Linear Motion: Speed, Distance and Time (Uniform Acceleration)

Final speed, distance and average speed of a body moving with uniform acceleration from initial speed, acceleration and time, with stopping distance.

Method: Textbook mechanics (equations of motion for constant acceleration)

Input parameters

Unit system: SI

Parameter	Value	Unit
Initial speed	0	m/s
Acceleration (negative to brake)	2.0000	m/s²
Time	5.0000	s

Calculated results

Parameter	Value	Unit
Final speed u + a t	10.000	m/s
Distance u t + ½ a t²	25.000	m
Average speed	5.0000	m/s

Notes for this case

- The acceleration does not oppose the motion, so there is no stopping distance.

Formula and method

$$v = u + at, \quad s = ut + \frac{1}{2}at^2, \quad s_{stop} = \frac{u^2}{2|a|}$$

Variables

u	Initial speed	m/s
a	Acceleration, in m/s² (negative to brake)	m/s²
t	Time	s
v	Final speed u + a t	m/s
s	Distance u t + ½ a t²	m
$\bar{v}$	Average speed	m/s
s_{stop}	Distance to stop from u at the deceleration	a

Method and standards

Integration of constant acceleration.

Assumptions and limits

- Constant acceleration. When braking, the body stops at t = u/|a| and stays at rest (no reversal); the stopping distance is shown only when the acceleration opposes the motion.
- Acceleration in m/s² in every unit system.

References

- Textbook mechanics (equations of motion for constant acceleration)

Report details

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

This calculator online

https://calc.firecad.com/mechanical/statics-dynamics/linear-motion-kinematics

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Reopens the calculator with the inputs of this report.