

Solar System Treasure Hunt

Overview: Fun day! You get to do not one, but *two* treasure hunts today. The first is on paper and asks questions about the presentation from last time. The second activity has 10 clues with real treasure. The more you know about astronomy, the faster you'll move through these.

What to Learn : Today you'll discover how much you already know about the specific details about all eight planets, the Sun and its composition, selected natural satellites, and smaller objects such as asteroids, dwarf planets, and comets.

Materials


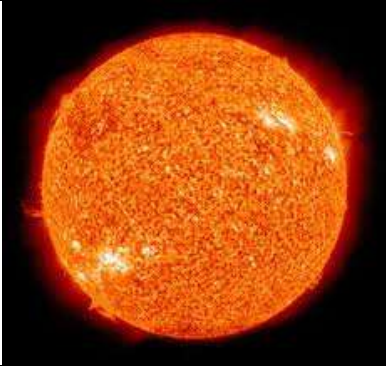


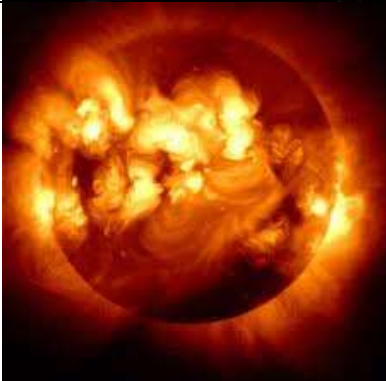
- A pencil


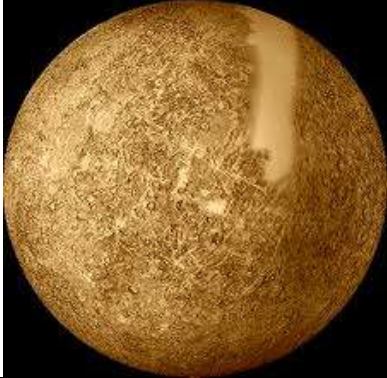


Experiment







1. There are two rounds for this treasure hunt: indoors and outdoors (if the weather's cooperating). In a moment, you are going to search your indoor area for answers to these clues.
2. Have someone else cut out the *First Treasure Hunt Clue Cards* and hide them in plain view for you to find.
3. While they are hiding the clues for you, print out the *First Treasure Hunt Clue Worksheet*. You'll use this when you search for the clues.
4. When ready, go find your clue cards and fill out your worksheet!
5. While you're working on finding the clues, your assistant will get busy hiding the clues from the *Second Treasure Hunt*.
6. Once you've completed the first treasure hunt and completed your worksheet, let your assistant know and they will hand you the first card from the *Second Treasure Hunt* and send you on your way.







First Treasure Hunt Clue Cards: Have someone else cut these out and paste in plain view all over the room to find easily. You will be answering 50 questions. Some cards contain information for more than one question, so you'll find there are 37 clue cards for the first part of the activity.


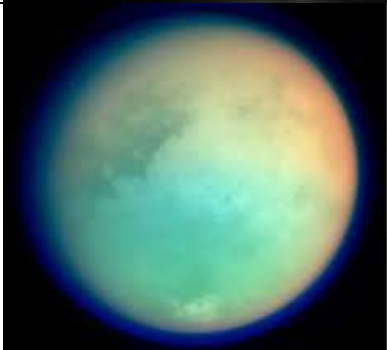

All images provided courtesy of NASA.





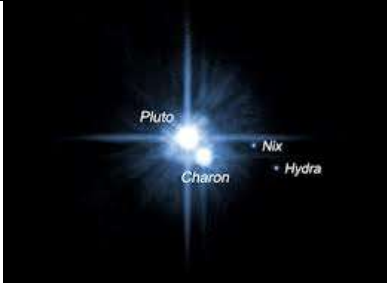
	Shape of our solar system is approximately circular.
	The Sun rotates once every 31 days at the poles and once every 27 days at the equator.
	Pluto is now part of the Kuiper Belt.
	Our solar system has eight planets, their moons, asteroids and comets.
	The core temperature of the Sun is 15 million degrees Celsius.




