**ACTIVITY: Shrink the Solar System**

**Activity idea**

In this activity, students make a scale model of the Solar System to help them understand distances in space.

By the end of this activity, students should be able to:

* get a feel for the huge distances involved in astronomy
* understand that measurement is an important part of science
* use a range of measurements, from mm to light years.

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**Introduction/background**

Creating a scale model of the Solar System is a good way to help understand distances in space. Distances in the Solar System are actually very small compared to the rest of space, so whatever scale model you make, take the next step and work out the scale distance to the nearest star – you’ll be amazed. For example, if you shrank the distance from the Earth to the Sun to the thickness of a piece of normal photocopy paper:

* the distance to the nearest star would need a stack of paper 21 metres high
* the diameter of the Milky Way would need a stack 500 km high
* the distance to the nearest galaxy would need a stack nearly 10,000 km high.

**What you need**

* Access to the article [Distances in space](https://www.sciencelearn.org.nz/images/1999-scaled-down-solar-system) and the image [Scaled-down Solar System](https://www.sciencelearn.org.nz/images/1999-scaled-down-solar-system)
* Copies of the student handout [How far?](#handout)
* Large-scale map of New Zealand and Australia that students can draw on, or place a clear sheet of plastic over the top and draw on that – a scale bar on the map will be very useful
* Ruler, tape measure
* Drawing compass

**What to do**

1. Use the article [Distances in space](https://www.sciencelearn.org.nz/images/1999-scaled-down-solar-system) to introduce some of the measurements that astronomers use and hand out copies of the student handout [How far?](#handout)
2. Hand out maps to students and ask them to imagine the Sun to be only 1 km in diameter (across). Have them mark the Sun on the map and centre it on your school or nearest city, depending on the scale of the map.
3. Explain that all the distances between the Sun and the planets will have to shrink now as well. Ask students to draw the orbits of the planets on the map using the right-hand column of the student handout [How far?](#handout) for measurements. Students can also use Google Earth on a computer to plot the distances using the ‘ruler’ function. The image [Scaled-down Solar System](https://www.sciencelearn.org.nz/images/1999-scaled-down-solar-system) is similar to what students’ maps should look like.

**Extension idea**

* Make a scale model of the Solar System that fits in the classroom, or mark the orbits of planets in chalk on the playground. You could include scale models of the planets as well as the orbits – if you do, it helps to keep the scales of orbits and planets the same.

**Student handout: How far?**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Planet** | **Actual distance from Sun (km)** | **Classroom model – distance if Sun 1 mm across (cm)** | **Playground model – distance if Sun 10 mm across (m)** | **Map model – distance if Sun 1 km across (km)** |
| Mercury | 57,950,000 | 4 | 0.42 | 42 |
| Venus | 108,110,000 | 8 | 0.78 | 78 |
| Earth | 149,570,000 | 11 | 1.1 | 107 |
| Mars | 227,840,000 | 16 | 1.6 | 164 |
| Jupiter | 778,140,000 | 56 | 5.6 | 559 |
| Saturn | 1,427,000,000 | 103 | 10.3 | 1,030 |
| Uranus | 2,870,300,000 | 206 | 20.6 | 2,062 |
| Neptune | 4,499,900,000  | 323 | 32.3 | 3,232 |
|  |  |  |  |  |
| Nearest star | 4.2 light years | 29 km | 2,900 km | 29 million km |
| Centre of Milky Way | 26,000 light years | 180,000 km | 18 million km | 180 million km |

You can choose any scale you like for your model Solar System. This website lets you enter any size for the Sun, then calculates the scale distances to the planets and beyond.
[www.exploratorium.edu/ronh/solar\_system/index.html](http://www.exploratorium.edu/ronh/solar_system/index.html)