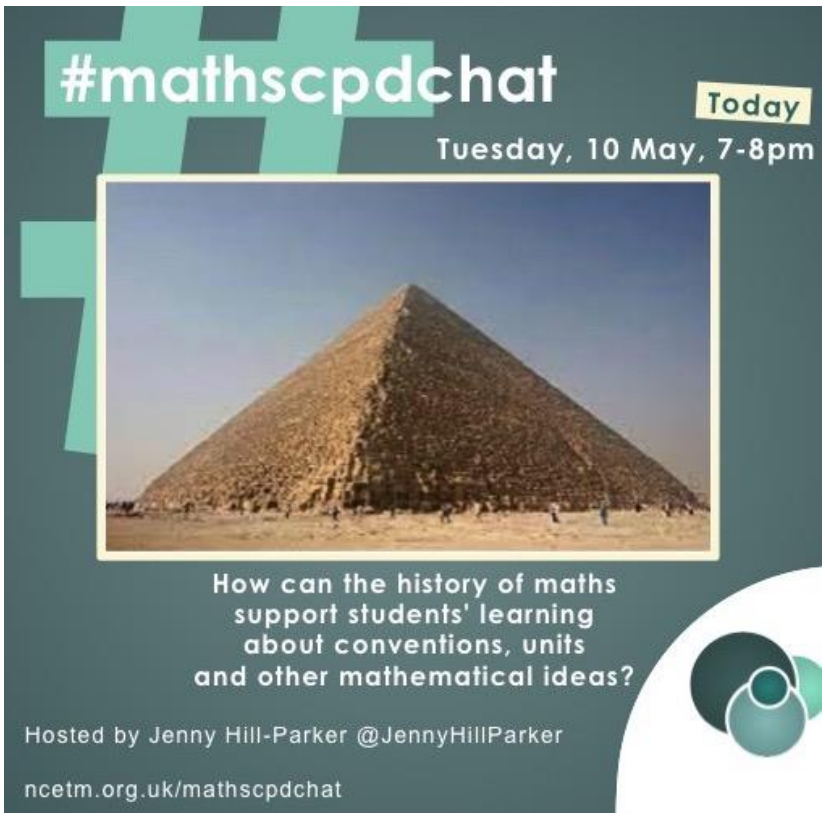
#mathscpdchat 10 May 2022

How can the history of maths support students' learning about conventions, units and other mathematical ideas?

Hosted by Jenny Hill-Parker

This is a summary of the discussion – to see all the tweets, follow the hashtag ***#mathscpdchat*** *in Twitter*



The links shared during this discussion were:

Gresham College Lectures which are 310 videos, each being of a different lecture about mathematics and/or its history. The lecturers are distinguished mathematics educators and mathematicians. For example, the last lecture that you find as you scroll down the webpage is Great Mathematicians, Great Mathematics: An introduction by Professor Raymond Flood. It was shared by Jenny Hill-Parker

Schools Writing Prize in the History of Mathematics which is where you will find detailed information about the 2022 prizes that will be given by the British Society for the History of Mathematics in cooperation with the *Plus Magazine* for the best essays or presentations on some aspect of the history of mathematics. Separate awards are presented every year to students in the 11 -15 age group and the 16-19 age group. It was shared by Jenny Hill-Parker

5 Simple Math Problems No One Can Solve which are problems presented by Avery Thompson that are 'easy to understand, supremely difficult to prove'. It was shared by Jenny Hill-Parker

Literacy in Mathematics which is are educational resources created by Jenny Hill-Parker to support literacy in Mathematics. The collection (presented on a padlet) include her Guided Reading resources that Jenny mentioned during the chat. It was shared by Jenny Hill-Parker

MacTutor History of Mathematics Archive which is a free online resource provided by the School of Mathematics and Statistics at the University of St Andrews, Scotland. It contains biographies of more than 3000 mathematicians and over 2000 pages of essays and supporting materials. It was shared by Mary Pardoe

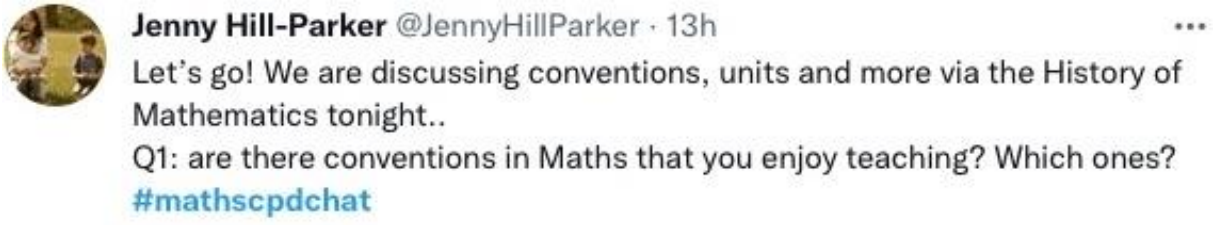
George Boole which is a page in the MacTutor History of Mathematics Archive. It is possible within the website to find a list of mathematicians associated with any of many listed locations (in this case, Lincolnshire). Therefore, teachers may be able to find maths-history resources of particular local interest to their students. It was shared by Mary Pardoe

The teaching of mathematics: some conclusions which is another page in the MacTutor History of Mathematics Archive. It summarises the key changes in Mathematics Education from the time of the fall of the Roman Empire until the industrial revolution in England. It was shared by Mary Pardoe

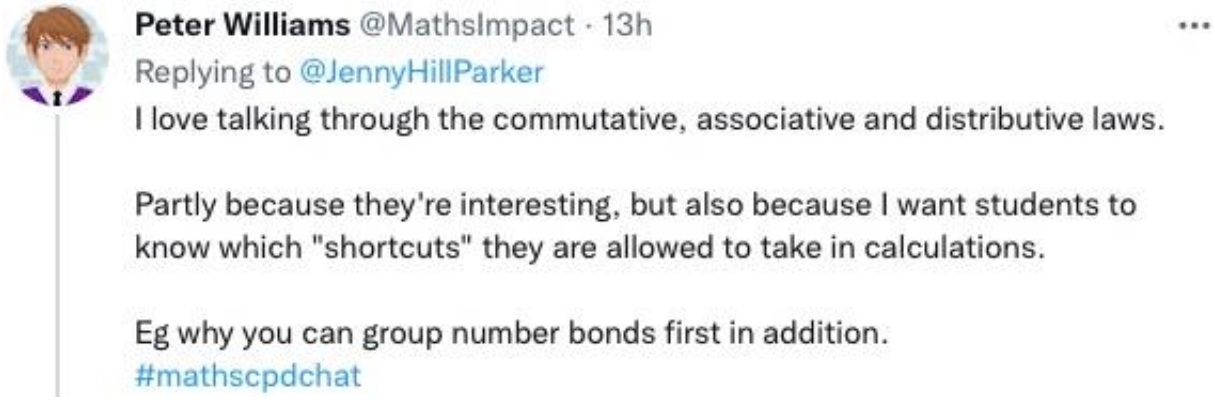
A full illustrated summary of the discussions in this #mathsCPDchat follows.

