

# STAT 231 (Statistics) Section 001

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**All important announcements related to the course will be posted on the course website on Learn.**

**Course syllabus is posted on Learn.  
Please read it!**

**I will often send out class emails using the course website so make sure you forward emails to an email address that you read regularly.**

**STAT 231 Course  
Notes** are  
available at UW  
Bookstore or  
download from  
the course  
website on  
Learn.

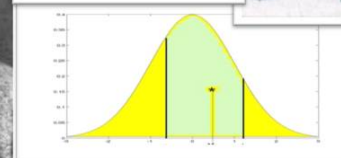
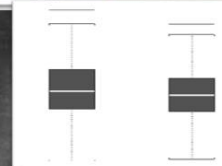
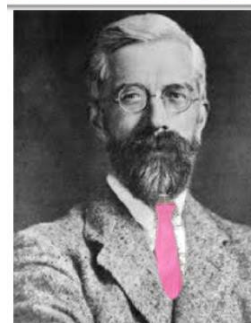
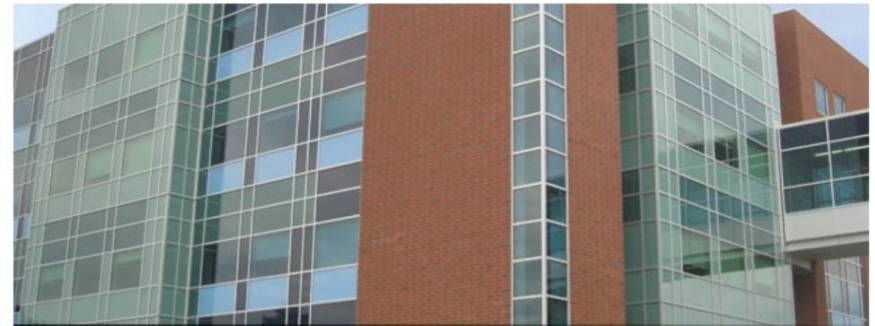
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**WATERLOO  
MATHEMATICS**

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**STAT 221/231/241  
COURSE NOTES  
FALL 2016 EDITION**

**STATISTICS AND ACTUARIAL SCIENCE**



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# Marking Scheme (see posted syllabus):

## ➤ Clicker Questions (5%)

For each clicker question asked during class, there will be two marks: one for answering (any answer), and another for a correct response. Only the best 75% of the clicker marks will be used to determine your clicker grade.

**You must attend the lecture section you are registered in to receive clicker marks.**

**Answering clicker questions for another student is an academic offence.**

# Marking Scheme Tests:

- **3 Tutorial Tests:** These are held during your assigned tutorial time. Different test questions will be used for different tutorial sessions. To prepare for these tests you should do the end-of-chapter problems in the Course Notes as indicated on Learn.
  - **Wednesday September 28 (5%)**
  - **Wednesday November 2 (5%)**
  - **Wednesday November 30 (5%)**
- **2 Midterm Tests:** Questions will be the same for all sections. To prepare for these tests you should do the end-of-chapter problems in the Course Notes as indicated on Learn.
  - **4:40-6:10, Thursday October 13 (15%)**
  - **4:40-6:10, Tuesday November 15 (15%)**
- **Final Exam:** Held during exam period, December 8-22. **(50%)**





# Policy on Missed Tests and Midterms

**If you miss a test or midterm due to illness or extenuating circumstances then you must contact me by email within 48 hours of the scheduled time of the test/midterm.**

**In case of illness you must provide a completed University of Waterloo Verification of Illness form.**

**See Course Syllabus regarding Missed Tests and Final Exam.**



# Marking Scheme Assignments:

**There will be 5 assignments using the statistical software R. Each assignment is worth 1%.**

**Due dates are indicated in the Course Schedule in the Course Syllabus posted on Learn.**

**You should already received a link from Crowdmark regarding Assignment 1. If not email me at [castruth@uwaterloo.ca](mailto:castruth@uwaterloo.ca) (Check your SPAM folder first!)**

**See Introduction to R and RStudio posted on Learn: Content -> Additional Resources**

# Office Hours and Piazza

- **Instructor and TA office hours will be posted in the **Calendar** on Learn.**
- **Help with course material can be obtained in tutorials, instructor office hours and the TA office hours.**
- **We encourage you to post questions to Piazza. TA's and instructors will be monitoring the forum and answering questions.**



