

## How many for a million?

### How many sheets of graph paper for 1 million, or 100 million, or a 1000 million squares?

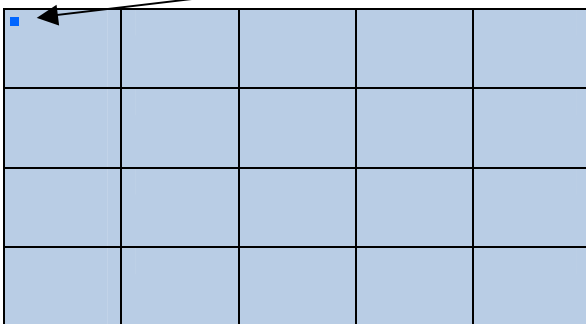
We can easily talk about a million years – but how can we give pupils an idea of how vast 1,000,000 actually is?

#### 1 million

Try giving your pupils single sheets of millimetre-squared graph paper then:

- ask them to colour in adjacent squares for each year of their life so far, probably 10 – 15 squares;
- ask them to work out how many squares are on one sheet of graph paper;  
*A. The sheets we used were 180mm x 280mm or just over 50,000 (50,400) squares per sheet.*
- they should calculate how many sheets they would need for a million squares;  
*A. For our sheets, 1,000,000 divided by 50,000 = 20 sheets.*
- show them 20 sheets of graph paper stuck together, with the life-span of one child coloured in, and the life-span of a 100 year old adult in a different colour, and ask them to note how small the life-spans are on the 20 sheets of graph paper representing a million years;
- tell them that 1 million years ago (1Ma = 1 million annum) was the middle of the last ice age, with glacial conditions and thick ice sheets covering northern continents.

A 100-year long life on 20 sheets of millimetre-squared graph paper, representing 1 million years.



A geological time spiral.

*This image is in the public domain because it contains materials that originally came from the United States Geological Survey*

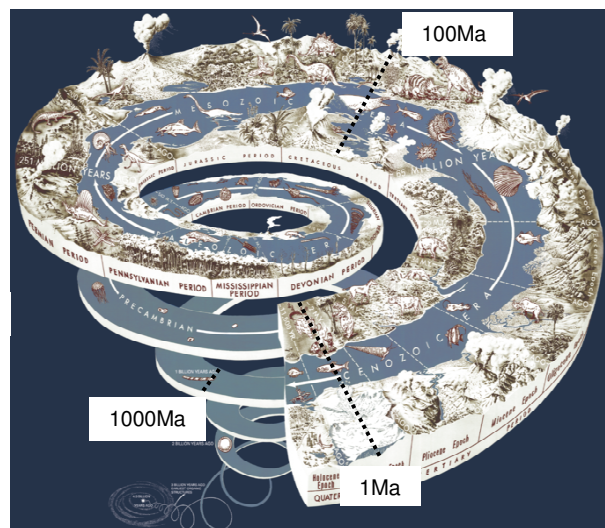
#### 100 million

- Ask them to calculate the area of the 20 sheets of graph paper;  
*A. Using A4-sized graph paper, 297mm x 210mm x 20 is just under 1.25m<sup>2</sup> (1.2474)*
- ask them to calculate how much wall would be covered by sheets representing 100 million years (100 million squares) (or 100x the measurement above);  
*A. 125m<sup>2</sup> wall, or a wall 4m high and more than 30m long (31.25m) – the size of a sports hall wall, covered by 2,000 sheets.*
- point out that the dinosaurs and ammonites were flourishing 100 million years ago.

See what 2,000 sheets of graph paper together would look like in the diagram at the end.

#### 1000 million

- Then they could calculate how much wall they would need for a 1000 million years;  
*A. 1250m<sup>2</sup> of wall; a wall 10m high and 125m long, the length of a street; or a wall 1m high and 1.25 km long, covered by 20,000 sheets.*
- note that a billion years ago tiny multicellular organisms had only recently evolved underwater (at about 1200 million years ago), and the land would have no plants or animals for the next 600 million years;
- finally, ask them to visualise how difficult it would be to find their own life-spans in the 20,000 sheets of graph paper needed for one thousand million millimetre squares (equivalent to one thousand million years ago).



## The back up

**Title:** How many for a million?

**Subtitle:** How many sheets of graph paper for 1 million, or 100 million, or 1000 million squares?

**Topic:** Calculations to help pupils to visualise the enormity of a million years, and then 1000 million years.

**Age range of pupils:** 10 – 15 years

**Time needed to complete activity:** 15 mins

**Pupil learning outcomes:** Pupils can:

- give an idea of a million years, 100 million years and 1000 million years, in comparison with their own life-spans;
- carry out simple calculations using arithmetic, a calculator or a spreadsheet.

**Context:**

Pupils are asked to use the 50,000 mm<sup>2</sup> squares on a sheet of graph paper as a means of visualising what 1 million, 100 million and 1000 million look like.

**Following up the activity:**

Pupils could be asked to carry out other calculations giving large figures, such as:

- How many 300mm rulers end-to-end would you need to measure one million mm (1 km)?  
*A. 3,333.3 rulers.*
- How long is a million seconds? *A. 11.57 days.*
- If you made £1000 per week, how long would it take you to make £1 million? *A. Nearly 20 years (19.2 years).*

**Underlying principles:**

- Since pupils find difficulty in working with large numbers, it helps to ask them to visualise what the large numbers would look like in different contexts.

**Thinking skill development:**

The calculations will help pupils to develop mathematical skills; visualising 1 million squares and translating those into a picture of a million years involves bridging skills.

**Resource list:**

- a piece of 1mm squared graph paper per pupil or group of pupils
- pencils or pencil crayons
- calculators, computer spreadsheets or spare paper for arithmetic
- 20 pieces of millimetre-squared graph paper stuck together into one large sheet, with 10-15 squares coloured in (life-span of a child) and 100 squares coloured in (life-span of a 100-year old adult).

**Useful links:**

Consult: <http://www.kokogiak.com/megapenny/> for web pages of the MegaPenny project helping to visualise a million and larger numbers using US pennies. Other ways of visualising a million can be found on the Wikipedia page: <http://en.wikipedia.org/wiki/Million> .

**Source:** Devised by Peter Kennett and written by Chris King of the Earthlearningidea Team.

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2,000 sheets of A4 paper (40 x 50) with 100 million squares would look like this – 20,000 sheets representing 1000 million squares would be ten times this size.

