

*For the teacher: **COULD THE SPACE SHUTTLE FLY TO THE MOON?***

*Many students have the impression that the space shuttle is way out in space. They get this impression from the free falling antics that they see the astronauts performing on the shuttle. Many students think that gravity “turns off” as soon as you get into space.*

*These and other misconceptions are common, but can be addressed by a number of simple activities. A very well received activity that has been the subject of a number of my workshops is “Bringing the Earth Down to Size”.*

## ***BRINGING THE EARTH DOWN TO SIZE***

**AIM:** To compare large heights from the surface of the Earth with its diameter.

### **KEY CONCEPTS:**

- Few structures, natural or made by humans, provide much contrast in height to a scaled model of the Earth
- Drawing things to scale helps to develop accurate mental pictures.

### **MATERIALS:**

A3 (or larger) paper   Pencil   Cotton (1.1 metres per group)   Metre rule

Centimetre ruler   Masking Tape   Earth Globe   Calculator (OPTIONAL)

### **PROCEDURE:**

1. Tape the paper to the desk so it will not shift later
2. Measure just over 1 metre of cotton and tie one end to the pencil
3. Tape the other end to the desk as shown in the diagram, so that you can swing an ARC of exactly 1 metre about half way up the sheet of paper. This 1 metre will represent the RADIUS of our Earth.  
HINT: You can wrap the string around the pencil a few times to get it more exactly equal to 1 m.
4. The ARC that you have drawn could be continued in a complete CIRCLE to represent the **outside** surface of our EARTH. If we completed the circle we would have drawn a **scale model** of the Earth that was 1 metre in RADIUS.

5. Now use the values on the SCALE HEIGHT TABLE that follows to carefully measure out the distances above and below the surface of the Earth of the features mentioned. CLEARLY LABEL EACH ITEM or draw a picture if you wish, and THEN ANSWER THE QUESTIONS ASKED.

**ASK YOUR TEACHER IF YOU NEED HELP WITH ANY OF THIS**

**ANSWER SHEET**

**NAME:.....**

<b>ITEM</b>	<b>REAL HEIGHT</b>	<b>SCALE HEIGHT</b>
Earth's radius	6,380 km	1.0 m (the outer surface)
Average altitude of the Space Shuttle	300 km	47.02 mm above surface
Altitude of a cruising international jumbo jet	12.2 km	1.91 mm above surface
The outer limit of Earth's atmosphere	150 km	23.51 mm above surface
Deepest Ocean Trench	11.0 km	1.72 mm BELOW surface
Mount Everest	8.8 km	1.38 mm above surface
A 100 story high skyscraper	0.3 km	0.05 mm above surface

TEACHER MARK FOR GROUP'S PRACTICAL EFFORTS ..... (5)

**Answer these questions in space provided (marks in brackets)**

1. What is the DIAMETER of the Earth in the model that you drew? (1)
2. If you could run your hand over a model of the Earth of the size you drew (radius 1m), how would it feel? EXPLAIN your answer. (3)
3. Show your teacher on the Globe of the Earth that is provided, the approximate height of the orbiting Space Shuttle.

Teacher Check: Very good (4 marks)  
 Good (3 marks)  
 Not quite right (2 marks)  
 No where near (0 marks)

4. If the Earth's diameter is approximately 12,800 km and the Moon's is 3,200 km what size radius would the Moon be compared to our 1m radius Earth? (1)
5. If the distance from the Earth to the Moon is approximately 400,000 km, how far away would the MOON be from your 1m radius scale model of the Earth? (1)