



Forget Measuring – Just Fold!

Become aware of the spacing of our solar system and the vast distances between objects!

Materials

- Solar System Trading Cards Jr
- 2 meters of adding machine tape
- Colored pencils or crayons
- Pencil

Directions:

Make a scale model of the solar system on calculator tape by placing the planets at the correct distance from the Sun without using a ruler to measure the distances.

1. Print a set of Solar System Trading Cards Jr, a set of colored pencils or crayons, a pencil, and 2 meters of calculator tape.
2. Use the Solar System Trading Cards Jr to help you arrange your planets in order, based on their distance from the Sun.
3. Your tape represents 40 times the distance from the Sun to Earth. Astronomers call the distance between the Earth and the Sun an AU. It happens that the dwarf planet, Pluto, is 40 AU from the Sun. So if Pluto is 40 times Earth's distance from the Sun, it is 40 AU from the Sun. With this in mind, where should you draw the Sun and Pluto on this tape?

Planet	AU
Mercury	.4
Venus	.7
Earth	1.0
Mars	1.5
Asteroids	~2.5
Jupiter	5.2
Saturn	10
Uranus	19.
Neptune	30.
Pluto	40

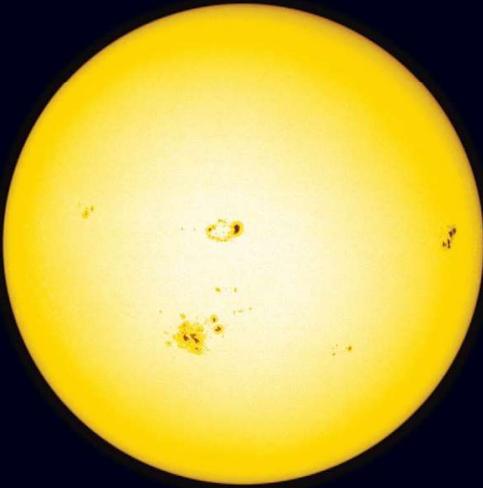
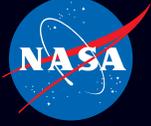
4. Draw the half Sun on the very edge of the tape on the left side and Pluto on the end of the tape on the right side. Label the Sun and Pluto. The chart at right shows the distance, in AUs, between the Sun and the planets. Look at the chart and find a planet that is about half of Pluto's distance from the Sun – about 20 AUs. Now think about how you can find the middle of the tape.



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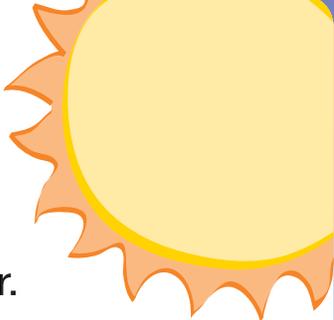
5. Fold the tape in half by lining up the ends and crease the tape. The crease represents 20 AUs (Write 20 AUs on this line. Label all other creases as you make your model.). But Uranus is not quite that far from the Sun. So draw Uranus to the left of this crease and label it. Now fold the tape back in half again and then fold it in half a second time. Crease it to make new folds. Open up the tape. You now have two new creases: one between the Sun and Uranus and one between Uranus and Pluto. What distances do these creases represent?
6. The crease between the Sun and Uranus is at 10 AU; the other one is at 30 AU. (Remember to label these distances.) Now look at the chart again. Are there any planets near 10 and 30 AU from the Sun?
7. Saturn is 10 AU from the Sun. Draw it on the left side of the fold that is half way between Uranus and the Sun. Neptune is at 30 AU from the Sun. Draw it on the fold that is half way between Uranus and Pluto. Now compare the tape with the chart. Are all the planets beyond the orbit of Saturn on the tape? Next fold the tape so the end with the Sun drawn on it meets the fold at 10 AU and crease it. What distance marks the crease? Is there a planet at that point?
8. All the planets from Saturn outward are on the tape. The crease made in the previous step is at 5 AUs. (Write this on your tape.) Jupiter is at about 5 AU. Draw Jupiter on the fold at 5 AUs and label it, half way between the Sun and Saturn. Fold the tape so that the end with the Sun is at 5 AUs where you just drew Jupiter and crease the tape. What distance marks this crease? Is there a planet at this distance?
9. The new fold line marks 2.5 AUs. The asteroids are found here. Write "asteroid belt" on the fold, half way between Jupiter and the Sun. Draw some dots to represent the asteroids. Fold the tape so that the Sun is at 2.5 AUs and crease the tape. What distance marks this crease? Is there a planet at this distance?
10. The crease marks 1.25 AUs. There is not a planet at this point, but Mars is a little farther (1.5 AUs), and the Earth is a little closer (1 AU). Draw Mars on the right side of the fold and Earth on the left side. These planets should not be on the fold, but they should be about the same distance from it. Fold the tape so that the end with the Sun is at 1.25 AUs and crease the tape. What distance marks this crease? Is there a planet at this distance?
11. The crease marks 0.62 AU, and Venus is just a bit farther. Place Venus just to the right of this new fold. Fold the tape so that the end with the Sun is on the fold at 0.62 AU and crease the tape. What distance marks this crease? Is there a planet at this distance?