# **Tutorials – Very Important**

**Tutorials will be conducted by the instructors.**

**See the Course Syllabus posted on Learn for the weeks in which tutorials are held.**

# Lecture Slides

**Lecture slides will be posted  
on Learn.**

# Laptop, iPads, etc.

**Latest research shows your non-class laptop use during lecture hinders the learning of your nearby peers.**

***Laptop multitasking hinders classroom learning for both users and nearby peers***

**F. Sana, T. Weston, N.J. Cepeda, *Computers and Education*, 62 (2013), 24-31**

**Please don't use your laptop for Facebook, YouTube, etc. during class time.**

# **For Next Class**

**Get Course Notes.**

**Read Chapter 1.**

**Review material from STAT 230.**

**Start Assignment 1.**

# Clicker Question 1

**What is your program?**

**A: Statistics or Actuarial Science**

**B: Applied Math, Pure Math or C&O**

**C: Computer Science**

**D: Business and Accounting (Double Degree, Math Bus, FARM, CA, etc.)**

**E: Other**

# Why is it important to learn about Probability (STAT 230) and Statistics (STAT 231)?

Check the Ted Talk:

***How juries are fooled by statistics.***

[www.youtube.com/watch?v=kLmzxmRcUTo](http://www.youtube.com/watch?v=kLmzxmRcUTo)



**Oxford mathematician Peter Donnelly talks about common mistakes made in interpreting statistics and the devastating impact these errors can have on people's lives.**



**Or if you prefer to read a book:**

*Math on Trial: How Numbers Get Used and  
Abused in the Courtroom*

by Leila Schneps and Coralie Colmez



# Math on Trial

**Includes stories about:**

- **Sally Clark, who was accused of murdering her children by a doctor with a faulty sense of calculation;**
- **19th-century tycoon Hetty Green, whose dispute over her aunt's will became a signature case in the forensic use of mathematics;**
- **Amanda Knox, who might have been kept in jail by a judge whose misunderstanding of probability led him to discount critical evidence.**

