

#mathscpdchat 7 March 2023

How 'mixed' is 'attainment' in your maths classes, and how does it affect pupils'/students' learning?

Hosted by [Rebecca Atherfold](#)

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



The graphic features a large teal hashtag symbol in the background. The text "#mathscpdchat" is prominently displayed in white. To the right, a yellow box contains the word "Today", and below it, the date and time "Tuesday, 7 March, 7-8pm" are written in white. A central image shows two classroom scenes: on the left, a close-up of a student writing; on the right, a wider view of a classroom with students at desks. Below the images, the discussion topic is repeated in white text. At the bottom, it states "Hosted by Rebecca Atherfold @becatherfold" and provides the URL "ncetm.org.uk/mathscpdchat". The NCETM logo is in the bottom right corner.

#mathscpdchat Today
Tuesday, 7 March, 7-8pm

How 'mixed' is 'attainment' in your maths classes,
and how does it affect
pupils'/students' learning?

Hosted by Rebecca Atherfold @becatherfold

ncetm.org.uk/mathscpdchat

The links shared during this discussion were:

[GCSE Maths - Coursework](#) which is a page from which you can reach some past (some time ago!) GCSE Set Coursework Tasks from the AQA examination board. One of these tasks was shared as an example during the chat. It was shared by [Maryse](#)

[Don Steward's Blogs - Home](#) which is the homepage of the late Don Steward who 'collected and trialled many people's ideas for effective tasks for teaching mathematics to 10- to 18-year-old students, and played at making them work'. This, [Fibonacci patterns](#), is an example from which you can reach many others. It was shared by [Maryse](#)

[Planning for Teaching GCSE Mathematics with Mixed Attainment Groups](#) which is a book by Mike Ollerton and Sam Hoggard from the Association of Teachers of Mathematics (ATM). It is suitable for use in all GCSE classroom group settings. It was shared by [Mary Pardoe](#)

[All Products from the Association of Teachers of Mathematics](#) which is where on the website of the Association of Teachers of Mathematics (ATM) you can see, and obtain, any of their products. It was shared by [Joanne Green](#)

[Mixed Attainment Maths](#) which is a website created to enable teachers of mixed-attainment maths classes to share resources and ideas. It contains a wide variety of resources, including links to the **Mr Barton Podcast episode with Helen Hindle** and to **Inquiry Maths**. It was shared by [Mary Pardoe](#)

[Mixed Attainment Maths Conference](#) which is a page at NRICH containing descriptions of, and links to, 'low threshold high ceiling' tasks, and other resources relevant to them. It was shared by [Mary Pardoe](#)

[Best practice in mixed attainment grouping](#) which is an article by Becky Taylor, Tom Francome and Jeremy Hodgen in the ATM's journal Mathematics Teaching 258 (2017). It was shared by [Mary Pardoe](#)

[Teacher Collaboration Supports Mixed-Attainment Classes](#) which is an illustrated case study from the NCETM in which a London school models one way to move to teaching for mastery with students in mixed-attainment classes. It was shared by [Mary Pardoe](#)

[How mixed-attainment grouping affects the way students experience mathematics](#) which is a Professional Development article from Lumen at Loughborough University. It includes a video of a seminar from the University's Mathematics Education Centre conducted in April 2021 by Tom Francome. It was shared by [Mary Pardoe](#)

[Diagnostic Teaching: 3 Provoking Discussion](#) which is an article by Alan Bell in the ATM's journal Mathematics Teaching 118 (1987). It is one in a sequence of MT articles by Alan Bell. It was shared by [Mary Pardoe](#)

An illustrated summary of the discussions in this #mathsCPDchat follows.

This was the host's five-minute-warning tweet:



Rebecca Atherfold @becatherfold · 1m



Almost ready to start [#mathscpdchat](#) Make sure you include the hash tag in your replies and comments please!



Rebecca's welcome tweet and first main question ...



Rebecca Atherfold @becatherfold · 16s

...

Welcome to tonight's #mathscpdchat We are going to be talking about mixed attainment in our classes. So my first question is: how do you adapt your teaching to allow for varying degrees of prior attainment?

... generated, as usual, more discussion than any other main question. During the following conversation using tasks diagnostically was mentioned:



Maryse @AllThingsMaths · 14h

...

Replying to @becatherfold

Identify the progression, then identify where students are with the topic.

Open ended tasks.

#mathscpdchat



Rebecca Atherfold @becatherfold · 14h

...

