

Problem of the Week: Week 1 (Sum2): Year 10: Number: Standard form and Accuracy

- calculate with numbers in standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer
- **{change recurring decimals into their corresponding fractions and vice versa}**
- apply and interpret limits of accuracy when rounding or truncating, **{including upper and lower bounds}**.

Big and small numbers in the physical world

<https://nrich.maths.org/7278>

Think about how best to approximate these things from the physical world around us. You will need to make some estimations and find information from friends or other sources, as would any scientist! Take care to represent all of your answers using a sensible number of decimal places and be sure to note all of your assumptions clearly.

1. Light travels at $c=3 \times 10^8$ metres per second. How fast is this in miles per hour? How many times faster is this than a sports car?

2. The Milky Way is a spiral galaxy with diameter about 100,000 light years and thickness about 1000 light years. There are estimated to be between 100 billion and 400 billion stars in the galaxy. Estimate the average distance between these stars.

3. Density of lead 11.34 g/cm^3 . How big would a tonne of lead be?

4. How many AA batteries contain enough charge between them to run a laptop for an hour?

NOTES AND BACKGROUND

An obvious part of the skill with applying mathematics to physics is to know the fundamental formulae and constants relevant to a problem. By not providing these pieces of information directly, you need to engage at a deeper level with the problems. You might not necessarily know all of the required formulae but working out which parts you can and cannot do is all part of the problem-solving process!

Recurring Mean

This problem is taken from the [UKMT Mathematical Challenges](#).

What is the mean of $1.\dot{2}$ and $2.\dot{1}$?