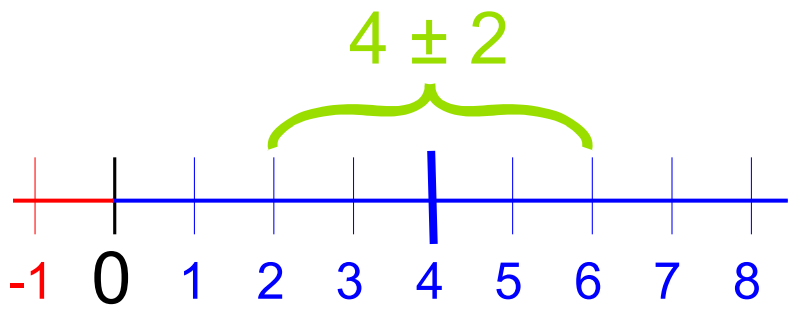
Confidence Intervals

https://www.mathsisfun.com/data/confidence-interval.html

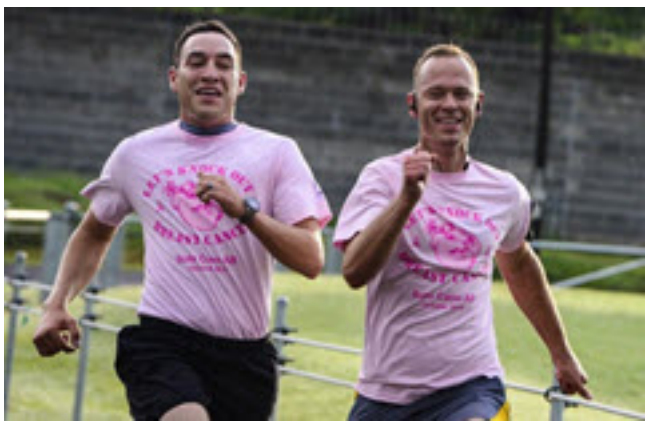


The above number line marks an interval of 4 plus or minus 2. Because 4 - 2 = 2 and 4 + 2 = 6, the interval of 4 ± 2 ranges from 2 (4 - 2) to 6 (4 + 2).

A Confidence Interval is similar; it marks a range of values in which we are fairly sure our true value lies.

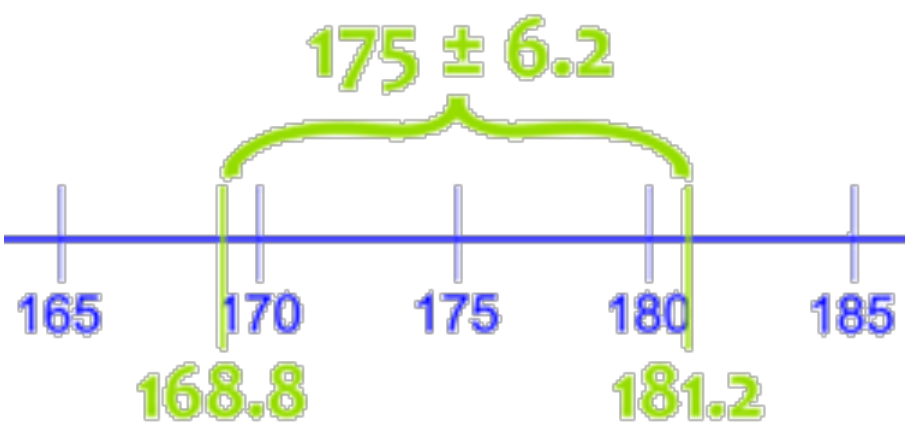
Example: Height

We can measure the heights of a random sample of 40 men and get a mean height of 175 cm. From this sample of men's heights, we can compute the standard deviation (20 cm).



We can then compute the Standard Error of the Mean, using the formula SEM = standard deviation divided by the square root of the sample's N. For this sample, the SEM is 3.162 cm.

We can then compute the **95% Confidence Interval** with the formula **Z-value** * **SEM**. To compute the 95% Confidence Interval, we use the Z-value 1.960, as demonstrated in the table on the next page. Because 1.960 * our SEM of 3.162 cm = 6.198 cm, we can report our 95% Confidence Interval as 175 cm (the mean) ± 6.198 cm.



Our 95% Confidence Interval means the true mean of ALL men (if we could measure all their heights) is likely to be between 168.802 cm and 181.198 cm.

But it might not be! The "95%" says that 95 of 100 samples will include the true population mean, but 5 of 100 samples won't.

We can choose which level of confident we want to use: 95%, 99%, 99.5% or even 99.9% are common choices. The Z-value for each Confidence Interval is listed below.

Confidence Interval	Z-value
80%	1.282
85%	1.440
90%	1.645
95%	1.960
99%	2.576
99.5%	2.807
99.9%	3.291