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Speed Unit Conversion Chart

Quick reference guide for velocity and speed measurements

Linear Speed Units

Unit	Symbol	Definition	Metric Equivalent	
Meter per second	m/s	SI unit of speed	1 m/s	
Kilometer per hour	km/h or kph	Distance in kilometers traveled per hour	0.2778 m/s	
Mile per hour	mph	Distance in miles traveled per hour	0.4470 m/s	
Knot	kn	Nautical mile per hour	0.5144 m/s	
Foot per second	ft/s	Distance in feet traveled per second	0.3048 m/s	
Mach	Ma	Speed relative to speed of sound	343 m/s (at sea level)	

Angular Speed Units

Unit	Symbol	Definition	Equivalent
Radian per second	rad/s	SI unit of angular velocity	1 rad/s
Rotation per minute	rpm	Rotations completed per minute	0.1047 rad/s
Rotation per second	rps	Rotations completed per second	6.2832 rad/s
Degree per second	°/s	Angular degrees per second	0.0175 rad/s
Hertz	Hz	Cycles per second	6.2832 rad/s

Linear Speed Conversion Factors

From	To m/s	To km/h	To mph	To knots	To ft/s
1 m/s	1	3.6	2.2369	1.9438	3.2808
1 km/h	0.2778	1	0.6214	0.5399	0.9113
1 mph	0.4470	1.6093	1	0.8689	1.4667
1 knot	0.5144	1.852	1.1508	1	1.6878
1 ft/s	0.3048	1.0973	0.6818	0.5925	1

Note: To convert from one unit to another, multiply the value by the conversion factor.

Angular Speed Conversion Factors

From	To rad/s	To rpm	To rps	To %s
1 rad/s	1	9.5493	0.1592	57.2958
1 rpm	0.1047	1	0.0167	6
1 rps	6.2832	60	1	360
1 °/s	0.0175	0.1667	0.0028	1

Common Speed References

Description	m/s	km/h	mph	knots
Average w alking speed	1.4	5.0	3.1	2.7
Average running speed	4.2	15.0	9.3	8.1
Typical highw ay speed limit	22.2-33.3	80-120	50-75	43-65
Typical cruising speed (aircraft)	236-264	850-950	528-590	459-513
Speed of sound (sea level)	343	1235	767	667
Earth's orbital speed	29,800	107,280	66,660	57,924

Key Speed Equations

- Average Speed: Speed = Distance / Time
- **Dimensional analysis:** [Speed] = [Length] / [Time]
- Angular to linear conversion: v = r × ω (where v is linear velocity, r is radius, ω is angular velocity)
- Kinetic Energy: $KE = \frac{1}{2}mv^2$ (where m is mass, v is velocity)
- Mach number: Ma = v / c (where v is speed and c is speed of sound in the medium)
- Relativistic effects: Significant when v > 0.1c (where c is speed of light, 299,792,458 m/s)

Highway Speed Limits

A speed limit of 65 mph converts to approximately 105 km/h (65 × 1.61 = 104.65 km/h). This is why speed limits in countries using the metric system are often set at 100 or 110 km/h, while mph countries typically use 65 or 70 mph for highways.

Aircraft Speed Measurement

Aircraft speeds are typically measured in knots. A commercial airliner cruising at 500 knots is traveling at approximately 926 km/h ($500 \times 1.852 = 926$ km/h) or 575 mph ($500 \times 1.15 = 575$ mph). This allows standardized aviation speed reporting worldwide.

Sports Performance Analysis

A sprinter running at 10 m/s is moving at 36 km/h ($10 \times 3.6 = 36$ km/h) or approximately 22.4 mph ($10 \times 2.237 = 22.37$ mph). This conversion helps compare athletic performance across different measurement systems.

Angular Velocity Applications

A motor spinning at 3600 rpm has an angular velocity of 377 rad/s ($3600 \times 0.1047 = 376.92 \text{ rad/s}$). For a wheel with a radius of 0.3 meters, this produces a linear speed of 113.1 m/s at the rim ($377 \times 0.3 = 113.1$ m/s), or about 407 km/h.

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