Your assignment is to perform one project, as described in this document. You will first submit a proposal for your project. After I approve your proposal you should collect your data and write your report. I will not evaluate draft reports; I have neither the time nor the inclination to read a report, return comments, and read it again. No exceptions! If you follow the directions given below, there should be no need to submit a draft report.

Each proposal will be worth one point and each report will be worth nine points, for a total of 10 points possible. Any credit you earn for a proposal will disappear if you do not subsequently submit a report.

You may work alone or as a member of a team of three or fewer students. If you work as a team, only one report should be submitted by the team—remember to include the names of all team members on the report. All members of the team will receive the same grade. Neither my expectations for, nor grading of, reports will be influenced by the size of the team.

The instructor will be grading the proposals and reports; thus, contact your instructor, not your TA, if you have any questions.

Nearly all students have uploaded their proposals and reports into a D2L dropbox. Documents with suffixes of .pdf; .docx; and .jpg have been popular with my students and work well with the following caveat: if you submit a .jpg file, make sure you upload with the proper orientation. (Holding my monitor sideways is no fun!)

Some students have submitted spreadsheets with annotations or even lengthy written passages. These will be accepted, but you might lose points for poor presentation. I predict that most of you in your careers will frequently be called upon to prepare a written report. In my experience, presentation matters! I hope that these projects will hone your skills at writing reports that include quantitative analyses.

The dropbox, whose boss is a computer program, will not accept late proposals or reports. As a result, there will be a dropbox for late submissions. You may ask for an excused late submission; simply state your reason (my dog ate my wifi connection, etc.) and I will decide. An unexcused late submission will receive a minor penalty.
Project Proposal: Due 11:59 PM on Friday, July 17, 2015. You are to perform/observe 100 dichotomous trials under fixed conditions; i.e., this project covers the materials in Chapters 11, 12 and 14, but not Chapters 15 and 16. When you define your trials and conditions, attempt to make choices so that your total number of successes in 100 trials will be between 18 and 82, inclusive. In other words, don’t make a success too easy or too difficult. If you obtain fewer than 18 successes your grade will be reduced by 0.4 points. (See item 4 in the report below.)

This restriction on the total number of successes you obtain might seem harsh, but I don’t think it is unreasonable to expect you to have some idea of what you are doing! If you are very uncertain about what will happen, you might do a pilot study of, say, 20 trials before you begin your real study. For example, in basketball you might find that shooting lay-ups (shots very close to the basket) will yield too many successes while shooting from a distance of 40 feet will yield too few successes.

All that I need in this proposal is a careful description of your 100 trials and your definition of what makes a trial a success.

Note: In the past, many students have made errors in defining their trials. You are not asked to compare two ways to do something. Fixed conditions means collect data one way. For example, if I select (basketball) free throws as my trials, I would pick one way to shoot and then do it. I would not compare left versus right hand; or men’s versus women’s ball; and so on.

Also, survey data are not allowed. As you will see in the description of the report below, it is important to have a temporal ordering of the trials; typically, there is no way to achieve such an ordering with survey data. If you really want to perform a survey, you may appeal this condition.

Finally, if you choose “Tossing a coin,” “Casting a die,” “Selecting a card from a deck of cards” or anything I deem equivalently trivial to be your trial, then I will accept your trials, but your proposal will lose 0.4 points. Note that if you choose some other equally trivial trial—spinning the spinner on Twister comes to mind—I will accept your trials, but your proposal will lose 0.4 points. In this latter case, you will be allowed to resubmit by 11:59 PM on July 19, if you want to attempt to earn the full 1 point for your proposal.

Project Report: Due 11:59 PM on Tuesday, August 4, 2015. Your report should include the following information.

1. Remind me of the definition of your trials.

2. Before you collect data, make a conjecture on the value of \( p \); call it \( p_c \). You must pick one number for \( p_c \); examples include 0.40 or 0.68; do not say: \( p_c < 0.50 \) or otherwise give more than one number.

3. List your 100 responses in the order they were obtained. Calculate the following:
   - \( x \): the total number of successes;
   - \( r \): the total number of runs;
   - \( v \): the length of the longest run of successes; and
   - \( w \): the length of the longest run of failures.
4. Obtain P-values for three tests of the null hypothesis that your trials are Bernoulli trials:

- Use the runs test with the two-sided alternative. Obtain the approximate P-value by using the normal curve—with continuity correction—with mean and standard deviation given by Equations (11.5) and (11.6) on page 270 of the Course Notes. Note that if you obtained $x < 18$ or $x > 82$ then you cannot perform the next two tests and your grade will be reduced.

- Obtain the approximate P-value—i.e., $P(V \geq v)$—for a one-sided alternative by using the table presented in [http://www.stat.wisc.edu/~wardrop/courses/VWdist.pdf](http://www.stat.wisc.edu/~wardrop/courses/VWdist.pdf)

  If your value of $v$ is not in the table, how much larger would it need to be for the data to be statistically significant?

- Obtain the approximate P-value—i.e., $P(W \geq w)$—for a one-sided alternative by using the table presented in [http://www.stat.wisc.edu/~wardrop/courses/VWdist.pdf](http://www.stat.wisc.edu/~wardrop/courses/VWdist.pdf)

  If your value of $w$ is not in the table, how much larger would it need to be for the data to be statistically significant?

5. Regardless of your results in item 4, assume now that your data are from Bernoulli trials and obtain the 95% confidence interval estimate of $p$ two ways:

- Use the approximate method, even if our conditions for its use are not met.

- Use the website to obtain the ‘exact’ confidence interval.

  Compare your two confidence intervals and comment. What do your CIs tell you about your conjecture $p_c$?

6. Use the data from your 100 trials to obtain the 90% prediction interval for the total number of successes you would obtain in $m = 200$ future trials. You do not need to perform these additional trials.