# STA 371G Outline
## Spring 2014

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Office Hours: Tuesday Thursday 3:30-4:30 PM. You are welcome to come by my office at other times, but to make sure that I will be there then, you may first call my office, send me an email, or talk to me before or after class to make an appointment.

### Tuesday, January 14

**Topics:**

- Introduction
- Probability
- Random variables
- Probability distributions
- Mean, variance and standard deviation of a random variable

### Thursday, January 16

**Topics:**

- Add a constant to a random variable
- Multiply a random variable by a constant
- Conditional, joint and marginal probabilities
- Independent random variables, sum of independent random variables
- Continuous random variables
- Probability density function: area under the curve represents probability
- Standard normal distribution $Z \sim \mathcal{N}(0, 1)$
- Standard normal calculations in Excel: NORMSDIST,
  or in R: pnorm (type "?pnorm" in R for help).

**Reading Assignments:**

If you are not familiar with the topics discussed in class, you are recommended to read:
pp. 156-168, 189-195, of Data analysis and decision making, 4th edition
or
pp. 196-206, 225-231 of Data analysis and decision making, 3rd edition

To learn more about these topics, you may further read:
Chapters 2.1, 2.2, 2.4, and 2.5 of OpenIntro Statistics, 2nd edition

## Tuesday, January 21

- Normal distribution $X \sim \mathcal{N}(\mu, \sigma^2)$
- Understand the meaning of the standard deviation $\sigma$ in a normal distribution: $P(\mu - \sigma < X < \mu + \sigma) =?$ and $P(\mu - 2\sigma < X < \mu + 2\sigma) =?$
- Standardizing a normal random variable $Z = \frac{X-\mu}{\sigma}$
  Interpretation: the value of $Z$ is the number of standard deviations that $X$ deviates towards the left (if $Z < 0$) or the right (if $Z > 0$) of the mean.
- Normal calculations in Excel:
  NORMSDIST, NORMDIST
  NORMSINV, NORMINV
  or in R:
  pnorm, qnorm (type "?pnorm" and "?qnorm" in R for help).
- Plot a normal distribution in Excel and R
- Example: Testing at ZTel, we will make an Excel spreadsheet for calculations

**Reading Assignments:**

To get familiar with the normal distribution, you are recommended to read:
pp. 211-215, 217-225 of Data analysis and decision making, 4th edition
or
pp. 247-250, 253-260 of Data analysis and decision making, 3rd edition

You may further read:
Chapters 3.1.1, 3.1.2, 3.1.4 and 3.1.5 of OpenIntro Statistics, 2nd edition

## Thursday, January 23

- Binomial distribution. Examples: the number of "Heads" in 100 coin flips, the number of votes for Republican in 1000 voters
- The normal approximation to the binomial
- Introduction to Monte Carlo simulation

- Uniform random variables: RAND() in Excel, runif in R
- Flip a coin, toss a die, repeat 1 million times
- Law of Large Numbers
- Sum of two dice
- Example: simulation of market return (using Excel)

**Reading Assignments:**

To learn the binomial distribution and its normal approximation, please read:
pp. 233-239 of Data analysis and decision making, 4th edition
or
pp. 268-273 of Data analysis and decision making, 3rd edition

For this topic, you may further read:
Chapters 3.4.1 and 3.4.2 of OpenIntro Statistics, 2nd edition