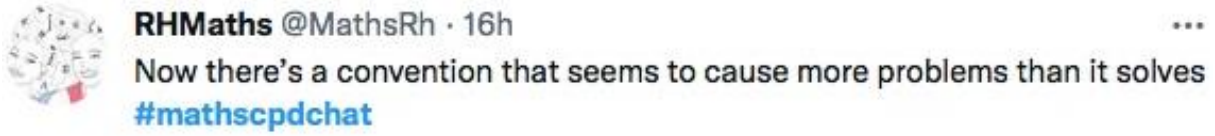
Jenny's Q1 generated most of the replies and discussion that comprised the chat. The (linked-to-Twitter) screenshots below show those conversations and replies. Click on any screenshot of a tweet to go to that actual tweet on Twitter.

The following conversations and replies were in response to these linked questions from the host Jenny Hill-Parker:



This conversation, in which 'opening a can of worms' featured, was between Peter Williams, Mary Pardoe, RHMaths, Joe Crowther and Vicky Osborne:





Joe @jcrowthermaths · 15h

Replying to @MathsImpact and @JennyHillParker

Out of interest how and when do you incorporate this into your teaching? I'd like to teach the field axioms properly from scratch but it's difficult to fit into the SoW, particularly the one I currently teach.

Peter Williams @MathsImpact · 15h

It's a bit haphazard to be honest, I just throw it in when it would be useful rather than it being explicit in the scheme of work (although this is something I plan to change!).

Often it's something I address as part of order of operations.

Vicky Osborne @CheerVix · 15h

Replying to @jcrowthermaths @MathsImpact and @JennyHillParker

I feel like they're needed before doing anything algebra related, it's just generalisation really isn't it, so year 7?!

This short conversation, about the meaning of 'QED', was between RHMaths, Jenny Hill-Parker and Sheena:

RHMaths @MathsRh · 13h

Replying to @JennyHillParker

#mathscpdchat I enjoy showing students the different conventions for saying 'this proof is complete'

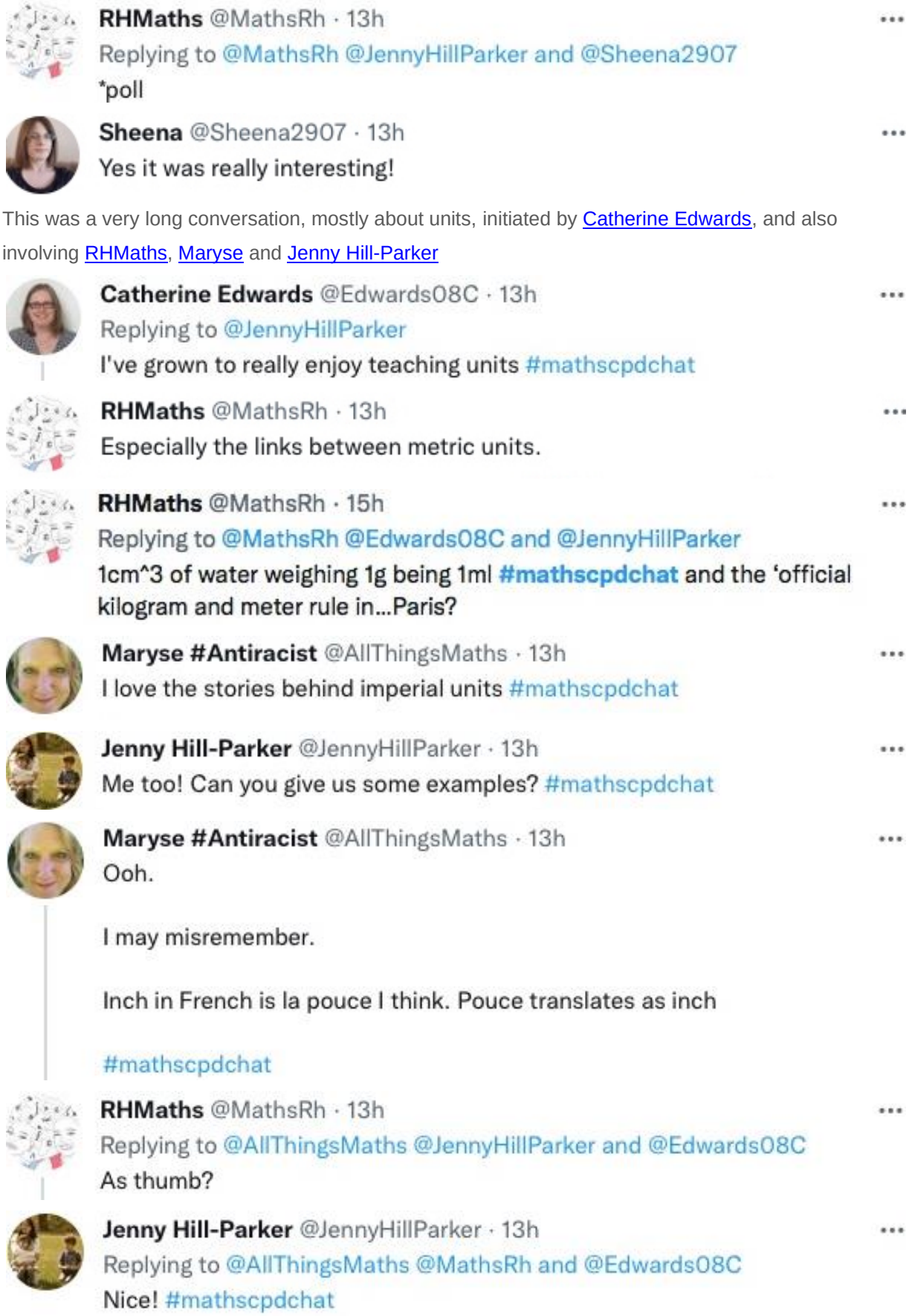
Jenny Hill-Parker @JennyHillParker · 13h

When you write QED? How else can you write 'this is complete?' And what does QED stand for?! #mathscpdchat

RHMaths @MathsRh · 13h

Replying to @JennyHillParker

#mathscpdchat from memory: Quod Erat demonstrandum : that which was to be shown. AKA tiny golden ratio rectangle/as required. I think @Sheena2907 hosted a proof on our favourites a while ago!



