

Exercise 1

One step in the manufacture of a certain metal clamp involves the drilling of four holes. In a sample of 150 clamps, the average time needed to complete this step was 72 seconds and the standard deviation was 10 seconds.

- (a) Find the probability that the average time to complete the step is between 65 and 74 seconds (inclusive).
- (b) Find a 93% confidence interval for the mean time needed to complete the step.
- (c) What is the confidence level of the interval (71, 73)?
- (d) How many clamps must be sampled so that a 88% confidence interval specifies the mean to within ± 1.5 seconds?
- (e) Find a 97% lower confidence bound for the mean time to complete the step.

Exercise 2

A new concrete mix is being designed to provide adequate compressive strength for concrete blocks. The specification for a particular application calls for the blocks to have a mean compressive strength greater than 1350 kPa. A sample of 100 blocks is produced and tested. Their mean compressive strength is 1356 kPa and their standard deviation is 70 kPa.

- a) Do you believe it is plausible that the blocks do not meet the specification, or are you convinced that they do? Explain your reasoning by carrying out the appropriate hypothesis test.
- b) If a sample of 10 blocks is produced and tested with their mean compressive strength at 1372 kPa and their standard deviation at 68 kPa. Find the P-value based on the same hypothesis.

Exercise 3

A particular type of gasoline is supposed to have a mean octane rating of 90%. Five measurements are taken of the octane rating and the results (in %) are 87.0, 86.0, 86.5, 88.0, 85.3.

- a) Test the requirements of the octane rating using the appropriate hypothesis test (assume $\alpha = 0.01$).
- b) Verify your result in part (a) using the appropriate confidence interval.