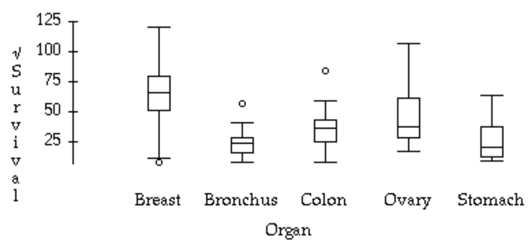
Note that p-values may not be in your tables; if so, state an appropriate inequality. Sometimes this happens with real data, so be ready for it.

1. NCAA collected data on graduation rates of athletes in Division I in the mid-1980s. Among 2,332 men, 1,343 had not graduated from college, and among 959 women, 441 had not graduated. Identify a test procedure that would be appropriate for analyzing the relationship between gender and graduation. Carry out the procedure and state your conclusion.

2. You've taken five observations from a Gamma$(2, \theta)$ distribution; they are 3.5, 4.3, 0.6, 1.1, and 2.2. Test $H_0 : \theta = 0.25$ against $H_A : \theta \neq 0.25$ using the likelihood ratio test.

3. 64 total patients with advanced cancers of the stomach, bronchus, colon, ovary or breast were treated with ascorbate. The purpose of the study was to determine if the survival times differ with respect to the organ affected by the cancer. A boxplot of the data follows. Looking at the boxplot, do you think the survival times differ? Why?



An ANOVA was performed, but unfortunately the table of results was smudged and some of the numbers are unreadable. Thankfully, there is still enough information here to recreate the table. Fill in all the blanks, find the p-value, and state your conclusion. Does this result agree with your guess from the boxplot?

	Df	Sum Sq	Mean Sq	F value
Treatment	____	________	2883940	______
Error	____	26448144	________	
Total	____	________		

Data from Cameron, E. and Pauling, L. (1978) Supplemental ascorbate in the supportive treatment of cancer: re-evaluation of prolongation of survival times in terminal human cancer. Proceedings of the National Academy of Science USA, 75.

4. You have one observation X that is limited to values between 0 and 1. You wish to test $H_0 : f_X(x) = 1$ against $H_A : f_X(x) = 2x$. Find the rejection region and power of the most powerful test with $\alpha = 0.1$. Using this test, what would you conclude if $X = 0.7$?

5. A manufacturer of light bulbs claims that its light bulbs have a mean life of 1520 hours. A random sample of 40 such bulbs is selected for testing. If the sample produces a mean value of 1498.3 hours and a standard deviation of 85 hours, is there sufficient evidence to claim that the mean life is significantly less than the manufacturer's claim, using the $\alpha = .01$ significance level? State the hypotheses, report the p-value, and draw the appropriate conclusion in context.

   Assuming the true standard deviation is really 85 hours, how large of a difference could this study detect with a power of 0.5 or greater?

   When you look more closely at the data, you find that the data is not normally distributed, but has a few large values as outliers, so you decide to do a sign test. You count that 30 of the bulbs have a life of less than 1520 hours. State the hypotheses, report the p-value, and draw the appropriate conclusion in context.

6. For a random sample of size n from a Bernoulli distribution with probability p, derive the maximum likelihood estimator, the method of moments estimator, and the Bayes estimator under squared error loss using a Beta(α, β) prior.