FOLD



The Sun

Solar System Trading Cards, Jr. Edition • www.nasa.gov



The Sun

The Sun is our star.

It is very hot.

The Sun is the biggest object in the solar system.

? Game Question ?

? Which planet is red? ?

NP-2005-9-726-GSFC (2/18) v.2

Image taken by SOHO (NASA/ESA)

FOLD



Mercury

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Mercury



Mercury is the first planet from the Sun.

Mercury is a small, rocky planet.

It has craters and looks like our Moon.

Mercury is the planet closest to the Sun.



Game Question



Which planet has water?



NP-2005-9-726-GSFC (3/18) v.2

Image taken by Messenger (NASA/JHU APL/Carnegie Inst. of Wash.)

FOLD



Venus

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Venus



Venus is the second planet from the Sun.

Venus is a rocky planet.

It has many clouds and it is hot.

Venus is about the same size as Earth.

? Game Question ?

? Which planet has many rings? ?

Image taken by the Galileo spacecraft (NASA/JPL)

NP-2005-9-726-GSFC (4/18) v.2

FOLD



Earth

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Earth



Earth is the third planet from the Sun.

Earth is a rocky planet.

It has one moon.

Earth is our planet, and it has air and water.

? Game Question ?
? Which planet spins on its side? ?

Image taken from Terra satellite data (NASA/GSFC)

NP-2005-9-726-GSFC (5/18) v.2

FOLD



The Moon

Solar System Trading Cards, Jr. Edition • www.nasa.gov

The Moon



The Moon is rocky and covered with dust.

The Moon travels around Earth.

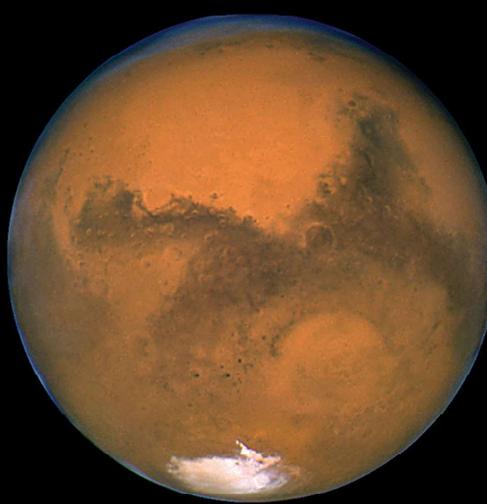
Game Question

Which planet was named for the Roman god of the sea?

NP-2005-9-726-GSFC (6/18) v.2

Image taken by National Optical Astronomy Observatory (NOAO)

FOLD



Mars

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Mars



Mars is the fourth planet from the Sun.

Mars is a rocky planet covered with dust.

It is red.

Mars has two small moons.