This was a very long conversation, mostly about units, initiated by Catherine Edwards, and also involving RHMaths, Maryse and Jenny Hill-Parker

Maryse #Antiracist @AllThingsMaths · 13h

You'd pull a yard of material off a roll that's an arm's length.

Foot is a step.

Acre. How much a horse can till in a day.

I should look them up so I'm not giving wrong information!

#mathscpdchat

Catherine Edwards @Edwards08C · 13h

Arms length is how we always pulled fabric off the roll before measuring, when I worked in a fabric shop. It's surprisingly close

Maryse #Antiracist @AllThingsMaths · 13h

I love that this is "real". It stops measurements being so abstract.

#mathscpdchat

Catherine Edwards @Edwards08C · 13h

I also quite like how made up metric units of measure are. Going back to this idea of conventions. A metre is only a meter because we say it is! #mathscpdchat

Jenny Hill-Parker @JennyHillParker · 13h

Replying to @Edwards08C @AllThingsMaths and @MathsRh

Yes, the imperial units had more of a meaning didn't they? It must have been sooo confusing when the change to metric units came in #mathscpdchat

RHMaths @MathsRh · 13h

Replying to @JennyHillParker @Edwards08C and @AllThingsMaths

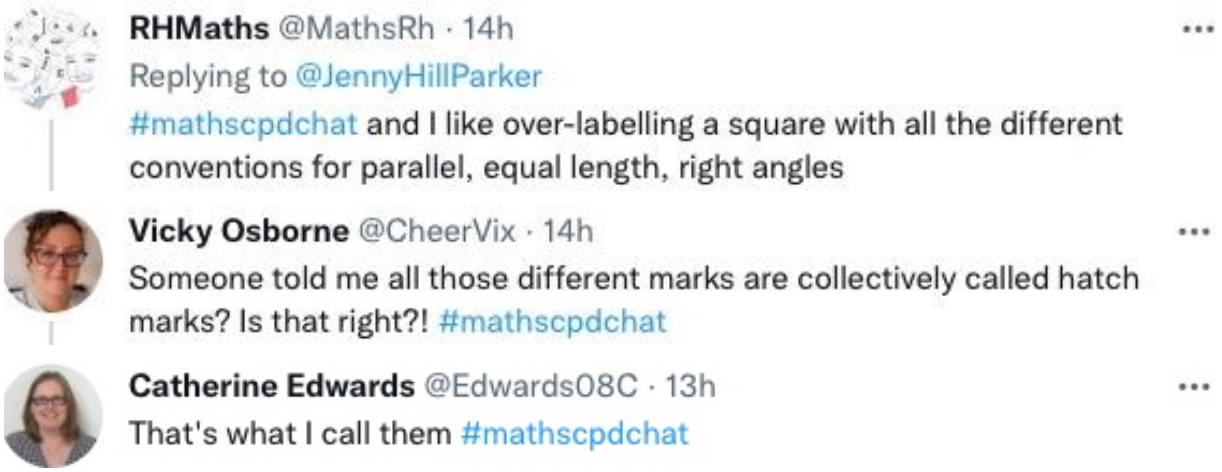
Still happening in some countries 🤣 #mathscpdchat including the U.K.!

Catherine Edwards @Edwards08C · 13h

Replying to @JennyHillParker @AllThingsMaths and @MathsRh

I like to tell about Napoleon decimalising time #mathscpdchat

RHMaths, Vicky Osborne and Catherine Edwards had a short conversation about 'hatch marks':



Vicky Osborne shared a story with Steve Lomax and Jenny Hill-Parker:

Vicky Osborne @CheerVix · 14h
Replying to @JennyHillParker
I love talking about the order of operations and how it came to be, and never ever using BIDMAS in those conversations #mathscpdchat
I'm pretty sure I made up the story but I've told it so many times it's canon now.

SteveLoMMXXII @MaxTheMaths · 13h
Tell me more

Jenny Hill-Parker @JennyHillParker · 13h
Replying to @MaxTheMaths and @CheerVix
Yes @CheerVix we need to know! #mathscpdchat

Vicky Osborne @CheerVix · 13h
Mathematicians used to KILL each other over their work and discoveries, some people say Pythagoras was a member of a cult of mathematicians who hunted down others and killed them! DEAD!! So it became really important to reduce the number of arguments and therefore deaths.

Vicky Osborne @CheerVix · 13h
One argument was always about if we should work left to right or if some operations should be considered more important and go first. <long explanation multiplication is repeated addition, indices are repeated multiplication> and brackets were brought in to keep the ones happy...

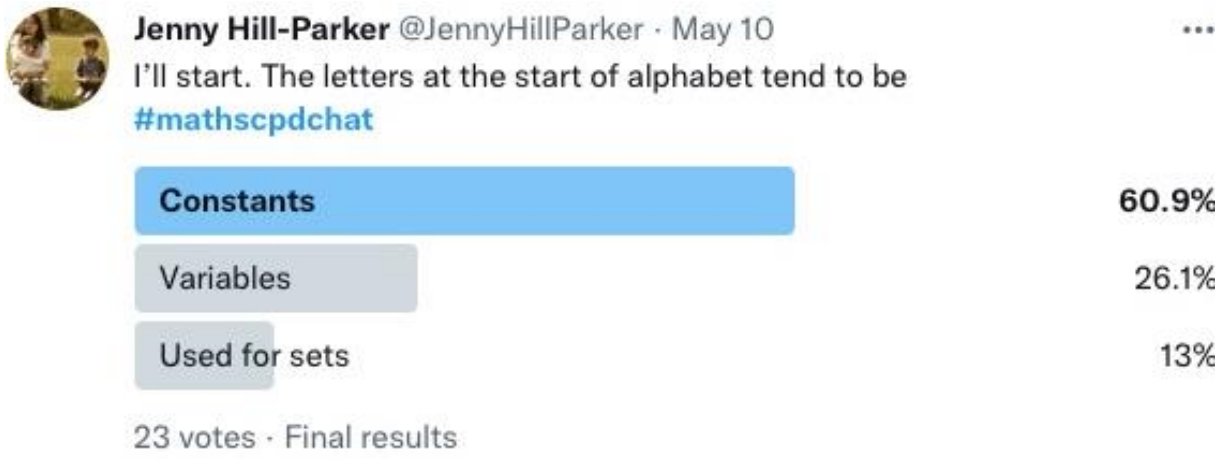
Vicky Osborne @CheerVix · 13h
Who wanted addition first! Everyone's alive! YAY!

