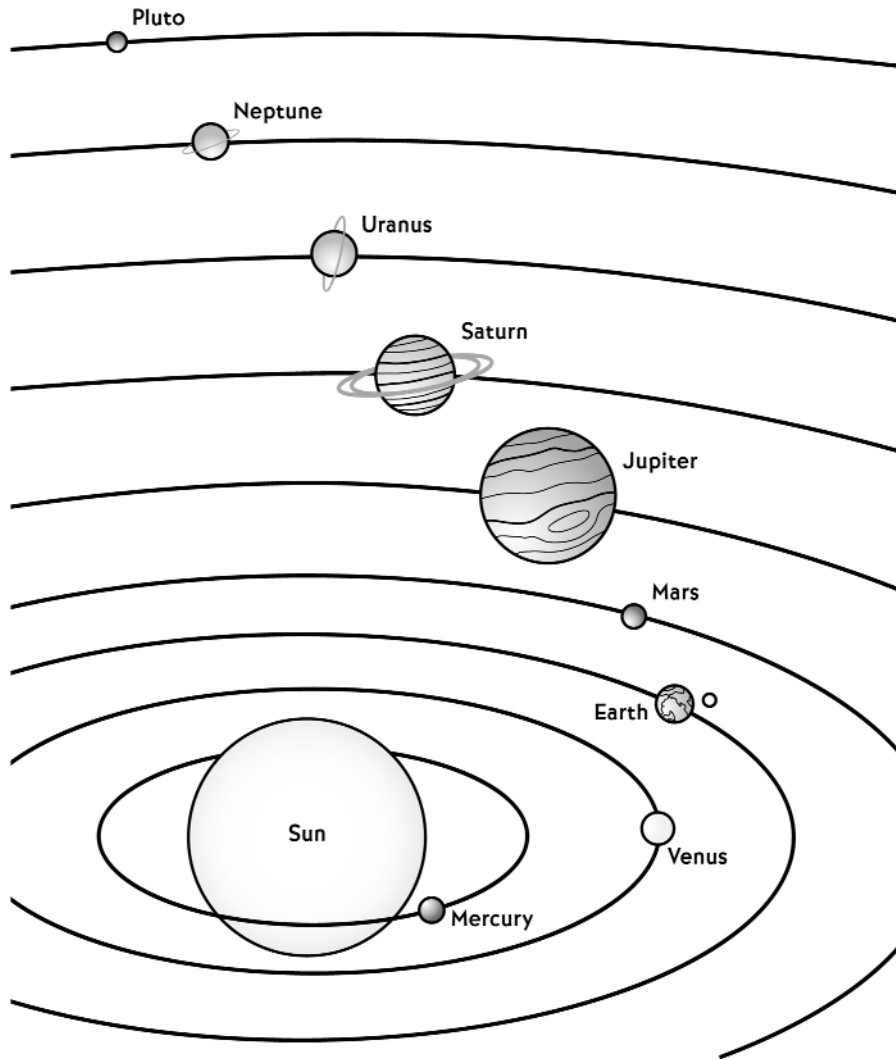


Name _____

Our Solar System



Classification:

solar system

Composition:

all objects (satellites) orbiting the Sun, including the nine major planets and their satellites, asteroids, meteors, and comets

Size:

15–30 trillion kilometers (9.3–18.6 trillion miles) in diameter

Position:

spiral arm of the Milky Way galaxy, 28,000 light years from the center

Orbit speed:

240,000 years around the center of the Milky Way

Planets:

9

Moons:

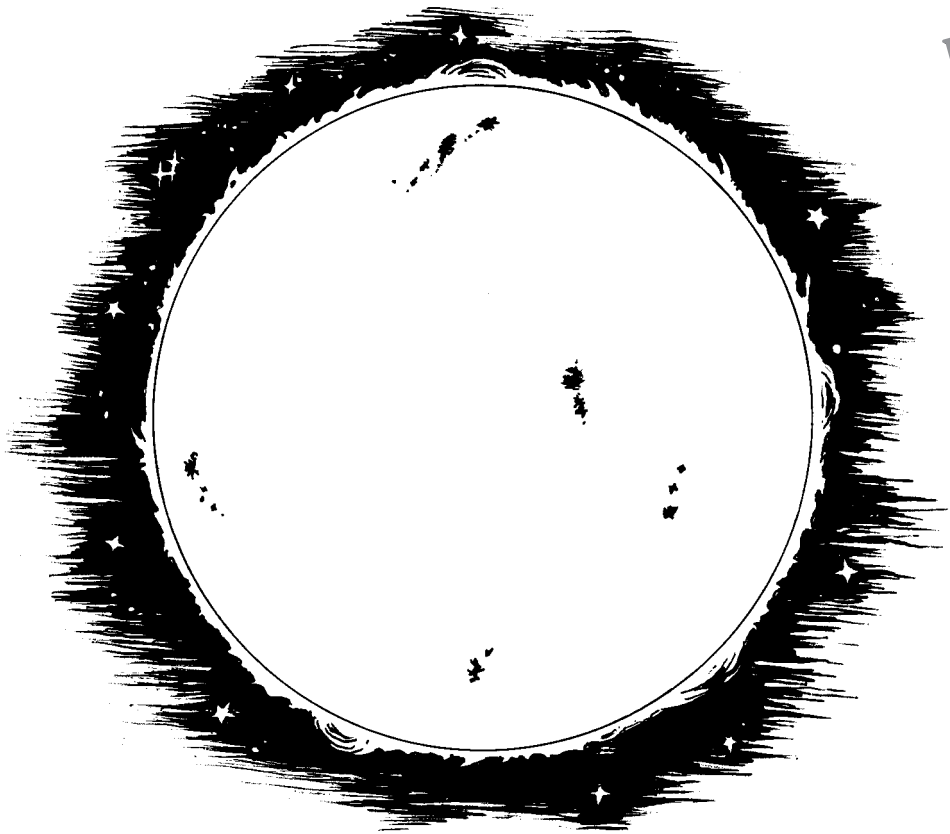
approximately 69

Other facts:

Our solar system is about 4.6 billion years old. The Sun's gravitational pull holds the entire solar system in orbit around it. Our solar system extends to the edge of the Oort Cloud, a loose cloud beyond the orbit of Pluto that is filled with comets.

Name _____

Sun



Classification:

star

Composition:

71% hydrogen, 27% helium and 2% other elements

Color:

yellow-white

Size:

1.4 million km (864,900 miles) in diameter

Position:

center of our solar system

Gravitational strength:

a 32 kg. (70 lb.) person on Earth would weigh 900 kg.
(2,000 lb.) on the Sun

Satellites:

9 planets

Temperature:

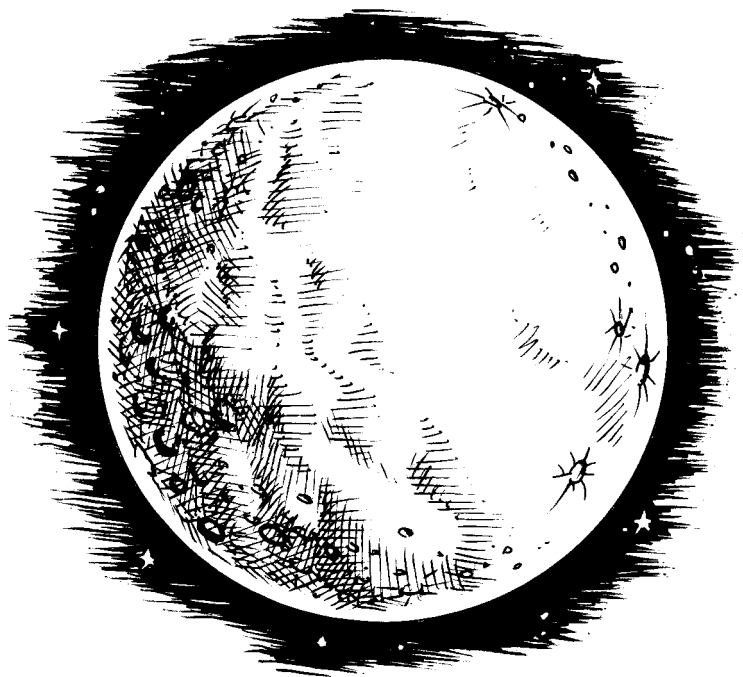
6,000 degrees Celsius (11,000 degrees Fahrenheit)
at the surface; 15 million degrees Celsius (27 million degrees
Fahrenheit) at the core

Other facts:

Our Sun is a medium-sized yellow star. It is powered by nuclear fusion, where hydrogen atoms fuse together to form helium, releasing a tremendous amount of energy. It takes 8 minutes for light to travel from the Sun to Earth.

