Confidence Interval for a Proportion (Wilson Score)

Wilson score and simple Wald confidence intervals for a proportion from x successes in n trials, at 90, 95 or 99 % confidence, with the point estimate.

Method: Wilson score interval

Input parameters

Unit system: SI

Parameter	Value	Unit
Successes (or defectives) observed	7.0000	
Trials (sample size)	120.00	
Confidence level	95 %	

Calculated results

Parameter	Value	Unit
Point estimate x/n	5.8333	%
Wilson lower limit	2.8541	%
Wilson upper limit	11.553	%
Wald lower limit (clipped at 0)	1.6400	%
Wald upper limit (clipped at 1)	10.027	%

Notes for this case

• The Wilson interval inverts the score test: it is centred on (p̂ + z²/2n)/(1 + z²/n) and stays inside 0–1 with close to the stated coverage even for small n or p near 0 or 1. The familiar Wald interval p̂ ± z√[p̂(1 − p̂)/n] is shown for comparison; it collapses to zero width when x = 0 or x = n and undercovers for small samples. z is the two-sided normal quantile for the chosen confidence.

Formula and method

$$p_{L,U} = \frac{\widehat{p} + \frac{z^2}{2n} \mp z\sqrt{\frac{\widehat{p}(1-\widehat{p})}{n} + \frac{z^2}{4n^2}}}{1 + \frac{z^2}{n}}$$

Variables

x	Successes (or defectives) observed	-
n	Trials (sample size)	-
$1-\alpha$	Confidence level	-
$\widehat{p}$	Point estimate x/n	-
p_L	Wilson lower limit	-
p_U	Wilson upper limit	-
$p_{L,Wald}$	Wald lower limit (clipped at 0)	-
$p_{U,Wald}$	Wald upper limit (clipped at 1)	-

Method and standards

Wilson interval.

Assumptions and limits

- Independent trials with a constant probability.

References

Wilson score interval

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/geometry/wilson-proportion-interval

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.