

MATH 232 (Introduction to Statistics) · Fall 2016

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Office Hours: MW 9:00 a.m.–10:00 a.m., 11:00 a.m.–12:00 p.m., and by appointment.

Course Number and Section: Section 02 (CRN 60187, meets MWF 10:00–10:50 in Bowman 203) and Section 03 (CRN 60191, meets MWF 13:00–13:50 in Bowman 204).

Canvas Page: Please find our page on MCLA's Canvas system. If you are not automatically granted access to this page, please contact the instructor.

Required Text: *Beginning Statistics*, by Larry J. Stephens, in *Schaum's Outlines* series. Second edition, 2006. ISBN 978-0-07-163533-2. Available in the MCLA bookstore and at online booksellers. Please obtain your textbook through legal means.

Optional Supplementary Text: *Elementary Statistics*, by Mario F. Triola. Eleventh edition, 2010. ISBN 978-0-321-57082-6. You are not required to purchase this text, but if you choose to do so, you may use any edition you like. I will also keep a copy on reserve in the Freel Library for you to use. Feel free to substitute this supplementary text with any beginning statistics textbook you prefer.

Goal

The goal of this course is to examine descriptive statistics, probability, sampling theory, and inferential statistics. With the increasingly larger capacities available for storing data on computers, it has never been more important for global citizens to have literacy in the science of collection, analysis, interpretation, and presentation of data. This is exactly what Statistics is. Descriptive statistics deals with the use of statistical tools to organize and summarize collected information; inferential statistics deals with inferring properties of populations given descriptive statistics taken from a sample.

Classes

Class time will focus both on delivering course content and on working complementary practical examples. You are expected to maintain your own notebook, and you will be held responsible for knowing the material worked through in each class. In class, you will be asked to form groups, and these groups will change several times over the course of the semester. Within your groups, you will be working through problems and discussing solutions periodically throughout each lecture. Bring your Schaum's Outline book to lecture, if you feel it will help you.

Supplemental Instruction

We are very fortunate, in this course, to have MCLA's Supplemental Instruction (SI) program available to us. Svetlana Morrell (sm5653@mcla.edu) is an undergraduate student at MCLA who has taken and excelled in MATH 232 before, and we have invited her back to act as a guide and helper for students under the SI program. Svetlana will schedule and conduct two sessions of SI per week, for your benefit. **All students are strongly encouraged to attend these sessions**, where Svetlana will help you practice and master the course material. It would be a great place to work on your homework, to come with questions about the reading, or to prepare for quizzes, exams, and the project reports. Please feel free to e-mail Svetlana with any questions about the course material, and she will do her best to ensure a positive learning outcome for you in this class.

Attendance Policy

Students are expected to attend all of their classes and to be aware of course requirements. Whenever possible, students should notify their instructors prior to an absence from class. Students who expect to be absent from classes for three days or longer should contact the Center for Student Success and Engagement for help notifying their instructors. The complete college attendance policy may be located at: <http://www.mcla.edu/Academics/registrar/academicpolicies/index>

Electronic Device Policy

While it is not forbidden to use electronic devices such as mobile phones, laptops, and tablets in the classroom, it is assumed that if a student is using such a device, it is for legitimate academic purposes (*e.g.*, taking notes, displaying electronic textbooks, using calculator functionality). The instructor reserves the right to request that students display their screen to prove that they are not violating this assumption.

Homework

Each week, the reading will be given in class and posted to the course's Canvas page. In mathematics, reading without working through problems is useless—so a small number of exercises will also be assigned most days. There will be seventeen total homework assignments collected in class, of which your highest twelve scores will be used to compute your final course average. No late assignments will be accepted for credit. You will receive a printed copy of each assignment (and will be able to find it on Canvas), and the due dates are listed below.

Your homework submissions will receive grades of 0, 1, or 2, corresponding, respectively, to an incomplete or unacceptable submission; a partially complete or partially acceptable submission; and a complete and mostly correct submission that shows effort on your part. Because the number of problems per assignment is small, it is my expectation that your solutions to those problems will be completed with great care and presented professionally. You are encouraged to typeset your solutions using L^AT_EX, or to hand-write them very neatly. If the work is not presentable or if it is illegible, you will not receive credit for it. You should take the problems that will be worked in class and in the handouts as examples of the level of work I expect from you. Merely giving the correct answer will also receive zero credit.

You are welcome to discuss homework problems with one another, but you must write up your homework solutions on your own. Be mindful of your academic integrity.