Name _____

Mercury



SPACE • FACT FILE • 003

Classification:

planet

Composition:

rocky planet with a nickel-iron core

Color:

brown and gray

Size:

4,878 km (3,031 miles) in diameter

Position:

1st planet from the Sun

Length of year:

88 days

Length of day (rotation):

59 days

Gravitational strength:

a 32 kg. (70 lb.) person on Earth would weigh
12 kg. (27 lb.) on Mercury

Moons:

0

Temperature:

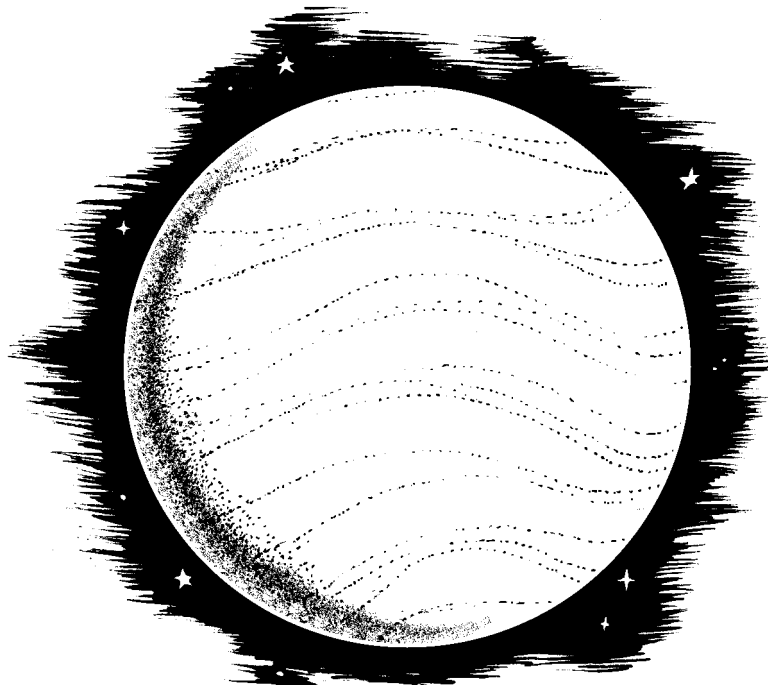
-185 degrees Celsius (-300 degrees Fahrenheit) at night;
400 degrees Celsius (800 degrees Fahrenheit) during
the day

Other facts:

Mercury is the fastest planet orbiting the Sun. It has a very thin atmosphere. This thin atmosphere means that Mercury heats up and cools down very quickly. Mercury is also the planet in our solar system with the most extreme temperature ranges.

Name _____

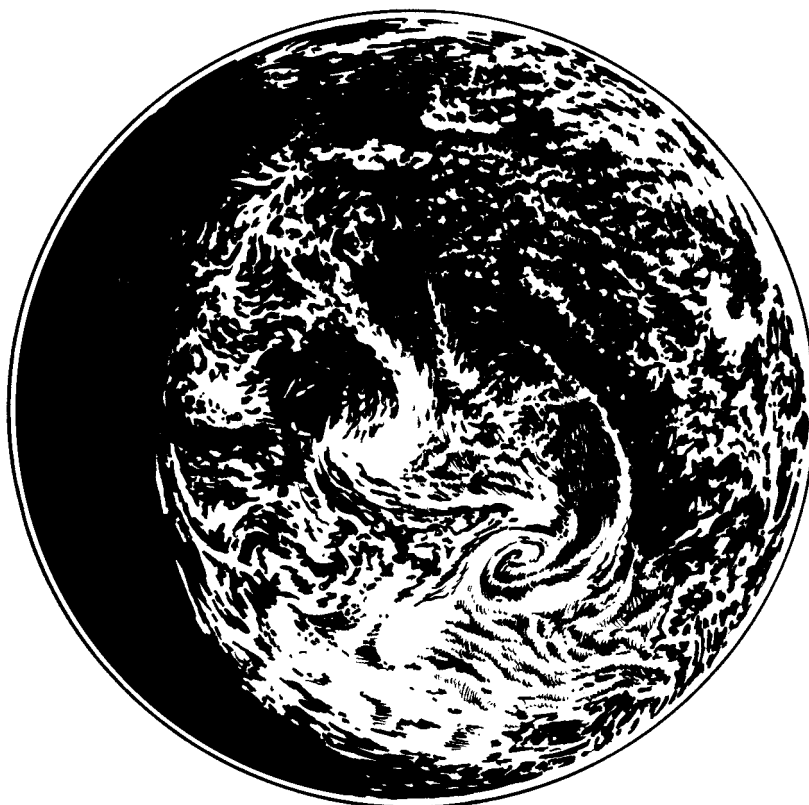
Venus



<u>Classification:</u>	planet
<u>Composition:</u>	rocky planet
<u>Color:</u>	cloudy orange
<u>Size:</u>	12,100 km (7,520 miles) in diameter
<u>Position:</u>	2nd planet from the Sun
<u>Length of year:</u>	225 days
<u>Length of day (rotation):</u>	243 days
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh 29 kg. (63 lbs.) on Venus
<u>Moons:</u>	0
<u>Temperature:</u>	500 degrees Celsius (900 degrees Fahrenheit)
<u>Other facts:</u>	Venus' surface is more than four times as hot as boiling water. Thick clouds of water and carbon dioxide trap heat on the planet's surface. They also reflect sunlight, making Venus the brightest planet visible from Earth.

Name _____

Earth



Classification:

planet

Composition:

rocky planet covered with water

Color:

mostly blue with green, brown, and white swirls

Size:

12,756 km (7,926 miles) in diameter

Position:

3rd planet from the Sun

Length of year:

365.25 days

Length of day (rotation):

24 hours

Moons:

1

Temperature:

14 degrees Celsius (57 degrees Fahrenheit) on average

Other facts:

Earth is the only planet in our solar system known to support life. It is also the only planet with water in liquid form (in addition to ice and vapor forms). Earth's atmosphere is oxygen-rich, which shields the planet from extreme temperature changes.

Name _____

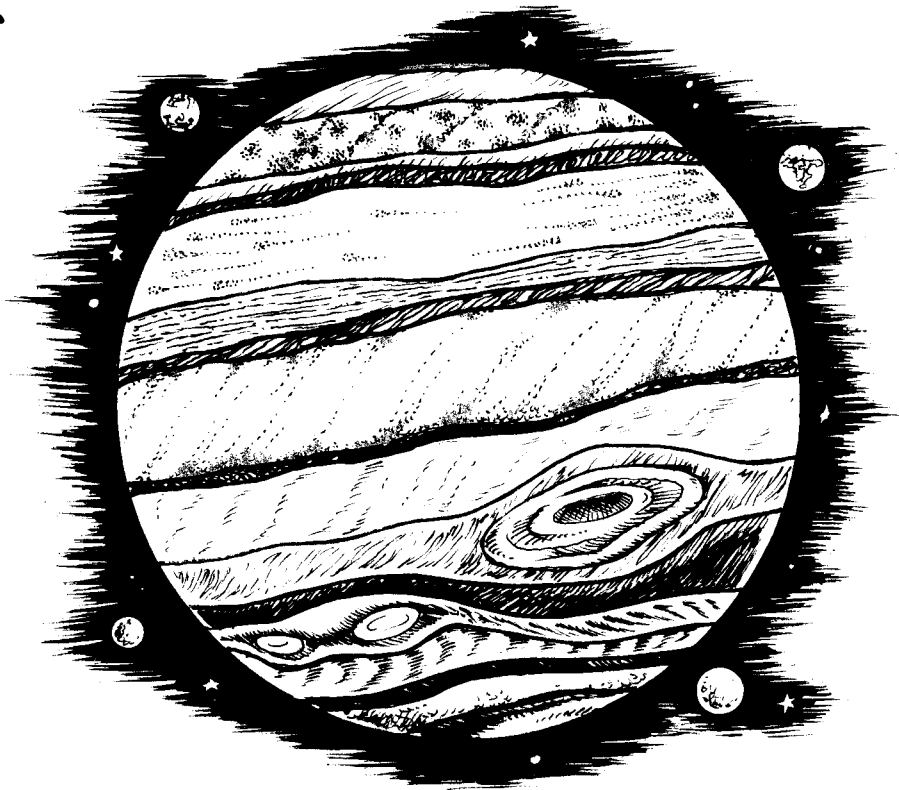
Mars



<u>Classification:</u>	planet
<u>Composition:</u>	rocky planet
<u>Color:</u>	red
<u>Size:</u>	6,787 km (4,217 miles) in diameter
<u>Position:</u>	4th planet from the Sun
<u>Length of year:</u>	687 days
<u>Length of day (rotation):</u>	24 hours and 37 minutes
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh 12 kg. (27 lbs.) on Mars
<u>Moons:</u>	2
<u>Temperature:</u>	-63 degrees Celsius (-81 degrees Fahrenheit)
<u>Other facts:</u>	Mars looks red from the rusty iron dust on its surface. There was probably once water in the form of liquid on Mars, which created river beds and canal formations. Now all of that water is frozen beneath the ground or at the polar ice caps.

