and from 2:00pm to 3:15pm on Tuesday and
Thursday.

Assignments – what do you have to do?

There are three kinds of assignments in this course:

- *Quizzes* (15% of grade): These quizzes will focus on the topics discussed in class and in the homework. There will usually be a quiz each Tuesday and Thursday at the end of class.

- *Projects* (25% of grade): There will be three projects during the semester, one on each of the three main topics of the course.

Project due dates	
Project 1: Logic	Thursday, February 13
Project 2: Algebra	Tuesday, March 11
Project 3: Statistics	Thursday, April 24

- *Exams* (60% of grade): There are two in-class exams and one final exam. Each exam is worth 20% of the course grade.

Exam dates	
Exam 1: Logic	Thursday, February 6, 2:00pm
Exam 2: Algebra	Tuesday, March 13, 2:00pm
Exam 3: Statistics	Monday, May 5, 12:45pm

Attendance is also a factor in your grade; see below.

Homework

Homework will be assigned from each section, but it will not be graded. You should bring questions about homework problems to class, office hours, or a tutoring lab.

Projects

You will complete three projects during the semester, one for each of the three main parts of the course. These projects will require to write prose responses of a modest length (2–4 pages), and create additional documents using Excel. Detailed instructions will be provided for each project. The due dates are listed above. You will submit your projects electronically using MU Online.

Overall grading scale

Your grade in the course is a weighted average of the three types of assignments. At the end of the semester, your overall letter grade will be assigned on the following scale:

90 − 100: A	80 − 90: B	70 − 80: C	60 − 70: D

You can view your grades on MU Online at any time.

How to get extra help

Office hours

I am in my office (SH 742E) most of the time, and I am always happy to answer questions or talk about the course material. Just stop by.

Tutoring labs

In addition to office hours, there are two free tutoring options for students in Math 160.

- The Mathematics Department has a free **drop-in** tutoring lab in Smith Music 115.

- The University College offers **appointment-based** tutoring in Laidley Hall.

For additional information, please see

http://www.marshall.edu/math/tutoringlab.asp

Course policies

Attendance policy

I expect you to attend every class. Unexcused absences from five days of class will result in a reduction of one letter grade for the semester; unexcused absences from six or more classes will result in an F. To obtain an excused absence, please go to the office of the Dean of Students in the MSC. Details about excused absences are on the last page of this syllabus.

Anti-plagiarism policy

Plagiarism of any kind is not permitted. Students who plagiarize on an assignment will receive a zero for that assignment, and the university-wide plagiarism policy will be followed. I will give you detailed information on what is considered plagiarism in this class.

University policies – what do you need to know?

For a complete list of the university policies that apply to this class, please see the undergraduate handbook at the following URL:

http://www.marshall.edu/wpmu/academic-affairs/policies/

In particular, this course includes the following university policies: Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Affirmative Action, Sexual Harassment.

Excused absences

I will excuse any absences that are covered by the university's excused absence policy, including:

1. *University-sponsored activities*: performing arts, debate and individual events, honors classes, ROTC, and departmental functions, etc. You must secure an excuse from the Dean of Students, Dr. Steve Hensley, in the MSC.

2. *Athletics*: official athletic events sponsored by the Athletic Department. Your coach will give you a letter to give to your instructors.

3. *Other university activities*: student government, student organizations, etc. The organization's sponsor will will give you a letter to give to your instructors.

4. *Short-term military obligation*. You must present your orders to the Dean of Students, Dr. Steve Hensley, in the MSC.

5. *Jury duty or subpoena*. You must secure an excuse from the Dean of Students, Dr. Steve Hensley, in the MSC.

6. *Religious holidays*. You must secure an excuse from the Dean of Students, Dr. Steve Hensley, in the MSC.

For other types of absences, I will decide on a case by case basis. Travel plans and work obligations can make it difficult to attend class, but they do not qualify as excused absences.

Learning outcomes

The table below shows the learning outcomes for the course. They describe the main skills that you will be tested on in the course. In general, the assignments that are intended to "practice" a skill will be graded with more partial credit than assignments that are intended to "assess" a skill.

Learning outcome	How the outcome will be practiced	How the outcome will be assessed
Demonstrate an ability to analyze arguments and construct fallacies.	Discussions, low-stakes writing, homework	Quizzes, exams, projects
Demonstrate an ability to translate natural language arguments into propositional and syllogistic forms.	Discussions, low-stakes writing, homework	Quizzes, exams, projects
Demonstrate a proficiency in utilizing formulas, solving equations and inequalities, and graphing the solutions.	Discussions, low-stakes writing, homework	Quizzes, exams, projects
Create tables and graphs from statistical data.	Discussions, low-stakes writing, homework	Quizzes, exams, projects
Interpret and analyze statistical studies.	Discussions, low-stakes writing, homework	Quizzes, exams, projects
Analyze and interpret statistical concepts such as measures of central tendency, measures of variation, and normal distributions.	Discussions, low-stakes writing, homework	Quizzes, exams, projects
Demonstrate a proficiency in the fundamentals of probability including expected value.	Discussions, low-stakes writing, homework	Quizzes, exams, projects
Compare linear growth and exponential growth rates and their real-world applications.	Discussions, low-stakes writing, homework	Quizzes, exams, projects
Apply techniques employing common logarithms to solve equations.	Discussions, low-stakes writing, homework	Quizzes, exams, projects

Course Objectives

1. This course will focus on the use of critical thinking to understand and interpret mathematical topics that will enable students to develop the quantitative reasoning skills they will need for a career in applied science or criminal justice.

2. Students will apply the quantitative thinking skills that they learn to analyze problems dealing with exponential growth and decay, logarithmic models, and other real-world scenarios.

3. Students will apply the inquiry based thinking skills that they learn to formulate focused questions and hypotheses, and collect and analyze data to draw justifiable conclusions.

4. Students will apply the integrative thinking skills that they learn to make connections and transfer skills and learning across mathematical disciplines and the social sciences.

5. Students will apply their information and technical literacy knowledge to research a series of projects for this course. They will use available sources to evaluate arguments for or against different propositions or available tools to analyze data.

6. Students will use their communication fluency skills to present their research. Each student will work on short projects on a variety of topics to be determined by the instructor.

Elements of critical thinking

The critical thinking domains of this course are Integrative Thinking; Quantitative Thinking; Information and Technical Literacy; Communication Fluency; and Inquiry Based Thinking This course will stress following elements of critical and integrative thinking.

1. Reasoning. This course begins with a chapter on logic. The topics include fallacies, inductive reasoning, deductive reasoning, truth tables, and Venn diagrams. These basic concepts are carried through the course as we analyze different topics in mathematics.

2. Representation. In this course students will research project topics that go beyond the material in the textbook. They will present their findings either in written form.

3. Information Literacy. Students will use a variety of sources to research the projects required for this class. Their projects will require them to use books, scholarly journals, and the Web to find the latest developments in their assigned topics.