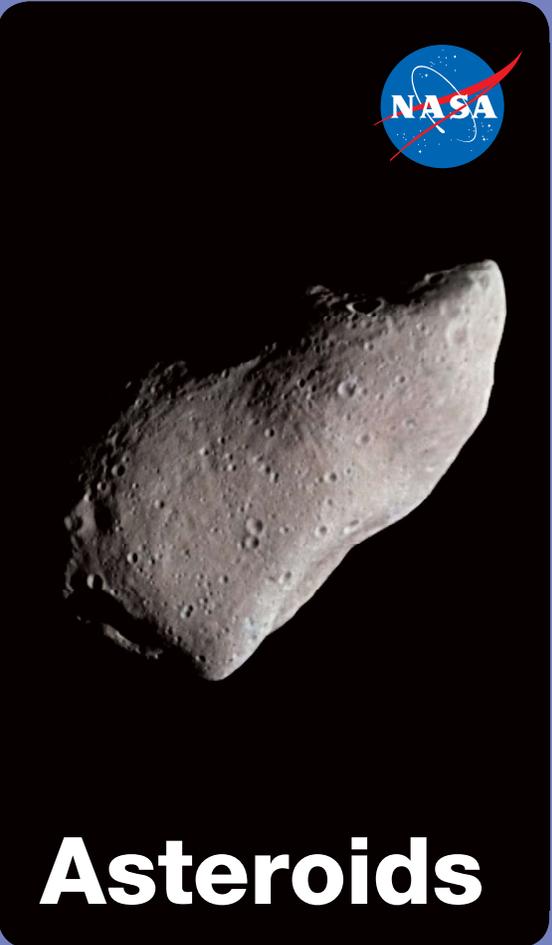
? Game Question ?

? Which object travels around Earth? ?

Image taken by Hubble Space Telescope (NASA/STScI)

NP-2005-9-726-GSFC (7/18) v.2

FOLD



Asteroids

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Asteroids



Asteroids are rocks found in the solar system.

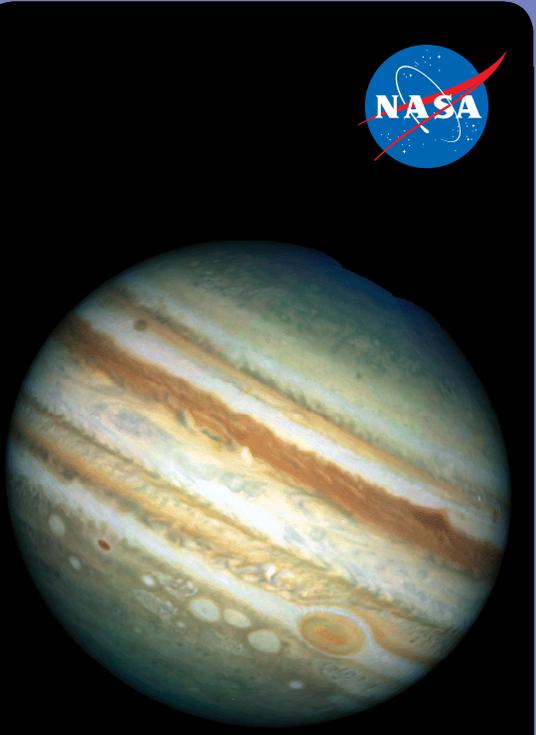
Most asteroids are found between Mars and Jupiter.

? Game Question ?
What is the biggest object in the solar system? **?**

NP-2005-9-726-GSFC (8/18) v.2

Image of Asteroid Gaspra taken by the Galileo spacecraft (NASA/JPL/USGS)

FOLD



Jupiter

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Jupiter



Jupiter is the fifth planet from the Sun.

Jupiter is made mostly of gas.

It has a big red spot.

Jupiter is the biggest planet in our solar system and has many moons.



Game Question



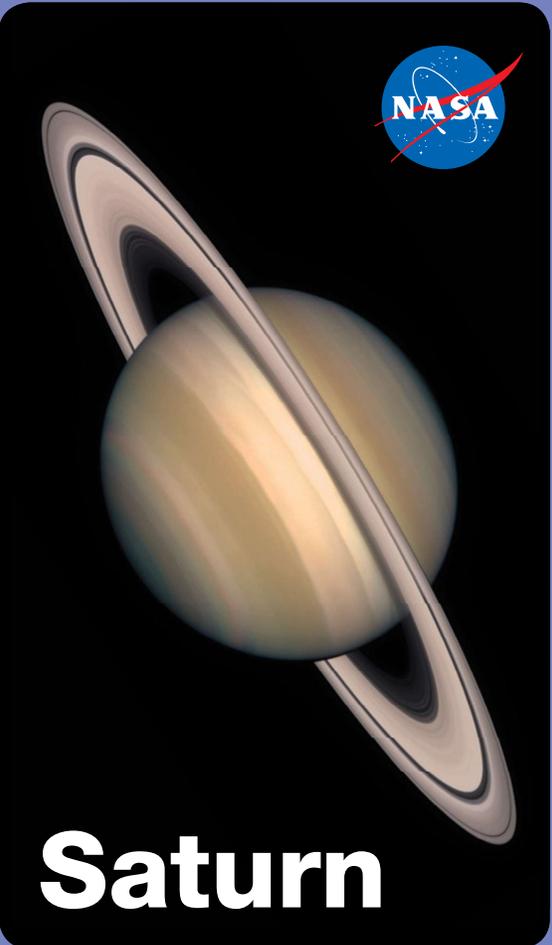
Which planet is closest to the Sun?