Name _____

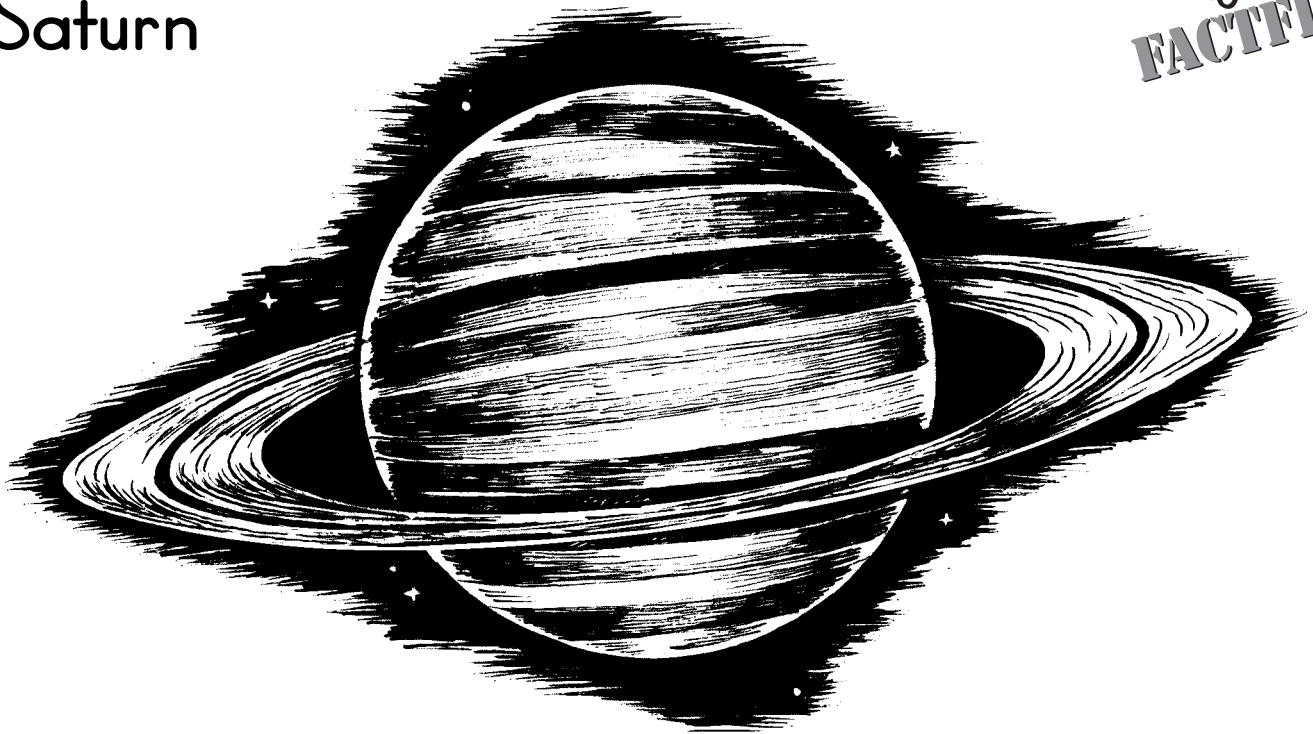
Jupiter



<u>Classification:</u>	planet
<u>Composition:</u>	gas giant, mostly hydrogen and helium
<u>Color:</u>	banded red and yellow with some blue-green
<u>Size:</u>	139,822 km (86,885 miles) in diameter
<u>Position:</u>	5th planet from the Sun
<u>Length of year:</u>	12 years
<u>Length of day (rotation):</u>	10 hours
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh 75 kg. (165 lbs.) on Jupiter
<u>Moons:</u>	16
<u>Temperature:</u>	-153 degrees Celsius (-243 degrees Fahrenheit)
<u>Other facts:</u>	Jupiter is the largest, most massive planet in the solar system. Jupiter has clouds and immense storms in its atmosphere. The Great Red Spot is a long-lasting hurricane as big as two Earths!

Name _____

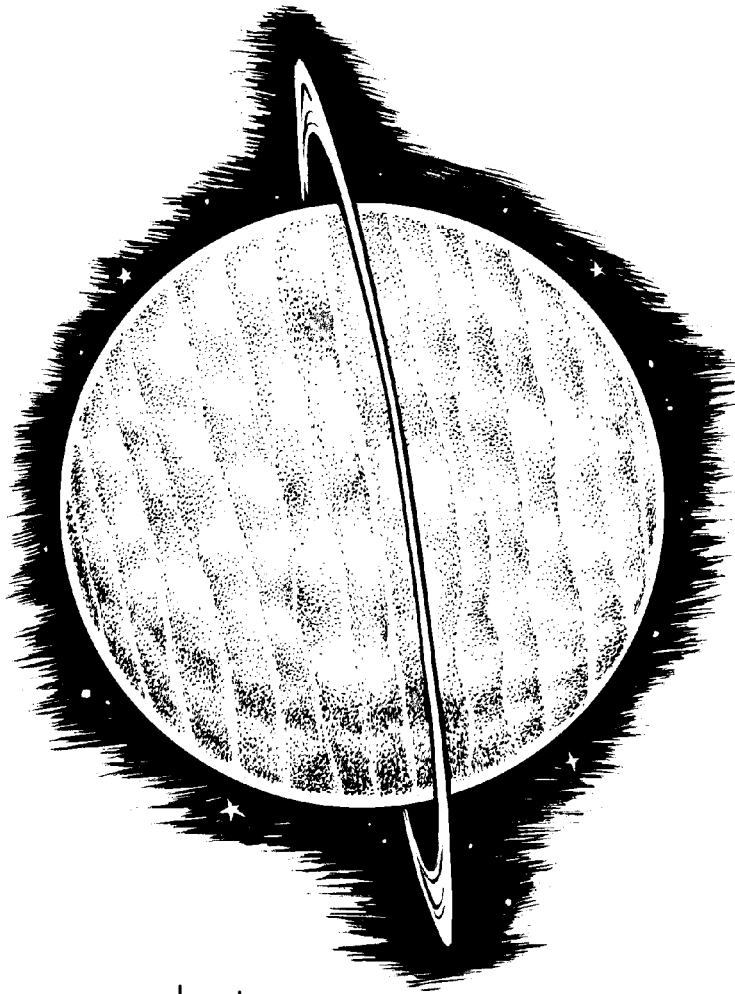
Saturn



<u>Classification:</u>	planet
<u>Composition:</u>	gas giant, made of hydrogen, helium, and methane
<u>Color:</u>	bands of orange and yellow
<u>Size:</u>	116,464 km (72,371 miles) in diameter
<u>Position:</u>	6th planet from the Sun
<u>Length of year:</u>	29 years
<u>Length of day (rotation):</u>	11 hours
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh 29 kg. (65 lbs.) on Saturn
<u>Moons:</u>	approximately 23
<u>Temperature:</u>	-185 degrees Celsius (-300 degrees Fahrenheit)
<u>Other facts:</u>	Saturn's rings are made of billions of chunks of dust and ice. Saturn is the only planet with rings that can be seen from Earth using a simple telescope. Saturn is huge, but it is not dense at all. It would float in water.

Name _____

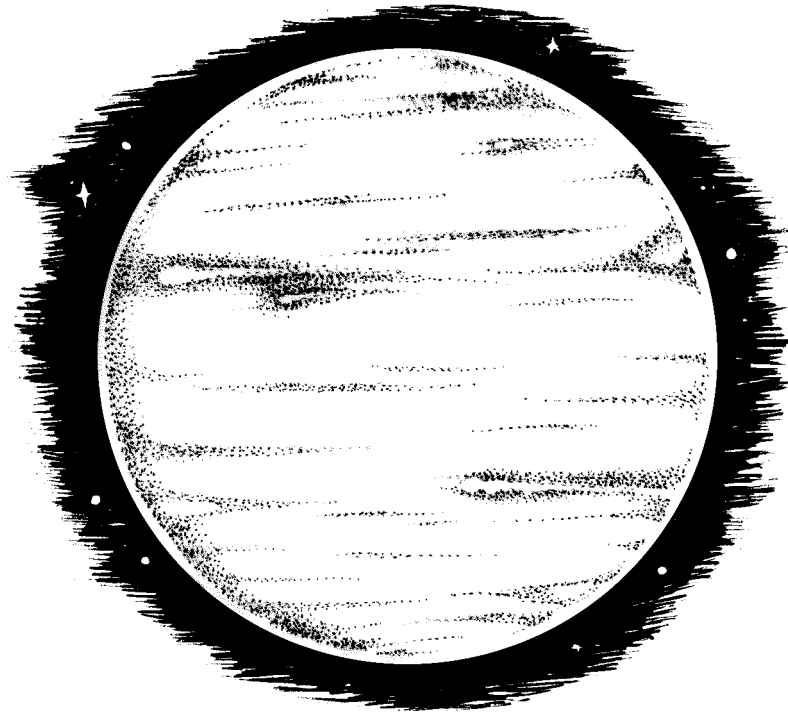
Uranus



<u>Classification:</u>	planet
<u>Composition:</u>	gas giant, made mostly of methane
<u>Color:</u>	blue-green
<u>Size:</u>	50,724 km (31,520 miles) in diameter
<u>Position:</u>	7th planet from the Sun
<u>Length of year:</u>	84 years
<u>Length of day (rotation):</u>	18 hours
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh 28 kg. (62 lbs.) on Uranus
<u>Moons:</u>	18
<u>Temperature:</u>	-214 degrees Celsius (-353 degrees Fahrenheit)
<u>Other facts:</u>	Uranus is tilted onto its side. It orbits the Sun with its poles aimed at the Sun. Astronomers believe that an object such as a large comet or asteroid hit Uranus and knocked it onto its side, creating Uranus's moons and rings.

