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STAT 341.01: Introduction to Probablility and Statistics

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STAT 341 Probability and Statistics
Spring 2022, MWF 2:00-2:50, Math 103

Course Information

- **Instructor**: David Patterson, Math 208, 243-6748, david.patterson@umontana.edu
- **Textbook:** None, but I will post all lecture slides and links to online resources
- **Prerequisites:** M 172 (Calculus II) or M 162 (Applied Calculus)
- **Software:** Some assignments will require the use of R. R is a high-level statistical programming language which is especially good for doing simulations. It is a free program which can be downloaded from http://www.r-project.org. RStudio (https://www.rstudio.com/products/rstudio/) is a free interface to R which I recommend. R and RStudio are also available in the Math 206 computer lab.
- **Office Hours**: See Moodle page

Catalog description

Offered autumn and spring. Prereq., one of M 162, 172 or 182. Probability, probability models and simulation, random variables, density functions, special distributions, and a brief survey of estimation and hypothesis testing. Computer use integrated throughout.

Learning Outcomes :

1. To understand basic probability, counting and combinatorial methods, and Bayes' Theorem.
2. To understand and use the Law of Large Numbers and the Central Limit Theorem.
3. To learn about models for discrete and continuous random phenomena and to apply these models to real problems.
4. To learn to simulate random phenomena in R or other computer language.

Important dates:

- **Monday, January 17**: Martin Luther King Jr. Day, no classes.
- **Monday, February 7, 5 pm**: last day to drop classes with refund and no entry on transcript. After this date through March 29, W will appear for dropped classes.
- **Monday, February 21**: Presidents' Day, no classes, offices closed.
- **Wednesday, February 23**: Midterm 1
- **Tuesday, March 29**: last day to drop without Dean's signature. After this date, WP or WF will appear on transcript rather than W.
- **Monday-Friday, March 21-25**: Spring break
- **Monday, April 4:** Midterm 2
- **Monday, May 2:** Midterm 3
- **Friday, May 6**: last day of classes. Last day to drop (requires Dean's signature). Last day to change to CR/NCR grading.
- **Wednesday, May 11: 3:20-5:20 pm:** Final exam. Final will not be given early.

Grading (+/- grading will be used):

- **Quizzes**: Group quizzes every Friday; I will drop your 2 low scores. There are no makeups on quizzes.
- **Homework**: Homework will be a combination of on-line (WebWork) and hand-in. More details below. I will drop your lowest homework score on each.
- **Midterm Exams 1,2,3**: Dates are **Wed, Feb 23; Mon, Apr 4; Mon, May 2**. There are no makeups as I allow you to drop one exam score if you take the final exam.
- **Final Exam (comprehensive): Wed, May 11, 3:20-5:20 pm.**
- **Final grades**: After the third midterm, I will give you a tentative letter grade based on 70% for the 3 midterms and 30% for homework/quizzes (10% hand-in homework, 10% WebWork, 10% quizzes). I will use 90, 80, 70, 60 cutoffs. If that grade is acceptable to you, you don't have to take the final exam. If it's not, take the final exam. Your final grade will then be based on your two best midterms and the final (70%) and homework/quizzes (30%). Taking the final cannot lower your grade from the tentative grade I assign after the third midterm.

Incompletes
Incompletes are given at the discretion of the instructor and are only considered in cases where the student has been in attendance and doing passing work up to three weeks before the end of the semester, and for reasons beyond the student's control and which are acceptable to the instructor, the student has been unable to complete the requirements of the course on time. Negligence and indifference are not acceptable reasons.

Students with disabilities are welcome to discuss accommodations with me.

Academic Honesty
All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary action by the University. All students need to be familiar with the Student Conduct Code. You can find it in the A-Z index on the UM home page.

Homework
There are two types of homework assignments:

- **Written assignments**. These are due at the beginning of class and are to be handed in as a hard copy. No late homework is accepted. If you cannot be in class, you may email me the homework by that time (please do <u>not</u> email me the homework if you will be in class). I will only accept emailed homework twice during the semester unless there are extenuating circumstances you have discussed with me.

  You are allowed and even encouraged to work with others on the homework as long as the solutions you present are your own. However, if you simply rely on me or others to direct you on every problem, then you will not improve your problem-solving skills.

- **Webwork assignments**. Some homework assignments will be on a web-based homework system called WebWork which will immediately tell you whether your each answer is correct or not. These problems will generally be of the more routine calculation type. Usually, there will be some required problems and then some optional

no-credit problems so that you can get more practice if you feel you need it. It is important that you know how to do these more routine problems, but it is up to you on how much practice you need.

Topics will include many (but not necessarily all) of the following:

The Law of Large Numbers for probabilities

Simulation in R

Sample spaces, events and probabilities

Conditional probability

Chance trees and Bayes' rule

Coincidences and rare events

Discrete random variables

Expected value and variance of discrete random variables

Law of Large Numbers for expected values

Discrete probability models: Bernoulli trials, binomial, geometric, negative binomial, and Poisson distributions

Poisson approximation of binomial distribution

Continuous probability models and probability density functions

Expected value and variance of continuous random variables

Continuous probability models: exponential and normal distributions

Expected value and variance of linear combinations of random variables

The square root law and the Central Limit Theorem

Normal approximation of the binomial distribution

Confidence intervals for simulations: proportions and means

Randomization tests