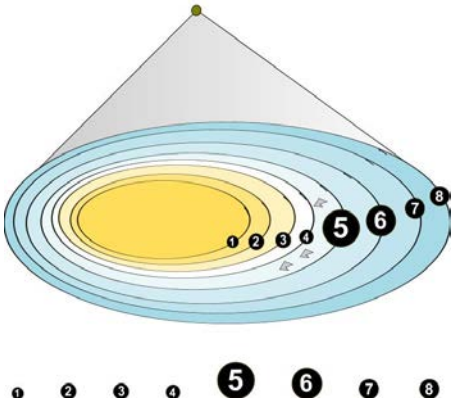
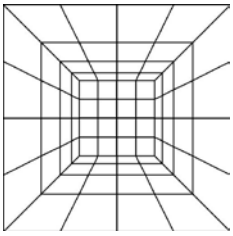
Orbit and Size- Student Activity



This diagram is an artist's impression of the planets, their orbits and their relative sizes. After finishing these activities, decide how accurate it is.

_____

We look towards the Moon or the planets in the night sky and they appear to quite small because they are far away. Artists use this apparent shrinkage to create a sense of distance or perspective. Lets test this idea.



Activity A - Perspective and Scale

Materials per student

- 2 rulers

Method

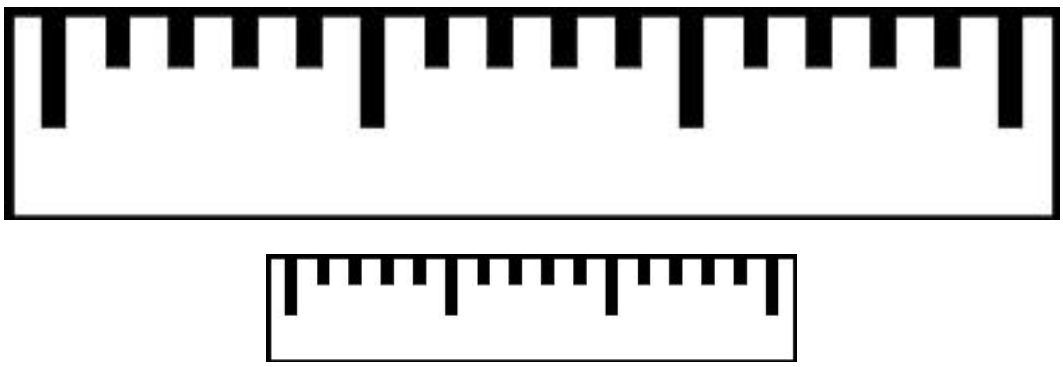
1. Place one ruler on top of the other with the closer ruler displaced downwards so that the measurement units on both rulers can be seen.
2. Hold up both rulers about 8cm in front of your nose.

Q. Do both rulers appear to be the same length? _____

3. With your right hand move the back ruler away until your right arm is fully extended.

Q. Do both rulers look the same length now? _____

Long ago many people thought that the Sun was smaller than the Earth because it appeared to be so in the sky. They did not appreciate how big it really was how far away it was.
When we deliberately draw things smaller than they are we say they are "***scaled down***".



By how much has the lower ruler been scaled down? _____

Has the length of the ruler changed? _____

Orbit and Size- Student Activity

Making scale models of the solar system

Scientists often have to work out the best way to describe things so that people can more easily understand them. Scale models and scale drawings are often used as the old adage goes, “a picture is worth a thousand words”. When it comes to astronomy however the distances between planets and their size are so large that any models have to be severely scaled down because of the enormous distances involved.

Activity B - Distances of Planets from the Sun

Measurements across our solar system are HUGE! The average distance of the Earth from the Sun is 149,597,870.7 kilometres. My pocket calculator refuses to attempt to compute the distance from Earth to Neptune in kilometres (39.53 X 149,597,870,7km). To fit the distances from the Sun onto a small area we need to change scale to another unit of measurement. Instead of kilometres we use the distance of the Earth to the Sun and call this one Astronomical Unit or AU.

1 Astronomical Unit (AU) is 149,597,870.7km

Q. Why do we use the mean (average) distance of planets from the Sun?

_____

Use the information in the table below

Planet	Distance to the Sun (mean) AU	Scaled distance on paper (cm:AU)
Mercury	0.39	
Venus	0.72	
Earth	1.00	
Mars	1.52	
Jupiter	5.2	
Saturn	9.51	
Uranus	19.3	
Neptune	30.07	

Materials

- One sheet A4 paper for good work
- Scrap paper for rough work
- Sellotape or glue
- A pencil eraser and ruler
- A calculator

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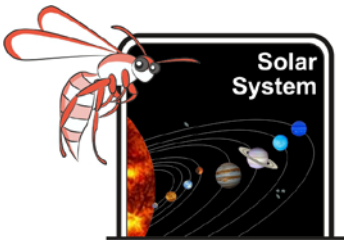

Method

1. Lay your worksheet "landscape" and measure the length of the longest edge. _____cm
2. Decide if these measurements need to be scaled up or scaled down to fit onto your worksheet? _____
3. Select an appropriate scale so that the largest distance will fit across this paper _____
4. Calculate the model distances from the Sun according to your scale and put these in the table provided.
5. Draw up the scaled model on the worksheet

Discussion

What problems did you have working at the scale you chose?

_____

Activity C - Relative Sizes of planets.

Materials

- Ruler
- A pair of compasses and pencil

Method

1. Estimate the scale required to fit Jupiter and Saturn on one page.
2. Decide which scale can you use to be able to draw all the planets on the paper provided.

Planet	Radius of planet AU	Radius of planet 1cm:1 AU
Mercury	0.38	
Venus	0.97	
Earth	1.00	
Mars	1.52	
Jupiter	11.20	
Saturn	9.47	
Uranus	3.75	
Neptune	3.50	

Extension

The radius of the Sun is 109AU.

How many sheets of A4 paper would you need to be able to represent the Sun at the scale 1cm:1AU?