Homework 1:	Monday, 12 Sept 2016
Homework 2:	Friday, 16 Sept 2016
Homework 3:	Monday, 19 Sept 2016
Homework 4:	Friday, 23 Sept 2016
Homework 5:	Monday, 26 Sept 2016
Homework 6:	Friday, 30 Sept 2016
Homework 7:	Monday, 03 Oct 2016
Homework 8:	Friday, 14 Oct 2016
Homework 9:	Monday, 17 Oct 2016
Homework 10:	Friday, 21 Oct 2016
Homework 11:	Monday, 24 Oct 2016
Homework 12:	Monday, 31 Oct 2016
Homework 13:	Friday, 04 Nov 2016
Homework 14:	Monday, 07 Nov 2016
Homework 15:	Friday, 18 Nov 2016
Homework 16:	Friday, 02 Dec 2016
Homework 17:	Monday, 05 Dec 2016

Quizzes

There will be ten quizzes given at the beginning of class on the dates listed below. Only the best eight of your quiz scores will be used to compute your final course grade. There will be no make-up quizzes given.

Quiz 1:	Wednesday, 14 Sept 2016
Quiz 2:	Wednesday, 21 Sept 2016
Quiz 3:	Wednesday, 28 Sept 2016
Quiz 4:	Wednesday, 05 Oct 2016
Quiz 5:	Wednesday, 19 Oct 2016
Quiz 6:	Wednesday, 26 Oct 2016
Quiz 7:	Wednesday, 02 Nov 2016
Quiz 8:	Wednesday, 16 Nov 2016
Quiz 9:	Wednesday, 30 Nov 2016
Quiz 10:	Wednesday, 07 Dec 2016

Exams

There will be three exams, given on the following dates:

Exam 1:	Friday, 07 October 2016
Exam 2:	Wednesday, 09 November 2016
Exam 3:	Date, time, and location to be announced

Project

There will be a single long-term project worth 12% of the course grade, and you are encouraged to choose your own topic (details about the project goals, expectations, and rubric will be given separately from this syllabus). You will need to submit three reports on your work throughout the course of the semester, due on the following dates:

First report due: Friday, 28 October 2016
Second report due: Monday, 21 November 2016
Final report due: Friday, 09 December 2016

Grading Scheme

Homework	best 12 × 2.083% =	25%
Quizzes	best 8 × 1.875% =	15%
Exams	3 × 16% =	48%
Project		12%

Final Grades

You will be assigned a letter grade corresponding to your final course average as follows:

98% ≤	A+	
91% ≤	A	< 98%
89% ≤	A-	< 91%
87% ≤	B+	< 89%
80% ≤	B	< 87%
78% ≤	B-	< 80%
76% ≤	C+	< 78%
69% ≤	C	< 76%
67% ≤	C-	< 69%
60% ≤	D	< 67%
	F	< 60

Students with Disabilities

Any student who believes he or she may need an accommodation based on the impact of a documented disability may be eligible for accommodations that provide equal access to educational programs at MCLA. Students are advised to contact that Disability Resource Office at (413) 662-5318 or stop by CSSE, Eldridge Hall to schedule an appointment. In compliance with the Americans with Disabilities Act (ADA), the Disability Resource Office will work with students to coordinate reasonable accommodations. Students who wish to request accommodations should do so within the first four weeks of the semester. Once accommodations have been determined, the student will provide a copy of his/her accommodation plan to each individual instructor. Students must fulfill all course requirements in order to receive passing grades in their classes, with or without reasonable accommodations. Please note that accommodations cannot be granted retroactively.

Center for Student Success and Engagement

The Center for Student Success and Engagement (CSSE) offers an integrated array of services and resources to assist your transition to college. We believe every student has the ability to excel academically and be successful, goals supported by a range of peer-advisory programs. If you need academic support, tutoring, or supplemental advising, please stop by their office at the top level of Eldridge Hall.

Counseling Services

MCLA's Counseling Services offers a range of services including individual and couples counseling, crisis intervention, outreach workshops and educational programming, psychiatric treatment, alcohol and other drug education, consultation to faculty, staff, parents, and students, and off-campus referrals. Group counseling is available as needs arise. Counseling services are confidential and free to all enrolled MCLA students, and it's perfectly normal to ask for help. Counseling Services is located in the MountainOne Student Wellness Center, 2nd Floor, and is open Monday-Friday from 8:30 am to 4:45 pm. Students are seen at Counseling Services by appointment only. To schedule an appointment, please call or drop by the office. Please do not use e-mail to make an appointment.

