STAT 1000 Section A01
Basic Statistical Analysis 1
Winter 2024

Time	Mondays, Wednesdays & Fridays, 10:30 a.m. – 11:20 a.m.
Location	172 St. John's (Schultz Lecture Theatre)
CRN	50080

Instructor	Tessa Reimer (She/Her) 330 Machray Hall Email: Tessa.Reimer@umanitoba.ca

Web Pages	UM Learn: http://umanitoba.ca/umlearn R Download (Windows): https://muug.ca/mirror/cran/bin/windows/ R Download (MacOS): https://muug.ca/mirror/cran/bin/macosx/ R Studio: https://posit.co/download/rstudio-desktop/ iClicker Student: https://student.iclicker.com
Office Hours:	Monday 12:00 p.m. – 1:00 p.m. Tuesday 1:00 p.m. – 2:00 p.m. Wednesday 1:00 p.m. – 2:00 p.m.

Territory Acknowledgment

The University of Manitoba campuses are located on original lands of Anishinaabeg, Cree, Oji-Cree, Dakota and Dene peoples, and on the homeland of the Métis Nation. We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

Calendar Description

(Lab required) This course is not recommended for students in certain programs (see the description of STAT 1150). 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. May not be held with STAT 1001, STAT 1150, STAT 2220. 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.

Evaluation

iClicker Questions/Participation	5%
Assignments (best 3 of 4)	12%
Quizzes (best 3 of 4)	18%
Midterm Test	25%
Final Examination	40%

If you miss a second assignment or quiz due to illness or another valid reason, and **provided that you have submitted a self-declaration form to your instructor within 24 hours of both missed due dates**, the weight of the second assessment will be transferred to your final exam. (See Page 14 of the course outline for an explanation and link to the required form.) A third missed assignment or quiz will be assigned a grade of zero.

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%).

Software

This course will make use of the statistical software R and RStudio. Both of these programs are free to use and are available for both Windows and MacOS systems. R is one of the most popular statistical software programs, and throughout the course, we will utilize R to help with our data analysis. We will use R through the RStudio environment, which will neatly organize and display your work. Finally, RMarkdown (a component of RStudio) will be used to format the documents that you submit for your assignments.

To download R, follow one of the links below (depending on your operating system):

Windows systems: https://muug.ca/mirror/cran/bin/windows/
MacOS systems: https://muug.ca/mirror/cran/bin/macosx/

Once you have downloaded and installed R, you may access RStudio through the link below:

https://posit.co/download/rstudio-desktop/

Detailed installation instructions will be provided on your *UM Learn* page.

Exam Information

The midterm test will be held **Thursday, March 7 from 6:00 p.m. to 8:00 p.m.** and will cover Units 1 – 4 in the course outline. It will consist of only multiple-choice questions. Students missing the midterm test for a valid reason will be permitted to write a deferred midterm at a later date.

The final exam will be 3 hours in duration and will be scheduled by the Registrar's Office. It will cover Units 1 – 9, with emphasis on Units 5 – 9. The final examination will contain both multiple-choice questions (worth 70% – 75% of the exam) and a written component (worth 25% – 30% of the exam).

Quizzes, the midterm and the final exam are **closed book**. You will need a **non-programmable scientific calculator** (graphing calculators are **not** permitted). Statistical tables will be provided, if required, and a formula sheet will be provided.

Textbook

There is **no required textbook** for this course. You will be provided with detailed notes and all the material you need.

iClickers

Throughout the course, extensive use of the iClicker classroom response system will be made in order to enhance your understanding of the material and promote classroom participation. iClicker questions are multiple-choice questions that you answer using an internet-enabled device. You may participate with the iClicker Student app on an iPhone/iPad (iOS 10+) or Android (OS 5.0+) device or you may participate with the iClicker Student web app (from your laptop or tablet). Note that iClicker participation constitutes a portion of your grade in this course and as such you are required to bring your device to each class and to ensure that it has functional batteries or is charged.

You will need to make a free iClicker Student account either through their app or their website, https://student.iclicker.com/. When you create your account, use your U of M email address (not your Gmail or other personal email account) and your 7-digit student ID number. Once registered, you will need to add my class. **Make sure you register for the correct section, STAT 1000 A01.**

For every iClicker 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 iClicker points. The purpose of this is twofold: (1) These iClicker questions are intended to help you learn the material and encourage you to participate in class, and (2) we acknowledge that you may have to miss a class from time to time for legitimate reasons, so you won't be penalized for missing a small number of questions. 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 iClicker account constitutes impersonation and is strictly forbidden under the University of Manitoba's academic integrity policy. (See page 12.) You may discuss iClicker questions with students seated next to you, but electronic communication is forbidden. You must be present to participate in the iClicker questions; answering the questions from another location constitutes academic dishonesty.