Replying to @AllThingsMaths

Do you use open ended tasks diagnostically at the beginning of a topic?

#mathscpdchat



Maryse @AllThingsMaths · 14h

...

Replying to @becatherfold

A mix. Sometimes at the start, sometimes mid topic, sometimes at the end. Equally, start/mid/end of lessons.

#mathscpdchat



Rebecca Atherfold @becatherfold · 14h

...

Replying to @AllThingsMaths

Do you have any good recommendations for sources for open ended tasks? #mathscpdchat



Maryse @AllThingsMaths · 14h

...

Replying to @becatherfold

Someone shared something great the other day and I can't find it. I'm on my phone rather than laptop just now.



Rebecca Atherfold @becatherfold · 14h

...

Replying to @AllThingsMaths

Tag me if you remember please! #mathscpdchat




Mary Pardoe @PardoeMary · 14h

Replying to @becatherfold and @AllThingsMaths

Alan Bell wrote a series of articles in Maths Teaching about diagnostic teaching. One of them, that teachers I worked with found particularly helpful, was in MT118 ... here: atm.org.uk/Mathematics-Te... This is an image from it ...

#mathscpdchat



The illustration shows a bag of flour labeled 'FLOUR', 'Light flour', and 'PLAIN'. A price tag next to it says '1.5 kg' and '42p'. To the right, there are drawings of a sugar bag, a box of baking powder, and a tin of bicarbonate of soda.

With this bag of flour Grandma can make fourteen large cakes or one hundred and twenty six small cakes

The large cakes were sold for £1.25 and the small cakes for 15pence each.

Here are some of the calculations that were done - what was Grandma trying to work out?

- i) 42×5 How much would 5 bags cost her?
- ii) $42 \div 1.5$ How much would 1 kg of flour cost?
- iii) $1.5 \div 42$ What weight would I get for 1p?
- iv) 126×15 How much money would I get from the small cakes?
- v) $1.5 \div 14$ How much flour for a big cake?
- vi) $14 \div 126$ What fraction of a small cake is a big one?
- vii) $1.5 \div 126$ How much flour does she need to make small cakes?

What other questions might she ask?
How many small cakes ~~does~~ will she have to sell to equal the money of the large cakes $14/124$?

GCSE 'coursework' tasks (used in bygone years), and various other resources, were discussed in this next discussion prompted by the host's first main question:



Vincent knight @Vincent12877947 · 14h

...

Replying to @becatherfold

Often through investigations starting together and then guided journeys through the levels teaching not to fear going “ off piste” regular challenges to give the very brightest opportunities to experience Unstructured paths groupings seating plans inclusive not isolating weakest



Vincent knight @Vincent12877947 · 14h

...

Replying to @Vincent12877947 and @becatherfold

The old gcse foundation and higher investigations of the 90s (edexcel) the number ones are great to get the process going and create the need to explore in a structured way Plenty of “ investigations” with number and Algebra my favourite is linking Algebra with Geometry



Rebecca Atherfold @becatherfold · 14h

...

Replying to @Vincent12877947

I shall take a look - I was working in primary in the 90s and don't know much of the older gcse resources #mathscpdchat



Maryse @AllThingsMaths · 14h

...

Replying to @becatherfold and @Vincent12877947

AQA have a whole booklet on them. I'll see if I can find them.

#mathscpdchat



Rebecca Atherfold @becatherfold · 14h

...

Replying to @AllThingsMaths and @Vincent12877947

Thanks! My own gcse (80s) had coursework but I can remember almost none of how it worked! #mathscpdchat



Maryse @AllThingsMaths · 14h

...

Replying to @becatherfold and @Vincent12877947

Some here

mymathsteacher.com/GCSEMaths/cour...

#mathscpdchat



Rebecca Atherfold @becatherfold · 14h

...

Replying to @AllThingsMaths and @Vincent12877947

Thanks! #mathscpdchat



Mary Pardoe @PardoeMary · 1m

...

Replying to @AllThingsMaths @becatherfold and @Vincent12877947

Yes ... from here you can get to 'coursework' tasks of past years such as this one ...

mymathsteacher.com/GCSEMaths/shee...

#mathscpdchat

Ruth was investigating fraction differences.