Image taken by Hubble Space Telescope (NASA/STScI)

NP-2005-9-726-GSFC (9/18) v.2

FOLD



Saturn

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Saturn



Saturn is the sixth planet from the Sun.

Saturn is made mostly of gas.

It has many rings.

Saturn is a big planet and has many moons.

? Game Question ?

? Which planet has a big red spot? ?

Image taken by Hubble Space Telescope (NASA/STScI)

NP-2005-9-726-GSFC (10/18) v.2

FOLD



Uranus

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Uranus



Uranus is the seventh planet from the Sun.

Uranus is made mostly of gas.

It spins on its side.

Uranus is a big, blue-green planet and has many moons.

? Game Question ?
? Which object is no longer called a planet? ?

Image taken by Hubble Space Telescope (NASA/STScI)

NP-2005-9-726-GSFC (11/18) v.2

FOLD



Neptune

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Neptune



Neptune is the eighth planet from the Sun.

Neptune is made mostly of gas.

It is named for the Roman god of the sea.

Neptune is a big blue planet and has many moons.



Game Question



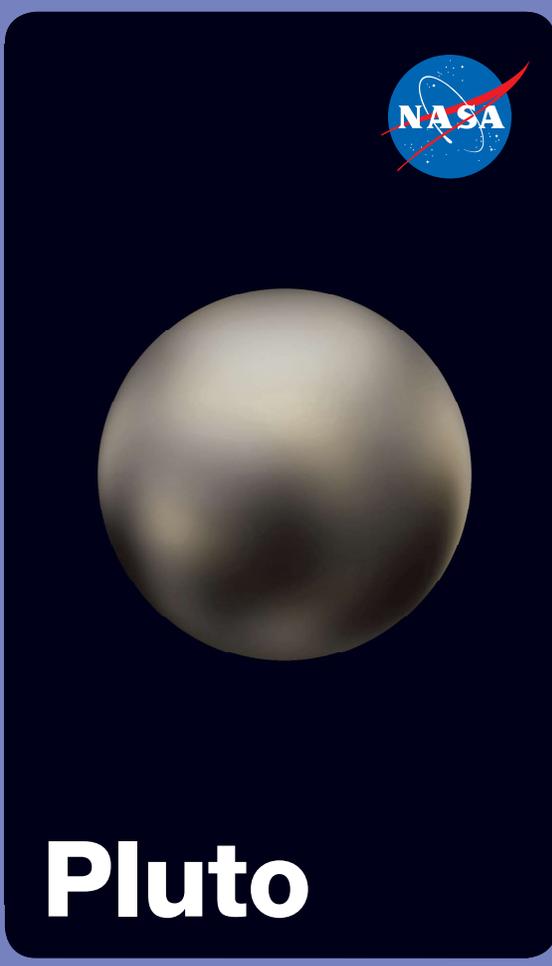
What objects are called dirty snowballs?



Image taken by Hubble Space Telescope (NASA/STScI)

NP-2005-9-726-GSFC (12/18) v.2

FOLD



Pluto

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Pluto



Pluto is made of ice and some rock.

It is a small object in our solar system.

