

For each problem below, identify the procedure you would use. Write and check all conditions. Use your calculator to do the calculations step. Some problems require you to find the sample size.

1. Let's say that 58% of 462 randomly selected college freshmen reported being overwhelmed by the task of managing their own time. (No one is there to nag them about allowing adequate time to study, do laundry, sleep, or get to class.) Construct and interpret a 90% confidence interval for p , the true proportion of college freshman that are overwhelmed by the task of managing their own time.

one proportion z interval

(.542, .618)

* Randomly selected

* Normality: $462(.56) = 267.96 \geq 10$
 $462(.42) = 194.04 \geq 10$

* Independence: more than 10 (462) college freshmen

2. A psychologist finds that fidgety patients tap their fingers on average 500 times during a 2 hour period. You wish to test this claim for the same patients, but in a room decorated with soothing colors and soft lighting. You believe that a warmly decorated room may alter the fidgeting behavior, causing subjects to tap their fingers less than they do under normal conditions. A random sample of 400 patients has a mean of 420 taps and a standard deviation of 60 taps in a 2 hour period. Test the claim at the 0.05 significance level.

one sample t test

$t = -26.67$

$p = 0$

$df = 399$

* Random sample

* $n = 400 \geq 30$ so CLT ensures approx. Normality.

* Independence - More than 10 (400) patients

3. What would change in your procedure for the above problem if the random sample contained only 10 patients? What additional information would you need to meet your assumptions?

We would need to know that the population is Normal OR we would need the actual data in order to graph it and check for approximate Normality.

4. If a random sample of 1,000 Austin residents contain 535 persons who prefer Time Warner internet to AT&T internet, is this sufficient evidence to conclude that more than half the people in Austin prefer Time Warner at the 0.01 level?

one proportion z test

$z = 2.21$

$p = .013$

* Random sample

* Normality: $1000(.5) = 500 \geq 10$
 $1000(.5) = 500 \geq 10$

* Independence: More than 10 (1000) Austin residents

5. To estimate the number of young animals per herd of mouse lemurs, a biologist randomly selects sites in a region of Madagascar and counts the young members of herds sighted near the chosen location. The mean from 25 sites is 8.2, with a standard deviation of 3.4. If the count of offspring is normally distributed, find an 80% confidence interval for the mean number of young per herd.

One sample t interval

(7.3, 9.1)

* Randomly selected sites

* pop. is normally distributed
so samp dist. is as well

* Independence: More than 10(25) sites

6. Smeltzer wants to know how many hours per week senior students spend with their friends in person (not texting or phoning). How many senior students must be randomly selected if she wants a 90% confidence level with a standard error of no more than 0.6 hours. Previous studies have had a standard deviation of 4 hours.

One sample t interval

$$\bar{x} \pm t^* \left(\frac{s}{\sqrt{n}} \right)$$

↖ standard error

$$\frac{4}{\sqrt{n}} \leq 0.6 \quad n \geq 45$$

7. A sample of 481 historians responded to questions about the performance of various U.S. presidents, and the results were presented at the annual conference of the Organization of American Historians (Associated Press, March 28, 1991). Of the 481 surveyed, 433 responded that Ronald Reagan lacked the proper intellect for the presidency. Construct a 90% confidence interval for the true proportion of all historians who believe that Reagan lacked the proper intellect for the presidency. (Note: We are assuming that the 481 historians were chosen randomly.)

One proportion z interval

(.879, .923)

* Stated as chosen randomly

* 433 ≥ 10, 48 ≥ 10 approx. Normal

* More than 10(481) historians
- Independence

8. A consumer group is interested in estimating the proportion of over ripe peaches at a local H.E.B. grocery store. How many randomly selected products should be checked in order to estimate this proportion within 3% with 96% confidence?

One proportion z interval

96% confidence means



$$z^* = \text{InvNorm}(.98) = 2.05$$

$$\hat{p} \pm z^* \left(\sqrt{\frac{pq}{n}} \right)$$

↳ margin of error

$$2.05 \left(\sqrt{\frac{(1.5)(1.5)}{n}} \right) \leq 0.03$$

$$n \geq 1168$$

9. Mrs. Donald wants to know if the homework load is different in the English and mathematics department at Westwood High School. She randomly selects 24 students. Twelve record the number of hours they spend during the semester on English homework and the other twelve record the number of hours they spend during the semester on math homework. Does there appear to be a significant difference in the homework load between the two departments?

