

TOILET PAPER SOLAR SYSTEM

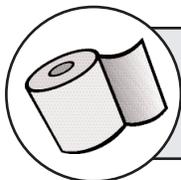
ADAPTED BY SUZANNE CHIPPINDALE

Based on an idea by the late Gerald Mallon, a planetarium educator who spent his life helping students understand the Universe.



A Family ASTRO Activity from the Astronomical Society of the Pacific

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- **Recommended for Ages:** 8 and up
- **Time to do:** 20 minutes
- **Type of Activity:** Facilitated
- **Number of People:** 1-4 per model
- **Set-up Time:** 3 minutes

WHAT'S THIS ABOUT?

Even in our own “cosmic neighborhood,” distances in space are so vast that they are difficult to imagine. In this activity, participants will build a scale model of the distances in the solar system using a roll of toilet paper. This is a great follow-up to the “Worlds in Comparison” activity, where families get a sense of the relative *sizes* of the planets.

MATERIALS INCLUDED

- Table of distances to give to participants (Two to choose from. The longer [200 sheets] requires 85 ft., the shorter [100 sheets] requires 42 ft. of space).

MATERIALS YOU'LL NEED TO GET

- One roll of toilet paper, 201 sheets or more, per family.
- Felt-tip marker(s) or gel pen, preferably 10 colors; but one pen per family will do.
- Clear tape for repairs

SETTING UP THE ACTIVITY

- Select either the 200 or 100 sheet model and photocopy the handout.
- Pass out pens, table of distances, tape dispenser and roll of toilet paper to each family team.

SUGGESTIONS FOR INTRODUCING THE ACTIVITY

This activity appeals to children’s love of bathroom humor, but keeps it clean. Representing both the sizes of the planets and the distances between them with the same model is very difficult unless you have 1000 yards to work with. This model only shows the relative distances between the planets and still requires approximately 85 feet to complete (in the longer scale on the next page).

If you have just completed the Worlds in Comparison activity before starting this one, note that at the scale used here, Jupiter would be the size of a grain of salt. You will want to mention to the families that the scales on the two activities are different. You can also remind the families that planetary orbits are ellipses, so the numbers here represent the average distance from Sun. Also, the planets will never all be in a straight line going out from Sun, as they are represented in this model.

DOING THE ACTIVITY

Take one sheet of toilet paper as a test sheet for the pens. Make sure the ink is not too wet, that the pens don't easily tear the paper. Also, have families practice writing on the delicate paper with one test sheet. After they have learned the best way to write on toilet paper, throw away the test sheet.

Suggest they make a dot on the seam between the first two sheets of toilet paper. This is the Sun. Write the word Sun beside the dot.

Then they can use the table of numbers provided to mark off the distances to each of the planets. The number in the table is the number of sheets of toilet paper needed to reach the orbit of each planet. It is important to tell participants that the counts in the table are starting from the Sun, not from the previous planet. (Thus, after get to Mercury, you need 1.7 more sheets to get to Venus.) They should make a dot and write the appropriate planet name on the toilet paper at the distance indicated. Ceres, the largest asteroid, is used to represent the asteroid belt.

If you don't have the time or space to complete the model, try to get to Jupiter and note that Saturn nearly doubles the distance. The same is true of going from Saturn to Uranus. Or, try using the short version of the scale in the third column below (Note that we have included two family handouts, one for each version).

Toss the toilet paper in recycling to clean up.

FAMILY CHALLENGE

Astronomers believe there is a vast cloud of frozen comets called the Oort Cloud that surrounds our solar system. It lies roughly 50,000 times farther from the Sun than the Earth is. Ask families how many squares of toilet paper you would need to put the cloud on the longer scale model? (Answer: $50,000 \times 5.1 = 255,000$ squares)

BACKGROUND

Pen Tips: If pens are very liquid they may bleed through too much or tear the paper. Gel pens work well.

Toilet Paper Tips: Cheap, flat toilet paper generally works best. Textured paper is okay; printed paper can be distracting.

| PLANET | DISTANCE FROM SUN (KM) | SQUARES OF TOILET PAPER OUT TO PLANET'S ORBIT (short version) | SQUARES OF TOILET PAPER OUT TO PLANET'S ORBIT (long version) |
|---------|------------------------|--|---|
| Mercury | 57,910,000 km | 1.0 | 2.0 |
| Venus | 108,200,000 km | 1.8 | 3.7 |
| Earth | 149,600,000 km | 2.5 | 5.1 |
| Mars | 227,940,000 km | 3.8 | 7.7 |
| Ceres | 414,436,363 km | 7.0 | 14.0 |
| Jupiter | 778,330,000 km | 13.2 | 26.4 |
| Saturn | 1,429,400,000 km | 24.2 | 48.4 |
| Uranus | 2,870,990,000 km | 48.6 | 97.3 |
| Neptune | 4,504,000,000 km | 76.3 | 152.5 |
| Pluto | 5,913,520,000 km | 100.0 | 200.0 |