	<p>A planet is an object that orbits the Sun, is massive enough for its own gravity to make it round, and has cleared its orbit of smaller objects.</p>
	<p>Mercury is the second hottest planet at 800°F (427°C). The side facing away from the Sun is -280°F (-173°C)</p>
	<p>Venus is the hottest planet at 863°F (462°C).</p>
	<p>Although Uranus is made mostly of hydrogen and helium, it's the cold methane gas that gives the blue-green color.</p>

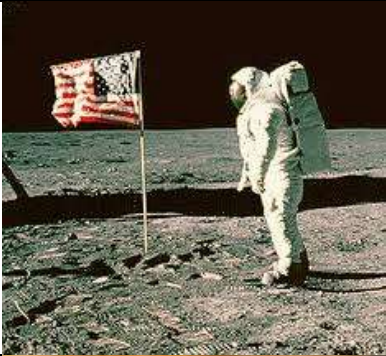
	<p>The Sun is made up of 25% helium and 75% hydrogen.</p>
	<p>Venus takes longer to spin once on its own axis than it does to orbit the Sun. Not only that, it rotates in the opposite direction from the rest of the planets.</p>
	<p>Comets are made of dust and ice, making them just like dirty snowballs. We think that the ice on Mercury was left by impacts from comets.</p>
	<p>The Earth's atmosphere is made up of 21% oxygen and 78% nitrogen, with trace amounts of other molecules.</p>
	<p>Venus was named after the goddess of love and beauty because it is the brightest object in the sky, other than the Sun and Moon.</p>
	<p>The Moon causes both ocean and land tides on the Earth.</p>

	<p>The two moons of Mars are named after Fear/Panic (Phobos) and Fleeing (Deimos).</p>
	<p>Jupiter is made of hydrogen and helium with a metallic hydrogen core. It's as large as it can be without shrinking. If you added more mass (hydrogen gas) to it, Jupiter would condense and get smaller. If you increased its mass by 80, it would compress and become a star.</p>
	<p>Iron oxide (rust) gives Mars its red color. The white at the poles are dry ice (frozen carbon dioxide) and water ice.</p>
	<p>1.3 million Earths can fit inside of Jupiter. If Jupiter were the size of a soccer ball, the Earth would be a marble. All the other planets can fit together inside Jupiter.</p>
	<p>Saturn's rings are made mostly out of ice travelling at 75,000 mph.</p>
	<p>There are shepherd moons inside of Saturn's rings.</p>

	<p>Mercury, Venus, Earth and Mars are rocky terrestrial planets. Jupiter and Saturn are gas giants. Uranus and Neptune are ice giants. Pluto, Ceres, Haumea, Makemake, and Eris are dwarf planets.</p>
	<p>Titan has an atmosphere made mostly of nitrogen.</p>
	<p>We think Saturn's moon, Iapetus, used to have a ring around it.</p>
	<p>Saturn's moon Mimas is where Star Wars got the idea for the Death Star.</p>

	<p>Uranus is the only planet that rolls around the Sun, tipped over on its side.</p>
	<p>Phobos is slowly moving inward toward Mars, and when the tidal forces inside this moon become stronger, they will either shatter the moon into a meteor shower or cause the bits to form a ring around Mars.</p>
	<p>The average daily wind speed on Neptune is 1200 mph. Neptune radiates 2.6 times as much energy out as it receives from the Sun.</p>
	<p>Neptune's blue color is from the methane gas, but it's also made up of hydrogen and helium. Since it's the furthest planet from the Sun (30 au, or 4.5 billion km, or 2 billion miles), it's also the coldest. Note that the five dwarf planets are colder objects than Neptune, since they are further still.</p>
	<p>Pluto and Charon orbit each other, and are also orbited by Hydra and Nix.</p>

	<p>70% of the Earth is covered by water. 2% of this is locked in ice.</p>
	<p>The Sun is 1 au (astronomical unit) from the Earth. 1 au is 93 million miles. It takes light about 8 minutes to travel this distance.</p>
	<p>Venus is the hottest planet because it traps the heat inside once it enters the thick atmosphere. The volcanoes on Venus are so active that the planet is constantly resurfacing itself.</p>
	<p>Blue stars measure above 10,000K (17,540°F or 9,727°C) at the surface. Red stars are about 2500K (4,040°F or 2,227°C). Our Sun, a white star, is 6,000K (10,340°F or 5,727°C).</p> <p>Note: K (Kelvin) is the absolute temperature scale for Celsius.</p>
	<p>The Pistol star releases as much energy in one second as our Sun does in one year.</p>



12 people have walked on the Moon.
Approximately 7 billion people walk on the Earth
today.



