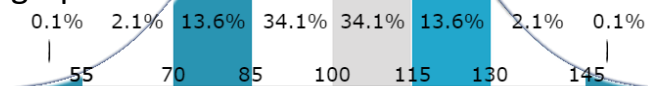## News

In the film *The Godfather Part II*, Michael Corleone says, "Keep your friends close, and your enemies closer." That was back in 1974. The advice now though is to keep your friends at least 2 metres away, and to also keep your enemies at least 2 metres away. Basically, ignore any advice given in old films. It doesn't apply anymore. Everything's changed.[1] Except in maths obviously. Everything that was true in maths in 1974 (and even before that) is still true, because mathematical truths are based on logical proof and viruses have no effect on things like that.

Maths Word

There has been quite a bit of maths in the news lately, in relation to the coronavirus pandemic. For example, you may have seen this graph.

Its shape shows how many cases of the virus we should expect at any given time, if protective measures have or have not been taken. The shape of this graph is called its **distribution**. The protective measures should have the effect of flattening the curve, enabling the NHS to cope with the number of cases.
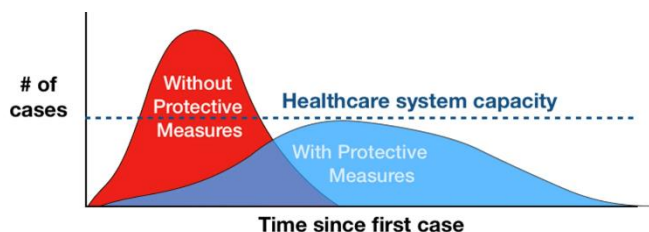
The Normal Distribution

One of the most common and most important distributions is called the normal distribution. It looks like this; similar to, but not quite the same as the curve in the coronavirus graph we have just seen. This graph shows

the results of a standard IQ test, for measuring people's intelligence. The average IQ, which is 100, is in the middle of the graph and is the highest point on the graph. If you look higher or lower than 100, you see that the height of the graph drops on both sides, forming a symmetrical shape sometimes called a bell curve. Many things that behave in this sort of way can be modelled using a normal distribution. In fact, it is called normal because it is the way most things normally behave.

A Strange Fact

Meanwhile, here's something that's not normal. π is the ratio between the diameter and circumference of a circle[2], and e is the base of the natural logarithm[3], so why is this true?

$$\frac{\pi^4 + \pi^5}{e^6} \approx 0.99999996$$

It's a very strange coincidence.

1. Yes, I know this is the strangest start to a maths newsletter we've ever had. Just go with it. It'll be fine.
2. Or is it between the circumference and diameter of a circle? Is there a difference?
3. You might want to look this up! It's a very interesting number.

Social Distancing

So why is social distancing so good at slowing down the spread of the virus? You've probably seen diagrams like this,
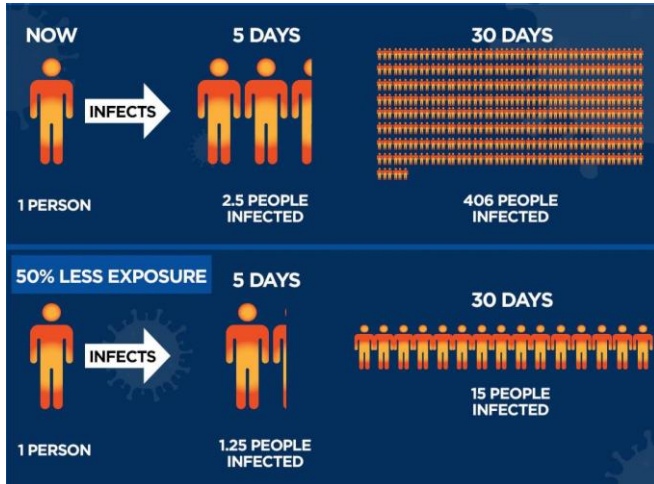
saying that if you halve the number of people you come into contact with you could reduce the number of people infected from 406 to 15 over a 30 day period. So how does this work? It's a bit like compound interest.[4] If you infect x people on the first day, then those x people infect x more people the next day, and so on, after n days there will be x^n infected people. If you halve the number of people who get infected every day, then after n days there will be

$$\left(\frac{1}{2}x\right)^n = \left(\frac{1}{2}\right)^n x^n = \frac{1}{2^n}x^n$$ infected people.

If you think about what this means over a 2 week period; after 14 days, if you halve the number of people that each person infects each day, the total number of infected people will be $\frac{1}{2^{14}} = \frac{1}{16384}$ of the number of people that would otherwise have been infected! The numbers used in the diagram we're being shown are slightly different, but the basic principle is the same.
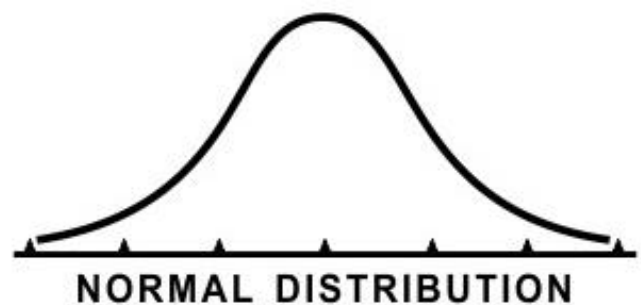
Addition Pyramids

Here's a puzzle from Jo Morgan.[5]
Let us know if you solve it!

Joke

The Easter Holidays

Don't forget to have a good break over the Easter holidays, and keep sending me jokes and puzzles for the newsletter!

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4. A year 9 topic, but you could look it up if you're in years 7 or 8.
5. I know. You don't know who that is. It doesn't matter. I'm just trying to give people credit for stuff!