EXPLORE: Estimation and Fermi Problems

Physicists should be curious! It is great to ask hard questions and get others thinking. Often in physics these difficult questions involve calculations and sometimes it is quicker, easier and more useful to make a power of 10 estimation known as an order of magnitude estimation rather than calculate an exact value.
This is a very important mathematical skill that you need to develop.

Watch this introduction video on Fermi Problems: https://youtu.be/0YzvupOX8Is

Using this idea of order of magnitude estimation, **visit these famous Cambridge landmarks and answer the following questions**. Remember exact numbers do not matter, we want an estimate.

1. Visit Great St. Mary's Church. How many ping pong balls would fit inside?
2. Visit Jesus Green. How many people could have a picnic there in one summer?
3. Visit a library in the city. How long would take to read every page inside?

Now, with Cambridge as an inspiration, come up with your own Fermi question and answer.

During our first lesson in September you will challenge your classmates with your question. Everyone will then work on the all of the proposed questions and we will discuss our order of estimate answers together.

Extra Reading: Research the Fermi Paradox for an interesting take on the probability of extra-terrestrial civilisation and survival or our own. This is far deeper than a simple maths challenge.

CHALLENGE: Physics in Sport

Physics and sports are intrinsically linked. Success in any sport depends on an athlete's ability to exploit the laws of physics to their advantage – this requires understanding of forces and mechanics. These topics form a large part of the first module you will study at A level.

Read this article on how cyclists have learned to work with air resistance and through innovative design have managed to shave seconds off their race times. https://www.bbc.co.uk/news/magazine-19166035

Calculations are often used in sport to analyse performance and increase the chance of future success.

To explore this idea, **please complete the *Estimating force in rugby tackles* worksheet** (link below). All of the information and equations you need are listed at the beginning of the worksheet. You should submit your answers through the online Isaac Physics answer form where you may get more information for each question. We will use this platform throughout the A level course.

Estimating force in rugby tackles worksheet:
http://www-spc.phy.cam.ac.uk/files/rugby_tackle_isaac_no_solutions.pdf
Please submit your answer to the worksheet on the Isaac Physics Platform:
https://isaacphysics.org/questions/rugby_tackle_answers?stage=gcse