Quizzes

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. Quizzes will consist of both multiple-choice questions and a written component. The quizzes are worth 18% of your final grade, and **only the best 3 of 4 quizzes will count towards your final grade** (i.e., your lowest quiz mark will be dropped). **There will be no make-up quizzes – if you have to miss a quiz for any reason, that will count as your lowest quiz mark, which will be dropped. You must attend and write the quizzes in the tutorial section in which you are registered.** You will need a non-programmable scientific calculator. Quizzes are **closed book**. You will receive any formulas from the formula sheet that pertain to material on that quiz.

Although there are different versions of the quiz questions, you are **not** permitted to discuss the quiz with students who have not yet written it. For any students who are members on an online chat group: During the week when quizzes are held, you may use these rooms to communicate with each other about the course, but you are **not** permitted to discuss specifics of the quiz until everyone has finished writing it (Friday at 4:30 p.m.).

Tutorials and Assignments

Tutorials will begin the week of January 15 – 19. (There are no tutorials the first week of classes, during Winter Term Break, the week of February 26 – March 1, the week of the midterm, or on April 8 – 10. See the Course Schedule on Page 8.) Other than the four weeks in which a quiz takes place in the tutorial, tutorials will consist of the T.A. going over the application of the R statistical software to course material that has been recently covered in class.

Assignments will consist of two parts. The first part will be released prior to your tutorial and will be partly demonstrated by your T.A. The second part will be released on Friday evenings. Both parts will be submitted together by Thursday on the week after your tutorial takes place. See the Course Schedule on Page 8 for exact dates.

In the first tutorial, your T.A. will introduce you to R and RStudio, and show you what the software looks like. However, it is expected that you will have R and RStudio installed prior to your first tutorial, and that you will have RMarkdown set up. There will be a detailed installation and setup guide on your *UM Learn* page.

An introductory tutorial will take place the week of January 15 – 19 to help ensure that all software is set up properly on your computer. Assignment 0 will be associated with this tutorial, which is meant to make sure you understand how to format your R-based assignments correctly. If you submit Assignment 0 by **Friday, January 26 at 11:59 p.m.** and you receive a score of 100%, you will receive a 1% bonus towards your final grade in the course.

Note that the device you bring to the tutorial must be able to run R and RStudio. This means either a Windows computer (running Windows 10/11) or a MacOS computer (running MacOS 10.15 or higher); most tablets and Chromebooks will not be sufficient. If you do not have access to a machine that can run RStudio, you may either use one of the computers in 311 Machray Hall or borrow a laptop from the lending locker at the Elizabeth Dafoe Library (see https://umanitoba.ca/libraries/laptops).

There will be four assignments in the course using the R statistical software. Your final submission will be formatted with RMarkdown, and submitted to Crowdmark for grading. Only the **best 3 of 4** assignment grades will count towards your final grade (i.e., the lowest grade will be dropped, which means you can miss one assignment with no penalty).

For the assignments:

- You may speak to your classmates, but you may not directly show your code/output to anyone.
- To be clear, you can help a classmate by directing them to a similar example in the notes or tutorial files, but you can not look directly at someone else's work or show them your work.
- Sharing your work or R code with someone, either directly or online (such as in a Telegram chat room) will be considered an act of academic dishonesty, as will copying someone else's work.
- Each student must submit their own assignment.
- If you need help with an assignment, please use the Statistics Help Centre, where there are graduate students in Statistics available to help you. (See below.)

Practice Questions

You will be provided with many practice questions in this course. In the **Practice Problems** folder on *UM Learn*, you will find written-answer questions for each unit, as well as detailed solutions. These problems will help you practice and learn the course material, and to prepare for the written-response questions on the quizzes and the final exam.

In the **Practice Multiple Choice Questions** folder on *UM Learn*, you will find many multiple choice questions for each unit. The letter answers for these questions are at the end of each file. In addition, videos will be posted for each unit, in which an instructor goes over the detailed solutions for each question. These questions will help you practice and learn the course material, and to prepare for the multiple choice questions on the quizzes, midterm and final exam.

Although they are not for marks, students are strongly encouraged to try these practice problems on a regular basis.