Name _____

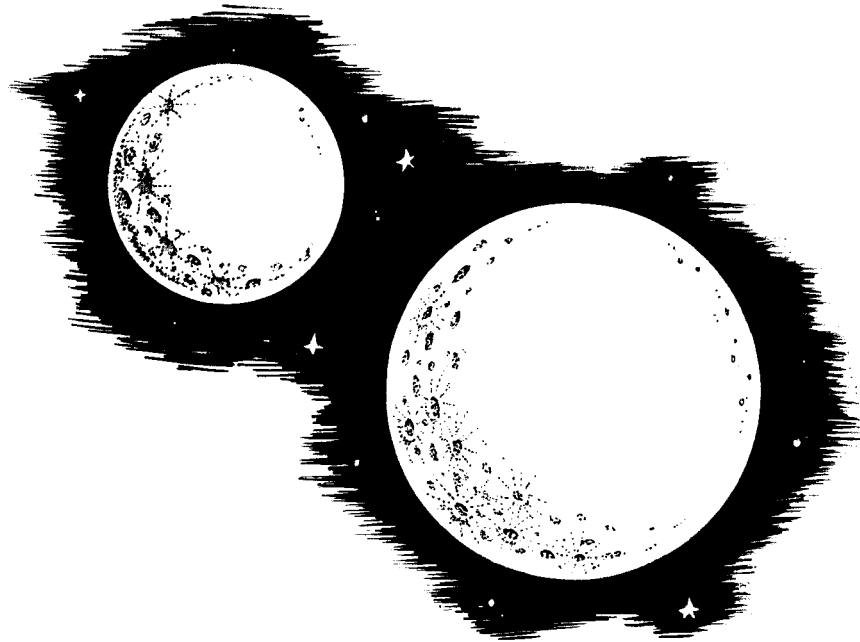
Neptune



<u>Classification:</u>	planet
<u>Composition:</u>	gas giant, made of hydrogen, helium, methane, and nitrogen
<u>Color:</u>	deep blue
<u>Size:</u>	49,526 km (30,775 miles) in diameter
<u>Position:</u>	8th planet from the Sun
<u>Length of year:</u>	165 years
<u>Length of day (rotation):</u>	19 hours
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh 36 kg. (79 lbs.) on Neptune
<u>Moons:</u>	8
<u>Temperature:</u>	-225 degrees Celsius (-373 degrees Fahrenheit)
<u>Other facts:</u>	Neptune is a frozen gas giant as blue as the deepest ocean. Its color comes from the icy methane clouds in the hydrogen atmosphere. The rocky core is surrounded by a frozen sea of water and ammonia.

Name _____

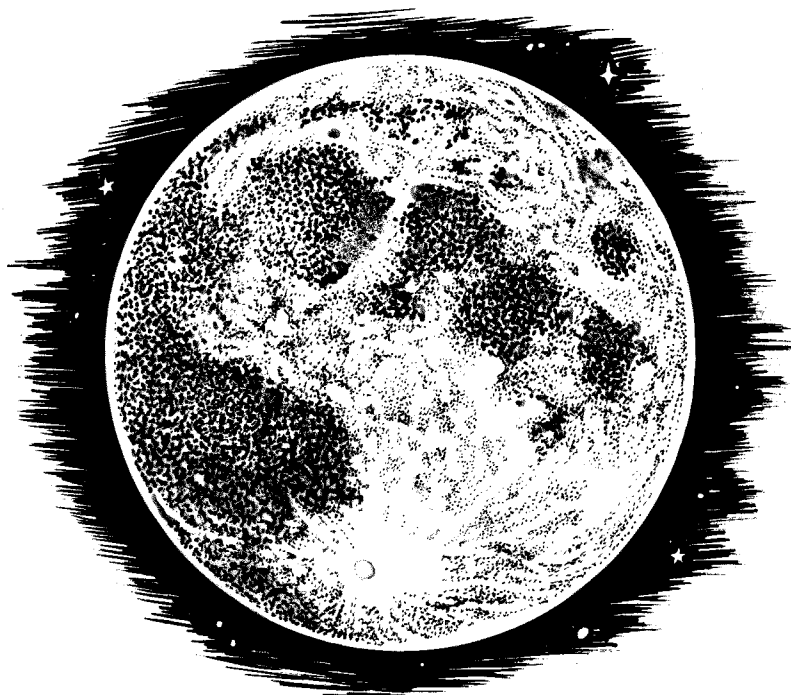
Pluto



<u>Classification:</u>	planet
<u>Composition:</u>	frozen, rocky planet
<u>Color:</u>	gray
<u>Size:</u>	2,274 km (1,413 miles) in diameter
<u>Position:</u>	9th planet from the Sun
<u>Length of year:</u>	248 years
<u>Length of day (rotation):</u>	6.4 days
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh 2 kg. (5 lbs.) on Pluto
<u>Moons:</u>	1
<u>Temperature:</u>	-220 degrees Celsius (-370 degrees Fahrenheit)
<u>Other facts:</u>	Pluto was discovered in 1930. It is smaller than our Moon, and scientists believe that Pluto might have been one of Neptune's moons that escaped. Pluto's orbit is very elliptical, or oval-shaped. For 20 years of its orbit, Pluto is actually closer to the Sun than Neptune. Pluto is 40 times farther from the Sun than Earth is.

Name _____

Moon



<u>Classification:</u>	satellite
<u>Composition:</u>	rocky
<u>Color:</u>	gray and white
<u>Size:</u>	3,475 km (2,160 miles) in diameter
<u>Position:</u>	orbiting Earth
<u>Orbit speed:</u>	27.4 days
<u>Length of day (rotation):</u>	27.4 days
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh 5 kg. (12 lbs.) on the Moon
<u>Temperature:</u>	from -160 degrees Celsius (-260 degrees Fahrenheit) to 115 degrees Celsius (240 degrees Fahrenheit)
<u>Other facts:</u>	The Moon's gravitational pull on the Earth creates the monthly movement of tides. Since there is no air on the Moon, the footprint left by Neil Armstrong (the first man to walk on the Moon) is still there. The Moon shines because it reflects the light of the Sun.

Name _____

Comets



Classification:

comet

Composition:

dust and ice nucleus; long tail of dust and vaporized gases

Color:

usually white

Size:

nucleus 16 km. (10 miles) long and 8 km. (5 mi.) wide,
glowing gas coma 1 million km. (600,000 mi.) in diameter,
dust tail 100 million km. (60 million mi.) long

Position:

elliptical orbit around the Sun

Orbit speed:

from 3 years to 9,000 years

Rotation rate:

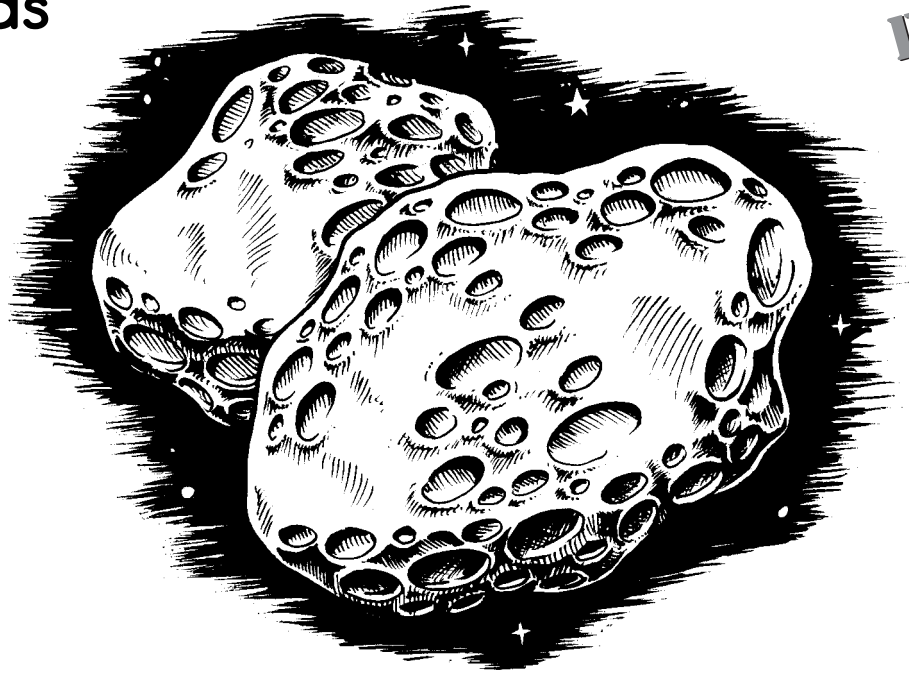
about 2 days

Other facts:

