Confidence intervals – how big does the sample size need to be?

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Select EQUA icon (or press A) from the main menu or by using the arrow keys to highlight and then press EXE.

This worksheet shows how you can use the graphical calculator to calculate the sample size dependent on the confidence interval (C.I.) size required.

$$\mu - k\,\tfrac{\sigma}{\sqrt{n}} \le \mu \le \mu + k\,\tfrac{\sigma}{\sqrt{n}},\text{ where k is the z-score for C.I. calculations}$$

Example: A researcher wants to estimate the mean length of fish that were caught in Lake Casio this season to be within 25 mm of the true mean length, with 95% confidence. Previous research of the fish in this area has revealed that the standard deviation of the length of fish, that have been caught and recorded, to be 40 millimetres. What is the minimum sample size that is required to meet this condition?

Answer: Here the mean is not required in this instance, we want to have the 95% confidence interval to be equal to 25. That is the 'distance' from the true mean +/- 25mm accuracy given the conditions:
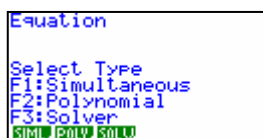
$$\mu - k\,\tfrac{\sigma}{\sqrt{n}} \le \mu \le \mu + k\,\tfrac{\sigma}{\sqrt{n}}\ \ [= 50],\text{ or } k\,\tfrac{\sigma}{\sqrt{n}} = 25$$

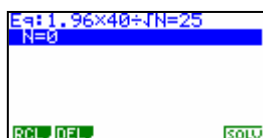Information given: 95% CI→ k = 1.96, σ = 40, $k\,\tfrac{\sigma}{\sqrt{n}}$ = 25 and n = ?

[N.B. margin of error = standard error x 1.96 yields the 95% confidence interval. On the graphical calculator we will use S for σ and N for n.]
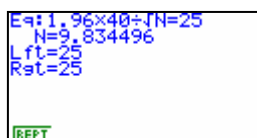
Method 1:
Enter into **SOLV**er [**F3**] and type in the equation 1.96x40/√N = 25 **EXE** to store it and [**F6**] to solve.
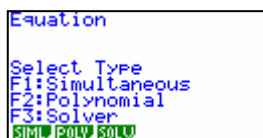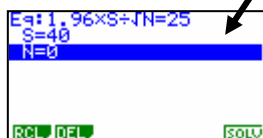

F3	F6

Method 2:
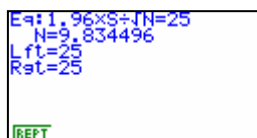Enter into **SOLV**er [F3] and type in the equation 1.96xS/√N = 25 **EXE** to store it, type in 40 for S and make sure that the cursor is 'resting' on the N 'the unknown' and then [**F6**] to solve.

F3	F6

Solution = 9.834496

Interpretation: The sample size is to include at least 10 fish for the mean length of fish caught in Lake Casio this season to be within 25 mm of the true mean length.