Jupiter's giant storm, the Great Red Spot, is
actually getting smaller. The current size is about
two Earth diameters.

First Treasure Hunt: Answer the questions below as you search around you for clues to the answer. Good luck!

1. The shape of our Solar System is _____.
2. How many planets do we have in our solar system? _____
3. Pluto is now part of the _____ Belt.
4. The Sun rotates once every _____ at its equator and _____ at the poles.
5. The core temperature of the Sun is _____.
6. A planet has three criteria: it orbits the _____, has _____
its orbit of smaller objects, and is large enough so its own _____ makes it round.
7. There are three types of planets: _____, _____, and
_____.
8. _____ is the closest, but not the hottest planet. The side facing the Sun gets to
_____ °F, and the side facing away from the Sun gets to _____ °F.
9. The solar system includes _____ planets, their _____, the _____ at the
center, and smaller objects such as _____ and _____.
10. The Sun is made out of 75% _____ and 25% _____.

11. Venus is called the goddess of _____, because it looks so bright to us from Earth, but it really has a surface temperature of _____ °F.
12. Comets are really dirty _____.
13. _____ is the brightest thing in the sky, other than the Sun and Moon.
14. Cold _____ is what gives Uranus its blue-green color. It's classified as _____ giant.
15. One day is longer than a year on _____. Not only that, it rotates _____.
16. Earth's atmosphere is made up of 21% _____ and 78% _____.
17. The Moon pulls on the surface on the Earth and causes tides on both the _____ and _____.
18. Mars's moons are named after _____ and _____.
19. _____ gives Mars its red color.
20. If the Earth was the size of a marble, Jupiter would be the size of a _____.
21. Jupiter can fit _____ Earths inside.
22. If you added more mass to _____ it would get smaller because it's a big ball of _____.

23. Jupiter is made out of _____ and _____ with a metallic _____
core.

24. The volcanoes on Jupiter's moon _____ spews its ice ash _____ miles high.

25. Saturn is surrounded by rings made mostly of _____ moving at _____ mph.

26. Inside Saturn's rings are _____.

27. Titan has an _____ made mostly of _____, so thick that if you
strapped wings onto your arms and flapped, you'd fly!

28. Scientists think that _____ used to have a ring around it, and it crashed down onto the
surface.

29. Jupiter is so large that all of the _____ in the solar system could fit inside of it.

30. _____ looks just like the Death Star.

31. The planet _____ rolls around the Sun while tipped on its side.

32. Phobos is slowly moving inward toward _____ and will either shatter or form a _____
around _____.

33. Our best guess is that the ice on Mercury was caused by _____

34. Average daily wind speed on Neptune is _____ mph.

35. Neptune is a giant ball of _____, which is also known as _____.

36. _____ and Pluto are a pair of objects because they both rotate around a point outside of each.

These two are also orbited by _____ and _____.

37. Seventy percent of the Earth's surface is covered by _____.

38. The Sun is _____ miles from the Earth, also known as _____.

39. The hottest planet is _____ because the heat that comes into the
planet gets _____.

40. There are how many stars are in our solar system? _____

41. Which color stars are the hottest? _____ Coolest? _____

42. The _____ star is the biggest one we've found and it releases as much energy in one
_____ as our Sun does in one year.

43. The planets and moons that people have walked on are _____

44. Jupiter's _____ is getting _____. It's about the size of two _____ right now.

45. _____ and _____ are gas giants, and _____ and _____ are ice giants.

46. _____ is the coldest planet in our solar system.

47. The five dwarf planets in our solar system are:

48. It takes light _____ to travel from the Sun to Earth.

49. _____ has so much volcanic activity that it constantly resurfaces itself.

50. What kind of ice is on Mars? _____ and _____.

STOP!!! You're done with the first activity!

