

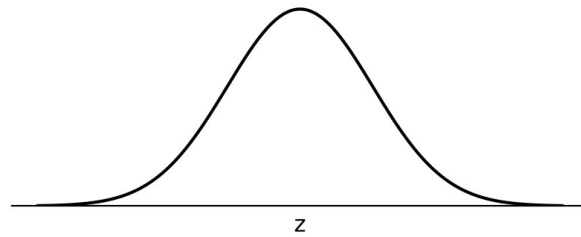
5B Confidence Intervals

Confidence interval:

Distribution of $\bar{X}$ (central limit theorem):

1. Show that a 95% confidence interval for μ , based on a sample of size n , is given by

$$\left(\bar{x} - 1.96 \times \frac{\sigma}{\sqrt{n}}, \bar{x} + 1.96 \times \frac{\sigma}{\sqrt{n}} \right)$$



Confidence limits:

Complete the table of percentage points of $N(0, 1^2)$ used for confidence intervals.

Confidence level	90%	95%	98%	99%
z				

Interpreting a 95% confidence interval:

2. The breaking strains of reels of string produced at a certain factory have a standard deviation of 1.5 kg. A sample of 100 reels from a certain batch were tested and their mean breaking strain was 5.30 kg.
- a) Find a 95% confidence interval for the mean breaking strain of string in this batch.

The manufacturer becomes concerned if the lower 95% confidence limit falls below 5 kg. A sample of 80 reels from another batch gave a mean breaking strain of 5.31 kg.

- b) Will the manufacturer be concerned?

Width of a confidence interval:

Factors that affect the width:

3. A random sample of size 25 is taken from a normal population with standard deviation 2.5. The mean of the sample is 17.8.
- a) Find a 99% C.I. for the population mean μ .
- b) What size sample is required to obtain a 99% C.I. of width of at most 1.5?
- c) What confidence level would be associated with the interval based on the above sample of 25 but of width 1.5, i.e. (17.05, 18.55)?

