what's the point of...

TRIGONOMETRY?

You can run... but you can't hide (forever...)

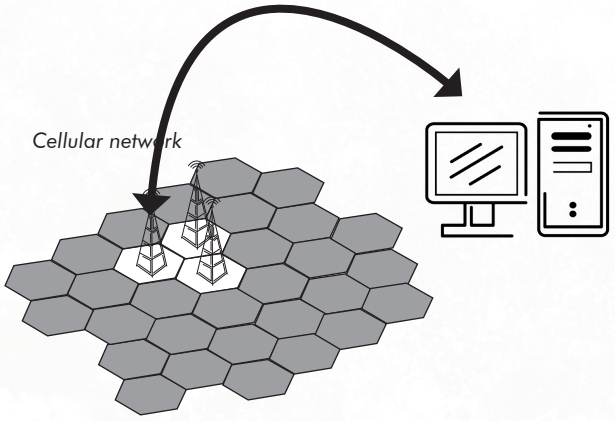
Going back to early July 2005, London was alive. But no sooner than the announcement for the 2012 Olympics been made, than Londoners were caught unawares by devastating acts of terrorism. The world is not always a safe place - but a little maths can help to make it a lot safer.

With security services across the world on full alert, the hunt was on for those responsible for the failed attacks of July 21st.

One of the suspects had fled to Rome in Italy, and took his mobile phone having changed his SIM card in the process. However a mobile phone can be tracked in two ways - using a unique identifier sent by the SIM card, and also by using a unique identifier sent by the handset (IMEI number).

Distances and angles between transmitters on a mobile phone network can help track phone users using:

$$\frac{A}{\sin A} \quad \frac{B}{\sin B} \quad \frac{C}{\sin C}$$

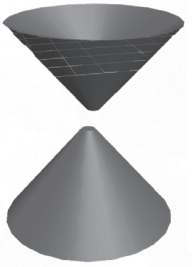


Using transmitters which are positioned at known locations, the minute a call is made from a handset, it is relatively simple to work out the location of the user using the sine rule, as their location is often the third point in a triangle.

Geometry and trigonometry also have huge roles in civil and military applications including locating aircraft through multilateration and hyperboloid shapes. This is based on the following principle: If a signal is sent from one location then receivers in different locations will get those signals but at different times. This is very useful for tracking aircraft and satellites.

Is Big Brother really watching you or is the world a safer place for all the surveillance? There are some questions maths can't answer...

Multilateration



$$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1$$

$$\frac{A}{\sin A}=\frac{B}{\sin B}=\frac{C}{\sin C}$$

• For further information, articles and resources visit: www.moremathsgrads.org.uk • www.mathscareers.org.uk plus.maths.org • nrich.maths.org • www.cs4fn.org

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Welcome to Hollywood

Have you ever watched an animated movie, and thought 'how do they do that?' The chances are it is not just tracing paper and colouring pens...

The maths learnt at GCSE and A Level can actually help bring animated movies to life.

Tony DeRose is a computer scientist at Pixar Animation Studios. He realised his love of mathematics could transfer into the real world and a really interesting job by bringing the pretend world of animation to life. "Without mathematics we wouldn't have these visually rich environments and visually rich characters," explains Tony.

Advances in maths can lead to advances in animation. Earlier maths techniques show simple, hard, plastic toys. Now, advances in maths help make more human-like characters and special effects. DeRose explains the difference a few years can make, "You didn't see any water in *Toy Story*, whereas by the time we got to *Finding Nemo*, we had the computer techniques that were needed to create all the splash effects." How do maths classes help with the animation?

Trigonometry helps rotate and move characters, algebra creates the special effects that make images shine and sparkle and calculus helps light up a scene.

DeRose encourages people to stick with their maths classes. He says, "I remember as a mathematics student thinking, 'Well, where am I ever going to use simultaneous equations?' And I find myself using them every day, all the time now."

Even simple triangles rotating in 3D can produce results that are winning Oscars, including the manipulation of Gollum from *Lord of the Rings*.

From modern art to computer games to architecture – the humble triangle has come a long way from the text books of the ancients…

Where will your maths skills take *you*?

Need a job? Know your trig!

The rough with the smooth, good times and bad times, highs and lows. There are many clichés that describe the phenomenon of the boom-slump cycle.

Did you know that using trigonometry we can forecast when there are going to be bad times and when there are going to be good times in the economy? Financial analysts and politicians use this knowledge to plan for times of high unemployment and for making investment decisions. The peaks represent times of high employment and the troughs represent times of high unemployment.

Maths helps in planning your future. Can you plan a future without maths?