English	54	125	56	72	48	91	55	111	97	90	75	84
Math	88	89	91	112	63	90	55	98	120	131	95	104

2 sample t test

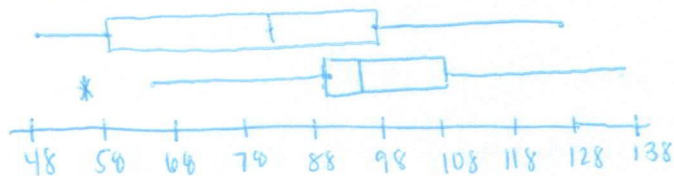
$$t = -1.59$$

$$p = .127$$

$$df = 21.7$$

* students were randomly selected

* Normality is NOT verified. LLT doesn't apply because $n < 30$ and "math" has an outlier



* independence: More than 10 (24) students

10. Mrs. Donald wants to know if the homework load is different in the English and mathematics department at Westwood High School. She randomly selects 12 students who agree to record the number of hours they spend on homework in the two disciplines for the semester. Does there appear to be a significant difference in the homework load between the two departments?

subject	A	B	C	D	E	F	G	H	I	J	K	L
English	54	125	56	72	48	91	55	111	97	90	75	84
Math	88	89	91	112	63	90	55	98	120	131	95	104

paired t test

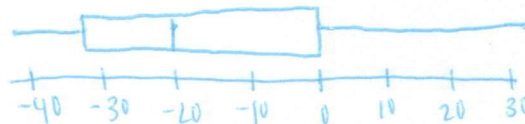
$$t = -2.19$$

$$p = .051$$

$$df = 11$$

* 12 students were chosen randomly

* Boxplot of the differences shows no outliers so we will assume approx. Normality.



* independence: More than 10 (12) students

11. To test the effectiveness of a new drug for insomnia, 80 patients at a clinic were given a pill containing the drug and 80 others were given a placebo. At the 0.01 level of significance, what can we conclude about the effectiveness of the drug if in the first group 56 of the patients felt a beneficial effect while 38 of those who received a placebo felt a beneficial effect? (The mind is a curious thing!)

2 proportion z test

$$z = 2.49$$

$$p = .0019$$

* We don't know if the patients were randomly assigned to their treatments

* $56 \geq 10$, $24 \geq 10$
 $38 \geq 10$, $42 \geq 10$ samp. dist. is approx. Normal

* independence: More than 10 (213) freshmen and 10 (154) seniors

12. Is there a correlation between test anxiety and exam score performance? Data on x = score on a measure of test anxiety and y = exam score consistent with summary quantities given in the paper "Effects of Humor on Test Anxiety and Performance" (*psych. Reports* (1999): 1203-1212) appears below. Test to see if the linear regression equation is useful in predicting test score using anxiety score.

x	23	14	14	0	7	20	20	15	21
y	43	59	48	77	50	52	46	51	51

Linear regression T test

$$t = -3.38$$

$$p = .012$$

$$df = 7$$

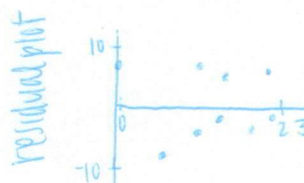
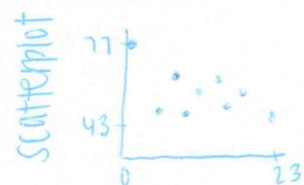
* Linear: scatterplot looks roughly linear

* Independence: more than 10 (9) scores

* Normal: histogram of residuals has no outliers

* Equal std. dev: Residual plot shows no patterns

* Random: Not told at all



13. A student survey is designed to determine if there is a difference between freshman and senior relationships. The proportion of students in each class who have been "going steady" for 3 months or longer was of interest. Of the 213 freshmen surveyed, 20 had been going steady for at least 3 months. Of the 154 seniors surveyed, 21 had been going steady for at least 3 months. Construct a 98% confidence interval for the difference between the two proportions.

2 proportion 2 interval

$$(-.122, .037)$$

* We weren't told if they were from two SRS's

* Normality: $20 \geq 10$, $193 \geq 10$
 $21 \geq 10$, $133 \geq 10$

* More than 10 (213) freshmen, 10 (154) seniors for independence

14. A traffic study interested in color preferences asks 133 randomly selected drivers which of the three colors (yellow, red, green) they least like. Does there seem to be a gender difference in color preference?

	red	green	yellow
male	27	14	26
female	28	18	20

χ^2 test for independence

$$\chi^2 = 1.29$$

$$p = .524$$

* Randomly selected drivers

* Expected counts are all greater than 5

$$\begin{bmatrix} 27.71 & 16.12 & 23.17 \\ 27.29 & 15.88 & 22.83 \end{bmatrix}$$

* More than 10 (133) drivers for independence