

What's Out Tonight?

November 2019 Sky Chart

OPTIMIZED FOR
1½ HOURS
AFTER SUNSET

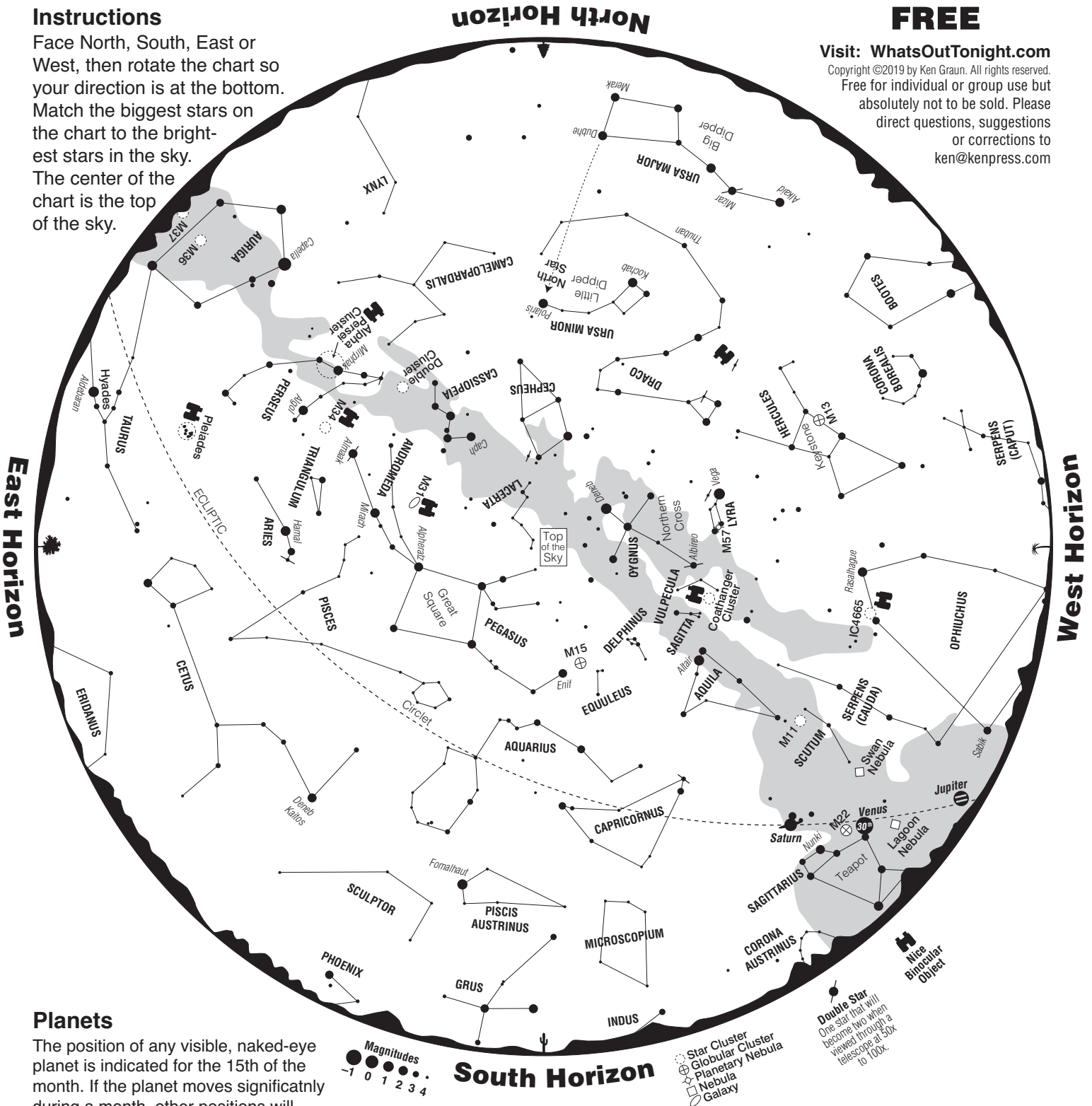
Instructions

Face North, South, East or West, then rotate the chart so your direction is at the bottom. Match the biggest stars on the chart to the brightest stars in the sky. The center of the chart is the top of the sky.

