

Statistical Inference AS 1.2

Applying skills to intervals and estimation

1. A random sample of 10 packs of butter of a particular brand has masses, measured to the nearest gram, as follows:

219 226 224 223 216
221 228 215 225 229

- a) Construct a 95% confidence interval for the true mean mass of a packet of butter, assuming that the masses are known to be normally distributed with standard deviation 8.45 g.
b) What can be inferred about the true mean population mass of a pack of this brand of butter?
2. A customer obtained a trial supply of lift wire from a manufacturer and measured the breaking strength, x Newtons, of each of a random sample of 12 lengths of wire, obtaining the results shown below.

80.2 83.5 76.2 79.2 88.7 90.2
93.4 75.1 87.2 83.4 82.6 81.2

- a) Use the sample to obtain a 99% confidence interval for the mean breaking strength of lengths of wire from the manufacturer.
b) The customer is considering using the wire to lift a mass of 89 Newtons. What advice would you give to the customer about the suitability of the wire for its intended use?
3. A random sample of 20 exam candidates was asked to record the time they spent revising a particular topic. For this sample, the mean time was 7.2 hours and the sample standard deviation was 1.5 hours.
a) Construct a 95% confidence interval for the mean time spent by candidates revising this topic.
b) Interpret this confidence interval carefully.
4. Experimental components for the use in aircraft engines were tested to destruction under extreme conditions. The survival times, X days, of ten components were as follows:

207 381 111 673 234 294 897 144 418 554

Assuming that the survival time, under these conditions, for all the experimental components is normally distributed with standard deviation 240 days, calculate a 90% confidence interval for the mean of X . Interpret this confidence interval carefully.

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5. In a mill random samples of four bags are taken every half hour from the output of a machine filling 0.5 kg bags of flour. The bags are accurately weighed and their masses (grams) are given in the table below.

		Sample									
		1	2	3	4	5	6	7	8	9	10
Weights		480	410	590	490	590	590	580	520	490	510
		520	570	590	520	410	460	540	510	500	530
		480	480	500	460	570	510	430	410	440	490
		590	590	540	530	510	420	500	520	410	500
mean		517.5	512.5	555	495	520	495	512.5	490	460	507.5

Assuming $\sigma = 58$ grams, draw up a control chart and plot the given observations. Comment on the control chart.

6. A plastics manufacturer produces components for the automotive industry by means of an injection moulding process. Under normal operating conditions 12% of the parts are defective. Calculate limits for a p-chart for proportion defective in routine samples of 100 components, plot the data given below and comment.

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. Defective	11	16	12	12	15	8	4	11	10	11	13	14	16	15	23