She wrote down this sequence of fractions:

$$\frac{1}{1} \quad \frac{1}{2} \quad \frac{1}{3} \quad \frac{1}{4} \quad \frac{1}{5} \quad \frac{1}{6} \quad \dots \quad \dots$$

Then she worked out the differences between the consecutive fractions:

$$\frac{1}{2} \quad \frac{1}{6} \quad \frac{1}{12} \quad \frac{1}{20} \quad \frac{1}{30} \quad \dots \quad \dots$$

Then she worked out the differences between the fractions in her second series:

$$\frac{1}{3} \quad \frac{1}{12} \quad \dots \quad \dots$$

Investigate further.



Maryse @AllThingsMaths · 15h

...

Replying to @AllThingsMaths @becatherfold and @Vincent12877947

This site is worth a look too.

donsteward.blogspot.com/?m=1

Legend.



Rebecca Atherfold @becatherfold · 15h

...

Replying to @AllThingsMaths and @Vincent12877947

Total legend! #mathscpdchat



Mary Pardoe @PardoeMary · 14h

...

Replying to @becatherfold @AllThingsMaths and @Vincent12877947

This MT article is very useful too! Here: discovery.ucl.ac.uk/id/eprint/1011.
#mathscpdchat

Best practice in mixed attainment grouping

Becky Taylor, Tom Francome and Jeremy Hodgen report on research findings exploring the issue of teaching secondary mathematics in mixed attainment classes.

It will come as no surprise to those teaching mathematics in secondary schools in the UK that it is unusual to arrange teaching groups in model for establishing and teaching sets specifically designed to exclude the aspects of setting that appear to cause harm. Best Practice in Mixed Attainment is a



Mary Pardoe @PardoeMary · 14h

...

Replying to @becatherfold @AllThingsMaths and @Vincent12877947

Also worth a read ... here: lboro.ac.uk/services/lumen..

(Time!)

#mathscpdchat

Professional Development

How mixed-attainment grouping affects the way students experience mathematics

Mixed-attainment mathematics teaching is not a common practice in England, despite evidence that ability grouping is not an effective strategy for improving educational outcomes. It is a much debated topic among teachers. In this talk, Tom Francome addresses the background to the debates and discuss a study comparing mathematics in two schools: School M (mixed-ability groupings) and School S (sets). This suggests that grouping practices could influence students' mindsets, teachers' mindsets and teachers' beliefs and practices. This is interesting currently, as social-distancing means many schools are teaching mathematics in mixed-attainment groups, and has implications for further research, as mixed-attainment groupings may be a factor in determining the way in which students experience learning mathematics.

The following tweet (shown above at the start of this conversation) prompted some more comments:



Vincent knight @Vincent12877947 · 14h

Replying to @becatherfold

Often through investigations starting together and then guided journeys through the levels teaching not to fear going "off piste" regular challenges to give the very brightest opportunities to experience Unstructured paths groupings seating plans inclusive not isolating weakest



Rebecca Atherfold @becatherfold · 14h

Replying to @Vincent12877947

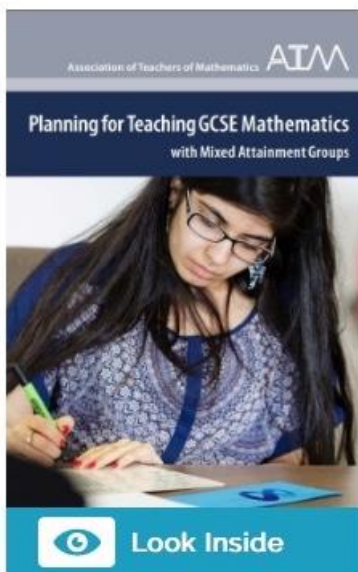
Do you have a good recommendation for finding investigations? Or any favourites? #mathscpdchat



Mary Pardoe @PardoeMary · 14h

Replying to @becatherfold and @Vincent12877947

This, from @ATMMathematics, is one of my favourites ... here: atm.org.uk/shop/All-Books. #mathscpdchat



Planning for Teaching GCSE Mathematics with Mixed Attainment Groups

Planning for Teaching GCSE Mathematics with Mixed Attainment Groups, by Mike Ollerton and Sam Hoggard

Non-Member Price: £16.00
Member Price: £12.00

Quantity [Add to cart](#)

 Look Inside



Joanne Green @MsJoanneGreen · 16h

They have a lot of things that I'd like to purchase @becatherfold #mathscpdchatatm.org.uk/shop/All-Produ...