FREE

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Planets

The position of any visible, naked-eye planet is indicated for the 15th of the month. If the planet moves significantly during a month, other positions will be noted with dates. The **ECLIPTIC** is the path of the Sun through the sky but the planets and Moon move along it, too. It passes through the constellations of the zodiac.

2019 November Planet Notes

Venus (around the 15th), at magnitude -3.9 , sets in the west 1.5 hours after the Sun. **Mars**, at magnitude 1.8, is in Virgo and rises in the east 2 hours before the Sun. **Jupiter**, at magnitude -1.9 is in Ophiuchus and low in the southwest when dark, setting in the west 2 hours after the Sun. **Saturn**, at magnitude $+0.6$, is in Sagittarius and low in the southwest when dark, setting in the west around 8:30.

Distances planets are from the Earth on the 15th of this month:
Venus: 140,000,000 miles, **Mars:** 230,000,000 miles,
Jupiter: 562,000,000 miles, **Saturn:** 985,000,000 miles.

November Notes

The Summer constellations still linger in the west but will retire soon for the winter. The bright stars *Deneb*, *Vega* and *Altair* form the **Summer Triangle**. Cygnus, the **Northern Cross**, has, as its bottom end, the beautiful blue/gold double star, *Albireo* that is visible with a telescope. More eastward is Pegasus and its **Great Square** with the Andromeda Galaxy closeby. On the eastern horizon is the red star, *Aldebaran*, an eye of the Bull. Above it is the **Pleiades** or Seven Sisters, always a favorite. It might look like a little dipper but it is NOT the Little Dipper.

Clusters, Nebulae & Galaxies

ly = Light year, a unit of distance. 1 ly = 6 trillion miles.

- Alpha Persei Cluster.** Distance: 600 ly / Diameter: 31 ly / Mag 1.2 / Spans 3° / 30 stars.
- Andromeda Galaxy.** Companion to our Milky Way Galaxy. Distance: 2,400,000 ly / Diameter: 120,000 ly / Mag 3.5 / Spans 3° x 1°.
- Coathanger Cluster.** 10 stars shaped like a bar-type coathanger. It spans 2° and its stars are 150 ly away.
- Double Cluster.** Two side-by-side clusters. Distances: 7,200 ly / Diameters: 63 ly / Mag 3.5 / Span 1° / 320 stars total. Best in a telescope.
- Pleiades.** And, the “Seven Sisters.” Visible with the eyes. Distance: 395 ly / Diameter: 13 ly / Spans 1.8° / 100 stars.
- IC4665.** Cluster. A large sprinkle of stars. Distance: 1,400 ly / Diameter: 17 ly / Mag 4.2 / Spans 40' / 30 stars.
- M15.** Globular Cluster. Distance: 34,000 ly / Diameter: 122 ly / Mag 6.2 / Spans 13'.
- M11.** *Wild Duck Cluster.* Distance: 5,600 ly / Diameter: 23 ly / Mag 5.8 / Spans 14' / 200 stars.
- M13.** Favorite Globular Cluster. Distance: 21,000 ly / Diameter: 104 ly / Mag 5.8 / Spans 17'.
- M22.** Beautiful Globular Cluster. Distance: 10,000 ly / Diameter: 70 ly / Mag 5.1 / Spans 24'.
- M34.** Large Cluster. Distance: 1,400 ly / Diameter: 14 ly / Mag 5.2 / Spans 35' / 60 stars. Try with binoculars, too.
- M36.** Cluster. Distance: 3,700 ly / Diameter: 13 ly / Mag 6.0 / Spans 12' / 60 stars. Try with binoculars, too.
- M37.** Cluster. Distance: 4,200 ly / Diameter: 29 ly / Mag 5.6 / Spans 24' / 150 stars. Try with binoculars, too.
- M57.** *Ring Nebula.* Planetary Nebula that looks like a smoke ring. Smaller than what you might think. Estimated to be 1 ly in diameter and 2,000 ly away. Mag 9 / Spans 76" or 1.3'.

Observing Tips

If possible, observe at a dark location and when the Moon is not bright. A bright Moon will make it more difficult to see the stars and impossible to see clusters, nebulae and galaxies. Only a small telescope at lower magnifications, around 50x, is required to see the objects listed above. The planets and Moon are best observed with a telescope around 100x. To get a feel for the size of objects, the Moon extends 30' (30 arc minutes). The binocular objects are best with binoculars because these objects are large in size—telescopes have too much magnification.

