



$$1^2+2^2+3^2+4^2+5^2+6^2+7^2+8^2+9^2+10^2+11^2+12^2+13^2+14^2+15^2+16^2+17^2+18^2+19^2+20^2+21^2+22^2+23^2+24^2=70^2$$

### News

Because this is going to be the last maths newsletter before the summer holidays, I thought I'd start with a picture of a cat.

Did you know that a cat can rotate its ears 180 degrees?<sup>1</sup> This is due to them having 32 muscles to control each ear.<sup>2</sup> What I find fascinating about this, as I'm sure you do

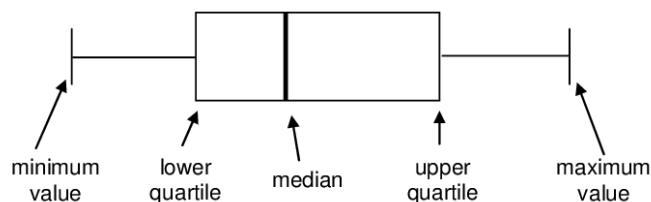


too, is the level of accuracy here. I've not found a website that says that actually a cat can rotate its ear 179 degrees or 181 degrees. What we clearly have here is one of two things. Either this angle has been rounded, and we don't know to what extent it's been rounded, or – and I prefer this idea – cats are really accurate when it comes to angles. As you know, cats are naturally very neat and tidy creatures. I like to think that the reason they have 32 muscles to control each ear isn't because the addition of the 32<sup>nd</sup> muscle provided them with an evolutionary advantage that just wasn't present with 31 or 33 muscles. I prefer to think that when they reached 32 muscles they thought, "32 is 2 to the power of 5. That's very neat, and I like that, being a neat and tidy cat. It's also the melting point of ice on the Fahrenheit scale. So let's stop adding muscles now. 32 is perfect."<sup>3</sup>

Anyway, enough of this...

### Maths Word

A **boxplot** (sometimes known as a **box and whisker diagram**<sup>4</sup>) is a kind of graph or chart<sup>5</sup> used mainly for comparing two different sets of data.



The reason why boxplots are interesting is that they were not invented until 1970, by a man named John Tukey. As far as I know, this makes the boxplot the newest thing to be included on the GCSE Maths syllabus<sup>6</sup>, unless of course you can find something even newer.

### Joke



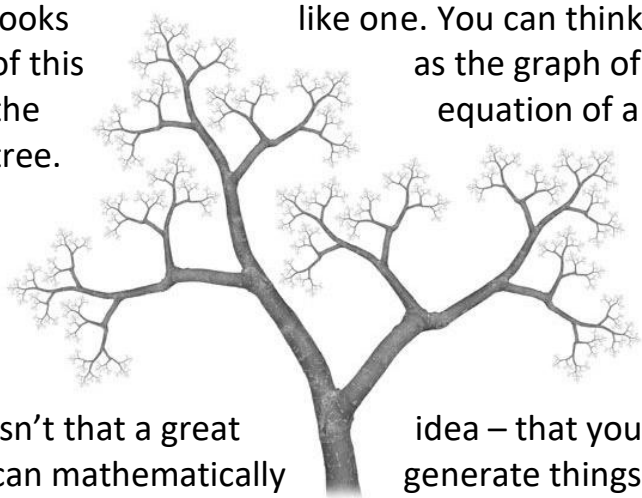
1. This seems to be a pretty undisputed fact, according to many websites.
2. Hang on a minute – what is this? The biology newsletter?
3. Notice that even though this is about cats. I didn't say 'purr-fect'. The important thing with puns is knowing where to draw the line (and before you tell me, I know 32 isn't a perfect number).
4. Notice the link here from the previous stuff about cats.
5. What is the difference between a graph and a chart? If you find out, please let us know.
6. In mathematical terms, 1970 is extremely recent.

# Fractals

## What does the B in Benoit B Mandelbrot stand for? Benoit B Mandelbrot

Benoit B Mandelbrot is largely responsible for the field of mathematics called fractal geometry.<sup>7</sup>, which shows how very simple mathematical rules can lead to complex results. This means that things that appear to be very messy and complex can sometimes be described mathematically without having to use very messy and complicated maths. For example, have you ever noticed that if you zoom in on a picture of a tree, it looks like its made up of smaller versions of itself? For example, look at this one. It's not a real tree, but it looks like one. You can think

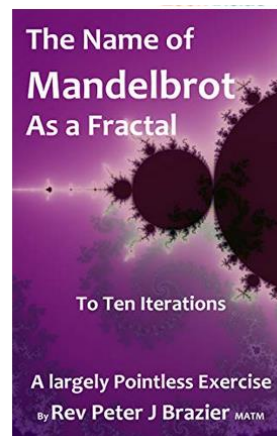
of this as the graph of the equation of a tree.



Isn't that a great idea – that you can mathematically generate things like trees? In fact, many of the complex landscapes and special effects in modern films are created in this way.<sup>8</sup>

The statement at the top of this column is a joke<sup>9</sup> based on the idea that if you zoom in on the name of Benoit B Mandelbrot, you will discover that the B is actually just another copy of his full name – Benoit B Mandelbrot – but what would the B in the full version of his middle name be short for? Where would this end?

Well, clearly it would never end, but what exactly would happen? I recently found out about this book called *The Name of Mandebrot as a Fractal to Ten Iterations*, by Reverend<sup>10</sup> Peter Brazier, who is actually working on a project about something called Fractal Theology. What would happen if you wrote the name Benoit B Mandelbrot in Word, then did a 'find and replace' so that every B (and also every lower-case letter b) was replaced by 'Benoit B Mandelbrot'? And what if you did this 10 times? Believe it or not, you would end up with a book that's 555 pages long. Peter Brazier says he "cannot begin to guess" how long the book would be if you did this 20 times. If any of you want to try it and let me know, I'll pass the answer on to him. What if you did it  $n$  times? If, at this point, you're thinking "but what's the point of this book?", there really isn't one. Peter himself describes it as "a bit of nonsense", but I'm sure you'll agree it's a fun idea and the fact that somebody has made this book makes the world a slightly more interesting and fun place to live. If you can find a book that's even more pointless than this though, please let me know and I'll tell everyone about it!



So now I've got no room for any new puzzles this week, but don't forget there are 69 other maths newsletters for you to work through on our school website at <http://kechg.org.uk/departments/mathematics/>. Have a good summer, and we'll see you all in September! 😊

7. See newsletter 4 for more about fractals. You can do this now because all the newsletters are on our website.

8. This video <https://www.youtube.com/watch?v=HvXbQb57IsE> is really great and tells you all about this.

9. You know – one of those 'maths jokes' that we love.

10. Remember how Flatland was written by a theologian? Clearly there is a link between some religious ideas and some mathematical ideas.