The Solar System to Scale

Curriculum Relevance: Year 5, Earth & Space
KS3, Space Physics

WONDERSTRUCK
SCIENCE ON FIRE

Children find space an intrinsically fascinating topic but one thing that can be hard to get across is the absolutely sheer mind-bending scale of it.

Most of us are used to seeing the Sun and planets laid out neatly in the pages of a text book or across a computer monitor. You can generally see colours and maybe even some surface detail and they don't really look too far apart.

The truth however is somewhat different.

A Scale Model of the Solar System

On page 3 is a table which gives the sizes of the planets and the distances between them. It also gives those distances scaled down so that 1000 000 km is represented by 5 cm. On pages 4&5 are representations of the planets which you can print out to this scale. It might be a good idea to laminate them if you want to use them more than once.

It will be useful to stick one complete set of cards to the tops of bamboo canes. That way you can stick them in the ground so they are visible from a distance when you lay out the Solar System to scale.

Classroom Use Suggestions

We use these resources ourselves when we go into schools and do workshops that may contain a space element and we've found that the following tends to work quite well.

- Get children to work in convenient sized teams (a table of 5 or 6 is fine)
- Give each team a complete set of cards
- Ask children to lay them out in the correct order. Give them 2 or 3 minutes.
- Go through the correct order.
- Now ask teams to put the correct distances between the planets. Over the hundreds of times we've done this activity in schools no one has ever got this anywhere near right.
- Take the class outside onto a playing field and lay the Solar System out to the correct scale (as shown in our table). Pacing the distances out is fine. A fairly large stride for someone about 1.72 metres tall (5 foot 8 inches) is about 1 metre. If it's raining, you can generally fit most of the inner Solar System into a long corridor or the school hall.

Some interesting things to do with your Solar System model

- If you stand on the spot where the Earth is and look at the Sun card the Sun printed on it will appear exactly the same size as the real Sun in the sky because the planets sizes and distances are all to scale. In fact, if you stand at the location of any of the planet cards the Sun on the Sun card will appear the same size as the real Sun would appear in the sky of that planet.

- There is talk of the possibility of sending humans to Mars maybe in the next 20 or 30 years. It's easy to underestimate how hard this will be. Look at the distance between the Earth and the Moon on the Earth/Moon card now look at the distance between the Earth and Mars. The furthest distance that any human being has ever travelled is to the Moon and back!

- Light travels very quickly - 300 000 000 metres per second in fact. That's just over seven times around the Earth in a second. However, it takes 8 minutes for light from the Sun to reach us on Earth because we are about 150 000 000 kilometres away. If you can find a friendly snail place it where the Sun card is. The speed it moves away from the Sun will be roughly equivalent to the speed of light on this scale.

- Sirius, the brightest star in the sky, is 13 cm across on this scale and would be 4000 kilometres away. That makes its diameter the same as a big light bulb. Can you imagine how bright a light bulb this size would need to be to b e visible from 4000 kilometres away? This gives you an idea of how much power a star produces.

- In a few billion years our Sun will start to run out of fuel and as part of that process it will swell up and become a red giant star. When it swells up it will become big enough to swallow Mercury, Venus and possibly the Earth. Take a look at the solar system model and think about the change in size that represents.

- When it comes to astronomy you may have heard talk about 'light years'. This is a measure of distance. It is simply the distance that light can travel in a year. It's a massive number. Light can travel 300 000 km in one second and there's 3600 of those in an hour, 24 of those in a day and 365 of those in a year. That means that in one year a beam of light will travel:

  300 000 x 3600 x 24 x 365 = 9 460 800 000 000 kilometres

  That's 9.46 trillion kilometres!

HAZARDS

It might be tempting while you're doing this, but never look directly at the Sun with the naked eye and certainly never look at it using any magnifying device!

Size of the Solar System

Body	Distance from sun (millions of km)	Diameter (km)	Scale distance from Sun (m)	Scale diameter (mm)
The Sun	0	1 390 000	0	70
Mercury	60	4 878	3.0	0.2
Venus	106	12 104	5.3	0.6
Earth	149	12 756	7.5	0.6
Mars	227	6 800	11.3	0.3
Ceres	415	950	20.8	0.05
Jupiter	778	143 884	38.9	7.0
Saturn	1 427	120 536	71.3	6.0
Uranus	2 870	51 118	143.5	3.0
Neptune	4 497	50 538	224.8	3.0
Pluto	5 900	2 324	295.0	0.1
Eris	10 050	2 400	502.0	0.1

Scale: 5 cm to 1 000 000 km

Those bodies marked in red are now designated as 'minor planets'

If you've found this useful...

