**21.28 Alcohol and zoning out**. Healthy men aged 21 to 35 were randomly assigned to one of two groups: half received 0.82 grams of alcohol per kilogram of body weight; half received a placebo. Participants were then given 30 minutes to read up to 34 pages of Tolstoy’s *War and Peace* (beginning at Chapter 1, with each page containing approximately 22 lines of text). Every two to four minutes participants were prompted to indicate whether they were “zoning out.” The proportion of times participants indicated they were zoning out was recorded for each subject. The table below summarizes data on the proportion of episodes of zoning out.**15** (The study report gave the standard error of the mean *s*/, abbreviated as SEM, rather than the standard deviation *s*.)



(a)What are the two sample standard deviations?

(b)What degrees of freedom does the conservative Option 2 use for two-sample *t* procedures for these samples?

(c)Using Option 2, give a 90% confidence interval for the mean difference between the two groups.

**21.34 Coaching and SAT scores**. Coaching companies claim that their courses can raise the SAT scores of high school students. Of course, students who retake the SAT without paying for coaching generally raise their scores, too. A random sample of students who took the SAT twice found 427 who were coached and 2733 who were uncoached.**21** Starting with their Verbal scores on the first and second tries, we have these summary statistics:



The summary statistics for Gain are based on the changes in the scores of the individual students. Let’s first ask if students who are coached increased their scores significantly.

(a)You could use the information on the Coached line to carry out either a two-sample *t* test comparing Try 1 with Try 2 for coached students, or a matched pairs *t* test using Gain. Which is the correct test? Why?

(b)Carry out the proper test. What do you conclude?

(c)Give a 99% confidence interval for the mean gain of all students who are coached

**21.35 Coaching and SAT scores, continued**. What we really want to know is whether coached students improve more than uncoached students, and whether any advantage is large enough to be worth paying for. Use the information in the previous exercise to answer these questions.

(a)Is there good evidence that coached students gained more on the average than uncoached students?

(b)How much more do coached students gain on the average? Give a 99% confidence interval.

(c)Based on your work, what is your opinion: do you think coaching courses are worth paying for?

**Hint:** *include the actual data. To apply the two-sample t procedures, use Option 1 if you have technology that implements that method. Otherwise, use Option 2*

**21.37 Improving your tips**. Researchers gave 40 index cards to a waitress at an Italian restaurant in New Jersey. Before delivering the bill to each customer, the waitress randomly selected a card and wrote on the bill the same message that was printed on the index card. Twenty of the cards had the message, “The weather is supposed to be really good tomorrow. I hope you enjoy the day!” Another 20 cards contained the message, “The weather is supposed to be not so good tomorrow. I hope you enjoy the day anyway!” After the customers left, the waitress recorded the amount of the tip (percent of bill) before taxes. Here are the tips for those receiving the good-weather message:**22**



The tips for the 20 customers who received the bad weather message are



(a)Make stemplots or histograms of both sets of data. Because the distributions are reasonably symmetric with no extreme outliers, the *t* procedures will work well.

(b)Is there good evidence that the two different messages produce different percent tips? State hypotheses, carry out a two-sample *t* test, and report your conclusions

**Do birds learn to time their breeding?** *Blue titmice eat caterpillars. The birds would like lots of caterpillars around when they have young to feed, but they breed earlier than peak caterpillar season. Do the birds time when they breed based on the previous year’s caterpillar supply? Researchers randomly assigned seven pairs of birds to have the natural caterpillar supply supplemented while feeding their young and another six pairs to serve as a control group relying on natural food supply. The next year, they measured how many days after the caterpillar peak the birds produced their nestlings.****25******Exercises 21.44*** *to* ***21.46*** *are based on this experiment*.

**21.45 Did the treatment have an effect?** The investigators expected the control group to adjust their breeding date the next year, whereas the well-fed supplemented group had no reason to change. The report continues: “but in the following year food-supplemented females were more out of synchrony with the caterpillar peak than the controls.” Here are the data (days behind the caterpillar peak):



Carry out a *t* test and show that it leads to the quoted conclusion