Academic Integrity

A college is a community of students and faculty interested in the search for knowledge and understanding. This requires a commitment to honesty and integrity. Honesty on the part of every college student is integral to higher education at Massachusetts College of Liberal Arts. Acts of dishonesty are not merely a breach of academic honesty but conflict with the work and purpose of the entire College Community. Violations of academic honesty include but are not limited to:

- Submitting the work of others as one's own
- Unauthorized communication during or about an examination
- Use of information (notes, electronic communication, etc.) that is not permitted during exams, tests, quizzes
- Obtaining or disseminating unauthorized prior knowledge of examination questions
- Substitution of another person in an examination
- Altering College academic records
- Knowingly submitting false statements, data or results
- Submission of identical or similar work in more than one course without the approval of the current instructor
- Collaborating on material after being directed not to collaborate
- Forging a signature or false representation of a College official or faculty member or soliciting an official signature under false pretense
- Other behavior or activities in completing the requirements of a course that are explicitly prohibited by an instructor
- Plagiarism (as defined below)

Plagiarism: The academic departments of the College have varying requirements for reporting the use of sources, but certain fundamental principles for the acknowledgment of sources apply to all fields and levels of work. The use of source materials of any kind and the preparation of essays or laboratory reports must be fully and properly acknowledged. In papers or laboratory reports, students are expected to acknowledge any expression or idea that is not their own. Students submitting papers are implying that the form and content of the essays or reports, in whole and in part, represent their own work, except where clear and specific acknowledgement is made to other sources. Even if there is no conscious intention to deceive, the failure to make appropriate acknowledgment may constitute plagiarism. Any quotation—even of a phrase—must be placed in quotation marks and the precise source stated in a note or in the text; any material that is paraphrased or summarized and any ideas that are borrowed must be specifically acknowledged. A thorough reordering or rearrangement of an author's text does not release the student from these responsibilities. All sources that have been consulted in the preparation of the essay or report should be listed in the bibliography. Upon an occurrence of alleged academic dishonesty instructors may exercise their discretion in imposing a sanction.

Instructors may also report this sanction to the Registrar or file additional charges against students if they believe that additional sanctions are appropriate. Instructors will notify the Registrar in writing in either or both of the following cases:

- Any acts of academic dishonesty whenever they have imposed a sanction that is beyond the value of the assignment
- The instructor requests that the College take further action.

The Academic Appeals Committee will hear academic grievances from and about students enrolled in the undergraduate program. It will also serve as a hearing board for students charged with academic dishonesty. Further information regarding instructor and student rights and responsibilities and appropriate procedures to be followed in applying this policy may be obtained from the Office of the Dean of Academic Affairs or the Registrar. Additional policies may be found at:

<http://www.mcla.edu/Academics/registrar/academicpolicies/index>

Policies with approval dates and text (focused on curriculum) can be found by clicking on “Approved Courses and Policies” at the left of the Campus Collaboration page, then clicking on “Undergraduate Policies”.

Tentative Schedule

Please find below the tentative schedule for the class. You are expected to have finished reading the indicated sections in the Schaum's Outline text before the lecture begins.

Date	Deliverables	Topic	Reading (do before lecture)
07 Sept		<i>Welcome; Measures of Central Tendency; Mean, Median, and Mode for Ungrouped Data</i>	pp. 46–48
09 Sept		<i>Measures of Dispersion; Range, Variance, and Standard Deviation for Ungrouped Data</i>	pp. 48–51
12 Sept	Homework 1 due.	<i>Measures of Central Tendency and Dispersion for Ungrouped Data; Chebyshev's Theorem; Empirical Rule; Coefficient of Variation; Z Scores</i>	pp. 51–54
14 Sept	Quiz 1.	<i>Measures of Position: Percentiles, Deciles, Quartiles; Interquartile Range; Box-and-Whisker Plot</i>	pp. 54–56
16 Sept	Homework 2 due.	<i>Experiment, Outcomes, Sample Space; Tree Diagrams and the Counting Rule; Events, Simple Events, and Compound Events</i>	pp. 71–73
19 Sept	Homework 3 due.	<i>Probability; Classical, Relative Frequency and Subjective Probability; Marginal and Conditional Probabilities; Mutually Exclusive Events</i>	pp. 73–78
21 Sept	Quiz 2.	<i>Dependent and Independent Events; Complementary Events; Multiplication Rule for the Intersection of Events; Addition Rule for the Union of Events</i>	pp. 78–81
23 Sept	Homework 4 due.	<i>Bayes' Theorem; Permutations and Combinations; Using Permutations and Combinations to Solve Probability Problems</i>	pp. 81–84
26 Sept	Homework 5 due.	<i>Random Variables; Discrete Random Variables; Continuous Random Variables; Probability Distribution; Mean of a Discrete Random Variable; Standard Deviation of a Discrete Random Variable</i>	pp. 98–102
28 Sept	Quiz 3.	<i>Binomial Random Variables; Binomial Probability Formula; Tables of the Binomial Distribution; Mean and Standard Deviation of a Binomial Random Variable</i>	pp. 102–106
30 Sept	Homework 6 due.	<i>Poisson Random Variable; Poisson Probability Formula; Hypergeometric Random Variable; Hypergeometric Probability Formula</i>	pp. 106–110
03 Oct	Homework 7 due.	<i>Uniform Probability Distribution; Mean and Standard Deviation for the Uniform Probability Distribution; Normal Probability Distribution</i>	pp. 124–128
05 Oct	Quiz 4.	<i>Review for Exam 1</i>	
07 Oct	Exam 1		
12 Oct		<i>Standard Normal Distribution; Standardizing a Normal Distribution</i>	pp. 128–132
14 Oct	Homework 8 due.	<i>Applications of the Normal Distribution; Determining the z and x Values When and Area under the Normal Curve is Known</i>	pp. 132–137
17 Oct	Homework 9 due.	<i>Normal Approximation to the Binomial Distribution; Exponential Probability Distribution; Probabilities for the Exponential Probability Distribution</i>	pp. 137–141
19 Oct	Quiz 5.	<i>Simple Random Sampling; Using Random Number Tables; Using the Computer to Obtain a Simple Random Sample</i>	pp. 152–154
21 Oct	Homework 10 due.	<i>Systematic Random Sampling; Cluster Sampling; Stratified Sampling; Sampling Distribution of the Sampling Mean</i>	pp. 154–156

