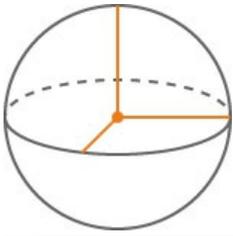


The Planet

Mars is no place for the faint-hearted. Arid, rocky, cold and apparently lifeless, the Red Planet offers few hospitalities. Fans of extreme sports can rejoice, however, for the Red Planet will challenge even the hardest souls among us. Home to the largest volcano in the solar system, the deepest canyon and crazy weather and temperature patterns, Mars looms as the ultimate lonely planet destination.

Size



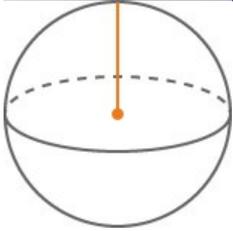
Volumetric Mean Radius

Distance from the planet's center to its surface, if the planet's volume were contained in a symmetric sphere

About half (53.2%) that of Earth

Mars:
3,389.5 kilometers
or
2,106.1 miles

Earth:
6,371 kilometers
or
3,958.8 miles



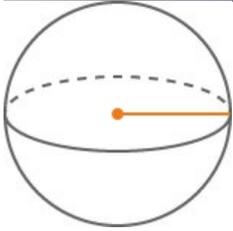
Polar Radius

Half the diameter of the planet from pole to pole

About half (53.1%) that of Earth

Mars:
3,376.2 kilometers
or
2,098 miles

Earth:
6,356.8 kilometers
or
3,950 miles



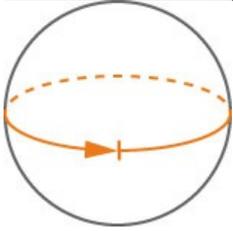
Equatorial Radius

Half the diameter of the planet at its equator

About half (53.2%) that of Earth

Mars:
3,396.2 kilometers
or
2,110 miles

Earth:
6,378.1 kilometers
or
3,963 miles



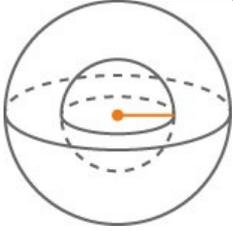
Equatorial Circumference

A measurement of the distance around the equator of Mars

About half (53.2%) that of Earth

Mars:
21,339 kilometers
or
13,259 miles

Earth:
40,075 kilometers
or
24,901 miles



Radius of the Core

The distance from the planet's center to the outer boundary of the core

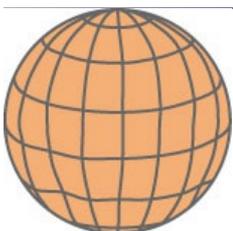
About half (50%) that of Earth

Mars:
Total core:
1,700 kilometers
or
1,056 miles

Earth:
Total core:
~3,400 kilometers
or
2,113 miles

"Solid" inner core:
~1,220 kilometers
or
758 miles

Liquid outer core:
~2,266 kilometers
or
1,408 miles



Surface Area

The sum of the areas of all shapes that cover the surface of the planet

About 28% that of Earth

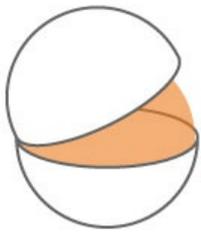
Mars:
144,371,391 square kilometers
(1.4437 x 10⁸ km²)
or
55,742,106 square miles

Earth:
510,064,472 square kilometers
(5.1006 x 10⁸ km²)
or
196,936,994 square miles

Bulk

Volume

About 15.1% that of Earth



The quantity of three-dimensional space that a planet contains

Mars:
163,115,609,799 cubic kilometers

(1.63116 x 10¹¹ km³)

Earth:
1,083,206,916,846 cubic kilometers

(1.0832 x 10¹² km³)

Mass

About 11% that of Earth



A measurement of the amount of matter Mars contains

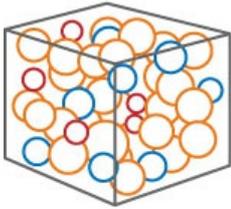
Mars:
641,693,000,000,000,000,000 kilograms
(6.4169 x 10²³ kg)

Earth:
5,972,190,000,000,000,000,000 kilograms
(5.9722 x 10²⁴ kg)



Mean Density

About 71% as dense as Earth



The planet's total mass divided by its total volume, which gives some clues about the planet's makeup (e.g., how much metal it has) and whether it is solid or gaseous

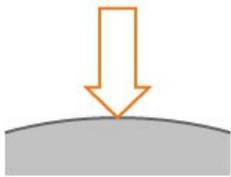
Mars:
3,933 kilogram/meter³

Earth:
5,514 kilogram/meter³

Gravity and More

Surface Gravity

About 38% that of Earth



The gravitational acceleration experienced at a planet's surface

Mars:
3.71 meters per second squared
or
12.2 feet per second squared

Earth:
9.80665 meters per second squared
or
32.174 feet per second squared

Escape Velocity

About 45% that of Earth



The speed an object needs to break free from the gravitational attraction of a planet, moon, or other body without further propulsion

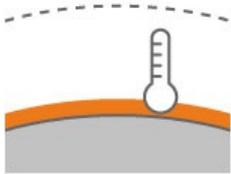
Mars:
18,108 kilometers per hour (5.03 km/second)
or
11,252 miles per hour

Earth:
40,284 kilometers per hour (11.19 km/second)
or
25,030 miles per hour

Temperature

Temperature of the Surface (Typical Minimum/Maximum)

Mars is colder than Earth because it is farther from the Sun.



