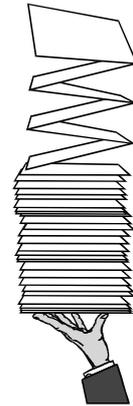


# Big Numbers

## Paper Folding

Take a piece of paper and fold it in half, then do it again and again until you have folded 15 times. Can you do it ?



The question is; why is it so difficult ?  
Think about how thick the paper would be after 15 folds.

A sheet of paper is roughly 0.1 millimetres thick.  
After one fold we times by 2.  
Use a calculator to help you.

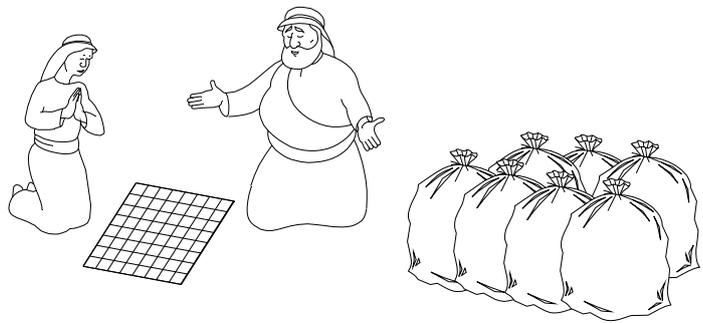
On the calculator, press  $0.1 \times 2 =$

For the second fold times by two again.  
Keep on until you have done  $\times 2$ , twenty times.

This is a big number, but it is millimetres. There are 1000 millimetres in a metre. So keep your answer in the display and press  $\div 1000 =$   
This tells you how thick the paper is. (Look at the bottom of the page to check you answer !)

The paper should be a little more than 3 metres thick. About the height of a tall room ! Do you think you could fold that ?

## Chessboard of Rice



There is a story that tells of a boy who did a great service for a king. The king asked the boy what he would like as a reward. The boy took a chess board. He put one grain of rice on the first square. He put two grains of rice on the second square. Then 4 grains on the third square, 8 on the fourth, 16 on the fifth. He then said to the king; "You must keep doubling the grains on each square, for all of the squares on the board". The king was very pleased; he thought that the reward was a very small one.

Just to see how many grains of rice the boy will get, work out how many grains there are on the last square of the chessboard.

- Use a calculator.
- Start with 1 for the first square and then do  $\times 2$  over and over.
- You want to do  $\times 2$  sixty four times !
- What do you get ?

An ordinary calculator will have to stop after only 34 times. The display just isn't big enough !

A scientific calculator would say  $1.8 \times 10^{19}$ . Which means 18 000 000 000 000 000 000.

If you assume that there are one million grains of rice in one sack. The boy would still get 18 000 000 000 000, which is 18 trillion sacks, just on the last square alone.

The King did not look so happy when he realised !!