SteveLoMMXXII @MaxTheMaths · 13h
Replying to @CheerVix and @JennyHillParker
👍

At the end of the chat RHMaths made a comment to which Vicky Osborne replied:

(to read the discussion sequence generated by any tweet look at the 'replies' to that tweet)

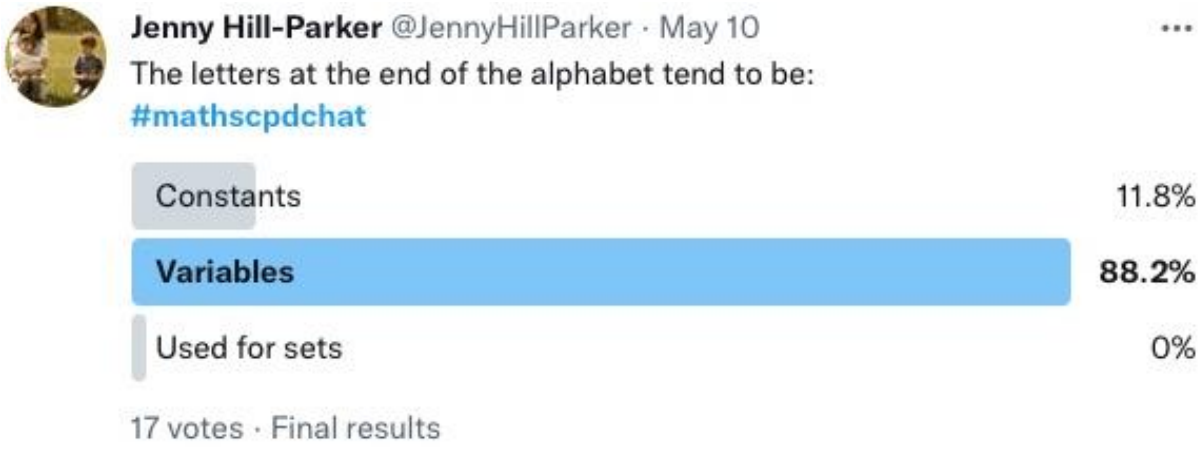
The host tweeted two polls. The first poll …



… prompted this short thread …

… and this:

This was the second poll:



In response to replies and discussions in the thread generated by the host's Q1 (shown above), Jenny (the host) started another shorter thread by asking this question …

… the single replies to which were …

… and:

Another suggestion from Lorna prompted some comments:

watching UK crumble 💙 @LornaMulhern · 14h

Replying to @JennyHillParker

Here's another. Positive direction of bearings is clockwise, positive direction measuring angles when rotating a line from the origin is anti-clockwise.

