

Working with Large Numbers
Physics II: Modern Physics
Tuesday and Wednesday, March 29 and 30, 2022
College of the Atlantic

Do these exercises in pairs. There is nothing to hand in. But please check with me before you leave so I can check your answers.

Scientific Notation

- Convert the following numbers to scientific notation:
 - 10000
 - 0.0004
 - 123000000
- Express the following quantities in scientific notation:
 - 300 million
 - 2.4 billion
- Express the following quantities in non-scientific notation:
 - 6.13×10^5
 - 4.3×10^{-3}
- Calculate the following, first without, and then with a calculator.
 - $(4 \times 10^6) \times (5 \times 10^3)$
 - $(10 \times 10^3) \times (5 \times 10^{-5})$
 - $\frac{20 \times 10^9}{300 \times 10^6}$
- Evaluate the following using a calculator:

$$\frac{4\pi}{\sqrt{3000 \times 2.2 \times 10^{-10}}} \quad (1)$$

$$9.1 \times 10^{-31} (300 \times 10^6)^2 \quad (2)$$

Large Numbers

These questions explore a number of different ways to make large numbers relatable and understandable.

1. Visualizing numbers
 - (a) Draw a number line from 0 to 10. On that number line, represent the numbers 1, 2, and 5.
 - (b) Draw a number line from 0 to 1000. On that number line, represent the numbers 10, 100, and 500.
 - (c) Draw a number line from 0 to one billion. On that number line, represent the numbers one million, two million, and 10 million.
2. Time...
 - (a) How many days are in a million seconds?
 - (b) How many years are in a billion seconds?
 - (c) How many years are in a trillion seconds?
3. The 2018 US national budget is around 4.4 trillion dollars. Included in this is 886 billion in military spending. US foreign aid (non-military) is around 33 billion.
 - (a) Convert all these numbers to per person.
 - (b) Briefly discuss the relative size of these numbers.
4. The net worth of Jeff Bezos, the founder of Amazon, is around 190 billion US dollars. Amazon was founded 27 years ago. At what rate, in US dollars per second, did Bezos accumulate wealth over these 27 years?
5. Repeat the above question but for a wealthy person from the US who might have a net worth of one million dollars after 30 years of work.