Great job answering the questions! Staple your papers together (or put your name at the top of each page at the very least) and turn it in so you can start on the second activity.

For the second treasure hunt, select one of the following three pages. Each page has a set of clues depending on where you do your hunt. You only need to complete one of the three hunts. Remember, for this next part, **you MUST find the clues in order**, meaning that you have to find the object the clue is describing or it doesn't count. Have fun!

Clues for the Playground Hunt: Cut these out and tape them around the playground. You can add a picture of each object along with the clue if you wish. Make sure you've warned the kids *not* to take the clues, but just LOOK at them. In addition to a playground, you'll need to toss a soccer ball and football on your field far apart from each other. As you place each clue in its proper spot, rip off the tab on the left with the instructions that were just for you. Make sure you've got the treasure with you when the kids come tearing back to you with the final clue. Have fun!

The Sun (CLUE #1): <i>Show this clue to get started.</i>	This object is hot, but not on fire. Explore the swings but don't perspire!
Mercury (CLUE #2): <i>Tape this clue under one of the swings.</i>	This planet is closest, but not the hottest. Check the football, and don't be modest!
Venus (CLUE #3): <i>Tape this clue to a football.</i>	This planet is so hot it can melt a cannonball, Crush spaceships, rain acid, and is in a tree tall.
Earth (CLUE #4): <i>Tape this clue in a tree (or plant).</i>	Most of this planet is covered with water. Find some water that never gets hotter.
Mars (CLUE #5): <i>Tape this clue near the drinking fountain.</i>	This planet is basically a rusty burp. Discover the slide and take a ride.
Jupiter (CLUE #6): <i>Tape this clue at the top of a slide.</i>	A planet so large it can hold the rest, Explore the bars with infinite zest!
Saturn (CLUE #7): <i>Tape this clue on the monkey bars.</i>	This planet had rings, but not made of gold. Explore near a door like an astronaut bold!
Uranus (CLUE #8): <i>Tape this clue on the exterior of a nearby door.</i>	Smacked so hard it now rolls on its side, Find the window that is ever so wide.
Neptune (CLUE #9): <i>Tape this clue on the exterior of a window.</i>	Check the soccer ball for hurricane, gigantic blue farts, and diamond rain.
Pluto (CLUE #10): <i>Tape this clue on a soccer ball.</i>	Instead of one there were two, then four... Visit your teacher for the one that is no more.

Clues for the Classroom Hunt: Cut these out and hide them in envelopes around your classroom. You can add a picture of each object along with the clue if you wish. This is great for rainy school days. Remind the kids that they have to find the right clue and go in order! You can number them if you want to, or have their lab partners hold them accountable. Also remind them *not* to take the clues, but look at them and move on. When you place the clue in its proper spot, rip off the tab on the left with the instructions that were just for you. Place the treasure under your desk for the final clue. Have fun!

The Sun (CLUE #1): <i>Show this clue to get started.</i>	This object is hot, but not on fire. Explore the coats but don't perspire!
Mercury (CLUE #2): <i>Tape this clue with the coats.</i>	This planet is closest, but not the hottest. Check the floor, and don't be modest!
Venus (CLUE #3): <i>Tape this clue in a corner on the floor.</i>	This planet is so hot it can melt a cannonball, Crush spaceships, rain acid, and is on an object tall.
Earth (CLUE #4): <i>Tape this clue on something very tall.</i>	Most of this planet is covered with water. Find some water but don't make it hotter.
Mars (CLUE #5): <i>Tape this clue to your sink or a water bottle left out on the counter.</i>	This planet is basically a rusty burp. Where would you take a bite and slurp?
Jupiter (CLUE #6): <i>Tape this clue next to where they store lunches. You can also stick it right on a lunchbox.</i>	A planet so large it can hold the rest, Explore our library with infinite zest!
Saturn (CLUE #7): <i>Hide this clue with a stack of books.</i>	This planet had rings, but not made of gold. Explore the door like an astronaut bold!
Uranus (CLUE #8): <i>Tape this clue on the classroom door.</i>	Smacked so hard it now rolls on its side, Find the window that is ever so wide.
Neptune (CLUE #9): <i>Tape this clue on a window.</i>	Check the ceiling for hurricane, gigantic blue farts, and diamond rain.
Pluto (CLUE #10): <i>Tape this clue on the ceiling.</i>	Instead of one there were two, then four... Look under a desk for the one that is no more.