Jenny Hill-Parker @JennyHillParker · 14h

Replying to @LornaMulhern

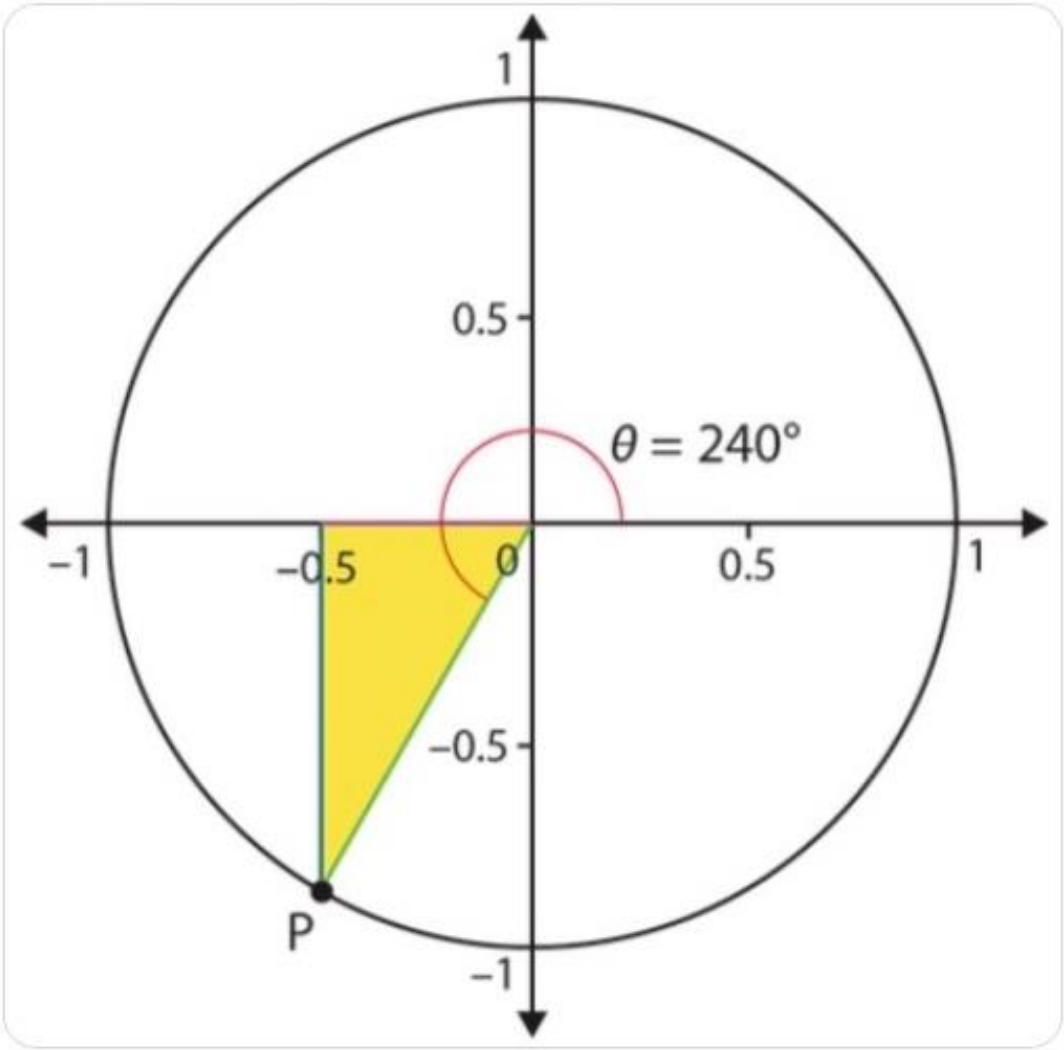
Hmmm, why is this? #mathscpdchat

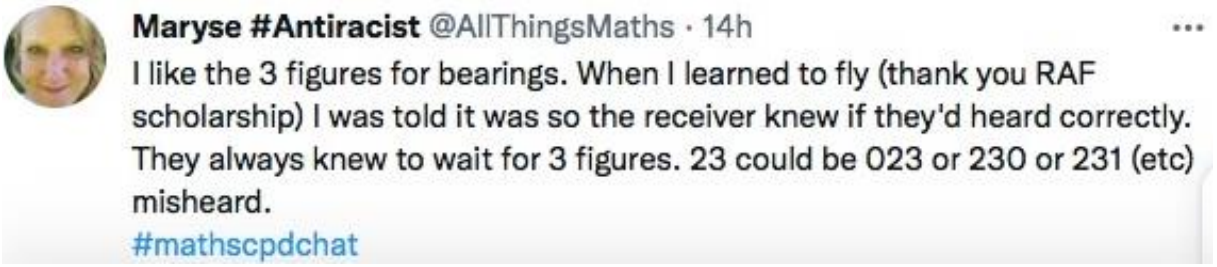
RHMaths @MathsRh · 13h

Don't leave us hanging #mathscpdchat

Mary Pardoe @PardoeMary · 14h

Yes ... several conventions in this, for example ... #mathscpdchat





In response to her own question …

… Jenny also asked …

… to which there were two replies:

While still responding to her own question …

… Jenny asked this interesting question (to which there were no replies):

This important tweet (see link at top of summary) …

Jenny Hill-Parker @JennyHillParker · 15h

There are Gresham lectures on the History of Maths here;

gresham.ac.uk/watch-now/brow...
#mathscpdchat

gresham.ac.uk
Browse All | Gresham College

… prompted this reply:

Mary Pardoe @PardoeMary · 15h

Replying to @JennyHillParker

And MacTutor History of Maths at St Andrews is very useful I have found.
mathshistory.st-andrews.ac.uk
#mathscpdchat

This tweet …

… was about this:

When: Wednesday, May 11, 2022 - 10:00 to 10:45

Where: Zoom

Abstract: In this talk we look at the story of numbers and counting across hundreds of thousands of years. Our journey starts in pre-history, as we consider how early humans kept track of how much 'stuff' they had. We continue the story with the development of counting and numbers by using several different artifacts. Markings on a 70,000-year-old stone and a 20,000-year-old bone reveal much about how important counting was to our ancestors. A decorated 5000-year-old macehead suggests that numbers were being used by those in charge to demonstrate their power and wealth, and a 4000-year-old clay tablet may indicate how people used numbers to design and build large monuments. These last two objects also provide clues to the development of the counting systems we use every day, for example using 60 to count time. We finish our tale with two books from the 9th and 13th centuries which reveal how our modern decimal (base 10) counting system first came to Europe.

Who for: This online talk is suitable for pupils who are in the final two years of primary school in Ireland or the UK.

Biography: Dr. Ciarán Mac an Bhaird is a lecturer in the Department of Mathematics and Statistics at Maynooth University, and also Director of the Mathematics Support Centre. Originally from Lough Egish in Co. Monaghan, Ciarán went to St. Oliver Plunkett's National School, Loughmourne, and then on to Our Lady's Secondary School, Castleblayney. He played GAA for Aughnamullen and soccer for St Ciara's and, in addition to working on the small family farm, he had a wide range of part-time jobs to help pay for college, including working in a furniture and a meat factory. His interest in the history of mathematics grew from another part-time job, working in the Library at Maynooth University, where Ciarán first saw the large collection of old mathematical texts. Around the same time, he also had his first experience of teaching mathematics when giving first-year tutorials. Ever since he has continued his interest in teaching and researching topics from the history of mathematics, while still trying to play some soccer and regularly going home at weekends with his young family to help his parents on the farm.

