EXAMPLES 3 — parametric difference tests

Interval estimation from samples (and a one-sample *t* test)

Q1. The following ten measurements were made of the light intensity at which a glare source impaired reading (in log trolands). Within what interval can we infer that the true mean (i.e. *population* mean, or mean of a very large number of such measurements) lies, with a 90% probability of being right?

4.32	5.07	4.29	6.02	5.11	4.93	3.98	4.83	5.50	6.10

Q2. In an experiment to measure the speed of discriminating words from non-words, the following 12 discrimination times (in ms) were recorded:

605	460	752	321	550	612	700	680	800	491	523	594

Within what interval is there a 95% probability that the true (population) mean lies?

Q3. In an experiment on judging the equality of weights the following ten values were set by a subject as being equal to 100 g. What is the 95% confidence interval within which the true (population) mean lies? Is the mean significantly different from 100 at the 5% level?

100.2	96.3	110.9	89.3	95.0	98.5	105.6	99.8	102.4	97.6

Two-sample *t* test

These examples will also appear in the 'Examples 4' sheet for nonparametric difference tests — and you might like to try a few more of the examples from 'Examples 4' using t tests as practice.

Q4. A traffic survey measures the speed of 15 cars chosen randomly each morning over a quarter-mile stretch of road. One ordinary Monday these were (in m.p.h.):

32	45	37	41	28	36	40	49	34	36	33	30	40	38	39

On the next Monday in another ordinary working week on which there were similar weather conditions, a 'simulated accident scene' was placed 50 yards before the start of the measurement area, and the speeds of fifteen cars measured were:

33	27	38	35	30	32	29	20	37	44	31	36	30	34	32

Did the simulated accident significantly reduce drivers' speeds?

Q5. Twelve student volunteers performed a card-sorting task: they sorted 250 cards on one day, 500 on the next day starting 20 min after having ingested a pharmacologically-active substance, and 250 on a third day. The table gives the number of errors in sorting they made on the second day, and the total errors on the first and third days. Does the substance have any effect on card-sorting accuracy?

Subject	1	2	3	4	5	6	7	8	9	10	11	12
Day 2	12	17	9	3	16	10	28	14	5	19	20	8
Days 1 & 3	16	16	11	5	10	13	36	11	8	11	20	14

Q6. The short-term memory span for digits was measured for a number of students specializing in arts (A) and science (S) subjects. The table gives each student's mean span with his subject group:

A	A	S	A	S	S	S	S	A	S	A	A	S	S	A
5.8	7.3	7.1	6.9	8.2	5.9	6.4	6.8	7.7	6.0	6.3	5.2	6.2	6.6	7.4

A	S	S	S	A	S	A	A	S	S
6.5	7.0	7.2	6.1	7.9	7.4	7.0	6.2	6.4	8.0

Is there a significant difference between the digit spans of arts and science students?

Q7. Two groups of subjects are shown an ambiguous figure, and the time taken until the first reversal of its appearance is measured for each subject. One group had previously seen the figure in a form strongly biased to show one of its alternative appearances; the other had no such pre-exposure (control group). The times to first reversal (in s) were:

Pre-exposure group	7.4	7.0	6.8	8.2	6.5	7.5	5.8	6.3	7.1	6.6
Control group	6.2	7.3	5.6	5.9	6.0	6.9	6.1	5.4		

Does pre-exposure to the biased figure lengthen the time to first reversal?

Q8. In an experiment in which briefly-flashed letters were superimposed on either a random or a checkerboard black-and-white pattern, one subject gave the following results:

Letter	a	c	e	n	o	s	u	v	x	z
% correct recognitions:										
On random field	67	43	49	31	40	52	35	74	83	77
On checkerboard	79	51	58	28	44	52	28	87	90	81

Do the checkerboard and random fields have significantly different effects on the visibility of the letter?

F test

Do the variances of the following pairs of groups differ at the .10 level?

Q9.	Group A:	–10	4	3	–5	12	6	7	1	–8
	Group B:	1	4	2	–1	5	–2	0	3	

Q10.	Group A:	20	47	150	10	60	120
	Group B:	60	65	45	30	25	