Product Search

Detailed Product Search

Shop >> All-Products

All Products



2021 Calendar - Mathematical Images and Questions
2021 Calendar - Mathematical Images and Questions -



2022 Calendar - Mathematical Images and Questions
2022 Calendar - Mathematical Images and Questions - AVAILABLE MID-NOVEMBER - PLACE YOUR ADVANCE ORDER NOW. How tall is the tree? How old? How would you find out? What might the leaves weigh in total? What area will they cover when they fall to the ground?

The other responses to Rebecca's first main question were this ...



Mary Pardoe @PardoeMary · 17h



Replying to @becatherfold

This NRICH page may be helpful ...?

nrich.maths.org/mixedattainmen...

#mathscpdchat



nrich.maths.org

Mixed Attainment Maths Conference - January 2019

This page contains the resources shared by Charlie and Alison at their workshops at the Mixed Attainment Maths conference.



Rebecca Atherfold @becatherfold · 17h



Replying to @PardoeMary

I haven't come across that - bookmarked! #mathscpdchat

... and the following interchange (this contributor always replies using quote-retweets so her comments are never part of longer conversations):



Joanne Green ✓ @MsJoanneGreen · 18h

...

@becatherfold #mathscpdchat I invite the pupils who are struggling to sit near the front at any seat they want to. I speak to them more. I go around the class to let people know that I'm checking their work. This means leaving the able to get along on their own whilst I'm busier.



Rebecca Atherfold @becatherfold · 19h

Welcome to tonight's #mathscpdchat We are going to be talking about mixed attainment in our classes. So my first question is: how do you adapt your teaching to allow for varying degrees of prior attainment?



Rebecca Atherfold @becatherfold · 18h

...

Replying to @MsJoanneGreen

So that might be different students on different days depending on the topic? #mathscpdchat



Joanne Green ✓ @MsJoanneGreen · 18h

...

@becatherfold #mathscpdchat No, these are established groups. One group is year 7 so they'll be assessed in 3-weeks. The class will know it's me marking it. So that meant a few more did work today. They've a long way to go though.



Rebecca Atherfold @becatherfold · 18h

Replying to @MsJoanneGreen

So that might be different students on different days depending on the topic? #mathscpdchat

Rebecca's second main question ...



Rebecca Atherfold @becatherfold · 18h

...

My second question tonight is how big (maybe in 'school maths years') is the prior attainment gap in your classes? One of my last classes had a group who got <10 on a foundation paper and a couple who got 70 + #mathscpdchat

... prompted three conversations and one single comment. This was about some post-16 issues ...



Karen @tallbirdtoo · 15h

...

Replying to [@becatherfold](#)

I think I live in a similar world. FE maths lecturer in first Yr of only providing gcse. We have stopped L1 and 2 FS. I have some learners coming to me with a FS E3 pass (just) and others who have gcse grade 3. They are class grouped due to vocational area.



Rebecca Atherfold @becatherfold · 15h

...

Replying to [@tallbirdtoo](#)

Sounds exactly the same situation.



Karen @tallbirdtoo · 15h

...

Replying to [@tallbirdtoo](#) and [@becatherfold](#)

And despite increase in maths confidence, regular attendance and participation in class, which I am so very proud of, they are still deemed to be below target.



Karen @tallbirdtoo · 15h

...

Replying to [@tallbirdtoo](#) and [@becatherfold](#)

I also still have historic CAG grades and am targeted to increase grades of learners who's grades are not representative of their prior understanding. Despite initial assessment and diagnostic indicators pointing at lower grades the higher target still stands.



Rebecca Atherfold @becatherfold · 14h

...

Replying to [@tallbirdtoo](#)

The legacy of covid - so many things like this.

... this conversation was about a particular [website dedicated to mixed-attainment teaching/learning](#) ...



Mary Pardoe @PardoeMary · 17h

...

Replying to [@becatherfold](#)

Even in setted groups the 'prior attainment' gap is often wider than we think? So this website can be very helpful in all types of setting or not-setting?

mixedattainmentmaths.com

[#mathscpdchat](#)



Rebecca Atherfold @becatherfold · 17h

...

Replying to [@PardoeMary](#)

I love this website - so useful for thinking about progression within a topic. Really recommend [@HelenHindle1](#) on [@mrbartonmaths](#) podcast
[#mathscpdchat](#)



Maryse @AllThingsMaths · 17h

...

Replying to @becatherfold @PardoeMary and 2 others

I used this site a lot when I was starting out.

I also used the old coursework tasks as I had experience of them back in the day.

[#mathscpdchat](#)



Rebecca Atherfold @becatherfold · 17h

...