Maynooth University Department of Mathematics and Physics

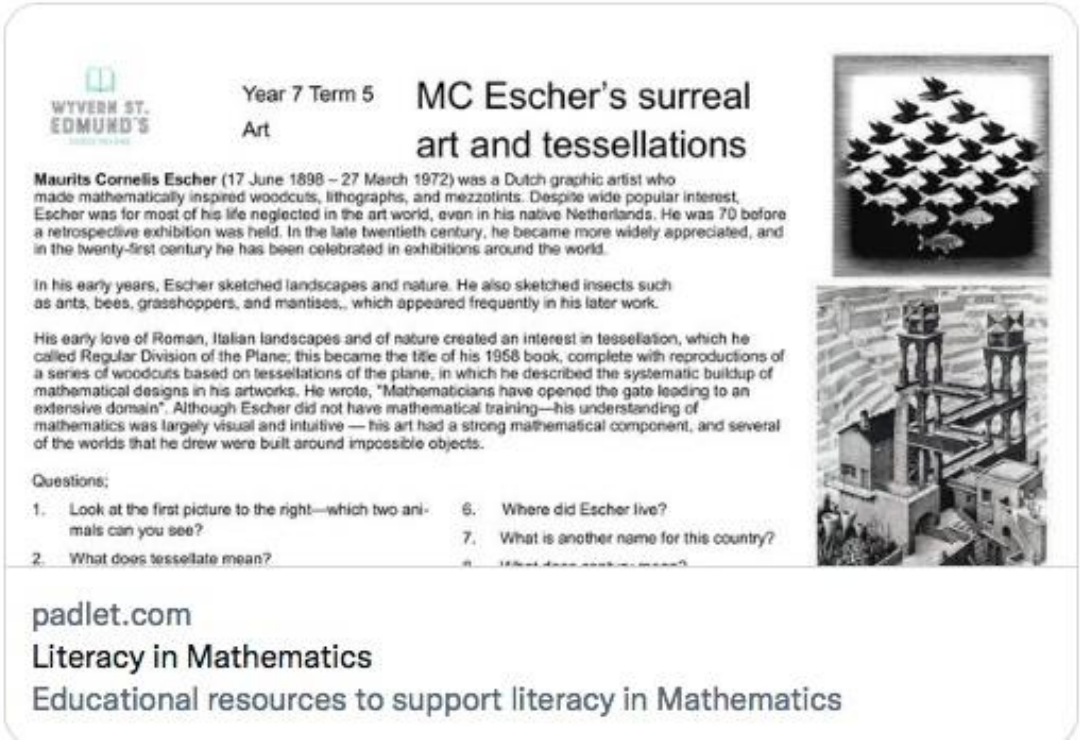
This question …

Jenny Hill-Parker @JennyHillParker · 16h

What resources to you use for discussing famous mathematicians with your students? Term 1 of my Guided Reading resources cover four of them...

padlet.com/jhill_parker/7....

#mathscpdchat



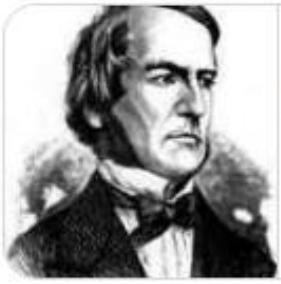
padlet.com
Literacy in Mathematics
Educational resources to support literacy in Mathematics

… prompted a short discussion:

Mary Pardoe @PardoeMary · 16h

Replying to @JennyHillParker

St Andrews' MacTutor has sooo.... many biographies!
e.g. ...
mathshistory.st-andrews.ac.uk/Biographies/Bo...
#mathscpdchat



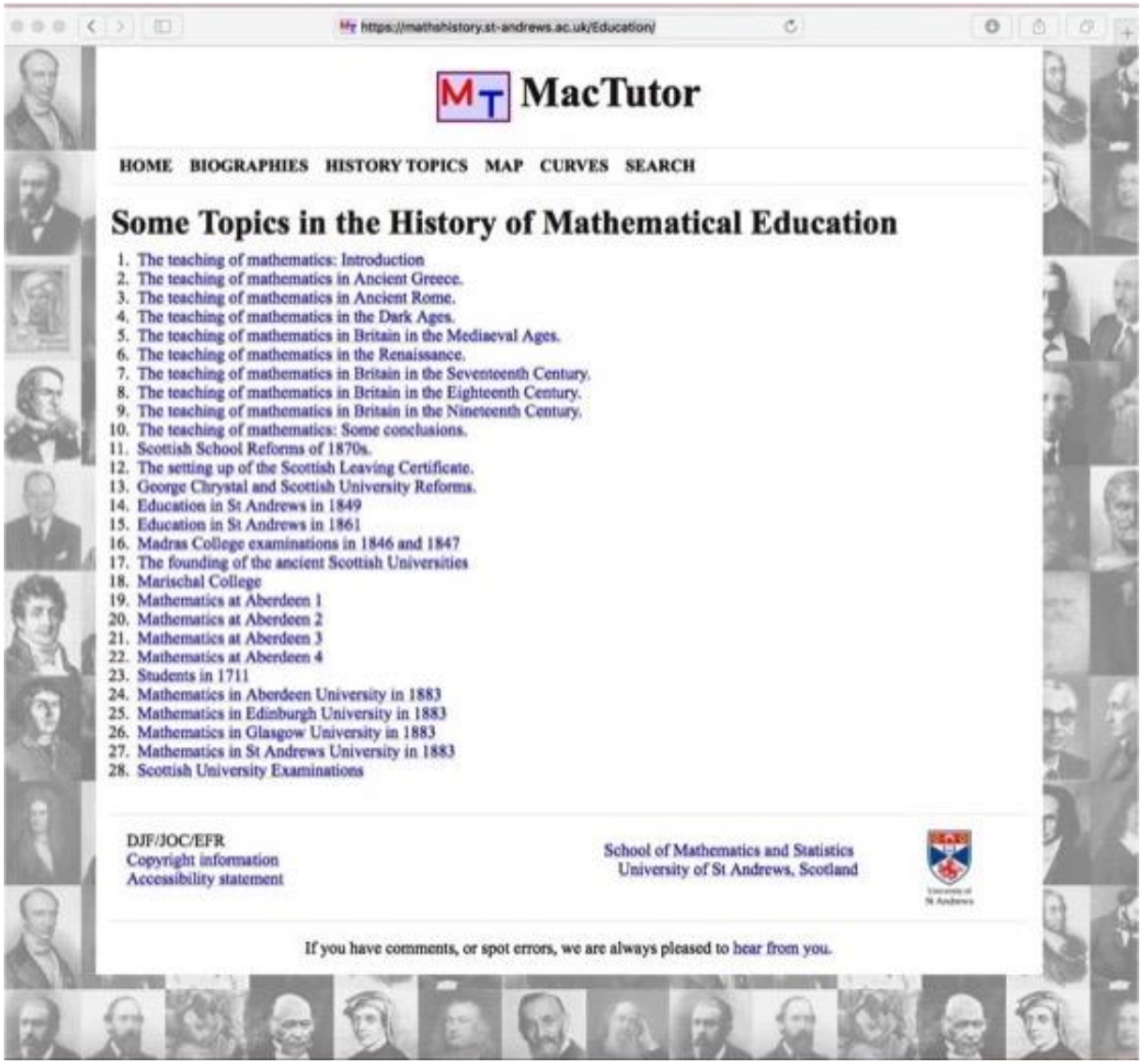
mathshistory.st-andrews.ac.uk
George Boole
George Boole approached logic in a new way reducing it to a simple algebra, incorporating logic ...

