

1. (5 points) Social Media Use Study A study of the use of social media asked a sample of 488 American adults under the age of 40 and a sample of 421 American adults aged 40 or over about their use of social media. Based on their answers, each subject was assigned a social media usage score on a scale of 0 to 25. Higher scores indicate greater usage. The subjects were chosen by random digit dialing of telephone numbers. Are the conditions for two-sample t inference satisfied?

- A. No: scores in a range between 0 and 25 can't be Normal.
- B. Maybe: the SRS condition is OK but we need to look at the data to check Normality.
- C. Yes: the SRS condition is OK and large sample sizes make the Normality condition unnecessary.

2. (5 points) The data in a two-sample problem are

- A. an SRS of matched pairs of observations drawn from a population.
- B. two independent SRSs, each drawn from a separate population.
- C. robust against non-normality.

3. (5 points) A Gallup Poll found that only 28% of American adults expect to inherit money or valuable possessions from a relative. The poll's margin of error was 3%. This means that

- A. we can be sure that the percent of all adults who expect an inheritance is between 25% and 31%.
- B. if Gallup takes another poll using the same method, the results of the second poll will lie between 25% and 31%.
- C. the poll used a method that gets an answer within 3% of the truth about the population 95% of the time.

4. (5 points) A 2010 study finds that in a random sample of 3000 American adults aged 18 and over, 1410 owned an MP3 player such as an iPod. How many American adults aged 18 and over must be interviewed to estimate the proportion who own MP3 players within ± 0.02 with 99% confidence? Use 0.5 as the conservative guess for p^*

- A. $n = 4148$
- B. $n = 1692$
- C. $n = 2401$

5. (20 points) Our bodies have a natural electrical field that is known to help wounds heal. Does changing the field strength slow healing? A series of experiments with newts investigated this question. In one experiment, the two hind limbs of 12 newts were assigned at random to either experimental or control groups. This is a matched pairs design. The electrical field in the experimental limbs was reduced to zero by applying a voltage. The control limbs were left alone. Here are the rates at which new cells closed a razor cut in each limb, in micrometers per hour:

Newt	1	2	3	4	5	6	7	8	9	10	11	12
Control Limb	36	41	39	42	44	39	39	56	33	20	49	30
Experimental Limb	28	31	27	33	33	38	45	25	28	33	47	23

(a) Make a stemplot or histogram of the differences between limbs of the same newt (control limb minus experimental limb). There is a high outlier.

(b) A good way to judge the effect of an outlier is to do your analysis twice, once with the outlier and a second time without it. Carry out two t tests to see if the mean healing rate is significantly lower in the experimental limbs, one test including all 12 newts and another that omits the outlier. Does the outlier have a strong influence on your conclusion?

6. (20 points) Does the order in which wine is presented make a difference? Several choices of wine are presented one at a time, and the subject is then asked to choose his or her preferred wine at the end of the sequence. In one study, subjects were asked to taste two wine samples in sequence. Both samples given to a subject were the same wine, although the subjects were expecting to taste two different samples of a particular variety. Of the 32 subjects in the study, 22 selected the wine presented first when presented with two identical wine samples.

Do the data give good reason to conclude that the subjects are not equally likely to choose either of the two wines when presented with two identical wine samples in sequence?

7. (20 points) An NHANES report gives data for 654 women aged 20 to 29 years. The mean BMI of these 654 women was $\bar{x} = 26.8$. On the basis of this sample, we want to estimate the mean BMI μ in the population of all 20.6 million women in this age group. Assume that the population standard deviation is known to be $\sigma = 7.5$.

(a) Give a 95% z confidence interval using the above information.

(b) In fact, the sample data had a sample standard deviation $s = 7.42$. What is the 95% t confidence interval for the mean BMI of all young women?

8. (20 points) A “subliminal” message is below our threshold of awareness but may nonetheless influence us. Can subliminal messages help students learn math? A group of students who had failed the mathematics part of the City University of New York Skills Assessment Test agreed to participate in a study to find out. All received a daily subliminal message, flashed on a screen too rapidly to be consciously read. The treatment group of 10 students (chosen at random) was exposed to “Each day I am getting better in math.” The control group of 8 students was exposed to a neutral message, “People are walking on the street.” All students participated in a summer program designed to raise their math skills, and all took the assessment test again at the end of the program. The table below gives data on the subjects’ scores before and after the program.

Is there good evidence that the treatment brought about a greater improvement in math scores than the neutral message? How large is the mean difference in gains between treatment and control? (Use 90% confidence.)

Treatment Group Before	Treatment Group After	Control Group Before	Control Group After
18	24	18	29
18	25	24	29
21	33	20	24
18	29	18	26
18	33	24	38
20	36	22	27
23	34	15	22
23	36	19	31
21	34		
17	27		