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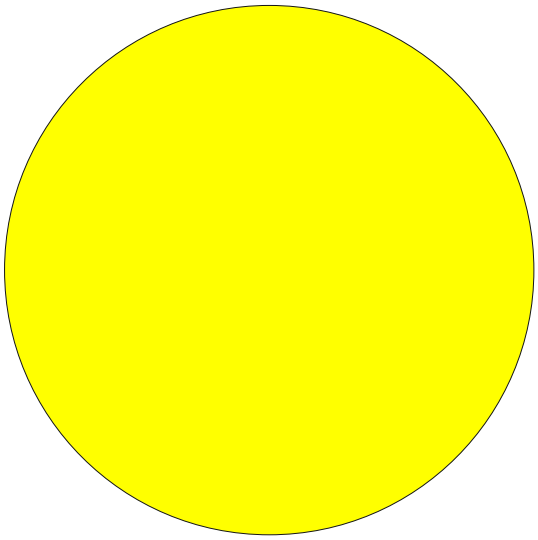


The Sun

Mercury

Venus

The Moon

Earth

Mars

Ceres

Jupiter

Saturn

Uranus

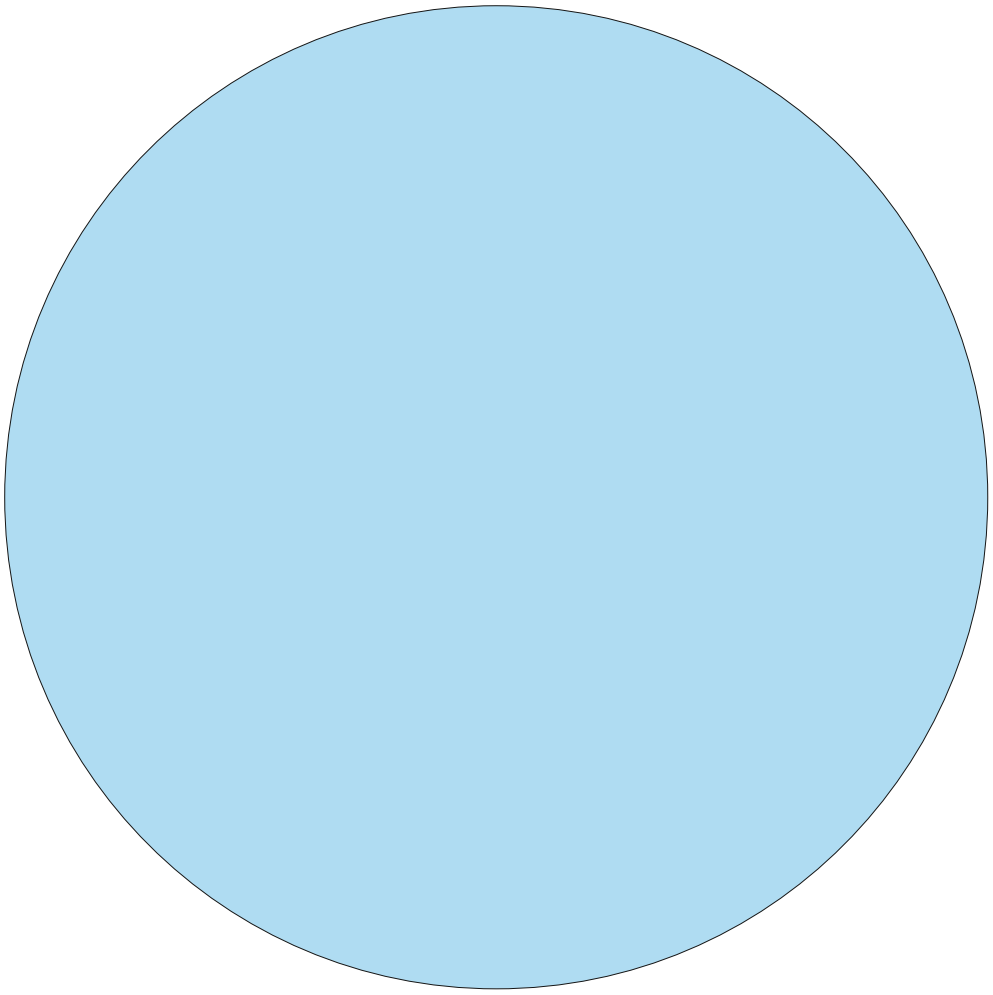
Neptune

Pluto

Eris

Below is a card showing the star Sirius to the same scale as our Sun and the planets. Sirius is the brightest star in the sky and can be found in the constellation Canis Major (The Great Dog).

It is 8.5 light years away. On this scale that would be about 4000 km away - so if you go and stand in Cairo or Jerusalem with this card that will be about right!



Sirius - the brightest star in the sky

It's generally a bluey-white colour but can vary