# STAT 1150 Section A01
# Introduction to Statistics & Computing
# Fall 2025

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| **Time** | Tuesday & Thursday, 10:00 a.m. – 11:15 a.m. |
| **Location** | 200 Fletcher Argue |
| **CRN** | 16016 |
| **Instructor** | Andrew Morris (He/Him)<br>Email: Andrew.Morris@umanitoba.ca |
| **Web Pages** | UM Learn: http://umanitoba.ca/umlearn<br>R Download (Windows): https://muug.ca/mirror/cran/bin/windows/<br>R Download (MacOS): https://muug.ca/mirror/cran/bin/macosx/<br>R Studio: https://www.rstudio.com/products/rstudio/#download<br>Crowdmark: http://www.crowdmark.com |
| **Office Hours:** | Tuesday 11:30 a.m. – 12:30 p.m.<br>Wednesday 10:30 a.m. – 11:30 a.m.<br>**Office Hours will take place in Room 106-110 Allen**. |

## 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 recommended for students in mathematically rich disciplines, including Statistics, Data Science, Mathematics, Actuarial Science, Computer Science, and related interdisciplinary programs. Topics to be covered include: summarizing and displaying large data sets, sampling, estimation and significance tests, probability calculations, random variables and probability distributions, introduction to regression and correlation analysis, statistical software. May not be held with STAT 1000, STAT 1001, STAT 2000, STAT 2001 and STAT 2220. Prerequisite: One of Pre-Calculus Mathematics 40S (70%), MATH 1018 (B), or MSKL 0100 (B).

# 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

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| Tutorial Worksheets* | 5% |
| Assignments & Quizzes** | 25% |
| Midterm Test | 25% |
| Final Examination | 45% |

*There will be a worksheet associated with each of the seven tutorials. Only the best five worksheets will count towards your final grade, i.e., the two lowest worsheet grades will be dropped.

**There will be six assessments – three assignments and three quizzes. Only the best five of six assessment grades will count towards your final grade, i.e., the lowest assessment grade (assignment or quiz) will be dropped. Any further missed assessments 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%).

# Textbook

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

## 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://www.rstudio.com/products/rstudio/#download

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

## Exam Information

The midterm test will be held **Thursday October 30 from 6:00 p.m. – 8:00 p.m.** The coverage of the midterm will be announced at least two weeks in advance. The final exam will be 3 hours in duration and will be scheduled by the Student Records Office. The final exam will cover all of the course material, with emphasis on material covered after the midterm. Students missing the midterm test for a valid reason will be permitted to write a deferred midterm at a later date. See the bottom of Page 13 for information regarding missed final exams.

Both the midterm and the final examination will contain multiple-choice questions and a written component.

Quizzes, the midterm and the final exam are **closed book**. A formula sheet will be provided, as will statistical tables, if required. For quizzes and exams, You will need a **non-programmable** scientific calculator (graphing calculators are not permitted). Electronic devices (including smartwatches and smart glasses) are not permitted during quizzes and exams.

# Quizzes

There will be three quizzes throughout the term, which will be written in your tutorial. Some questions will require the use of R Studio, but all answers will be written by hand and submitted on paper. The quizzes are **closed book**, but you will be provided with any relevant formulas. You will also be permitted to use the R Studio help menu. **You must attend and write the quizzes in the tutorial section in which you are registered.**

You are not permitted to discuss the quiz with anyone until all students have finished writing that week (Friday at 4:30 p.m.). Any communication about the quiz content before that time will be considered academic dishonesty.

Quizzes are scheduled for the following dates:

| | Dates |
|---|---|
| Quiz 1 | September 23 – 24 |
| Quiz 2 | October 14 – 15 |
| Quiz 3 | November 25 – 26 |

**There will be no make-up quizzes.**

# Tutorials

Your tutorial will be held once a week, beginning the week of September 8 – 12. (There are no tutorials the first week of classes, the week of the midterm, or during the Fall term break.) In the first tutorial, your TA 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 have RMarkdown set up. There will be a detailed installation and setup guide on your *UM Learn* page.