Replying to @AllThingsMaths @PardoeMary and 2 others

I find it really useful to get students to engage with where they might be in terms of their understanding [#mathscpdchat](#)

... and in this third conversation a particular example of scaffolding was discussed:



Maryse @AllThingsMaths · 18h

...

Replying to @becatherfold

Huge range.

Thinking of one class, from limited understanding of place value to being able to calculate in standard form.

[#mathscpdchat](#)



Rebecca Atherfold @becatherfold · 18h

...

Replying to @AllThingsMaths

Whoah! Can I ask what year group? [#mathscpdchat](#)



Maryse @AllThingsMaths · 18h

...

Replying to @becatherfold

Year 8

Using a lot of place value columns to support.

Funnily enough, standard form helped the place value to click today.

[#mathscpdchat](#)



Rebecca Atherfold @becatherfold · 18h

...

Replying to @AllThingsMaths

Maybe that's a connection that isn't obvious to some students
[#mathscpdchat](#)

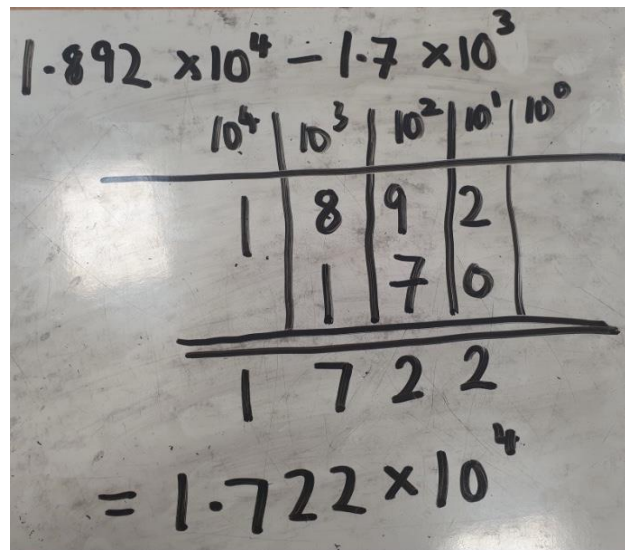


Maryse @AllThingsMaths · 18h

...

Replying to @AllThingsMaths and @becatherfold

This is something we did today. Using columns for each question. Students were getting fluent by the end and were picking out their own questions.



Handwritten mathematical work on a whiteboard showing the subtraction of 1.7×10^3 from 1.892×10^4 using a columnar method. The work is as follows:

$$1.892 \times 10^4 - 1.7 \times 10^3$$

10^4	10^3	10^2	10^1	10^0
1	8	9	2	
	1	7	0	
<hr/>				
1	7	2	2	

$= 1.722 \times 10^4$



Rebecca Atherfold @becatherfold · 18h

...

Replying to @AllThingsMaths

That's lovely. Students who need it have the scaffold to see what's going on
[#mathscpdchat](#)



Maryse @AllThingsMaths · 18h

...

Replying to @becatherfold

Meanwhile, another group did the same questions, no scaffold, and others used standard form to problem solve.

[#mathscpdchat](#)



Maryse @AllThingsMaths · 18h

...

Replying to @becatherfold

I think place value isn't something I've focused on enough. Listening (reading) to conversations between EY practitioners has increased my appreciation.

[#mathscpdchat](#)



Rebecca Atherfold @becatherfold · 18h

...

Replying to @AllThingsMaths

[#mathscpdchat](#) I think it is quite easy to miss gaps or a general lack of understanding there

This was the single comment:



Joanne Green ✓ @MsJoanneGreen · 19h

...

It's colossal! The school I'm at has eloquent pupils, they are excellent speakers. But their written work is poor as they don't understand maths too deep. This causes them to chat instead of try. It's a tale of two extremes [#MathsCPDchat](#) @becatherfold Some Year 7 are Year 4 and...

Rebecca's third main question ...



Rebecca Atherfold @becatherfold · 18h

...

I'd like to ask next what benefits having a wide range of attainment brings to a class [#mathscpdchat](#)

... prompted a single comment, one conversation, in a two-way interchange. This was the single comment ...



Jenny Hill-Parker @JennyHillParker · 16h

...

Replying to @becatherfold

So you can teach to the top and scaffold for the rest. Higher expectations for all

... this was the conversation ...



Maryse @AllThingsMaths · 18h

...

Replying to @becatherfold

I started my journey when we stopped setting on test results. Then moved further. One year a student was in the "wrong set". She ended up attaining in line with her class. And so my learning began.