Statistics Help Centre

In 107 Allen Building, graduate students and senior undergraduate students in Statistics are available to help you with any questions you have about the course, as well as the installation of R and RStudio. The Help Centre is open starting on January 10 (except on university closures and during the term break) at the following times:

Monday	10:00 a.m. – 5:00 p.m.
Tuesday	10:00 a.m. – 7:00 p.m.
Wednesday	10:00 a.m. – 5:00 p.m.
Thursday	10:00 a.m. – 5:00 p.m.
Friday	10:00 a.m. – 5:00 p.m.
Saturday	1:00 p.m. – 5:00 p.m. (online at https://umanitoba.zoom.us/j/63661229764)

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 UM Learn page.

Course Schedule

Week	Dates	Midterm	Tutorials	Assignment Release Dates	Assignment Due Dates
Week 1	Mon, Jan. 8 - Fri, Jan. 12		**No Tutorial**		
Week 2	Mon, Jan. 15 - Fri, Jan. 19		**Tutorial 0: Introduction**	**Assignment 0 Released Fri, Jan. 19**	
Week 3	Mon, Jan. 22 - Fri, Jan. 26		**Tutorial 1**	**Assignment 1 Released Fri, Jan. 26**	**Assignment 0 Due Fri, Jan. 26**
Week 4	Mon, Jan. 29 - Fri, Feb. 2		**Quiz 1 (Unit 1)**		**Assignment 1 Due Thu, Feb. 1**
Week 5	Mon, Feb. 5 - Fri, Feb. 9		**Tutorial 2**	**Assignment 2 Released Fri, Feb. 9**	
Week 6	Mon, Feb. 12 - Fri, Feb. 16		**Quiz 2 (Units 2 & 3)**		**Assignment 2 Due Thu, Feb. 15**
Winter Term Break	Mon, Feb. 19 - Fri, Feb. 23		**No Tutorial**		
Week 7	Mon, Feb. 26 - Fri, Mar. 1		**No Tutorial**		
Week 8	Mon, Mar. 4 - Fri, Mar. 8	**Midterm (Units 1 - 4) Thu, Mar 7 6:00 - 8:00 p.m.**	**No Tutorial**		
Week 9	Mon, Mar. 11 - Fri, Mar. 15		**Tutorial 3**	**Assignment 3 Released Fri, Mar. 15**	
Week 10	Mon, Mar. 18 - Fri, Mar. 22		**Quiz 3 (Units 4 & 5)**		**Assignment 3 Due Thu, Mar. 21**
Week 11	Mon, Mar. 25 - Fri, Mar. 29*		**Tutorial 4**	**Assignment 4 Released Fri, Mar. 29**	
Week 12	Mon, Apr. 1 - Fri, Apr. 5		**Quiz 4 (Units 6 & 7)**		**Assignment 4 Due Thu, Apr. 4**
Week 13	Mon, Apr. 8 - Wed, Apr. 10		**No Tutorial**		

* Students with Friday tutorials will have a pre-recorded online tutorial made available to them in lieu of the in-person tutorial on Friday, March 29 (Good Friday)

Course Outline

Unit 1 – Examining Distributions

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

Unit 2 – Correlation & Regression

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

Unit 3 – Sampling & Experimental Design

- populations and samples
- voluntary response sample, convenience sample
- simple random sample
- stratified random sample
- multistage sample
- systematic sample
- census
- undercoverage, nonresponse
- observational study vs. experiment
- factors, factor levels, treatments
- placebo effect, control group
- principles of experimental design
- completely randomized design
- randomized block design

Unit 4 – Density Curves & Normal Distributions

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

The midterm test covers material from Units 1 – 4.
The test is on **Thursday, March 7, 2024** from 6:00 p.m. to 8:00 p.m.

Unit 5 – Probability & Sampling Distribution of the Sample Mean

- randomness, definition of probability
- sample space
- basic probability rules
- probability distributions
- sampling distribution of a sample mean
- Central Limit Theorem

Unit 6 – Confidence Intervals

- estimating with confidence
- confidence interval for a population mean (σ known)
- margin of error
- effect of sample size, confidence level, standard deviation
- effect of population size
- sample size calculation for estimating a population mean

Unit 7 – Hypothesis Testing

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

Unit 8 – Inference for the Population Mean when σ is unknown

- confidence intervals and hypothesis tests for a population mean (σ unknown)
- matched pairs t procedures

Unit 9 – Sampling Distribution and Inference for Proportions

- sampling distribution of a sample proportion
- confidence intervals and hypothesis tests for a population proportion
- sample size calculation for estimating a population proportion

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The final examination covers material from Units 1 – 9, with emphasis on Units 5 – 9. The exam is 3 hours in duration and will be scheduled by the Registrar's Office.

