

STAT 1000 Section A01
Basic Statistical Analysis 1
Winter 2020

Time Monday/Wednesday/Friday 1030 a.m. – 11:20 a.m.
Location 172 Shultz Lecture Theatre
CRN 50080

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Web Pages UM Learn: <http://umanitoba.ca/umlearn>
Statistics: <http://umanitoba.ca/statistics>
iClicker Registration: <https://app.reef-education.com/>

Office Hours: Monday 1:30 p.m. – 2:30 p.m.
Tuesday 10:30 a.m. – 11:30 a.m.
Wednesday 1:30 p.m. – 2:30 p.m.

If the above times are not convenient for you, please call, email or speak to me to arrange an alternate time to meet. I will do my best to return all email or telephone messages within 24 hours.

Calendar Description

(Formerly 005.100) An introduction to the basic principles of statistics and procedures used for data analysis. Topics to be covered include: gathering data, displaying and summarizing data, examining relationships between variables, sampling distributions, estimation and significance tests, inference for means. Not to be held with STAT 1001, STAT 2220 (005.222). Prerequisite: Any grade 12 or 40S Mathematics, or equivalent.

Teaching Philosophy and Goals

It is the desire of the Department of Statistics to present this course in a manner that emphasizes and illustrates the statistical analysis arising from “real-world” applications. Whenever possible, we will attempt to bring real-life examples and data into the classroom. Upon completion of this course students can proceed in many directions: to further intensive study of statistics, to one or more additional courses in statistics, to the use of statistical methods in other fields of study, or to being a consumer of statistical information in daily life. It is our objective to serve all of these diverse directions.

The course is designed to include basic topics deemed crucial for problem formulation and understanding of the foundations of statistical thinking and reasoning. The concepts of statistical analysis will be stressed. The course will place an emphasis on the development of critical thinking skills.

Software will be used in this course to aid in the analysis of data. The computer program that has been selected for this course, Microsoft Excel, is easy to use and is available free for use with Mac or Windows systems. The program also has many advanced statistical features that you will find useful in subsequent courses.

We are interested in feedback from you. If you can think of ways in which this course could be improved, please let us know.

Evaluation

i►clicker Questions/Participation	5%
Quizzes	10%
Midterm Test	35%
Final Examination	50%

Marks for i►clicker sessions, quizzes and the midterm test will be posted on the UMLearn gradebook (see the web link on Page 1).

Subject to the caveat in the paragraph below, the following are the minimum percentage grades required to receive each of the various letter grades: A⁺ (90%), A (80%), B⁺ (75%), B (70%), C⁺ (65%), C (60%), D (50%).

There is an **additional requirement** for obtaining a C in the course: **to obtain a grade of C or better, you must obtain at least 50% on the final examination.**

Exam Information

The midterm test will be held **Monday, March 2, 2020 from 5:30 p.m.– 7:30 p.m.** and will cover Units 1 – 5 in the course outline. The final exam will be 3 hours in duration and will be scheduled by the Student Records Office. The final exam will cover Units 1 – 11, with emphasis on Units 6 – 11. Students missing the midterm test for a valid reason (and with documentation) will be permitted to write a deferred midterm test at a later date.

The midterm will consist of only multiple-choice questions. The final examination will contain both multiple-choice questions and a written component, in an approximate 60:40 ratio.

For quizzes, the midterm test and the final examination: (i) nonprogrammable handheld calculators are permitted (graphing calculators are **not** permitted), (ii) electronic devices, such as cell phones or headphones, are prohibited, (iii) statistical tables will be provided, if required, and (iv) a formula sheet with selected formulas will be provided (for the midterm test and final examination only).

i►clickers

Throughout the course, extensive use of the i►clicker classroom response system will be made in order to enhance your understanding of the material and promote classroom participation. Note that i►clicker participation constitutes a portion of your grade in this course.

You are required to bring your i►clicker or an internet enabled device that runs a web browser or the REEF app to each class. If you are using a physical clicker, it is your responsibility to ensure that it has functional batteries. You may either use a remote purchaseable at the bookstore, a remote loanable from UMSU's Answer's booth for a deposit, or you may use a laptop, iPhone/iPad (iOS 10+), or Android (OS 5.0+) device. You will need to make a free REEF account either through their app or at the website, <https://app.reef-education.com/>. Once registered you will need to add my class in your app or web profile. It is **very** important that you register using your U of M email and use your 7-digit student ID. If you are using a physical iClicker remote, you will have to add your clicker ID number (found on the back by the barcode) to your profile page in REEF.

For every i►clicker response you give, you will be awarded 1 point. For questions with a correct answer, an additional point will be awarded for selecting the correct response. Full marks (5/5) will be given if you receive at least 75% of the total possible i►clicker points. Partial marks (3/5) will be given if you receive between 50% and 75%. No marks (0/5) will be given if you receive less than 50%.

The use of another student's i►clicker constitutes impersonation and is strictly forbidden under the University of Manitoba's academic integrity policy. (See page 4.)

Tutorials & Quizzes


You will attend a tutorial once per week (beginning from January 20 – 24). Your T.A. will go through practice questions, which will be posted in advance on UMLearn. It is recommended that you attempt the questions in advance, and that you print them out and bring them with you to the tutorial. You should also bring your calculator.

There will be four quizzes throughout the term, which will be written during the tutorial time. Your T.A. will distribute a handout at your first tutorial with the quiz dates for your section. The material covered on each quiz will be announced in advance in class and on UM Learn. The quizzes are worth 10% of your final grade in the course. Only your best three of four quiz marks will count towards your final grade. **You must attend and write the quizzes in the tutorial section in which you are registered.** There will be no make-up quizzes.

