Slope and Gradient Converter (%, Degrees, 1 in n)

Convert a slope given by rise and run into percent grade, angle in degrees, ratio 1 in n and slope length, for roads, drains, ramps, roofs and pipelines.

Method: Trigonometry of a slope

Input parameters

Unit system: SI

Parameter	Value	Unit
Rise (vertical)	1.0000	m
Run (horizontal distance)	50.000	m

Calculated results

Parameter	Value	Unit
Grade (rise / run)	2.0000	%
Angle	1.1458	°
1 in n (run per unit rise)	50.000	
Length along the slope	50.010	m

Notes for this case

- A 100 % grade is 45°, not vertical. Drainage falls are often written 1 in n (run per unit of fall).

Formula and method

$$G = \frac{\Delta z}{L_h}, \quad \theta = \arctan G, \quad n = \frac{L_h}{\Delta z}, \quad L_s = \sqrt{\Delta z^2 + L_h^2}$$

Variables

Δz	Rise (vertical)	m
L_h	Run (horizontal distance)	m
G	Grade (rise / run)	-
θ	Angle	rad
n	1 in n (run per unit rise)	-
L_s	Length along the slope	m

Method and standards

Right-angled triangle relations.

Assumptions and limits

- Straight slope, given by rise and run. To convert from a grade or an angle, enter a run of 100 and the grade in per cent as the rise, or a run of 1 and tan θ as the rise.
- A level surface (zero rise) gives zero grade and angle; 1 in n is then not defined and not shown.

References

- Trigonometry of a slope

Report details

Report reference	FCC-HFQ2-QR26 (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Slope and Gradient Converter (%, Degrees, 1 in n)
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	4 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/slope-gradient-conversion

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.