Meteor Showers

- Southern TAURIDS.** Peaks around **November 5** with 5 meteors/hour.
- Northern TAURIDS.** Peaks around **November 13** with 5 meteors/hour.
- LEONIDS.** Peaks around **November 17** with 10 meteors/hour.

Brightest Stars

- Aldebaran.** Rising in TAURUS. Magnitude +1. Distance: 65 ly. Diameter: 36 times the Sun's. Orange Giant.
- Altair.** In AQUILA. Magnitude +0.9. Distance: 19 ly. Diameter: 1.9 times the Sun's.
- Capella.** In AURIGA. Magnitude +0.1. Distance: 42 ly. Diameter: 15 times the Sun's. It's actually 4 orbiting stars.
- Deneb.** In CYGNUS. Magnitude +1.3. Distance: 3200 ly. Diameter: 222 times the Sun's. Blue-White Supergiant.
- Fomalhaut.** In PISCIS AUSTRINUS. Magnitude 1.2. Distance: 25 ly. Diameter: +1.9 times the Sun's.
- Mirach.** In ANDROMEDA. Magnitude +2.1. Distance: 199 ly. Diameter: 89 times the Sun's.
- Mirfak.** In PERSEUS. Magnitude +1.8. Distance: 592 ly. Diameter: 64 times the Sun's.
- Polaris.** In URSA MINOR. Magnitude +2. Distance: 431 ly. 2,400 times brighter than the Sun. Supergiant Star.
- Vega.** In LYRA. Magnitude +0.02. Distance: 25 ly. Diameter: 2.4 times the Sun's.

Mythology

FOR THE CENTRAL CONSTELLATIONS, NORTH TO SOUTH

Arcas and his beautiful mother, Callisto were turned into the Little and Big Bears, **URSA MINOR** and **MAJOR** because of jealous Juno, wife of promiscuous Jupiter, who favored Callisto. During an early war between the Titans and Olympians, **DRACO**, the Dragon was flung to the North and frozen in place by the cold.

King **CEPHEUS** and Queen **CASSIOPEIA** ruled Ethiopia. Their daughter **ANDROMEDA** is being rescued by **PERSEUS** from the Sea Monster, **CETUS**. Andromeda was to be sacrificed to Cetus because Cassiopeia boasted of her and her daughter's beauty.

CAPRICORNUS is a “Seagoat,” the partially transformed, half-goat, half-fish body of the god Pan who got scared and hurriedly escaped the monster Typhoon in order to warn Jupiter. The word panic is derived from Pan. **AQUARIUS** is the Water and Cup Bearer, a servant of the gods. **PEGASUS**, the Winged Horse is the deliverer of Jupiter's thunderbolts. **CYGNUS**, the Swan helped Helios find the pieces of his son, having fallen from the chariot that pulls the Sun across the sky. **AQUILA** is Jupiter's Eagle that carries out tasks. **LYRA**, the Lyre was invented by Mercury and mastered by Apollo's son, Orpheus whose music had magical powers. **PISCES** represents Venus and Cupid who changed themselves into Fishes tied with a length of string to stay together and escape the monster Typhoon.

Moon Phases

- ☾ **First Quarter.** Monday, **November 4**, 4:23 am, CT
- ☉ **Full Moon.** Tuesday, **November 12**, 7:34 am, CT
- ☾ **Third or Last Quarter.** Tuesday, **November 19**, 3:11 pm, CT
- **New Moon.** Tuesday, **November 26**, 9:06 am, CT

What's Out Tonight? November 2019 Sky Chart

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What's Out Tonight?

Sky Chart Supplement

Clusters, Nebulae & Galaxies

An **Open Cluster** is a group of several to hundreds of stars that were born out of the same nebula cloud. A group often forms a pretty pattern. The Pleiades and Praesepe are great examples. Open clusters reside in our Milky Way Galaxy. Our Sun is no longer in its group.

Globular Clusters look like fuzzy balls because they contain tens of thousands stars held together by their mutual gravity. All of the globulars that can be seen in the sky are part of our Milky Way Galaxy, and there are about 200 of them that surround our galaxy like a halo. M22 in SAGITTARIUS is a northern favorite.

A **Planetary Nebula** is an old term that has nothing to do with the planets. Instead, it is a round or symmetrical nebula that is the shed atmosphere of a dying star. At its center is a white dwarf star. When our Sun dies, it will create a planetary nebula. These objects have diameters of a few light years and are located in our galaxy. The Ring Nebula, M57, in LYRA is a favorite.