How hot or cold the surface varies between day and night and among seasons

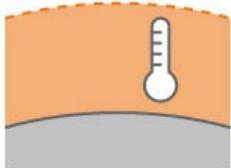
Mars:
-190 to 86° Fahrenheit
-120 to 30° Celsius
150 to 303 Kelvin

Earth:
-126 to 136° Fahrenheit
-88 to 58° Celsius
185 to 331 Kelvin

Average Temperature of the Atmosphere

Mars:
-81° Fahrenheit
-63° Celsius
210 Kelvin

Earth:
59° Fahrenheit
15° Celsius
288 Kelvin



Measurement of how hot or cool the atmosphere is at different altitudes (heights relative to the surface)

Composition

Composition of the Planet

Mars' composition is similar to Earth's



The chemical materials that make up a planet

Mars:

Crust and Surface : mostly iron-rich basaltic rock similar to Earth's thin crust

Mantle: Silicate rock

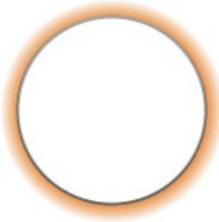
Core: probably an iron, nickel, and sulfur core, but whether it is hot liquid or cooled metal is not known

Earth:

Crust and Surface: iron magnesium silicate igneous rocks, like basalt

Mantle: Silicate rock rich in magnesium and iron

Core: Iron-nickel alloy



Composition of the Atmosphere

The chemical materials that make up the layers of gases surrounding a planet or moon, which are held in place by the object's gravity

Mars' atmosphere is 100 times less dense than Earth's

Mars:**Main Gases:**

96% Carbon Dioxide (CO₂)*
1.93% Argon (Ar)**
1.89% Nitrogen (N₂)
0.145% Oxygen (O₂)
<0.01% Carbon Monoxide (CO)

Earth:**Main Gases:**

78.09% Nitrogen (N₂)
20.95% Oxygen (O₂)
0.93% Argon (Ar)
0.039% Carbon Dioxide (CO₂)

Both planets also have other gases in very small amounts (trace gases).

Did you know...?

**Carbon dioxide is used for carbonation in beverages. Frozen carbon dioxide is "dry ice."*

***Argon is used to make blue "neon lights."*

In Space

Distance

Perihelion**1.405 times that of Earth****Mars:**

206,655,215 kilometers
2.06655 x 10⁸ km
or
128,409,598 miles
or
1.381 AU

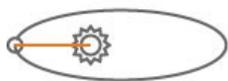
Earth:

147,098,291 kilometers
1.47098 x 10⁸ km
or
91,402,640 miles
or
0.9833 AU*

An AU is an astronomical unit. In simple terms, 1 AU is the average distance between the Sun and Earth.

Did you know...?

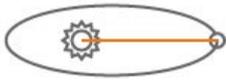
**The reason that the perihelion of Earth is less than 1 AU is that this is a measure of its closest distance from the Sun (its minimum distance). 1 AU is the average between the minimum and maximum distances.*



The closest distance between the Sun and Mars as the Red Planet travels in its orbit around the Sun

Aphelion**1.639 times that of Earth**

The farthest distance between the Sun and Mars as the Red Planet travels in its orbit around the Sun

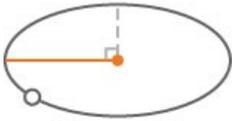


Mars: 249,232,432 kilometers 2.49232×10^8 km <i>or</i> 154,865,853 miles <i>or</i> 1.666 AU	Earth: 152,098,233 kilometers 1.52098×10^8 km <i>or</i> 94,509,460 miles <i>or</i> 1.017 AU
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An AU is an astronomical unit. In simple terms, 1 AU is the average distance between the Sun and Earth.

Orbit

Orbit Size Around Sun (semi-major axis)



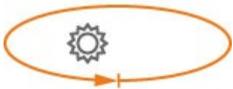
One half of the longest diameter of an orbital ellipse (radius of the orbit at the orbit's two most distant points)

About 1.5 times that of Earth

Mars: 227,943,824 kilometers 2.2794382×10^8 km <i>or</i> 141,637,725 miles <i>or</i> 1.523662 AU	Earth: 149,598,262 kilometers 1.4959826×10^8 km <i>or</i> 92,956,050 miles <i>or</i> 1.000 AU
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An AU is an astronomical unit. In simple terms, 1 AU is the average distance between the Sun and Earth.

