Circular Orbit Velocity, Period and Escape Velocity

Circular orbital velocity, orbital period and escape velocity at an altitude above the Earth, Moon or Mars, from the body's gravitational parameter.

Method: Two-body circular orbits

Input parameters

Unit system: SI

Parameter	Value	Unit
Central body	Earth	
Altitude above the surface	400.00	km

Calculated results

Parameter	Value	Unit
Orbit radius	6,778.1	km
Circular orbit velocity	7,668.6	m/s
Orbital period	92.560	min
Escape velocity	10,845	m/s
Gravitational acceleration at the altitude	8.6760	m/s²

Notes for this case

• Two-body circular orbit about a spherical body: v = √(μ/r), T = 2π√(r³/μ), v_esc = √(2μ/r). Altitudes are from the equatorial (Earth, Mars) or mean (Moon) radius.

Formula and method

$$v_c = \sqrt{\frac{\mu}{r}}, \quad T = 2\pi\sqrt{\frac{r^3}{\mu}}, \quad v_{esc} = \sqrt{\frac{2\mu}{r}}, \quad r = R + h$$

Variables

body	Central body	-
h	Altitude above the surface	m
r	Orbit radius	m
v_c	Circular orbit velocity	m/s
T	Orbital period	s
v_{esc}	Escape velocity	m/s
g_h	Gravitational acceleration at the altitude	m/s²

Method and standards

Keplerian two-body motion.

Assumptions and limits

- Point-mass central body, circular orbit, no drag or perturbations.

References

Two-body circular orbits

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/aerospace/orbital-velocity-period

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.