A **Nebula** is a giant hydrogen gas cloud that is located in our galaxy. Within these clouds, concentrations of gas can occur and gravitationally condense to form stars and accompanying planets. A set of stars created by a nebula is known as an Open Cluster. The Orion Nebula, M42 is a favorite.

Galaxies contain billions of stars. All galaxies are beyond our Milky Way Galaxy, where our Sun resides. When you are observing a galaxy, you are looking through our galaxy into the true depths of the universe. The Andromeda Galaxy, M31 can be seen with the naked eye.

Double Stars

A Double Star is a star that looks like one star but when magnified sufficiently (from 6x to 200x), it separates into two or more stars. Some are very pretty because of contrasting colors. *Castor* in GEMINI is a favorite and *Albireo* in CYGNUS is well liked for its blue & gold colors.

Moon

Starting from New Moon, the Moon cycles through phases every 29 days, 12 hours, 44 minutes, 3 seconds. It is 2,160 miles in diameter and averages 239,000 miles from Earth. A New Moon is not visible in the sky because the Moon is positioned very close to the Sun. Solar eclipses occur at New Moon. The best time to observe the Moon is during a phase because the craters appear their sharpest near the terminator, the line that separates the lighted side (day side) from the dark side (night side).

Cycle of Moon Phases



Planets

The planets are best observed with a telescope using magnifications from 50x to 200x. The five naked-eye planets are Mercury, Venus, Mars, Jupiter and Saturn. Venus is extremely bright and hugs close to the Sun, so you see it for a short time in the west after sunset or in the east before sunrise. Jupiter can be out all night and always outshines any star. Everyone enjoys its 4 Galilean moons and cloud bands, easily visible at 50x. It is possible to see the moons with well-focused binoculars. Saturn is everyone's favorite because of its beautiful rings. Mars gets close to Earth about every 2 years at which time it is very bright. This is the best time to observe it but you need higher magnifications around 150x to see the surface coloration.

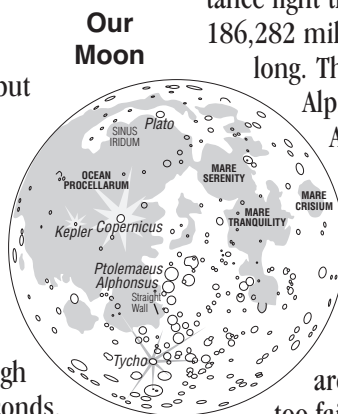
At arm's length...



	Diameter In Miles	Rotation Its Day	Distance from Sun In Miles	Revolution Its Year
SUN	865,000	30 days	—	—
MERCURY	3,032	59 days	36,000,000	88 days
VENUS	7,521	243 days	67,000,000	225 days
EARTH	7,926	24 hours	93,000,000	365 days
MARS	4,228	24.6 hours	142,000,000	687 days
JUPITER	88,844	9.8 hours	484,000,000	11.8 years
SATURN	74,900	10.2 hours	887,000,000	29 years
URANUS	31,764	17.9 hours	1,800,000,000	84 years
NEPTUNE	30,777	19.2 hours	2,800,000,000	164 years
PLUTO	1,433	6.4 days	3,700,000,000	248 years

Light Year (ly) & Nearest Stars

A Light Year (ly) is a unit of length and is equal to the distance light travels in one year. Since light moves at the speed of 186,282 miles a second, one light year is nearly 6 trillion miles long. The closest nighttime star visible to the naked eye is Alpha (α) Centauri in the constellation CENTAURUS. Alpha Centauri shines brightly at magnitude -0.01 and is just 4.4 light years away. The very closest star is Proxima in CENTAURUS at just 4.22 ly away. It is too faint to see with the eyes because it shines at magnitude $+11$. The second closest star visible to the naked eye is Sirius at 8.6 ly followed by Epsilon (ϵ) Eridani at 10.5 ly and Procyon at 11.4 ly. There are several stars closer than these three but they are too faint to be seen with the naked eye.