Many ancient cultures thought that comets were bad luck. Halley's Comet is the most famous comet. It has a very regular orbit, passing Earth every 76 years. A comet is like a giant snowball. When it nears the Sun, some of its dust, ice, and gases vaporize in long trails. The tails of the comet are pushed away from the Sun by solar winds. The ion, or gas tail appears straight, while the dust tail appears slightly curved. The dust and gases reflect sunlight and seem to glow.

Name _____

Asteroids



Classification:

asteroid

Composition:

rock and metals

Color:

black, sandy brown, and gray

Size:

a few feet to 900 km. (550 mi.) in diameter

Position:

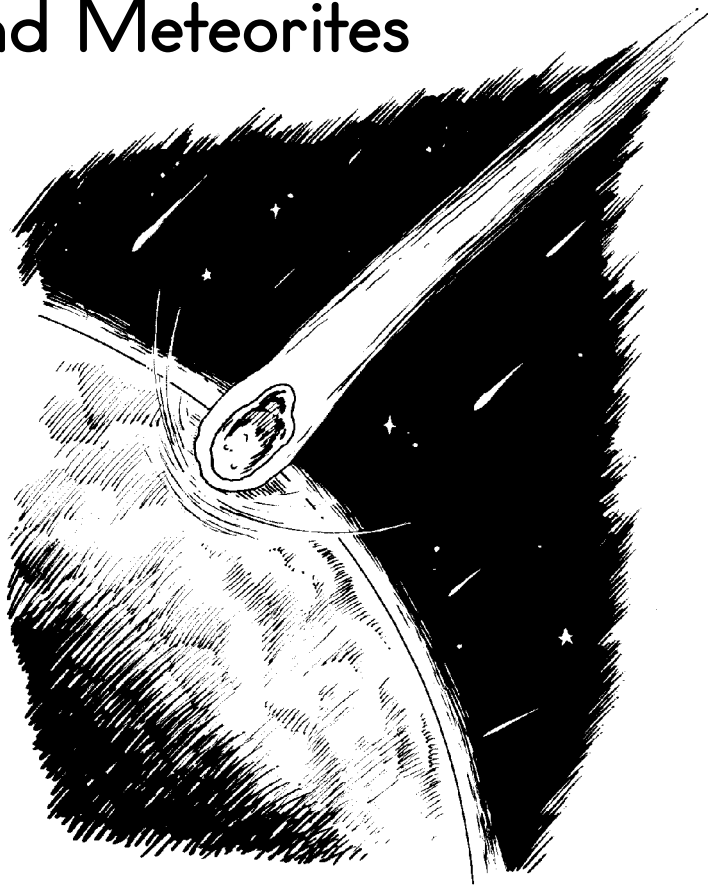
most asteroids orbit the Sun in an asteroid belt located between Mars and Jupiter

Other facts:

Ceres, the largest asteroid, was the first one discovered. Ida has its own moon, Dactyl. All of the asteroids put together would not equal the mass of Earth's moon. Scientists think that an asteroid crashing into Earth might explain the extinction of the dinosaurs. Two groups of asteroids, the Apollos and the Atens, cross Earth's orbit.

Name _____

Meteors and Meteorites



Classification:

meteoroids

Composition:

rock, metal, and ice

Color:

brown, gray, or black

Size:

as small as dustlike particles; as large as several kilometers in diameter

Position:

usually seen entering the Earth's atmosphere

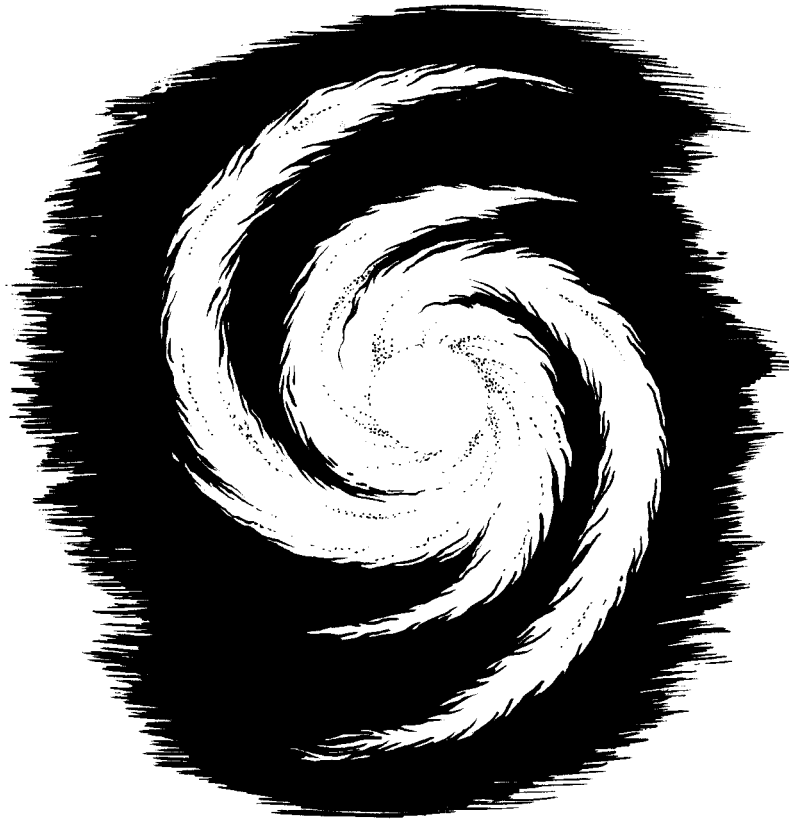
Other facts:

Meteors are bits of comets, asteroids, or other space debris that hit Earth's atmosphere and burn up, leaving a bright streak in the night sky. Meteors usually burn up completely, but sometimes they survive and crash into the Earth. A meteor that survives impact is called a meteorite.

Meteor showers are created when a comet passes by the Earth and leaves material in its path. Because comets have regular orbits, these showers can be predicted. For example, the Perseid shower occurs on August 12, and the Leonid shower occurs on November 17.

Name _____

Milky Way Galaxy



Classification:

galaxy

Composition:

billions of stars and their satellites

Color:

mostly white, with blue, yellow, and red stars

Size:

