

Solar System Challenge

I have included a challenge if you feel able to do it. It may well take longer than a normal maths activity so I am repeating the challenge over a couple of weeks. It will work best if you can work alongside an adult. I know toilet rolls have been in short supply so if you are worried about this please don't feel obliged to complete the challenge. At the end of this sheet there are some questions that you could answer by just using the data table.

The challenge is to see if you can make a model of the solar system, so that both the sizes of the planets and their distances from each other and the Sun are all to scale?

This is not a straightforward problem, since although the planets are very big, their diameters are much, much smaller than the distances between them and the Sun. If you work through it you will be using very large numbers and this will help you understand not only the size of the Solar System but also what very large numbers actually mean.



Getting started

Collect the following resources:

- a toilet roll (unused and complete)
- a large blow-up ball (the bigger the better, to represent the Sun)
- a range of spherical (or nearly spherical) objects, ranging in size from a mustard seed up to small to medium-sized balls
- a large space - big enough to take an unrolled toilet roll. Choose a calm day outside as the wind can affect the model.

The unrolled toilet roll will represent the distance from the sun - to be placed at one end - to the outermost planet.

Hint: Pluto is now classified as a dwarf planet rather than a planet. If you include it, you increase the distance you need to work with from 4,500 million km to 5,900 million km. It is probably best not to include it!

Scaling the distances in the solar system



Use [this table](#) to help you decide how you are going to make your model. You could:

- make each piece of toilet paper a particular distance, say, 20 million km
- divide the total distance between the Sun and Neptune by the number of pieces in your toilet roll
- divide the total distance between the Sun and Neptune by the length of the toilet roll

Or you may have your own ideas about how you want to scale your model.

Mark where each planet will go on the toilet roll.

Scaling the planets

Using the data in the table, start by putting the planets in order of size. Then pick spherical objects to represent each planet.

Put the objects in the right places on the toilet roll.

- Which is the biggest planet?
- Which is the smallest?
- Which planets are closest together?
- Which are furthest apart?

Improving your model

If you wanted to use the same scale as you used for your toilet roll solar system to make models of the planets, how big would the biggest planet be? How big would the smallest be? Is this a practical scale for a model solar system?

If you made the smallest planet so that it had a diameter of 1 cm, how big would the distance from the sun to Neptune need to be? How about if you represented the smallest planet with a mustard seed?

If you make your own planets, find out what colour they appear to be, and paint them.

Working with your model

Make a colourful poster for each planet using the more information about the planets sheet.

You could include things like:

- how far it is from the Sun
- its diameter
- its mass
- any unusual features
- the number of moons, and their names if there aren't very many
- whether it is a rocky planet or a gas giant
- if it has an atmosphere, what is it made of
- how long its 'year' and its 'day' are
- its lowest and highest surface temperatures, and whether one side is always shielded from the Sun or not
- some calculations:
 - how strong is its gravity, how high could you jump
 - how fast would a rocket have to go to escape from its gravitational pull
 - how long would it take an email to get from Earth to the planet
 - how long it would take a rocket to get from Earth to the planet
- the problems humans have to overcome if they were ever to establish a colony on the planet. Or you may have other things you want to find out about the planets which you could include.

Using the Data Table

Can you answer these questions?

1. Which planet is closest to the sun?
2. Which planet is farthest from the sun?
3. How many planets are between Earth and the sun?
4. Which planets are Earth's nearest neighbours? How can you tell?