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Date	Deliverables	Topic	Reading (do before lecture)
24 Oct	Homework 11 due.	<i>Mean and Standard Deviation of the Sample Mean; Shape of the Sampling Distribution of the Sample Mean and the Central Limit Theorem; Applications of the Sample Mean</i>	pp. 156–160
26 Oct	Quiz 6.	<i>Sampling Distribution of the Sample Proportion; Mean and Standard Deviation of the Sample Proportion; Shape of the Sampling Distribution of the Sample Proportion and the Central Limit Theorem; Applications of the Sampling Distribution of the Sample Proportion</i>	pp. 160–164
28 Oct	Project Report 1 Due.	<i>Point Estimate; Interval Estimate; Confidence Interval for the Population Mean: Large Samples; Maximum Error of Estimate for the Population Mean</i>	pp. 179–182
31 Oct	Homework 12 due.	<i>The t Distribution; Confidence Interval for the Population Mean: Small Samples</i>	pp. 182–187
02 Nov	Quiz 7.	<i>Confidence Interval for the Population Proportion: Large Samples; Determining the Sample Size for the Estimation of the Population Mean; Determining the Sample Size for the Estimation of the Population Proportion</i>	pp. 187–190
04 Nov	Homework 13 due.	<i>Null Hypothesis and Alternative Hypothesis; Test Statistic, Critical Values, Rejection and Nonrejection Regions</i>	pp. 200–202
07 Nov	Homework 14 due.	<i>Review for Exam 2</i>	
09 Nov	Exam 2		
14 Nov		<i>Type I and Type II Errors</i>	pp. 202–207
16 Nov	Quiz 8.	<i>Hypothesis Tests about a Population Mean: Large Samples; Calculating Type II Errors</i>	pp. 207–212
18 Nov	Homework 15 due.	<i>P Values; Hypothesis Tests about a Population Mean: Small Samples; Hypothesis Tests about a Population Proportion: Large Samples</i>	pp. 212–219
21 Nov	Project Report 2 Due.	<i>F Distribution; F Table; Logic Behind a One-Way ANOVA</i>	pp. 299–304
28 Nov		<i>Sum of Squares, Mean Squares, and Degrees of Freedom for a One-Way ANOVA; Sampling Distribution for the One-Way ANOVA Test Statistic; Building One-Way ANOVA Tables and Testing the Equality of Means</i>	pp. 304–311
30 Nov	Quiz 9.	<i>Logic Behind a Two-Way ANOVA; Sum of Squares, Mean Squares, and Degrees of Freedom for a Two-Way ANOVA</i>	pp. 311–315
02 Dec	Homework 16 due.	<i>Building Two-Way ANOVA Tables; Sampling Distributions for the Two-Way ANOVA; Testing Hypothesis Concerning Main Effects and Interaction</i>	pp. 315–320
05 Dec	Homework 17 due.	<i>Straight Lines; Linear Regression Model</i>	pp. 339–342
07 Dec	Quiz 10.	<i>Least-Squares Line; Error Sum of Squares; Standard Deviation of Errors; Total Sum of Squares; Regression of Sum of Squares</i>	pp. 342–348
09 Dec	Final Project Report Due.	<i>Mean, Standard Deviation, and Sampling Distribution of the Slope of the Estimated Regression Equation; Inferences Concerning the Slope of the Population Regression Line</i>	pp. 348–350
12 Dec		<i>Estimation and Prediction in Linear Regression; Linear Correlation Coefficient; Inference Concerning the Population Correlation Coefficient</i>	pp. 350–354