about 1,500 light years thick and 75,000 light years across

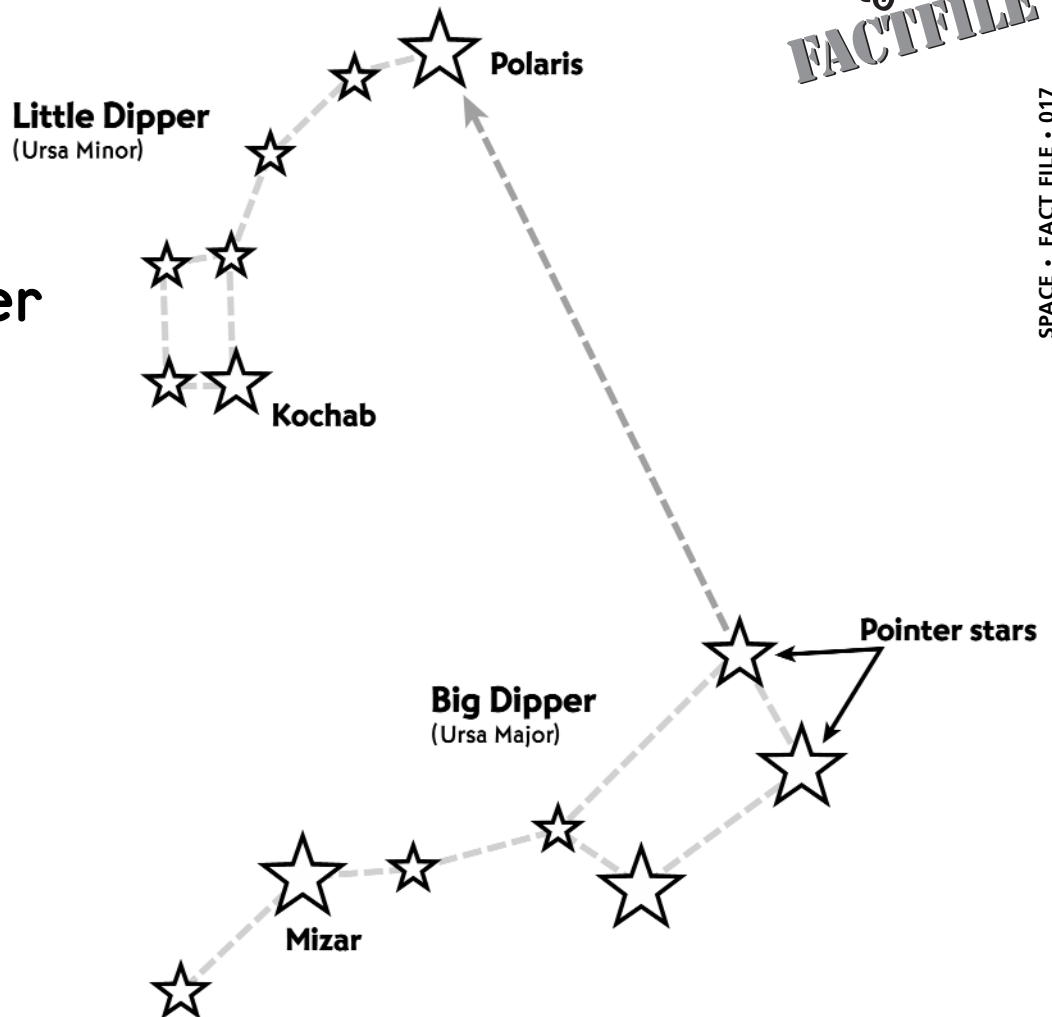
Other facts:

Every star visible to the naked eye is part of the Milky Way.

It is thought to contain over 200 billion stars. Our Sun is merely a speck in one of the spiral arms, around 28,000 light years from the center. Scientists have mapped nearby sections of the galaxy's spiral arms, but since so much interstellar matter gets in the way, they are not sure how many arms it actually has.

Name _____

Big Dipper and Little Dipper



Classification:

constellations

Composition:

7 stars each

Position:

Northern Hemisphere's night sky

Color:

mostly white

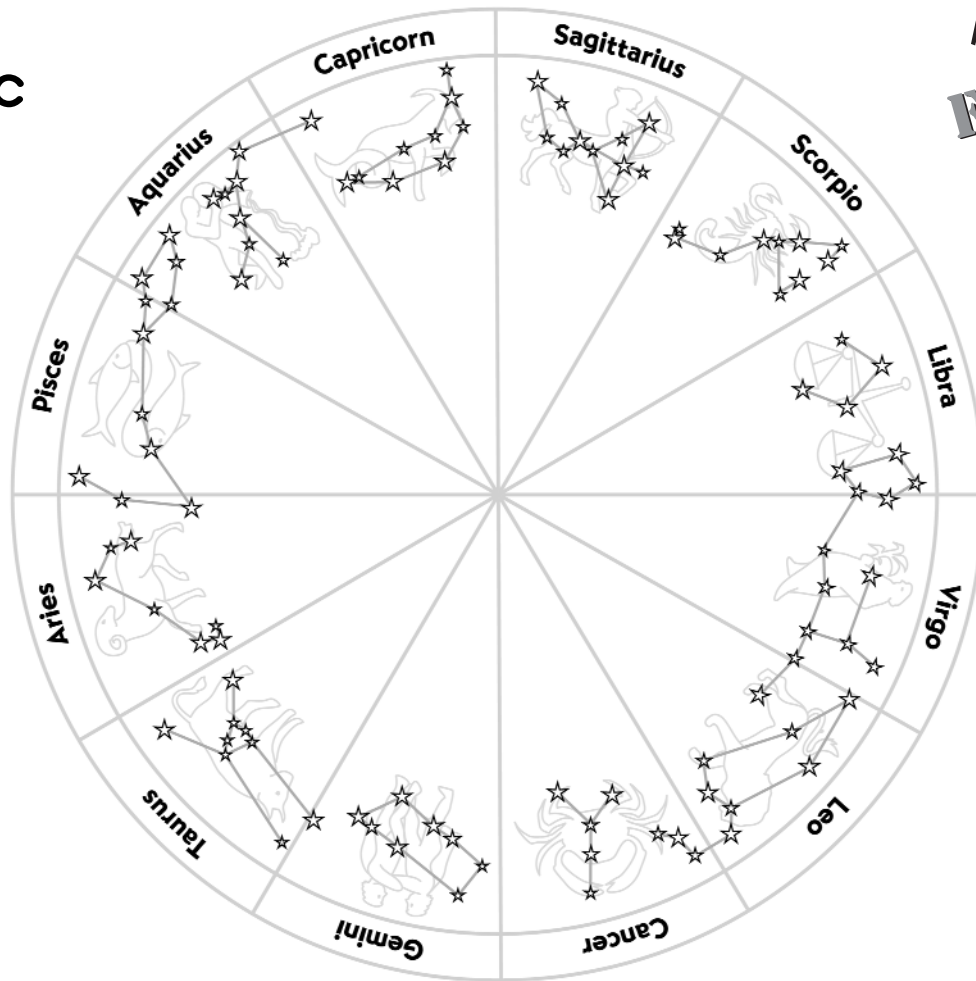
Other facts:

These well-known constellations are also known as the Great Bear and Little Bear. In Greek mythology, Zeus and Callisto had a son named Arcas. Hera, Zeus's jealous wife, turned Callisto into a bear. While hunting, Callisto's son almost killed her accidentally, but Zeus rescued her and placed her among the stars. Her son, also turned into a bear, was placed beside her.

The Little Dipper contains Polaris, the northern Pole Star. You can find Polaris by following the line created by the two stars that make up the end of the bowl of the Big Dipper.

Name _____

Zodiac



<u>Classification:</u>	constellations
<u>Composition:</u>	groups of stars
<u>Color:</u>	usually white
<u>Size:</u>	dividing the sky in the Northern Hemisphere into 12 sections
<u>Position:</u>	along an imaginary line called the ecliptic, which follows Earth's orbit

Other facts:

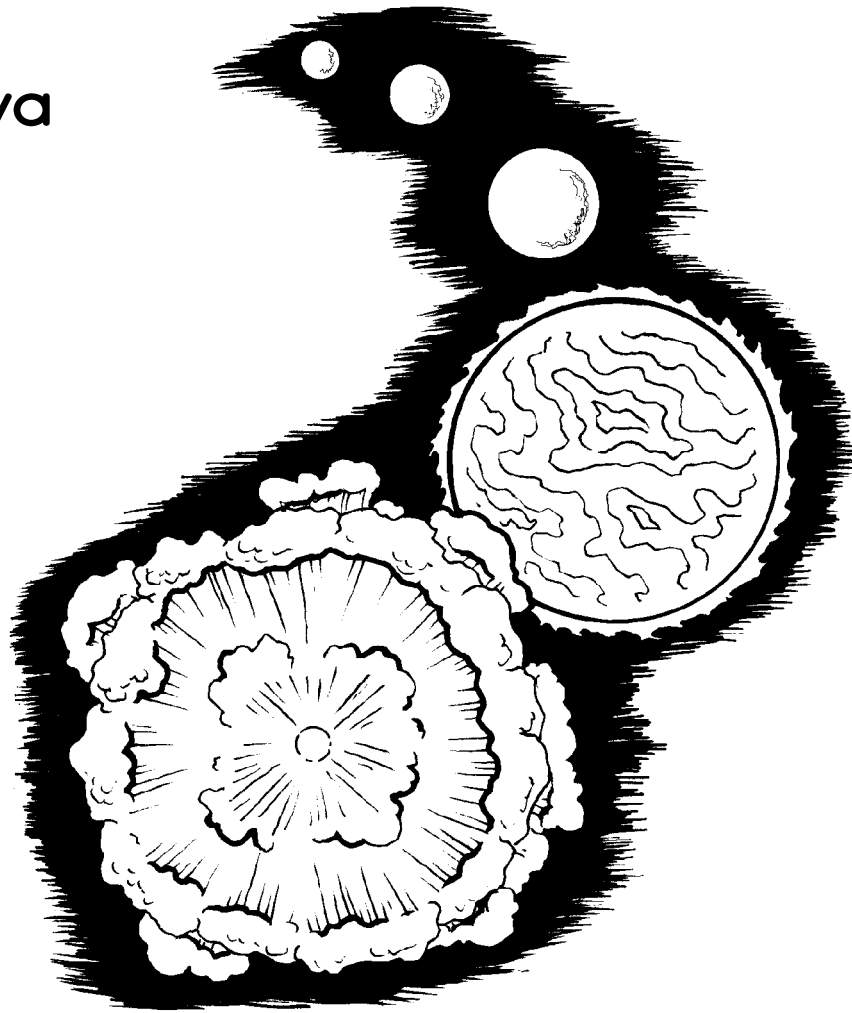
As Earth orbits the Sun, different constellations in the zodiac become visible on the horizon.