Clues for the Household Hunt: Cut these out and hide them in envelopes around your house. You can add a picture of each object along with the clue if you wish. This is great for homework assignments, homeschool students, and home study programs. Remind the kids that they have to find the right clue and go in order! When you place the clue in its proper spot, rip of the tab on the left with the instructions that were just for you. Place the treasure in the mailbox for the final clue. Have fun!

The Sun (CLUE #1): <i>Show this clue to get started.</i>	This object is hot, but not on fire. Explore the dryer but don't perspire!
Mercury (CLUE #2): <i>Hide this in the dryer.</i>	This planet is closest, but not the hottest. Check the sock drawer, and don't be modest!
Venus (CLUE #3): <i>Hide this in the sock drawer.</i>	This planet is so hot it can melt a cannonball, Crush spaceships, rain acid, and is in a tree tall.
Earth (CLUE #4): <i>Hide this clue in a tree (or plant).</i>	Most of this planet is covered with water. Visit the bathtub without making it hotter.
Mars (CLUE #5): <i>Hide this clue in the bathtub.</i>	This planet is basically a rusty burp. Discover the refrigerator and take a slurp.
Jupiter (CLUE #6): <i>Hide this clue next to the milk.</i>	A planet so large it can hold the rest, Explore our library with infinite zest!
Saturn (CLUE #7): <i>Hide this clue with a stack of books.</i>	This planet had rings, but not made of gold. Explore near the front door like an astronaut bold!
Uranus (CLUE #8): <i>Hide this clue on the front door.</i>	Smacked so hard it now rolls on its side, Find the window that is ever so wide.
Neptune (CLUE #9): <i>Hide this clue by sticking it on a window.</i>	Check the sink for hurricane, gigantic blue farts, and diamond rain.
Pluto (CLUE #10): <i>Hide this clue in the sink.</i>	Instead of one there were two, then four... Visit the mailbox for the one that is no more.

Reading

Our solar system includes rocky terrestrial planets (Mercury, Venus, Earth, and Mars), gas giants (Jupiter and Saturn), ice giants (Uranus and Neptune), and assorted chunks of ice and dust that make up various comets and asteroids.

Two planets (Ceres and Pluto) have been reclassified after astronomers found out more information about their neighbors. Ceres is now an asteroid in the Asteroid Belt between Mars and Jupiter. Beyond Neptune, the Kuiper Belt holds the chunks of ice and dust, like comets and asteroids as well as larger objects like dwarf planets Eris and Pluto.

Beyond the Kuiper belt is an area called the Oort Cloud, which holds an estimated 1 trillion comets. The Oort Cloud is so far away that it's only loosely held in orbit by our Sun, and constantly being pulled gravitationally by passing stars and the Milky Way itself. The Voyager Spacecraft are beyond the heliosphere (the region influenced gravitationally by our Sun) but have not reached the Oort Cloud.

The Sun holds 99% of the mass of our solar system. The Sun's equator takes about 25 days to rotate around once, but the poles take 34 days. You may have heard that the Sun is a huge ball of burning gas. But the Sun is not on fire, like a candle. You can't blow it out or reignite it. So, where does the energy come from?

The nuclear reactions deep in the core transform 600 million tons per second of hydrogen into helium. This gives off huge amounts of energy which gradually works its way from the 15 million-degree Celsius temperature core to the 15,000-degree Celsius surface.

Stars like to live together in families. Galaxies are stars that are pulled and held together by gravity. Some galaxies are sparse while others are packed so densely you can't see through them. Galaxies also like to hang out with other galaxies (called galaxy clusters), but not all galaxies belong to clusters, and not all stars belong to a galaxy.

Active galaxies have very unusual behavior. There are several different types of active galaxies, including radio galaxies (edge-on view of galaxies emitting jets), quasars (3/4 view of the galaxy emitting jets), blazars (aligned so we're looking straight down into the black hole jet), and others. Our own galaxy, the Milky Way, has a super-massive black hole at its center, which is currently quiet and dormant.