Academic Integrity

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. The following link describes various types of academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation), and offers several resources to help students understand and avoid academic dishonesty:

http://umanitoba.ca/student-supports/academic-supports/academic-integrity

The Student Discipline Bylaw, which describes the potential consequences of academic dishonesty, can be found at the following link:

https://umanitoba.ca/governance/sites/governance/files/2021-09/Student%20Discipline%20Bylaw%20-%202021_09_01.pdf

An academic integrity and student conduct tutorial can be found at the following link. For this course, it is recommended in particular that you view the parts on Tests & Exams and Inappropriate Collaboration.

http://umanitoba.ca/student/resource/accessibility/files/AI-Student-Conduct-Tutorial/story_html5.html

The use of generative artificial intelligence (genAI) tools and apps is strictly prohibited for all assessments (including assignments) in this course. This includes ChatGPT and other AI writing and coding assistants. Use of genAI in this course constitutes an act of academic dishonesty.

Copyrighted Material

All course notes, assignments, tests, exams, practice questions and solutions are the intellectual property of your instructor or the Department of Statistics. **The reproduction, posting or distribution of these materials is strictly forbidden without their consent**. It is **illegal** to upload any course material to any website. For more information, see the University's Copyright Office website at http://umanitoba.ca/copyright.

Recording of Class Lectures

Your instructor holds 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** without permission from your instructor.

Class Communication

The University requires all students to activate an official University email account. Please note that all communication between you and your instructor 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.

Voluntary Withdrawal

The voluntary withdrawal date is **March 20** (by which time you will have received your marks for the first two quizzes, the midterm test and the first two assignments). If you are unlikely to be successful in the course, or are not achieving the grade that you are aiming for, you should consider a VW from the course. Students enrolled in the course after the VW deadline will be assigned a final grade.

Health and Safety

The University of Manitoba is committed to maintaining a safe learning environment for all students, faculty, and staff. Should campus operations change because of health concerns related to a pandemic or other campus-wide emergency, it is possible that this course will move to a fully remote delivery format. Should the instructor be required to stay at home for an extended period and an alternate instructor not be available, the course may move temporarily to a remote delivery format.

Illness

Remember: **Stay home if you are sick**. Your lowest quiz grade and your lowest assignment grade will be dropped. **The purpose of this policy is that we know you may be unable to complete an assessment sometime during the term, either due to illness or some other valid reason**. Please complete the self-declaration form (see Page 13) if you have to miss an assessment.

Academic Accommodations

Student Accessibility Services

Students who have, or think they may have, a disability (e.g., mental illness, learning, medical, hearing, injury-related, visual) are encouraged to contact Student Accessibility Services to arrange a confidential consultation. Instructors are notified by Student Accessibility Services what accommodations their registered students require, which will help the instructor determine fair, feasible and reasonable academic accommodations without compromising academic standards. This takes time and planning, so reach out at the start of term.

SAS students can write their exams and tests in spaces organized by the SAS Exam Centre; however, they must register with the SAS Exam Centre a few weeks in advance. Please be sure to do so to receive the accommodations.

Student Accessibility Services
http://umanitoba.ca/student-supports/accessibility
520 University Centre
204-474-7423
Student_accessibility@umanitoba.ca

Medical Notes and Other Documentation

The Self-Declaration for Brief and Temporary Absences Procedure and Policy is effective as of September 1, 2022, and therefore students will not be required to present medical or other documentation for absences due to extenuating circumstances of five days (120 hours) or less; however, you must complete the form at the following link:

https://umanitoba.ca/sites/default/files/2022-09/Self%20Declaration%20Fillable%20Form-%20FINAL%20for%20Website.pdf

You must submit the form to your instructor in lieu of any medical or other documentation. Please note that further documentation may be requested from students who claim multiple temporary absences or absences for more than five days. You only need to submit this form if you miss an assessment (i.e., you do not need to inform your instructor if you have to miss a lecture). Note that personal vacations or work obligations are **not** considered valid excuses to miss assessments.

Final Exams

If you have conflicting scheduled final exams, or if you miss a final exam due to illness or some other valid reason, **you must contact an academic advisor in your home faculty** (http://umanitoba.ca/academic-advisors/) as soon as possible to apply for a deferred exam. Deferred final exams are **not** arranged through your instructor or the department. Note that the granting of a deferred exam is not necessarily guaranteed.