Toilet Paper Solar System

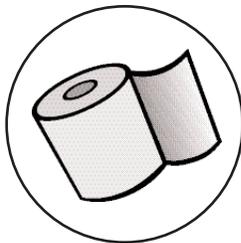


200-Sheet Model

BY SUZANNE CHIPPINDALE

An Activity for the Whole Family from Project ASTRO

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What's This About?

Even in our own “cosmic neighborhood,” distances in space are so vast that they are difficult to imagine. In this activity, we will build a scale model of the solar system using a roll of toilet paper.

Materials

- Planetary distances table
- Roll of toilet paper
- Gel pen or felt tip pen to write on toilet paper

What to Do

Take one sheet of toilet paper and test the pens. After learning the best way to write on toilet paper, throw away the test sheet.

Make a dot on the seam between the first two sheets of toilet paper. This is the Sun. Write the word Sun beside the dot.

Use the table of distances provided to mark off the distances to each of the planets. The number in the table is the number of sheets of toilet paper needed to reach the orbit of each planet from the Sun, so keep a running count as you go along. Make a dot and write the appropriate planet name on toilet paper at each distance indicated. Ceres, the largest asteroid, is used to represent the asteroid belt.

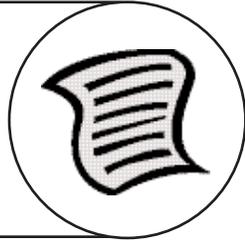
Toss the toilet paper in recycling to clean up.

Family Challenge

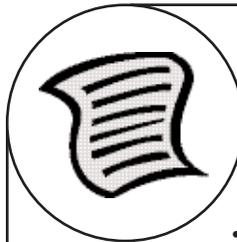
Astronomers believe there is a vast cloud of frozen comets called the Oort Cloud that surrounds our solar system. It lies roughly 50,000 times farther from the Sun than the Earth is. How many squares of toilet paper would you need to put the cloud on your model?

Note:

Keep a running count as you work on this. Each distance is from your starting point, the Sun



| PLANET | SQUARES OF TOILET PAPER FROM THE SUN |
|---------|--------------------------------------|
| Mercury | 2.0 |
| Venus | 3.7 |
| Earth | 5.1 |
| Mars | 7.7 |
| Ceres | 14.0 |
| Jupiter | 26.4 |
| Saturn | 48.4 |
| Uranus | 97.3 |
| Neptune | 152.5 |
| Pluto | 200.0 |

Note:

- 200 sheets of toilet paper stretch out to nearly 84 feet. Make sure you have room for your model before you start.
- Use colored pens to mark the distance to the planet's orbit from the Sun and label the orbit with the planet's name on the toilet paper.

Toilet Paper Solar System

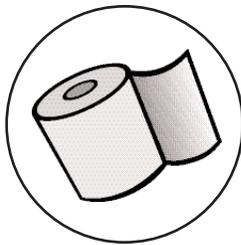


100-Sheet Model

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Make a dot on the seam between the first two sheets of toilet paper. This is the Sun. Write the word Sun beside the dot.

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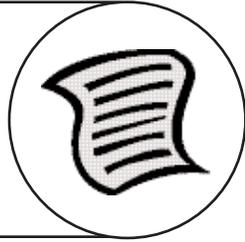
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Family Challenge

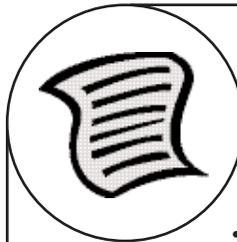
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Note:

Keep a running count as you work on this. Each distance is from your starting point, the Sun



| PLANET | SQUARES OF TOILET PAPER FROM THE SUN |
|---------|--------------------------------------|
| Mercury | 1.0 |
| Venus | 1.8 |
| Earth | 2.5 |
| Mars | 3.8 |
| Ceres | 7.0 |
| Jupiter | 13.2 |
| Saturn | 24.2 |
| Uranus | 48.6 |
| Neptune | 76.3 |
| Pluto | 100.0 |

Note:

- 100 sheets of toilet paper stretch out to nearly 42 feet. Make sure you have room for your model before you start.
- Use colored pens to mark the distance to the planet's orbit from the Sun and label the orbit with the planet's name on the toilet paper.