## Playground planets <br> Modelling the relative sizes of the planets and their distances from the Sun

Ask the pupils to name the planets in our Solar system from the sun outwards. It can be useful to use a mnemonic to help to remember the order.

| Mercury | Most |
| :--- | :--- |
| Venus | Volcanoes |
| Earth | Erupt |
| Mars | Marmalade |
| Jupiter | Jam |
| Saturn | Sandwiches |
| Uranus | Under |
| Neptune | Normal |
| Pluto* | Pressure |

*Pluto is now considered to be a dwarf planet made of rock and ice, the largest member of the Kuiper belt

Explain that the planets closest to the Sun (Mercury to Mars) are rocky planets and those further away (Jupiter to Neptune) are made mostly of gas.

Ask the pupils to try to match the balls provided to the planets and to the Sun. The correct sizes are provided in the following table:-
The scale is approximately 2 billion to 1

| Planet | Diameter (km) | Model diameter <br> $(\mathbf{m m})$ |
| :--- | :---: | :---: |
| Mercury | 4,879 | 2 |
| Venus | 12,106 | 6 |
| Earth | 12,756 | 6 |
| Mars | 6,792 | 3 |
| Jupiter | 142,984 | 71 |
| Saturn | 120,536 | 60 |
| Uranus | 51,120 | 26 |
| Neptune | 49,528 | 25 |
| Pluto | 2,300 | 1 |
| Sun | $1,392,000$ | 696 |

In the playground or school field, ask the pupils to position the planets at their correct distances from the Sun. One pupil holds the 'Sun' and a looped end of rope. The other pupils position themselves along the rope at the metre distances from the end of the rope shown by the figures in bold in the second table:-

| Planet | Distance from <br> Sun (km) | Distance along <br> rope from Sun (m) <br> c.100 billion to 1 | Distance from <br> Sun (m) <br> c.2 billion to 1 |
| :--- | :---: | :---: | :---: |
| Mercury | $46,000,000$ | $\mathbf{0 . 4 6}$ | 23 |
| Venus | $109,000,000$ | $\mathbf{1 . 0 9}$ | 54.5 |
| Earth | $150,000,000$ | $\mathbf{1 . 5}$ | 75 |
| Mars | $235,000,000$ | $\mathbf{2 . 3 5}$ | 117.5 |
| Jupiter | $780,000,000$ | $\mathbf{7 . 8}$ | 390 |
| Saturn | $1,400,000,000$ | $\mathbf{1 4}$ | 700 |
| Uranus | $2,700,000,000$ | $\mathbf{2 7}$ | 1350 |
| Neptune | $4,500,000,000$ | $\mathbf{4 5}$ | 2250 |
| Pluto | $7,370,000,000$ | $\mathbf{7 3 . 7}$ | 3685 |



Pupils at Ysgol Brynhyfryd, Ruthin, Denbighshire Photo: Steve Blakesley

## The back up:

Title: Playground planets
Subtitle: Modelling the relative sizes of the planets and their distances from the Sun

Topic: The Earth and beyond
Age range of pupils: 8 to 16 years
Time needed to complete activity: 45 minutes

Pupil learning outcomes: Pupils can:

- list the correct order of the planets from the Sun;
- identify the relative sizes of the planets and the Sun using scaled models;
- place the planets at the correct scaled distances from the Sun
- appreciate the enormous distances involved and the enormous size of the Sun relative to the planets.


## Context:

This activity can be used in any lesson about space and astronomy. It can also be used in mathematics for work on large numbers and scale. The scale of

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2 billion to 1 demonstrates very well the enormous size of the Sun compared with the planets. For the distances of the planets from the Sun, however, it is best to use a scale of 100 billion to 1 so that the activity can be carried out within school grounds. Figures for the scale of 2 billion to 1 are given in the second table; Pluto is then over 3 km away from the Sun.

## Following up the activity:

If there is enough space when the pupils are the correct distances from the Sun, they would walk around the Sun simulating the orbits of the planets. The planets revolve around the Sun at different speeds and their orbits vary from circles to ellipses. A discussion could follow about year length and day length on the planets. Research could be carried out on their composition and the number of moons they have.
There could also be discussion about the frequent misrepresentations of planet size and distances in books, models and on TV programmes, such as 'Star Trek'.

## Underlying principles:

- The solar system is made up eight planets (nine including Pluto) which travel round the Sun in elliptical movements.
- $98.8 \%$ of the mass of the solar system consists of the Sun.
- The Sun is one of billions of stars that make up our galaxy, the Milky Way. There are billions of galaxies in the known Universe.
- The solar system is 4.6 billion years old.
- The Universe from the Big Bang to the present day is about 13 billion years old.


## Thinking skill development:

Relating the models to the planets in the solar system involves bridging.

## Resource list:

- $2 \times 2 \mathrm{~mm}$ dia. silver dragee - cake decoration (Mercury and Pluto)
- $1 \times 3 \mathrm{~mm}$ dia. ball bearing (Mars)
- $2 \times 7 \mathrm{~mm}$ dia. ball bearings (Earth and Venus)
- $2 \times 23 \mathrm{~mm}$ dia. balls, e.g. hi-bounce power balls, (Uranus and Neptune)
- $1 \times 56 \mathrm{~mm}$ dia. ball, e.g. spherical fishing float, with card ring disk (Saturn)
- $1 \times 66 \mathrm{~mm}$ dia. ball, e.g. tennis ball, (Jupiter)
- $1 \times 6500 \mathrm{~mm}$ dia. ball e.g. beach ball, Pilates exercise ball (Sun)
- 75 metres of thin rope or a metre trundle wheel (Note: some of the balls will have to be close approximations to the actual diameter required and can be made from modelling clay.)


## Useful links:

www.spacerocketroadshow.co.uk www.conceptcartoons.com www.nasa.gov/audience/forkids/kidsclub/flash/index

## Source:

Adapted by the Earthlearningidea Team from an idea by Steve Blakesley (Blakesley Consultants http://blakesleyconsultants.com).

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