Assignments

There will be no formal assignments in this course. However, numerous practice problems (with solutions) will be posted for each unit. Students are strongly encouraged to try these practice problems on a regular basis.

Software Download

The latest version of Microsoft Excel (2016) can be downloaded to your computer by logging into your university email at <http://365.myumanitoba.ca>, clicking on the gear icon  in the top right corner, and then selecting Office 365. On the webpage that opens in a new tab, click on Software in the Settings group and follow the instructions from there.

Statistics Help Centre

In room 311 Machray Hall (which contains a number of computers), graduate students and senior undergraduate students in statistics are available to help you at the following times (from January 13 to April 9):

Monday	9:30 a.m. – 3:30 p.m.
Tuesday	9:30 a.m. – 7:00 p.m.
Wednesday	9:30 a.m. – 2:30 p.m.
Thursday	9:30 a.m. – 7:00 p.m.
Friday	9:30 a.m. – 12:00 noon.

Note: The lab will be closed on holidays and during the Fall term break (February 18 – 21).

Voluntary Withdrawal

The voluntary withdrawal date is **March 18** (by which time you will have received your marks for the first two quizzes, the midterm test and several i►clicker sessions).

Academic Integrity

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that describe academic integrity (including plagiarism, cheating, inappropriate collaboration and examination impersonation, as well as typical penalties) can be found at:

<http://umanitoba.ca/student/guide/academic-integrity.html>

Copyrighted Material

All course notes, assignments, tests, exams, practice exams and solutions are the intellectual property of your instructor or the Department of Statistics. Reproduction or distribution of these materials is strictly forbidden without their consent.

Recording of Class Lectures

Your instructor and the University of Manitoba hold copyright over the course materials, presentations and lectures which form part of this course. No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission from your instructor.

Use of Electronics in the Classroom

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. A student may use technology in the classroom setting only for educational purposes approved by the instructor and/or the University of Manitoba Accessibility Services. Students should not engage in electronic messaging/posting activities (e-mail, texting, video or voice chat, social networking (e.g. Facebook)) or electronic gaming during scheduled class time.

Class Communication

The University requires all students to activate an official University email account. Please note that all communication between your instructor and you as a student must comply with the Electronic Communication with Students Policy. Please see

http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html

You are required to obtain and use your U of M email account for all communication between yourself and the university.

Student Accessibility Services

If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

<https://umanitoba.ca/student/accessibility/about-us.html>

ROASS Schedule A

Schedule A of the Responsibilities of Academic Staff with regards to Students (ROASS) policies of the University of Manitoba lists resources and policies for students. It is important that you familiarize yourself with these resources and policies. Schedule A will be posted on your instructor's UMLearn page.

Course Outline

Unit 1 – Examining Distributions

- types of variables: quantitative, categorical, nominal, ordinal
- graphs for categorical variables: bar charts, pie charts, histograms, time plots
- examining distributions, dealing with outliers
- describing distributions with numbers: mean, weighted mean, median, quartiles, percentiles, interquartile range, range, variance and standard deviation
- five-number summary and boxplots
- the $1.5 \times \text{IQR}$ rule for suspected outliers, outlier boxplots
- resistant measures

Unit 2 – Scatterplots, Correlation and Regression

- association, response variable, explanatory variable
- examining scatterplots
- correlation
- least-squares criterion and least squares regression line
- r^2
- residuals, outliers, influential observations
- cautions about correlation and regression
- association vs. causation, lurking variables
- extrapolation

Unit 3 – Sampling Design

- populations and samples
- voluntary response sample
- convenience sample
- simple random sample
- census

- stratified random sample, multistage sample
- undercoverage, nonresponse

Unit 4 – Design of Experiments

- observations vs. experiment
- experimental units
- factors, factor levels, treatments
- placebo effect, control group, bias
- principles of experimental design
- completely randomized design
- randomized block design
- matched pairs design

Unit 5 – Density Curves and Normal Distributions

- continuous random variables, density curves
- normal distributions
- 68–95–99.7 rule
- standardizing observations (z -scores)
- normal distribution calculations

The midterm test covers material from Units 1 – 5.
The test is on **Monday, March 2, 2020** from 5:30 p.m. – 7:30 p.m.

Unit 6 – Randomness and Probability

- randomness, the language of probability
- probability models, sample space, events, unions, intersections
- some probability rules, independence, general addition rule
- discrete random variables
- binomial setting and binomial distribution

Unit 7 – Sampling Distributions

- sampling distribution of a sample mean
- bias and variability
- Central Limit Theorem
- sampling distributions for proportions

Unit 8 – Confidence Intervals for a Population Mean (σ known)

- estimating with confidence
- margin of error
- effect of sample size, confidence level, standard deviation
- effect of population size
- assumptions
- choosing the sample size

Unit 9 – Tests of Significance

- tests for a population mean (σ known)
- hypotheses, test statistic, P -value, statistical significance
- two-sided tests and confidence intervals

Unit 10 – Inference for One Population Mean (σ unknown)

- one-sample t procedures — confidence intervals and tests

Unit 11 – Inference for a Population Proportion

- confidence intervals and tests for a population proportion
- choosing the sample size

The final examination covers material from Units 1 – 11, with emphasis on Units 6 – 11. The exam is 3 hours in duration and will be scheduled by the Student Records Office.
