❶ The manufacturer of a suntan lotion wants to know whether or not a new ingredient increases the protection against sunburn. Seven volunteers have their backs exposed to a sun lamp with the old lotion on one side and the new lotion on the other side of the spine. A higher number indicates more burning. Does the new ingredient improve the effectiveness of the lotion?

The data are:

volunteer	1	2	3	4	5	6	7
Old lotion	42	51	31	61	44	55	48
New lotion	38	53	36	52	33	49	36

Run a hypothesis test using all 6 or 7 steps. Assume $\alpha = .05$. Write out all of your 6 or 7 steps.

❸ A chaperone notes that some high school students at a theme park have a greater fear of roller coasters than others. She suspects this is due to the fact that some are significantly taller than their peers. She notes the students' indicated comfort levels, and their heights, as listed below:

Height (cm) students comfortable on roller coasters	**Height (cm) students uncomfortable on roller coasters**
n = 12	n = 34
Mean height = 169	Mean height = 174
$S^2 = 15$	$S^2 = 13$

a. State the independent and dependent variables.
b. Using $\alpha = .05$, calculate an independent-samples t test using all 6 steps of hypothesis testing.

❻ A psychologist conducts a study of perceptual illusions under two different lighting conditions. The experimenter reported: "There was insufficient evidence to reject the null hypothesis. The mean number of effective illusions was 6.72 under the bright conditions and 6.85 under the dimly lit conditions, a difference that was not significant, $t(19) = 1.62$, $p > 05$."
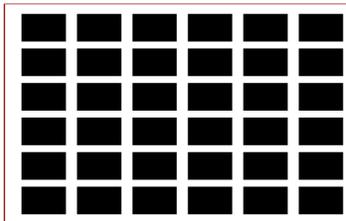
☀ How many subjects participated in this study?

☀ Explain this result to a person who has never had a course in statistics.

❷ Use the t-table in the back of the book to find the critical t values for each of the following two-tailed hypotheses:

$\alpha = .05$, $n_1 = 12$, $n_2 = 11$
$\alpha = .05$, $n_1 = 15$, $n_2 = 11$
$\alpha = .01$, $n_1 = 25$, $n_2 = 25$

❹ In dependent t-tests, what do the data "depend" on? What are two advantages of dependent t-tests over independent t-tests?

❺ How much smarter are you than others who have not taken a statistics class??

Adapted from K. Taylor, 2010
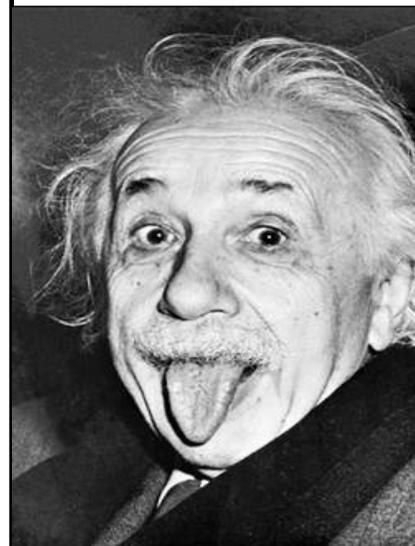
A study was conducted to analyze gender differences. MRI pixel counts were used to measure brain sizes of women and men. Participants were also given IQ tests. Two t-tests were conducted to compare IQs and pixel counts of men and women. Answer the questions below using the SPSS output.

Group Statistics

	gender	N	Mean	Std. Deviation	Std. Error Mean
total pixel count	male	20	954855.40	55911.35	12502.16
	female	20	862654.60	55893.56	12498.18
Full scale IQ	male	20	115.00	24.99	5.59
	female	20	111.90	23.69	5.30

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		Lower	Upper
total pixel count	Equal variances assumed	.004	.951	5.216	38	.000	92200.80	17677.91		56413.74467	1.27988E5
	Equal variances not assumed			5.216	38.000	.000	92200.80	17677.91		56413.74455	1.27988E5
Full scale IQ	Equal variances assumed	.319	.576	.403	38	.689	3.10	7.70		-12.48493	18.68493
	Equal variances not assumed			.403	37.892	.689	3.10	7.70		-12.48639	18.68639

a. How many females participated in this study?
b. What was the computed t-statistic for "total pixel count" assuming variances are equal?
c. What was the computed t-statistic for "Full scale IQ" assuming variances are equal?

❼

a. What was the statistical conclusion for the pixel-count study? Accept or reject? Difference or no?
b. What was the statistical conclusion for the IQ study? Accept or reject? Difference or no?
c. Explain possible reasons for both findings. What could explain any significant differences?

❽

Adapted from K. Taylor, 2010

9 For the following studies, choose the correct t-test to analyze the data. The choices are: one-sample t-test, independent samples t-test, or dependent samples t-test.

Wiley (2005) found that people with a high level of previous knowledge about a given controversial topic (e.g., abortion, military intervention) had better average recall for arguments on both sides of that issue than did those with lower levels of knowledge.

Talarico and Rugin (2003) recorded two sets of memories of 54 students. Subjects conveyed memories related to the terrorist attacks on 9/11/01 (called flashback memories for their vivid-ness and emotional content) and also conveyed everyday memories. The researchers found that flashback memories were no more consistent over time than everyday memories, even though they were perceived to be more accurate.

Engle-Friedman and colleagues (2003) studied the effects of sleep deprivation. Fifty students were as-signed to one night of sleep loss (students were required to call the laboratory every half-hour all night) and then one night of no sleep loss (normal sleep). The next day, students were offered a choice of math problems with differing levels of difficulty. Following sleep loss, students tended to choose less challenging problems.

Taylor and Ste-Marie (2001) studied eating disor-ders in 41 Canadian female figure skaters. They compared the figure skaters' data on the Eating Disorder Inventory to the means of known popula-tions, including women with eating disorders. On average, the figure skaters were more similar to the population of women with eating disorders than to those without eating disorders.

Engle-Friedman, M., et al. (2003). The effect of sleep loss on next day effort. Journal of Sleep Research, 12, 113-124.

Holden, G.W. Thompson, E.E. Zambarano, R.J. Marshall, L.A (1997). Journal of Social and Personal Relationships, 14(4), 481 -490.

Talarico, J.M. & Rubin, D.C. (2003). Confidence, not consistency, characterizes flashbulb memories. Psychological Science, 14, 455-461.

Taylor, G.M. & Ste. Marie, D.M. (2001). Eating disorders symptoms in Canadian female pair and dance figure skaters. International Journal of Sports Psychology, 32, 21-28.

Wiley, J. (2005). A fair and balanced look at the news: What affects memory for controversial arguments. Journal of Memory and Language, 53, 95-109.

Adapted from K. Taylor, 2010