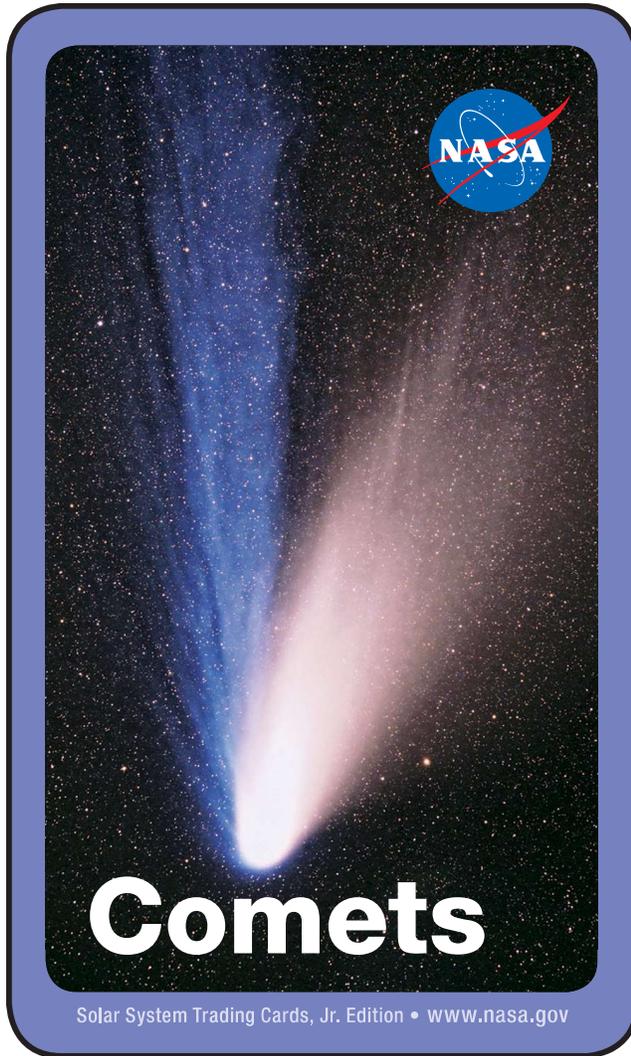
Pluto was a planet for 76 years, but it was removed from the planet list in 2006.

Game Question
What rocks are found between Mars and Jupiter?

NP-2005-9-726-GSFC (13/18) v.2

"Map" from Hubble Space Telescope data (NASA/STScI)

FOLD



Comets

Comets are made of ice and dust.



They are called dirty snowballs.

When a comet comes close to the Sun, it forms a long tail.



Game Question



Which planet is about the same size as Earth?



Image of Comet Hale-Bopp © Wei-Hao Wang 1997

NP-2005-9-726-GSFC (14/18) v.2

FOLD



Telescope Trivia: Hubble Space Telescope

Solar System Trading Cards, Jr. Edition • www.nasa.gov

Hubble Space Telescope

- 1 The telescope is named for astronomer Edwin P. Hubble.
- 2 The telescope is about the size of a school bus.
- 3 The space shuttle Discovery put the telescope into space in 1990.
- 4 Computers on the ground control the telescope.
- 5 The telescope travels around the Earth about every 90 minutes.

Image of Hubble Space Telescope taken by astronauts aboard space shuttle Atlantis (NASA)

NP-2005-9-726-GSFC (15/18) v.2

FOLD

Did you know?



Read this list.

How many do you know?

How did you learn the facts you know?

- 1 The solar system is made up of the Sun, planets, moons, asteroids, and comets.
- 2 The Sun is the center of the solar system.
- 3 All planets travel around the Sun.

Solar System Trading Cards, Jr. Edition • www.nasa.gov

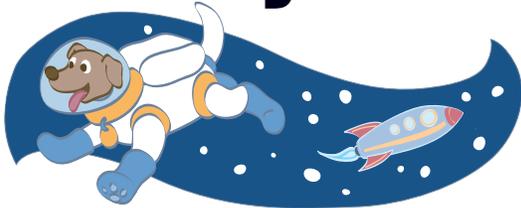
Did you know?

- 4 Planets are not all the same size.
- 5 Some planets are made of rocks.
- 6 Some planets are made of gas.
- 7 Many planets have moons.
- 8 Spacecraft cannot land on Jupiter, Saturn, Uranus, or Neptune.
- 9 Asteroids and comets are made of different stuff.
- 10 Comets do not always have a tail.

NP-2005-9-726-GSFC (16/18) v.2

FOLD

How to Play



- 1 One person reads the statements on the “Did You Know” card aloud, to introduce the players to the solar system.
- 2 Each player gets one card.
- 3 Players silently read the information on the back of their cards.

Solar System Trading Cards, Jr. Edition • www.nasa.gov

How to Play

- 4 The game begins when one player reads aloud the information and the question on the back of the card.
- 5 The player holding the card with the answer to that question stands and reads the information on his or her card, including the next question.
- 6 The game continues until all the cards have been read.

NP-2005-9-726-GSFC (17/18) v.2