Math 207
Introduction to Statistics

z- and t-Test Exercises

1. A coin is tossed 10,000 times, and it lands heads 5,167 times. Is the chance of heads equal to 50%? Or are there too many heads for that? State the null and alternative hypotheses. Compute z and P.

2. Use the table below to find the specified area under the t-distribution (Student's curve).

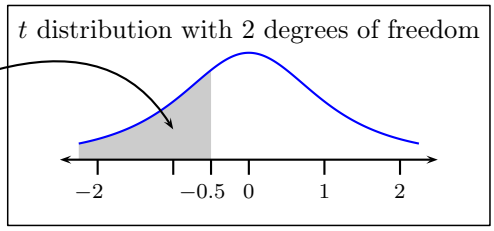
   a) To the left of -1.0 if degrees of freedom is 3.

   b) To the right of 1.0 if degrees of freedom is 3.

   c) To the right of 1.5 if degrees of freedom is 2.

   d) To the left of 0.5 if degrees of freedom is 2.

Degrees of Freedom	t			
	-2.0	-1.5	-1.0	-0.5
1	0.148	0.187	0.250	0.352
2	0.092	0.136	0.211	0.333
3	0.070	0.115	0.196	0.326



3. A spectrophotometer is being calibrated for its daily use. Two measurements are taken which give readings of 71 and 84. The device is well-calibrated if its average measurement is 70. Perform a t-test to conclude whether or not the device is well-calibrated.

4. (#4 on page 496) One large course has 900 students, broken down into sections meeting with 30 students each. The section meetings are led by teaching assistants. On the final, the class average is 63, and the SD is 20. However, in one section the average is only 55. The TA argues this way:

> If you took 30 students at random from the class, there is a pretty good chance they would average below 55 on the final. That's what happened to me — chance variation.

Is this a good defense? Answer yes or no, and explain briefly.

5. If you used a z-test to answer the previous question, redo it using a t-test. If you used t, redo it using z.

The Two-Sample z-Test to Compare Two Boxes

1. Four hundred draws are made at random with replacement from box A. The average of these draws is 110 and their SD is 60. Independently, 100 draws are made at random from box B. Their average is 90 and SD is 40. Formulate the null and alternative hypotheses. Calculate the z and P values.

2. Repeat the previous exercise if the average of the draws from A was 95.

3. Repeat Exercise 1 if the number of draws from A was 100 and the number of draws from B was 36.

4. (#3 from page 506) In 1970, 59% of college freshmen thought that capital punishment should be abolished; by 2005, the percentage had dropped to 35%. Is the difference real, or can it be explained by chance? You may assume that the percentages are based on two independent simple random samples, each of size 1,000.

5. (#5 from page 507) A university takes a simple random sample of 132 male students and 279 females; 41% of the men and 17% of the women report working more than 10 hours during the survey week. To find out whether the difference in percentages is statistically significant, the investigator starts by computing $z = (41 - 17)/0.048$. Is anything wrong? If so fix it. Then do the test.

6. (#1 from page 518) Five hundred draws are made at random with replacement from a box of numbered tickets; 276 are positive. Someone tells you that 50% of the tickets in the box show positive numbers. Do you believe it? Answer yes or no, and explain.