Dying stars blow off shells of heated gas that glow in beautiful patterns. William Herschel (1795) coined the term "planetary nebula" because the ones he looked at through 18th century telescopes looked like planets. They actually have nothing to do with planets – they are shells of dust feathering away.

Answers to Exercises: Solar System Treasure Hunt

1. The shape of our Solar System is circular.
2. How many planets do we have in our solar system? 8
3. Pluto is now part of the Kuiper Belt.
4. The Sun rotates once every 27 days at its equator and 31 days at the poles.
5. The core temperature of the Sun is 15 million degrees Celsius.
6. A planet has three criteria: It orbits the Sun, has cleared its orbit of smaller objects, and is large enough so its own gravity makes it round.
7. There are three types of planets: rocky terrestrial, gas giants and ice giants.
8. Mercury is the closest, but not the hottest planet. The side facing the Sun gets to 800°F, and the side facing away from the Sun gets to -280°F.
9. The solar system includes eight planets, their moons, the Sun at the center, and smaller objects such as comets and asteroids.
10. The Sun is made out of 75% hydrogen and 25% helium.
11. Venus is called the goddess of love because it looks so bright to us from Earth, but it really has a surface temperature of 863°F.
12. Comets are really dirty snowballs.
13. Venus is the brightest thing in the sky, other than the Sun and Moon.
14. Cold methane is what gives Uranus its blue-green color. It's classified as an ice giant.
15. One day is longer than a year on Venus. Not only that, it rotates in the opposite direction.
16. Earth's atmosphere is made up of 21% oxygen and 78% nitrogen
17. The Moon pulls on the surface on the Earth and causes tides on both the land and ocean.
18. Mars's moons are named after Fear/Panic and Fleeing/Flight.
19. Iron oxide (rust) gives Mars its red color.
20. If the Earth was the size of a marble, Jupiter would be the size of a soccer ball.
21. Jupiter can fit 1.3 million Earths inside.
22. If you added more mass to Jupiter it would get smaller because it's a big ball of gas.
23. Jupiter is made out of hydrogen and helium with a metallic hydrogen core.
24. The volcanoes on Jupiter's moon Io spew its ice ash 300 miles high.
25. Saturn is surrounded by rings made mostly of ice moving at 75,000 mph.

26. Inside Saturn's rings are shepherd moons.
27. Titan has an atmosphere made mostly of nitrogen so thick that if you strapped wings onto your arms and flapped, you'd fly!
28. Scientists think that Iapetus used to have a ring around it, and it crashed down onto the surface.
29. Jupiter is so large that all of the planets in the solar system could fit inside of it.
30. Mimas looks just like the Death Star.
31. The planet Uranus rolls around the Sun while tipped on its side.
32. Phobos is slowly moving inward toward Mars and will either shatter or form a ring around Mars.
33. Our best guess is that the ice on Mercury was caused by comets.
34. Average daily wind speed on Neptune is 1,200 mph.
35. Neptune is a giant ball of gas, which is also known as an ice giant.
36. Charon and Pluto are a pair of objects because they both rotate around a point outside of each. These two are also orbited by Hydra and Nix.
37. Seventy percent of the Earth's surface is covered by water.
38. The Sun is 93 million miles from the Earth, also known as 1 au.
39. The hottest planet is Venus because the heat that comes into the planet gets trapped inside.
40. There are how many stars are in our solar system? One. The Sun.
41. Which color stars are the hottest? Blue. Coolest? Red.
42. The Pistol star is the biggest one we've found and it releases as much energy in one second as our Sun does in one year.
43. The planets and moons that people have walked on are Earth and the Moon.
44. Jupiter's Great Red Spot is getting smaller. It's about the size of two Earths right now.
45. Jupiter and Saturn are gas giants, and Uranus and Neptune are ice giants.
46. Neptune is the coldest planet in our solar system.
47. The five dwarf planets in our solar system are: Eris, Makemake, Haumea, Pluto, and Ceres.
48. It takes light 8 minutes to travel from the Sun to Earth.
49. Venus has so much volcanic activity that it constantly resurfaces itself.
50. What kind of ice is on Mars? Dry ice and water ice.