[#mathscpdchat](#)



Rebecca Atherfold @becatherfold · 18h

...

Replying to @AllThingsMaths

That's so interesting #mathscpdchat



Maryse @AllThingsMaths · 18h

...

Replying to @AllThingsMaths and @becatherfold

Moves students forward in different areas of maths.

Richer tasks. Better links.

Culture and expectation.

Belief.

#mathscpdchat



Rebecca Atherfold @becatherfold · 18h

...

Replying to @AllThingsMaths

I love your reply here ❤️ #mathscpdchat



Maryse @AllThingsMaths · 18h

...

Replying to @becatherfold

I loved today. Sitting with 2 students (trainee taking the lesson with support) who declared they couldn't.

Bit of support and structure and they were doing it.

They taught me lots today.

#mathscpdchat



Rebecca Atherfold @becatherfold · 18h

...

Replying to @AllThingsMaths

Working like that gives such an insight into learning #mathscpdchat

... and this was the two-way exchange:



Mary Pardoe @PardoeMary · 18h



Replying to @becatherfold

It can bring benefits to teachers too ... encouragement to collaborate a bit more perhaps? This 'Teacher collaboration supports mixed-attainment classes' case study from the NCETM, here: ncetm.org.uk/classroom-reso.. is interesting.

#mathscpdchat



ncetm.org.uk

Teacher collaboration supports mixed-attainmen...

A London school models one possible way to make the transition



Rebecca Atherfold @becatherfold · 18h



Replying to @PardoeMary

Something else to bookmark! #mathscpdchat

The host's last question ...



Rebecca Atherfold @becatherfold · 19h



My last question tonight is, given that the chat has been pretty pro-mixed attainment, whether you think there are students who would benefit from being in a class with a reduced attainment gap? #mathscpdchat

... prompted four replies. This ...



Jenny Hill-Parker @JennyHillParker · 16h



Replying to @becatherfold

Mixed attainment for ks3 and then not when in tiers for GCSE?

... this ...



Maryse @AllThingsMaths · 19h



Replying to @becatherfold

I think there can be at the extreme ends, but then they'd be in a class with a wide distribution anyway.

All the arguments I've come across against generally lead to teacher workload and confidence. Both of which I completely understand.

#mathscpdchat



Rebecca Atherfold @becatherfold · 19h

Replying to @AllThingsMaths

Yes I understand too #mathscpdchat

...

... this ...



Usman @usmannasir93 · 19h

Replying to @becatherfold

I think it depends on how big the attainment gap is. For example, I have taught our year 7 stars provision that had students who struggled to do numbers bonds to 10.

...



Rebecca Atherfold @becatherfold · 19h

Replying to @usmannasir93

#mathscpdchat yes a smaller group gives the opportunity to really try and sort that out #mathscpdchat

...



Karen @tallbirdtoo · 16h

Replying to @becatherfold and @usmannasir93

An attainment gap can have benefits. Inspire and peer work. But sometimes, if gap to big it can be demoralising to some who struggle and frustrating to those who excel. Can be exhausting to make sure everyone gets the support/ challenge they need. @PixiMaths is a good site.

...

... and this:



Joanne Green ✓ @MsJoanneGreen · 19h

@becatherfold #mathscpdchat Yes. Proper small groups and not just intervention groups. Also, teaching assistant and teacher in the room. Some higher attaining pupils don't need a teacher. School I'm at has Year 11 only in on Strike days.

...



Rebecca Atherfold @becatherfold · 19h

Replying to @MsJoanneGreen

I misread that as year 11 only come in when it's a strike day! Was very confused for a moment! #mathscpdchat

...



Joanne Green ✓ @MsJoanneGreen · 19h

lol, they wish! 🤔

#mathscpdchat @becatherfold

...

At some point during the chat the following comment was tweeted, and although it was very relevant to the whole topic, it was not obviously in response to any of the host's four main questions, nor part of any particular conversation:



Joanne Green  @MsJoanneGreen · 19h ...

#mathscpdchat @becatherfold I write sums with the mixed group upon the board when they are doing them. This helps the people who are uncertain & unconfident to ask. I & also able to point out little differences in methods and presentation: $(D \times 7) + 6$ is $7D+6$.

Rebecca closed the chat with this message:



Rebecca Atherfold @becatherfold · 19h ...

So that brings tonight's **#mathscpdchat** to an end. But please use the hashtag if you do add comments! Always interesting!