The Sun appears to rise in the section of the sky containing a different constellation each month. Astrologers believe that our personalities are influenced by the location of the Sun and planets relative to the 12 constellations when we are born.

The constellations are an optical illusion. Each star in a constellation is at a different distance from Earth, but we see them as the same distance away. If we were viewing the stars from a far-off galaxy, the constellations would be different.

Name _____

Supernova



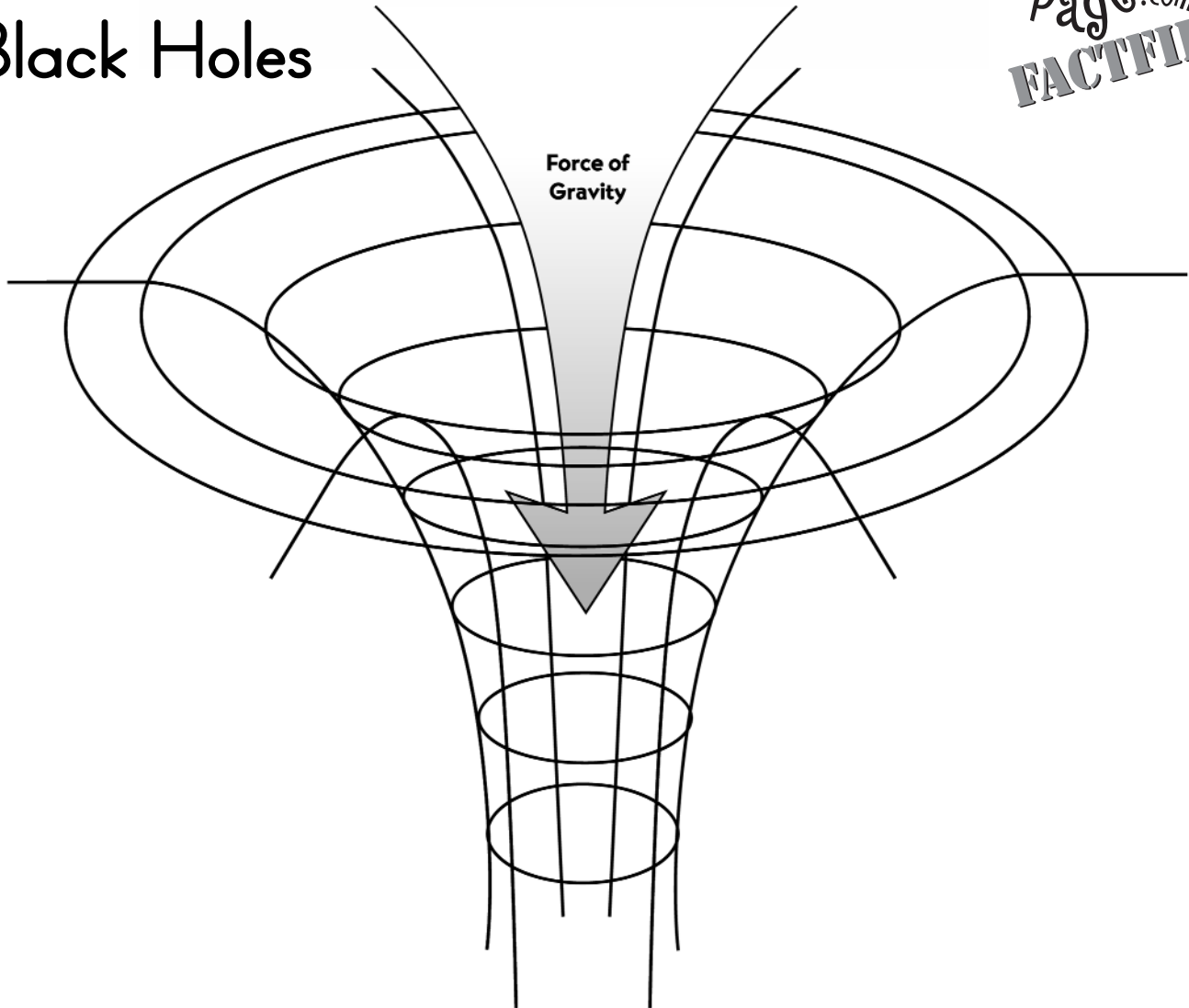
<u>Classification:</u>	star
<u>Composition:</u>	hydrogen and helium
<u>Color:</u>	red
<u>Size:</u>	1 billion km. (602 million mi.) in diameter as a supergiant, then a collapsed core 20 km. (12 mi.) in diameter
<u>Temperature:</u>	170 million degrees Celsius (306 million degrees Fahrenheit)

Other facts:

At the end of its lifetime, a star 10 times as massive as the Sun becomes a supergiant star. It runs out of hydrogen fuel and starts to consume helium and carbon in its core. But without the hydrogen, there isn't enough outward pressure to counter the star's own gravity, and it collapses in on itself. The star's collapse releases more than 100 times more energy than the Sun has released in its entire lifetime, and it explodes in a brilliant flash called a supernova. For a few days, one supernova can shine brighter than an entire galaxy.

Name _____

Black Holes



<u>Classification:</u>	black hole
<u>Composition:</u>	collapsed star core, gravity well
<u>Color:</u>	invisible
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh an almost infinite amount inside a black hole

Other facts:

Very heavy stars explode as a supernova, but their gravity is so strong that their core will keep collapsing until it becomes smaller than the head of a pin. Black holes have such powerful gravity that nothing—not even light—can escape from them. We can see them by watching the effect of their immense gravity. Black holes pull matter and light from nearby stars.

It is thought that galaxies have black holes at their centers.

Name _____

Stars

Composition:

hydrogen and helium gases

Color:

red, yellow, white and blue; blue stars are the brightest and hottest, while red stars are the coolest

Main sequence stars:

Main sequence stars are the most common stars. Their brightness is proportional to their temperature. Main sequence stars are in the prime of their life cycle and are expected to shine for billions of years. Our Sun is a yellow main sequence star.

Red dwarf stars:

Red dwarf stars are common. They are faint, small, and cool, burning fuel slowly in order to last longer. Red dwarfs are older stars.

Giant stars:

These rare stars are massive and bright. The red supergiant Betelgeuse is a thousand times as large as our Sun. Rigel, a blue supergiant, is one of the brightest stars in the sky. Many stars turn into red giants late in their lives, once they have burned away all their hydrogen.

White dwarf stars:

White dwarfs are old, cold, fading stars that have burned up all their nuclear fuel. Most stars end up as white dwarf stars at the end of their life cycles.

Pulsars:

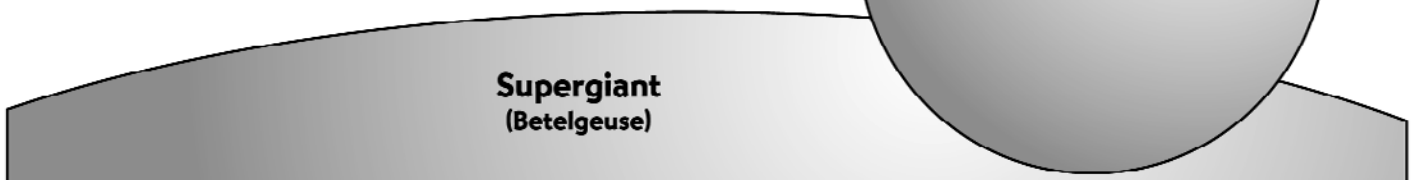
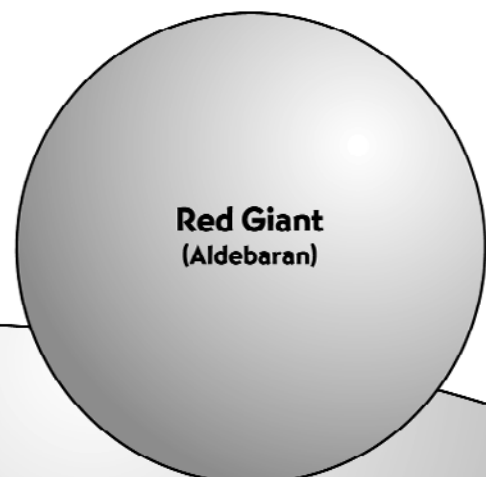
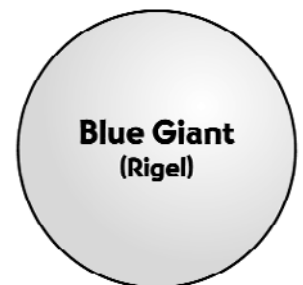
Pulsars are rapidly spinning neutron stars that flash bursts of radio waves. They are created from the remaining parts of a supergiant's collapsed core.