# 2013 was the International Year of Statistics

<https://www.youtube.com/watch?v=nTBZuQR7dRc#t=18>

See also: <http://www.statistics2013.org/>

# Hal Varian, Google's Chief Economist, January 2009

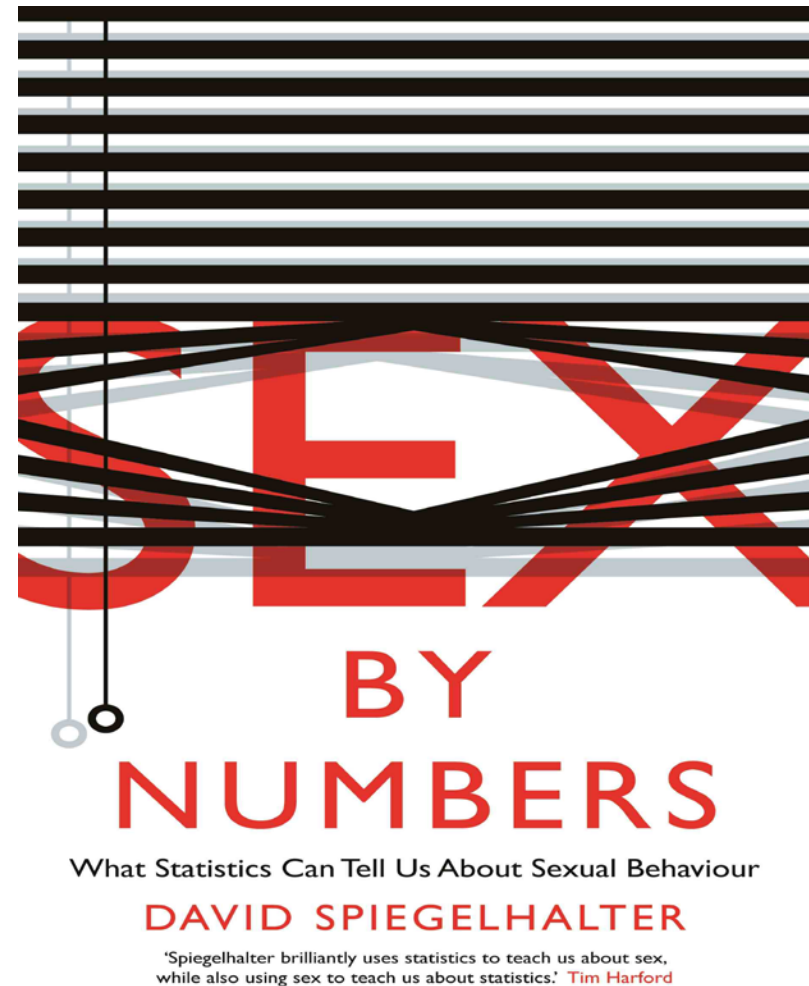
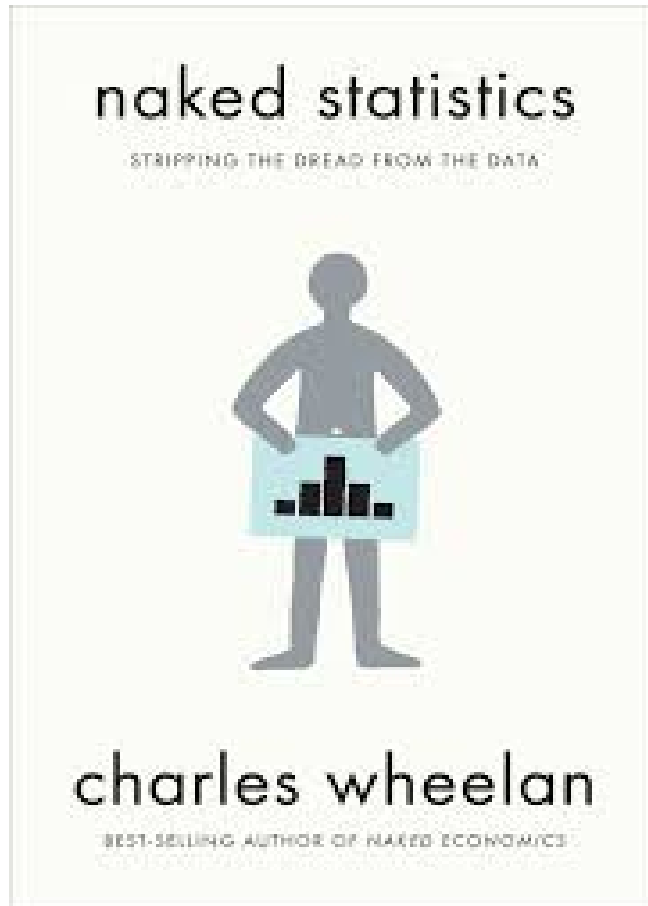
**“I keep saying the **sexy** job in the next ten years will be statisticians. People think I'm joking, but who would've guessed that computer engineers would've been the sexy job of the 1990s?”**



# Data Scientist: The Sexiest Job of the 21st Century



# Statistics really is all about SEX:





# **The Joy of STATS!**

**Hans Rosling's 200 Countries, 200 Years,  
4 Minutes - The Joy of Stats - BBC Four**

**<https://www.youtube.com/watch?v=jbkSRLYSojo>**

# **Statistics in the Media**

**Please see other examples of statistics in everyday life posted on Learn:**

**Content -> Additional Resources  
-> Statistics in the Media**

# **STAT 230 Review**

- **Discrete Distributions: Binomial, Poisson, Multinomial**
- **Continuous Distributions: Normal (Gaussian), Exponential**
- **p.f./p.d.f., c.d.f., and how to calculate probabilities**
- **Expected value/mean, variance and standard deviation, covariance**
- **Independent and identically distributed (i.i.d.) random variables**
- **Mean and variance of a linear combination of random variables**
- **Distribution of a linear combination of i.i.d. Normal random variables**
- **Central Limit Theorem**

## Clicker Question 2

**Your grade in STAT 230 lies in what interval?**

**A: [90, 100]**

**B: [80, 89)**

**C: [70, 79)**

**D: [60, 69)**

**E: [50, 59)**

# **Chapter 1: Introduction to Statistical Sciences**

***Statistical Sciences* is concerned with all aspects of empirical studies.**

***An empirical study* is one in which we learn by observation or experimentation.**

**We collect data to increase our knowledge about the world around us and/or to make decisions.**

# Empirical Studies

**A key feature of an empirical study is that it involves *uncertainty*.**

**If we run the experiment more than once we don't get identical results each time.**

**We will use the probability models you learned about in STAT 230 to try and model this uncertainty.**

**To talk about empirical studies we need to define some terms.**