Jenny Hill-Parker @JennyHillParker · 16h

I love this site. How would you use it in the classroom? #mathscpdchat

Mary Pardoe @PardoeMary · 16h

I would use (have used) it in preparation for what I would do (have done) in the classroom.
#mathscpdchat



Mary Pardoe @PardoeMary · 16h

Btw … mathshistory.st-andrews.ac.uk/Education/conc…
#mathscpdchat

MacTutor

HOME BIOGRAPHIES HISTORY TOPICS MAP CURVES SEARCH

The teaching of mathematics: Some conclusions.

The fortunes of Mathematics in Education have varied considerably through the ages, from the highest respect and devotion in Greece, its almost disappearance in the Mediaeval ages, to its subsequent re-emergence in the modern times. The key changes in this development have been in response to a small number of events in history and the actions of a few people and organisations.

These can be summarised as follows:

1. The fall of the Roman Empire and the subsequent loss of knowledge and educational practises due to the succession of wars that followed this event.

2. The efforts of a few key people, Charlemagne and Alcuin being probably the foremost among them, to improve educational standards and the knowledge of the general populace and the clergy. Pope Sylvester II also played his part in improving the Church's opinion of Mathematics in the later period of the Dark Ages.

3. The increase in knowledge thanks to texts saved and recovered by the Arabs. Brought to Europe by knights on crusades, and the work of Fibonacci in introducing and promoting the new and improved numerical systems.

4. The rise in commerce and navigation during the Renaissance which meant that people with a good level of mathematical knowledge were sought after as tutors for individuals, or teachers for schools of trade and navigation that were beginning to appear.

5. The invention of the printing press which led to a much wider dissemination of knowledge and mathematical advances thanks to the reduced cost of buying or acquiring books and texts.

6. The foundation of further universities as centres of knowledge and learning.

7. The effect of the Reformation of the Church in both Scotland and England had far reaching consequences for educational standards. Scotland experienced a rise in both the number of schools, and the quality of education supplied by them, and England saw the added effect of the Act of Uniformity in the establishment of the Dissident Academies, many of whom were more open to the mathematical sciences then the traditional Grammar Schools and Universities. Scottish Councils copied this with the foundation of several mathematically strong Academies in Perth, Dundee and other cities.

8. Finally the effect of the industrial revolution with the increased numbers of immigrant workers from the rural areas which because of the rise in illiteracy and lack of numerate skills highlighted the lack of education available there and the insufficient services in the cities.

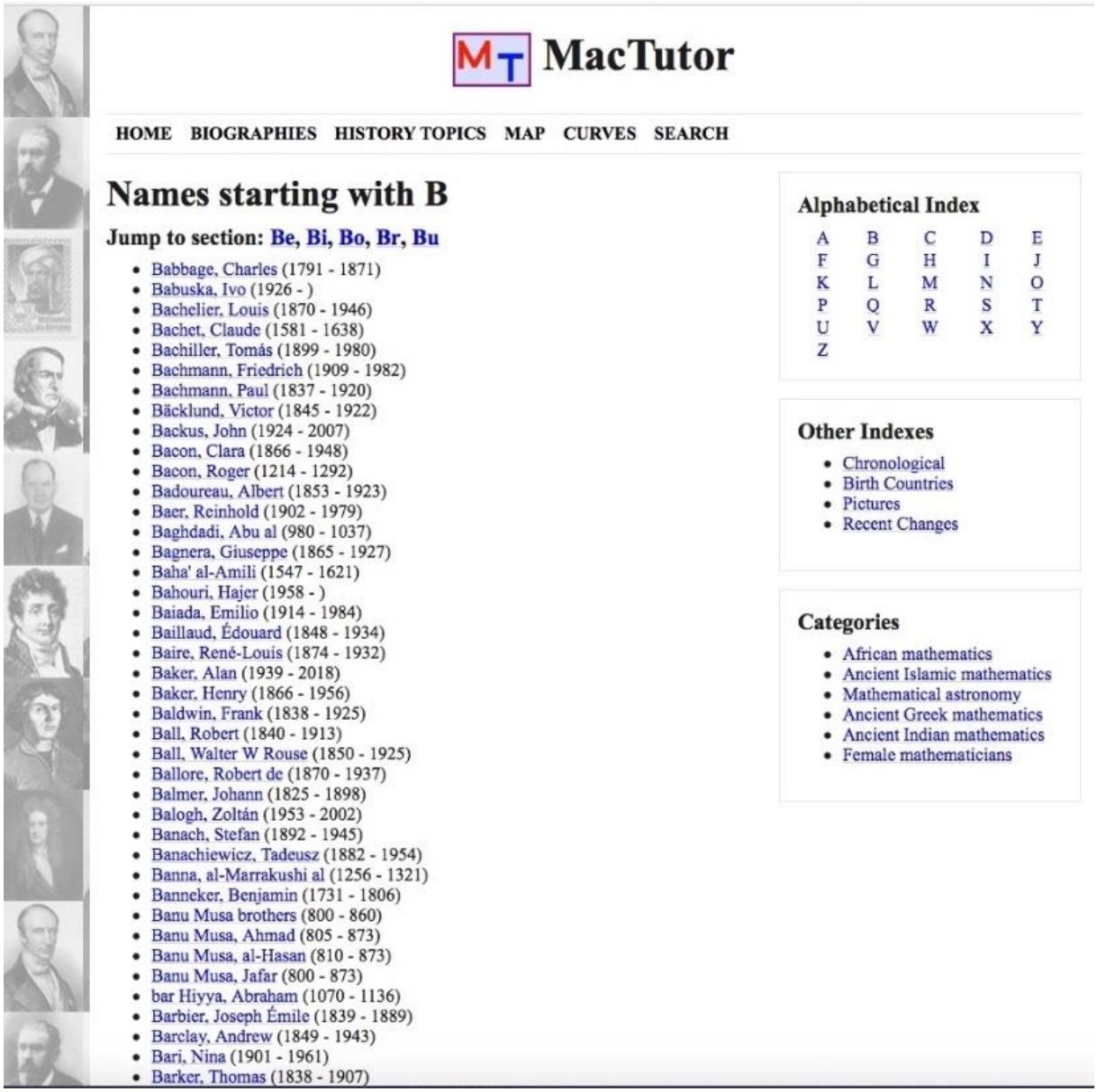
All of these factors and events influenced the position of Mathematics in society and education, and the opinions of the public to the subject. The struggle to highlight the importance of a sound mathematical understanding needed in today's world continues with efforts aimed at improving the image of the subject being sponsored and run by both governments and public organisations.