Each tutorial will have two segments. In the first segment, your TA will demonstrate that day's content in R; in the second segment, you will complete a short worksheet in RMarkdown based on the material covered that day. The worksheet will be submitted electronically through a Crowdmark link, and will be due by 11:59 p.m. the day after your tutorial. Worksheet 1 will have an extended due date, **three** days after your tutorial at 11:59 p.m. **Worksheets submitted after the due date will not be accepted**. These worksheets will comprise 5% of your final grade in the course. Only the best 5 of 7 tutorial worksheet grades will count towards your final grade, i.e., the lowest two grades will be dropped.

# Assignments

There will be three assignments in the course, which will make use of of the R statistical software. Your final submission will be formatted with RMarkdown, and submitted to Crowdmark for grading. See the course schedule for assignment due dates.

You will have one week to do each assignment, which will be due at 11:59 p.m. on the due date. **Late assignments will be penalized 25% per day, up to three days after the due date. Assignments more than three days late will receive a grade of zero. (Note that an assignment that is submitted even one minute late at 12:00 a.m. will be considered a day late, so don't leave it until the last minute.)**

For the assignments:

- You may speak to your classmates, but you may not directly show your code/output to anyone. (Note that this includes the questions done by the TA in your tutorial – if a student misses a tutorial, they can either go to the help centre, or find similar code in their course notes and practice problems.)
- 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 TAs in Statistics available to help you. (See the schedule on the next page.)
- The use of generative artificial intelligence (genAI) tools and apps is strictly prohibited for all 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, and will result in a grade of zero.

## 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 questions on the quizzes, midterm and 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. 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 Room 106-110 Allen, 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 at the following times (from September 4 until the day of the final exam):

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| Monday – Friday | 9:00 a.m. – 4:00 p.m. (106-110 Allen Building) |
| Saturday* | 10:00 a.m. – 2:00 p.m. |

*The Saturday help centre hours will take place online at https://umanitoba.zoom.us/j/65380394747?pwd=8e3JN2Y4wCtDmsO3xi2j56xdgzqW7Y.1.

# STAT 1150 Course Schedule

| Week | Dates | Tutorials & Quizzes | Tutorial Worksheet Due Dates | Assignment Release & Due Dates |
|---|---|---|---|---|
| **Week 1** | Sep. 3 – Sep. 5 | **No Tutorial** | | |
| **Week 2** | Sep. 8 – Sep. 12 | **Tutorial 0** | **No Worksheet Submission** | |
| **Week 3** | Sep. 15 – Sep. 19 | **Tutorial 1** | **Worksheet 1 Due three days after tutorial** | |
| **Week 4** | Sep. 22 – Sep. 26 | **Quiz 1** | | **Assignment 1 Released Sep. 26** |
| **Week 5*** | Sep. 29 – Oct. 3 *See Note Below | **Tutorial 2** | **Worksheet 2 Due one day after tutorial** | **Assignment 1 Due Oct. 3** |
| **Week 6** | Oct. 6 – Oct. 10 | **Tutorial 3** | **Worksheet 3 Due one day after tutorial** | |
| **Week 7**** | Oct. 13 – Oct. 17 **See Note Below | **Quiz 2** | | **Assignment 2 Released Oct. 17** |
| **Week 8** | Oct. 20 – Oct. 24 | **Tutorial 4** | **Worksheet 4 Due one day after tutorial** | **Assignment 2 Due Oct. 24** |
| **Week 9** | Oct. 27 – Oct. 31 | **Midterm Test October 30** | | |
| **Week 10** | Nov. 3 – Nov. 7 | **Tutorial 5** | **Worksheet 5 Due one day after tutorial** | |
| **Fall Term Break** | Nov. 10 – Nov. 14 | **No Tutorial** | | |
| **Week 11** | Nov. 17 – Nov. 21 | **Tutorial 6** | **Worksheet 6 Due one day after tutorial** | |
| **Week 12** | Nov. 24 – Nov. 28 | **Quiz 3** | | **Assignment 3 Released Nov. 26** |
| **Week 13** | Dec. 1 – Dec. 5 | **Tutorial 7** | **Worksheet 7 Due one day after tutorial** | **Assignment 3 Due Dec. 2** |

