ASTRONOMY AND FOOTBALL

Trigger questions:	Where do you live? What is our planet called? Where does the light and heat on Earth come from? (*The sun*) Holding up the small pea (*Earth*) and large beachball (*the Sun*) "How big is the Sun compared to the Earth?" (*about 7000 times bigger!*) Why does the sun look so small to us? (*Because it is so far away*) What would happen to you if you went close to the sun? (*You would roast!*) Does the sun move? (*No, the Earth revolves around the sun, once in a year*).
Content:	**SCIENCE:** Forces
	MATHS: Number: Place value (ordering), operations (multiply) Shape and Space; 2-D shapes, 3-D shapes Measures: Length – use and interpret scales on maps and plans
Skills:	Measuring
Cross-curricular Links:	**Geography:** Natural Environments: Planet Earth in Space; drawing to scale **History:** up until the 16th Century people thought that the sun, stars and planets revolved around the Earth; Copernicus then suggested that the sun was at the centre of the solar system; this is what we believe today. **Art:** Solar system model
Activities:	**Older children:** (1) On the 'football field' (*whether paper, schoolyard or whatever*) place the sun on one goal-line, and Neptune on the other goal-line. Measure the distance between the two goal-lines. Using the distances from the sun in Astronomical Units can you place the planets (*either by drawing them as circles, or placing appropriately-sized balls or fruit*) at approximately the correct distance from the sun. *(Because it is difficult to deal with distances of thousands of millions of kilometres, astronomers often use Astronomical Units (A.U.): they called the distance from Earth to the sun 1 A.U. Mars is just over one-and-a-half times further from the sun than the Earth, so its distance is called 1.52 A.U.*

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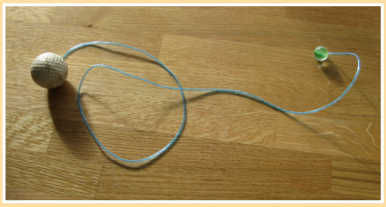
Planet	Average distance from sun	
	Kilometres (Km)	Astronomical Units (AU)
Mercury	58 million	0.39
Venus	108 million	0.72
Earth	150 million	1.00
Mars	228 million	1.52
Jupiter	778 million	5.20
Saturn	1430 million	9.54
Uranus	2880 million	19.18
Neptune	4500 million	30.06

(2)To get an idea of the size and distance of the Moon compared to the Earth, use a small marble for the moon and a ping pong or golf ball for the Earth.



The distance of the Moon from the Earth is roughly 30 times the diameter of the Earth.

Can the children work out how long a piece of string should be if it was to connect the Moon to the Earth. (*This should be about 120 cm., as the diameter of the golf ball is about 4 cm.*). They could then cut the string and join the marble and ping pong ball.

Younger Children:

The children can be given the different sized balls (*or fruit*) representing the planets, and asked to:

(1) Line them up in order of size
(*Starting with the smallest: Mercury, Mars, Venus, Earth, Neptune, Uranus, Saturn, Jupiter*).

"Is the Earth one of the (a) smaller (b) bigger (c) medium-sized planets? (Medium)

(2) Using the 'football pitch', place the Sun on one goal-line and Neptune on the other. Then place the planets in their correct order in distance from the sun – giving them the distances in Astronomical Units in a jumbled order. e.g.

PLANET	DISTANCE FROM SUN IN ASTRONOMICAL UNITS (AU)
Uranus	19.18
Mars	1.52
Jupiter	5.20
Saturn	9.54
Earth	1.00
Mercury	0.39
Neptune	30.06
Venus	0.72

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All children:
In the school hall or yard children can act out the solar system. One child can be the sun, while others are planets and moons. The planets rotate (i.e. the children go round in circles – **careful: dizziness!** – at the same time as they orbit the sun. At the same time the moons have to try and orbit the planets! (*This can be a bit chaotic, but the children learn about rotation and orbiting. It also helps them to understand day and night – e.g. ask them whether they think it is day or night when they are turned away from the sun.*).

Safety:

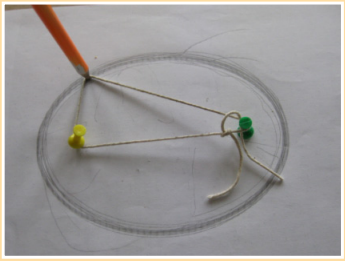
Care with dizziness if acting out solar system.
Care with pins if drawing ellipse.

Follow-up Activities:

1. An ellipse can be drawn as follows: Equipment: pencil, paper, string, 2 pins.

Put the 2 pins into the paper – a suggested distance is about 10 cm. apart lengthways on A4 paper. Tie the string into a loop that fits loosely around the two pins (*the looser the string the larger the ellipse*).

Hold the pencil against the inside of the string – the string now forms a triangle – move the pencil around the pins, keeping the string taut all the time.



You now have an ellipse!

2. The planets could be coloured or highlighted with any special characteristic, e.g. red for Mars, rings for Saturn, etc.

MORE MATHS:

There is plenty more scope for Maths in the Solar System, e.g.

1. Using the table above:
(a) Fractions : About how far is Mercury from the Sun compared with the Earth? (*Two-fifths*)

So why could we not live there? (*We'd roast!*).
(b) Percentages: Estimate how much further from the Sun Neptune is than Saturn.

$$\left(\frac{30-10}{10} \times 100 = 200\%\right)$$

2. The Moon is about 384,400 km. from the Earth. If you could fly to the Moon at a constant speed of 1000 kilometers per hour, which is the speed of a fast passenger jet, how long would it take a rocket to reach the Moon from Earth? (*About 16 days*).

Younger Children:
What shapes do they see in the football pitch far right?
How many of each shape can they find?

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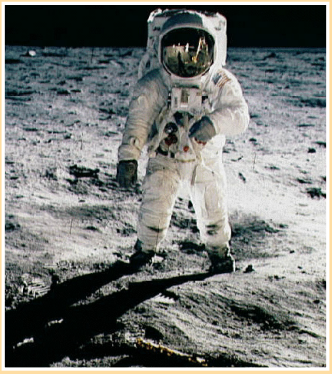
Did You Know?



The Moon has no water and no wind. So it is probable that footprints left by astronauts on its surface will never be worn away.

All the planets in the Solar System rotate anticlockwise, except for Venus. It is the only planet that rotates the other way.

Mercury is not the hottest planet even though it is nearest to the Sun. Venus is the hottest planet, even though it is further from the Sun than Mercury. Venus has a thick atmosphere (*clouds of gas*) to keep the heat in at night, while Mercury has no atmosphere to keep the heat in and so gets very cold at night.

If you could go by car to the sun at a speed of 120 kilometres per hour, it would take you about 140 years to get there (*but you would have roasted in the meantime*)!

Useful Websites:

The educational section of the European Space Agency: www.esa.int<http://esamultimedia.esa.int/docs/edu/AstronomyFootball_EN.pdf and http://www.esa.int/esaKIDSen/OurUniverse.html

To help understand the size of the Solar System, and distances measured in Astronomical Units see http://www.sky-watch.com/articles/howfar.html

NASA, the American Space Agency, has a good educational website for kids: http://science.nasa.gov/kids/kids-solar-system/