Article by: *J J O'Connor* and *E F Robertson* based on a University of St Andrews honours project by Elizabeth Watson submitted May 2000.

Mary Pardoe @PardoeMary · 16h

Replying to @PardoeMary and @JennyHillParker

#mathscpdchat



Another question from the host …

Jenny Hill-Parker @JennyHillParker · 16h

What historical Maths problems do you use with your students? Are there favourites that you look forward to?
This is one my favourites!

#mathscpdchat

Geometry and Measures 1

A fence around Planet Earth

Suppose you tie a rope tightly around the Earth's equator. You then add in extra rope so that when you pick the rope up so it is 1m off the Earth's surface, and is still a perfect circle all the way round. How much extra rope would you need to be able to do this?

This puzzle is old, a version of it appears in William Whiston's The Elements of Euclid circa 1702. More latterly it appears in Showtime drama 'House of Lies' about a group of management consultants.

Consider how much rope you would need when it is lying on the ground.

Circumference of the Earth is $C = 2\pi r$ where r=radius of the Earth

When the rope is picked up to a height of 1 metre, the radius is increased to (r+1) metres, so the new circumference is

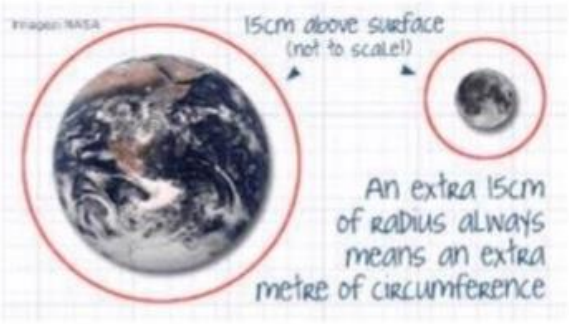
Circumference at a height of 1 meter = $2\pi(r+1)$

This multiplies out to give; $= 2\pi r + 2\pi$

The difference in the two circumferences is $2\pi r - (2\pi r + 2\pi)$

Which equals 2π—ie is NOT dependent on the radius!

So no matter the size of the sphere (could be a tennis ball!), the extra rope needed for a 1 meter high fence is 2π, i.e. 6.3 extra metres.



Questions

1. Can you draw the puzzle out? Mark on the Earth's radius r, as well as the radius made by the rope, r+1.

2. Find the circumference of the Earth, and the circumference of the rope, and therefore the difference.

3. Tell your family/firends—it's the most amazing bit of Maths ever!

… was followed by this …

Jenny Hill-Parker @JennyHillParker · 16h

Replying to @JennyHillParker

I love teaching this too; the reasons why October is the 10th month and not the 8th, and the link to the Roman Empire #mathscpdchat

Geometry and Measures 2

Octagon and October..

We know that the names of some of the polygons are

Septagon—7 sided shape

Octagon—8 sided shape

Nonagon—nine sided shape and so on..

So why do the months not follow the pattern;

September—9th month

October—10th month

November—11th month?

The early Roman calendar had 10 months named Martius, Aprilis, Maius, Junius, Quintilis, Sextilis, September, October, November, and December. In that calendar, the last 6 months used the recognized numerical prefixes.

This calendar had a major flaw in that the days in all the months didn't add up to a full year. A couple of centuries later, January and February were added to the calendar to bring the calendar closer to 365 days.

When these two months were prepended to the calendar it seems that it didn't occur to them to rename the others (or to add January and February to the end). So now the prefixes don't match the numerical order.

So, what happened to Quintilis and Sextilis?

In 44BC Quintilis was renamed to July to honour Julius Caesar. Later in 8BC Sextilis was renamed to August to honour Augustus Caesar. What happened with the other names?

Over the centuries, the Roman calendar was replaced with the Julian calendar, and then finally (for now) the Gregorian calendar. The number of days in each month and the names of the months were tweaked to get to where we are today.

Questions

1. What does oct mean in octopus and Octagon? What month is October?

2. What does dec mean in decagon and decimal? What month is December?

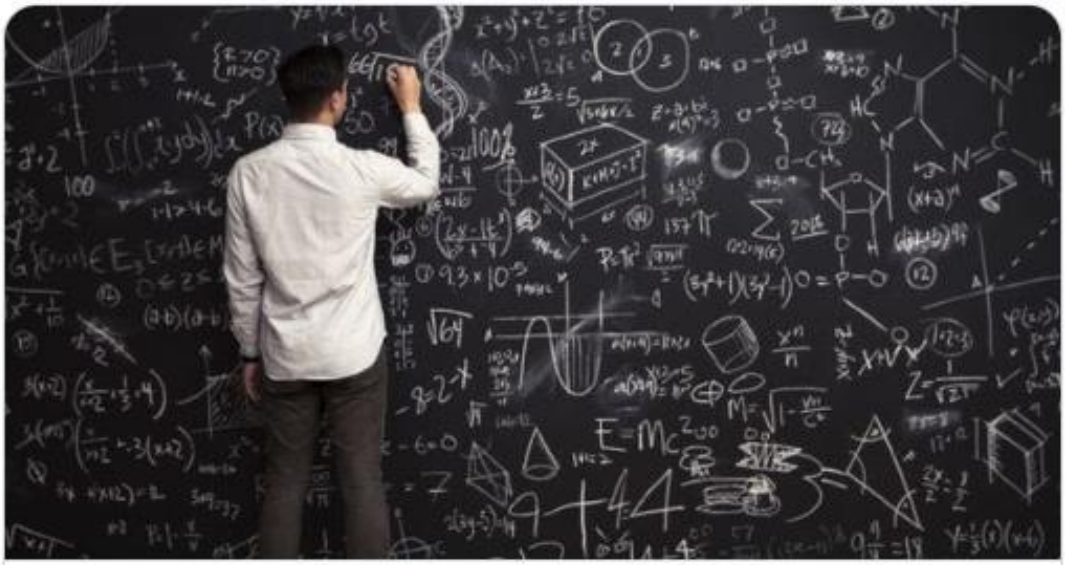
3. Why is there a difference?

… and this:

Jenny Hill-Parker @JennyHillParker · 16h

I'd be interested to see what too sets make of these problems;

#mathscpdchat



popularmechanics.com

5 Simple Math Problems No One Can Solve

Easy to understand, supremely difficult to prove.