Pulsar
(Crab Nebula Pulsar)

Red Dwarf
(Barnard's Star)

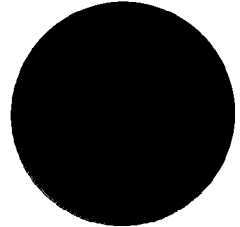
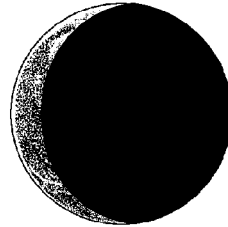
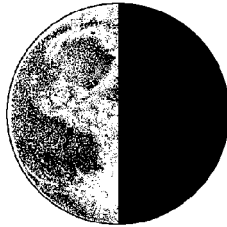
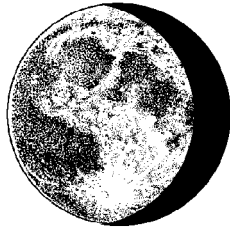
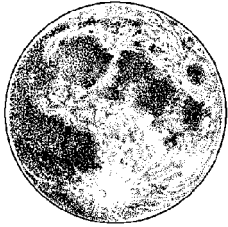
White Dwarf
(Sirius-B)

**Main
Sequence**
(The Sun)



Name _____

Moon Phases



Phases: full moon, gibbous moon, half moon, crescent moon,
new moon

Length of Cycle: 27.4 days

Facts:

The Moon appears to pass through a series of phases, changing its appearance every few days. It moves from completely visible during the full moon stage to barely visible in the new moon stage. There are five phases: full moon, gibbous moon, half moon, crescent moon, and new moon. When the Moon seems to be expanding, we say that it is waxing; when it looks like it is shrinking, we say that it is waning.

The phases are caused by the orbit of the Moon around the Earth. The Sun always lights the half of the Moon facing it. However, the lit part of the Moon that we can see from the Earth changes as the Moon rotates. When the Moon is between the Sun and the Earth, none of the lighted parts of the Moon are visible from Earth. When the Moon is on the side of the Earth opposite the Sun, all of the lit face of the Moon can be seen from Earth.

Name _____

Human Space Flight

Facts:

The rocket technology of World War II and the global competition between the USA and USSR (the former Russian Republics) led to the development of space flight. The USA and USSR were in a race to send humans into space.

The USSR took an early lead in the space race. In 1957, they launched Sputnik, the first artificial satellite to orbit the Earth. Sputnik II carried Laika, the first dog in space. The first man in space, Yuri Gagarin, and the first woman, Valentina Tereshkova, were Russians, too. Gagarin orbited the Earth in 1961, and Tereshkova orbited the Earth in 1963. Aleksei Leonov was the first man to leave the orbital craft and spacewalk.

The first American to orbit the Earth was John Glenn in 1962. The Americans finally caught up to the Russians in 1966, when their Gemini 8 spacecraft successfully performed a docking maneuver that would make a Moon landing possible. In 1969, the American astronauts Neil Armstrong and Buzz Aldrin walked on the surface of the Moon.



The Apollo 11 launch

Name _____

Space Mission Timeline

<u>Mission Name</u>	<u>Year</u>	<u>Astronaut</u>	<u>Achievement</u>
Vostok 1	1961	Gagarin	First human to orbit the Earth
Mercury 3	1961	Shepard	First American to enter space
Vostok 2	1961	Titov	First human in space for over 24 hours
Mercury 6	1962	Glenn	First American in orbit
Vostok 3 & 4	1962	Nikolayev	First joint mission in space
Vostok 6	1963	Tereshkova	First woman in space
Voskhod 2	1965	Leonov	First spacewalk
Gemini 8	1966	Armstrong	First docking with another vehicle
Apollo 8	1968	Borman	First humans to orbit the Moon
Apollo 11	1969	Armstrong	First human landing on the Moon
Soyuz 10	1971	Shatalov	First docking with Salyut space station
Apollo 17	1972	Cernan	Last mission on the Moon
Skylab 2	1973	Conrad	First docking with Skylab space station
Soyuz 19 & Apollo 18	1975	Leonov Stafford	First US & USSR joint mission, called the Apollo-Soyuz Project
Columbia (STS-1)	1981	Young	First orbital flight of US Space Shuttle
Challenger (STS-8)	1983	Ride	First American woman in space
Challenger (STS-51L)	1986	Scobee	Shuttle explodes, killing all seven aboard
Soyuz T-15	1986	Kizim	First occupation of Mir space station
Discovery (STS-31)	1990	Shriver	Hubble Space Telescope launched
Endeavour (STS-61)	1993	Covey	Hubble Space Telescope repaired in space
Discovery (STS-63)	1995	Collins	First female pilot and mission commander
Atlantis (STS-111)	2002	Korzun	Expedition Five team replaces E4 team on the International Space Station

This is a small sampling of notable events in the history of human space flights. We cannot list all the missions undertaken by the US and Russia on one page, and we have chosen to list the earliest and most interesting accomplishments. Space research and exploration have been continually developing and improving, even in those years when no missions are listed.

Astronauts

Facts:

The word “astronauts” comes from Greek words meaning “star sailors.”

Astronauts in Russia are called cosmonauts, which means “space sailors” in Greek.

Very few people are chosen by their countries’ space programs. Since the first human launch in 1961, over 400 people have gone into space. That might seem like a lot, but it is only ten people a year, picked out of six billion Earthlings.

All astronauts have a college degree, and many have advanced degrees and doctorates in science and math. All astronauts must also be in good shape mentally and physically. There are two types of astronauts: pilots and mission specialists. Pilots must have very good eyesight and years of experience flying jet aircraft. The first Americans in space were all former military pilots. Mission specialists are experienced scientists who perform experiments, deploy satellites, and repair equipment in space.

Astronauts learn how to live, eat, sleep, work, and play in zero gravity. They pilot spacecraft in space and land them on Earth. They walk in EVA (extravehicular activity) spacesuits in space to repair and assemble satellites.



Name _____

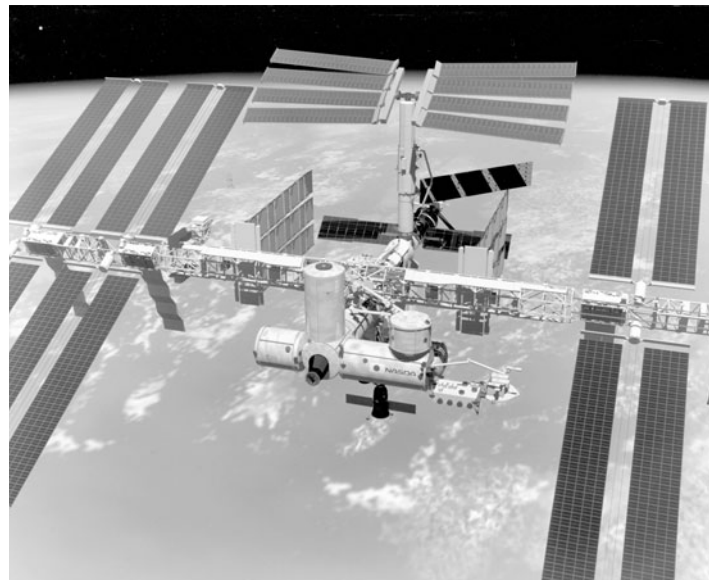
International Space Station

<u>Classification:</u>	satellite
<u>Composition:</u>	modular living quarters, laboratories, and solar panels
<u>Size:</u>	about 108 m. (365 ft.) across; 80 m. (290 ft.) long
<u>Position:</u>	orbiting Earth
<u>Orbit speed:</u>	1 hour and 32 minutes
<u>Gravitational strength:</u>	a 32 kg. (70 lb.) person on Earth would weigh close to nothing on the ISS
<u>Temperature:</u>	22 degrees Celsius (72 degrees Fahrenheit) inside
<u>Other facts:</u>	

The International Space Station is the first truly international space project. It is a permanent station currently being staffed and constructed by 16 different countries, including the United States, Canada, Russia, France, Italy, and Japan. Each country is building a part of the space station. These parts, called modules, are assembled together in space during spacewalks. The US and Russia built the first three modules, which include the living quarters, docking station, and power systems. Canada built a giant robot arm for retrievals and construction. The European Union and Japan are working on developing high-tech laboratories for scientific experiments in space.

The ISS is currently occupied by three astronauts, but the finished station (in 2005) will be able to support a crew of seven.

The astronauts perform experiments in zero-gravity and operate the station. Each three-person team lives on board the station for 4 to 6 months. The amount of room on the ISS is currently about as big as a three-bedroom house. When it is completed, it will be the size of three houses put together.



A model of what the International Space Station will look like when it is completed.