***There are no classes or tutorials on Tuesday September 30 (National Day for Truth and Reconciliation). If your regular tutorial is on Tuesday, you will get an email explaining how and when the tutorial will be conducted for this week.**

****There are no classes on Monday October 13 (Thanksgiving Day).**

# Course Outline

### Unit 1 – Examining Distributions

- types of variables: quantitative, categorical (nominal, ordinal)
- graphs: bar 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, quantile boxplots, outlier boxplots
- resistant measures

### Unit 2 – Probability, Density Curves & Normal Distributions

- randomness, definition of probability
- sample space, events
- basic probability rules
- probability distributions
- continuous variables, density curves
- continuous uniform distribution
- statistic vs. parameter
- normal distributions
- 68–95–99.7 rule
- standardizing observations ($z$-scores)
- normal distribution calculations

### Unit 3 – Sampling Distributions

- simple random sample
- sampling distribution of a sample mean
- Central Limit Theorem
- sampling distribution of a sample proportion

**Unit 4 – Confidence Intervals for $\mu$ when $\sigma$ is known**

- estimating with confidence
- confidence interval for a population mean ($\sigma$ 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 5 – Hypothesis Testing for $\mu$ when $\sigma$ is known**

- hypothesis tests for a population mean ($\sigma$ known)
- hypotheses, test statistic, $P$-value, statistical significance
- critical value method
- two-sided tests and confidence intervals

**Unit 6 Inference for $\mu$ when $\sigma$ is unknown**

- the $t$ distributions
- confidence intervals for $\mu$ ($\sigma$ unknown)
- hypothesis tests for $\mu$ ($\sigma$ unknown)

**Unit 7 – Inference for Proportions**

- confidence intervals for a population proportion
- sample size calculation for estimating a population proportion
- hypothesis tests for a population proportion

**Unit 8 – Inference for the Means of Two Populations**

- dependent vs. independent samples
- matched pairs $t$ procedures (dependent samples)
- inference for comparing means of two populations (independent samples, equal population variances)
- inference for comparing means of two populations (independent samples, unequal population variances)

**Unit 9 – 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, extrapolation
- association vs. causation, lurking variables
- simple linear regression model
- residual plots
- inference for $\beta_1$ in the simple linear regression model
- confidence intervals for $\mu_Y$ in regression

# 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

**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**.

# Voluntary Withdrawal

The voluntary withdrawal date is **November 18** (by which time you will have received your marks for the first two quizzes, the midterm test, the first two assignments, and several worksheets). 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.

# 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

https://umanitoba.ca/governance/sites/governance/files/2021-06/Electronic%20Communication%20with%20Students%20Policy%20-%202013_09_01%20RF.pdf

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

## Professional Conduct

Students in the University community can freely express their thoughts, opinions, and beliefs; however, they must observe the Respectful Work and Learning Environment Policy (https://umanitoba.ca/about-um/respectful-work-and-learning-environment-policy) and treat each other, staff, and faculty with respect. Students who are alleged to have breached the Respectful Work and Learning Environment Policy will be investigated and disciplined according to the Student Non-Academic Misconduct and Concerning Behaviour Procedure.

# 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/student-supports/academic-supports/student-advocacy/self-declaration-policy-students#supports-and-resources-for-students

If you miss the midterm, you must submit this form in lieu of any medical or other documentation. Note that personal vacations or work obligations are **not** considered valid excuses to miss the midterm. It is not necessary to submit this form if you miss a lecture, a tutorial, a quiz, or an assignment. The lowest quiz or assignment grade, and the lowest two worksheet grades are dropped. Additional missed quizzes, assignments and worksheets will be assigned a grade of zero. The Self-Declaration form will not be accepted in such instances.

Please note that further documentation may be requested from students who claim multiple temporary absences or absences for more than five days.

### 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.