Circumference of Orbit

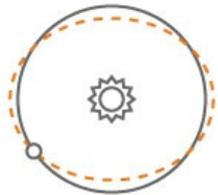


The distance Mars travels in its orbit around the Sun.

About 1.5 times that of Earth

Mars: 1,429,085,052 kilometers (1.429×10^9) km <i>or</i> 887,992,283 miles	Earth: 939,887,974 kilometers (9.399×10^8) km <i>or</i> 584,019,311 miles
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Orbital Eccentricity

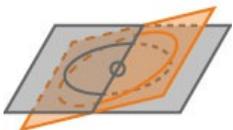


A measurement of how much Mars' orbit around the Sun differs from a perfect circle; 0 = a perfect circle, and values between 0 and 1 represent an elliptical (oval) orbit

Mars' orbit is about 5.6 times more elliptical than that of Earth, which is nearly a perfect circle

Mars: 0.0933941	Earth: 0.01671123
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Orbit Inclination



The angle an orbit is "tilted" relative to a reference plane

Earth's orbital plane is almost flat, but Mars' has a slight tilt

Mars: 1.85 degrees	Earth: 0.00005 degrees
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0 degrees (reference plane for describing the position of bodies in the solar system)

The ecliptic is the plane of Earth's orbit around the Sun

Speed

Average Orbital Velocity



The rate of change in Mars' position: how fast it is moving in its orbit around the Sun (its speed)

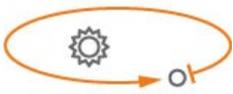
About 81% (0.808) that of Earth

Mars: 86,677 kilometers per hour (2.4077×10^4) meters per second <i>or</i> 53,858 miles per hour	Earth: 107,218 kilometers per hour (2.9783×10^4) meters per second <i>or</i> 66,622 miles per hour
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Year

About twice as long as an Earth year

Length of Year (Sidereal Period or Revolution)

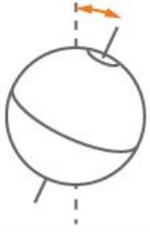


The time it takes for a planet or other body to make a full orbit of the Sun (or outside of our solar system, its primary star)

Mars:
about 687 Earth days

Earth:
365.25 Days

Tilt / Seasons



Axial Tilt (Obliquity)

The angle between Mars' orbital plane and its spin axis

Very similar to Earth's - only a 2-degree difference

Mars:
25.2°

Earth:
23.5°



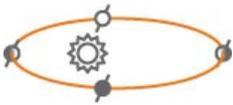
Change in Axial Tilt

Variations in the angle of tilt

The tilt of Mars changes more dramatically over time

Unlike Earth, substantial changes in the obliquity (or tilt) of Mars occur on timescales of hundreds of thousands to millions of years and result in long-term climate change

Seasons



Changes in the amount of sunlight reaching different latitudes due to the varying orientation of the axial tilt as the planet orbits the Sun

Mars' year is almost twice as long as Earth's so its seasons are longer too

4 seasons, roughly twice as long as those on Earth, but with more variation given Mars' eccentric orbit and the fact its orbital speed varies more as result (fastest when at perihelion; slowest at aphelion)

Season (Northern Hemisphere)	Length of Season on Earth	Length of Season on Mars
Spring	93	194
Summer	93	178
Autumn	90	142
Winter	89	154

Day



Average Length of Day (Sidereal Rotation Period)

The time it takes for a planet or other body to make one rotation (one spin on its axis)

About 37 minutes longer than an Earth day

Mars:
24 hours, 37 minutes
(24.623 hours)
1.029 Earth days

Earth:
23 hours, 56 minutes
(23.934 hours)

In Our Night Sky

Mars Opposition

The distance to Mars varies from about 56 million kilometers (about 35 million miles) to 400 million kilometers (about 249 million miles). Why the difference? And why so close now?

More About
MARS OPPOSITION

Solar Conjunction

When the Sun comes between Earth and Mars, communications with Mars spacecraft diminish drastically. Find out how the mission teams cope!

[More About
SOLAR CONJUNCTION](#)

Mars Retrograde

When Mars is close, it appears to move backwards from night to night! Find out why.

Find out where and when Mars will be in your neighborhood.

[More About
MARS RETROGRADE](#)

Mars Close Approaches

Close is a relative term. At its closest, Mars is still tens of millions of miles away from Earth. Still, the decreased distance during "closest approach" allows for fuel-conserving flights to Mars every 26 months and a good view of Mars once or twice every 15 to 17 years for Earth-bound sky watchers. For help viewing Mars, please contact your local [Night Sky Network](#) astronomy club.

[More About
MARS CLOSE
APPROACHES](#)

Human Time

Humans from all cultures around the world have been curious about the "Red Planet" Mars since before recorded history.

[More About
Mars In Human History](#)