Guide to the Stars

- 11-inch diameter, ISBN 1-928771-03-3
- 16-inch diameter, ISBN 1-928771-01-7
- Equatorial, ISBN 1-928771-77-7
- Southern Hemisphere, ISBN 1-928771-11-4
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Sky Charts

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Solar System Information

Planet Summary (From Heavens-Above)

Year Month Day Time

	Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune	Pluto
Right ascension	15 ^h 36 ^m 16.7 ^s	15 ^h 55 ^m 59.9 ^s	13 ^h 11 ^m 39.3 ^s	17 ^h 31 ^m 38.2 ^s	19 ^h 6 ^m 21.7 ^s	2 ^h 8 ^m 5.8 ^s	23 ^h 9 ^m 25.5 ^s	19 ^h 29 ^m 28.2 ^s
Declination	-21° 48' 32"	-20° 46' 51"	-6° 42' 45"	-23° 5' 12"	-22° 25' 50"	12° 23' 51"	-6° 33' 41"	-22° 25' 38"
Range (AU)	0.749	1.558	2.530	5.925	10.415	18.839	29.343	34.229
Elongation from Sun	17.1°	21.2°	21.0°	43.4°	65.3°	174.0°	125.8°	70.6°
Brightness	1.1	-3.8	1.8	-1.7	0.6	5.7	7.8	14.3
Equatorial Diameter	8.98"	10.71"	3.70"	33.27"	15.96"	3.74"	2.33"	0.10"
Phase Angle	124.4°	29.5°	12.5°	7.5°	5.1°	0.3°	1.5°	1.6°
Constellation	Libra	Scorpius	Virgo	Ophiuchus	Sagittarius	Aries	Aquarius	Sagittarius
Meridian transit	13:13	13:31	10:47	15:07	16:42	23:42	20:44	17:05
Rises	08:13	08:27	05:05	10:11	11:44	17:11	15:02	12:07
Sets	18:12	18:35	16:30	20:03	21:40	06:18	02:31	22:03
Altitude	2.3°	6.6°	-19.0°	20.7°	31.9°	10.1°	34.6°	33.4°
Azimuth	242.2°	240.2°	274.2°	222.4°	201.4°	81.7°	127.3°	195.3°
Inferior Conjunction	2019-Jul-21 2019-Nov-11	2018-Oct-26 2020-Jun-03	-	-	-	-	-	-
Opposition	-	-	2018-Jul-26 2020-Oct-13	2019-Jun-10 2020-Jul-14	2019-Jul-09 2020-Jul-20	2019-Oct-28 2020-Oct-31	2019-Sep-10 2020-Sep-11	2019-Jul-14 2020-Jul-15
Superior Conjunction	2019-Sep-03 2020-Jan-10	2019-Aug-13 2021-Mar-25	2019-Sep-02 2021-Oct-07	2018-Nov-25 2019-Dec-27	2019-Jan-01 2020-Jan-13	2019-Apr-22 2020-Apr-26	2019-Mar-06 2020-Mar-08	2019-Jan-11 2020-Jan-13
Max. eastern elongation	2019-Oct-19 2020-Feb-10	2018-Aug-17 2020-Mar-24	-	-	-	-	-	-
Max. western elongation	2019-Aug-09 2019-Nov-28	2019-Jan-05 2020-Aug-12	-	-	-	-	-	-
Perihelion	2019-Aug-19 2019-Nov-15	2019-Aug-08 2020-Mar-19	2018-Sep-16 2020-Aug-03	2011-Mar-17 2023-Jan-20	2003-Jul-26 2032-Nov-28	1966-May-21 2050-Aug-16	1876-Aug-26 2042-Sep-03	1989-Sep-05 2237-Sep-15
Aphelion	2019-Oct-02 2019-Dec-29	2019-Apr-17 2019-Nov-28	2019-Aug-25 2021-Jul-12	2017-Feb-17 2028-Dec-27	2018-Apr-17 2047-Jul-15	2009-Feb-26 2092-Nov-22	1959-Jul-16 2125-Dec-01	1866-Jun-04 2114-Feb-18

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Planet	Distance from Sun (AU)	Distance from Earth (AU)	Velocity (km/s)
Mercury	0.40	0.89	46.84
Venus	0.73	1.58	34.88
Earth	0.99	0.00	29.96
Mars	1.65	2.56	22.24
Jupiter	5.25	5.84	12.93
Saturn	10.04	10.30	9.16
Uranus	19.83	18.83	6.58
Neptune	29.93	29.24	5.46
Pluto	33.91	34.10	5.47