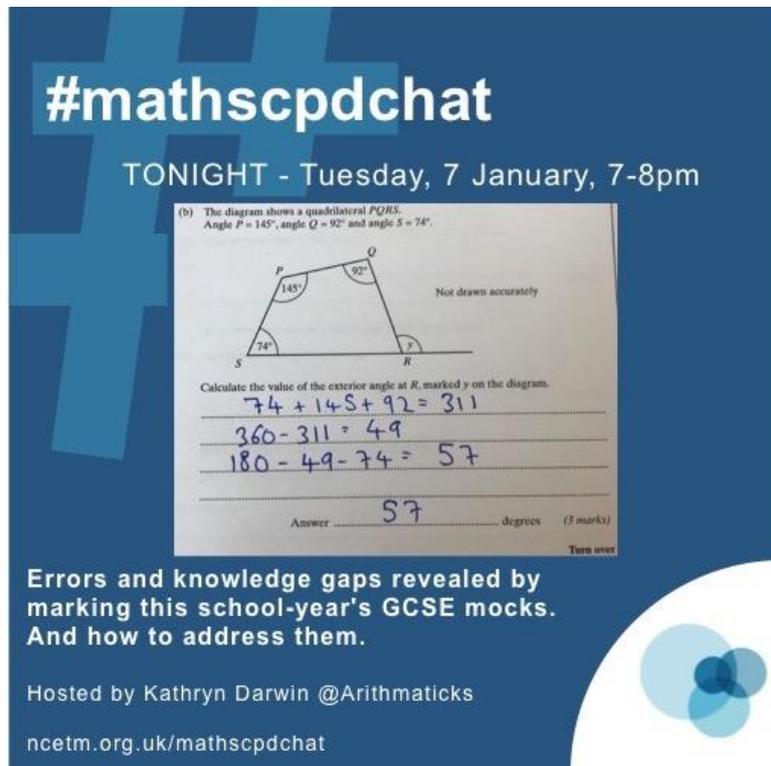


#mathscpdchat 7 January 2020

Errors and knowledge gaps revealed by marking this school-year's GCSE mocks. And how to address them.

Hosted by [Kathryn Darwin](#)

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



#mathscpdchat

TONIGHT - Tuesday, 7 January, 7-8pm

(b) The diagram shows a quadrilateral PQRS.
Angle P = 145°, angle Q = 92° and angle S = 74°.

Not drawn accurately

Calculate the value of the exterior angle at R, marked y on the diagram.

$$74 + 145 + 92 = 311$$

$$360 - 311 = 49$$

$$180 - 49 - 74 = 57$$

Answer 57 degrees (3 marks)

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Hosted by Kathryn Darwin @Arithmaticks

ncetm.org.uk/mathscpdchat

Some of the areas where discussion focussed were:

reasons for (aims of) setting the recent mock GCSE maths exam that your students sat, and that you marked:

- so that students would gain experience in preparation for 'the real thing';

- so that **senior teachers could compare the attainment of students** in this Year 11 cohort with that of those in previous Year 11 cohorts;
- to **reveal students who need particular help**, and the mathematics with which they need help;
- to **inform the planning for students' learning** between the time of the mock exam and the real exam;

a question that arose was:

- how to **motivate students who in the mock exams achieved a grade below that which the teacher believes they have the ability to achieve** ... various ways of setting-up competitions (in which students compete against themselves to do better) in order to motivate students ... looking with individual students at how many more marks they would need to be awarded in order to achieve the next grade;

teachers' most significant observations made during, and realisations arrived at as a result of, marking mock exams:

- the **questions that students did not attempt or that they answered incorrectly** ... that it is natural for teachers to focus on the mathematics that students are struggling with in order to address those areas;
- **improvements in students' attainments** that are seen by teachers to result directly from specifically-focussed teaching prior to the exam ... that such evidence of progress inspires students to aim to make even more progress before the 'real' exam;

unexpected or surprising aspects of students' 'performances' in the mock exams:

- **their inability to carry out simple calculations involving fractions** (such as evaluating ' $\frac{1}{2} \times 5$ ') ... that some students interpret the representation of a fraction multiplied by a whole number as a fraction multiplied by another fraction of which the denominator is not shown (for example they interpret ' $\frac{1}{2} \times 5$ ' as ' $\frac{1}{2} \times \frac{5}{5}$ ') ... that pupils need to understand that '5' can be written as ' $\frac{5}{1}$ ', and that working with reciprocals and fractions greater than 1 can help students 'see' this;
- **students applying their knowledge of the 'same-denominator-rule-for-adding-fractions' inappropriately (incorrectly) when working with probabilities expressed as fractions** ... using such examples as non-examples of the 'same-denominator-rule-for-adding-fractions';
- **their inability to identify the symmetry properties of 2-D shapes** ... that Year 11 students' not having 'met' the symmetry of 2-D shapes since during Year 7 may contribute to this inability ... that getting students to develop a 'sketching habit' (to support many aspects of their mathematical thinking, including when they have

'forgotten' properties of 2-D shapes) is difficult, many students appearing to adopt the attitude of 'I can't be bothered to draw a sketch';

- **their inability to use rotation to simplify solutions of geometrical problems and in geometrical proofs** ... that this may be because teachers themselves struggle to use rotation in this way ... that this might be addressed in teachers' professional development;
- students (doing the Higher Level papers) **getting the order of operations wrong when trying to simplify algebraic expressions** such as ' $3a - a \times 4a + 2a$ ' ... that this may be a consequence of teachers addressing 'BIDMAS' as a 'stand-alone' topic ... finding that some students act as if the correct order of operations only matters during 'order-of-operations' lessons ... using the analogy of politeness (we don't have 'polite' days), saying "just as the rules of etiquette apply always, so do the 'BODMAS' rules";
- students who can do the maths **not showing any working**, so that when they make a small error, they lose all the marks ... that this is in spite of teachers 'drilling into them' that they 'must write-down all their calculations';

noticings during the marking of mock exam papers that made teachers smile:

- anything that 'makes you think that THEY WERE LISTENING'
- seeing that a **Foundation-Level class used the 'difference-of-two-squares'** to factorise an algebraic expression;
- seeing that many **students responded correctly to all the questions on the first three pages** of the exam paper;
- seeing that, when attempting a trigonometry question, **students named the triangle-sides correctly and applied trig ratios appropriately;**

whether teachers use QLA (Question Level Analysis), and their reasons for doing so, or for not doing so:

- **linking QLA with an online homework platform**, thus enabling students to 'target' their revision/improvement;
- **giving each student a printout of their own QLA**, with linked videos/tasks for their independent study;
- **using QLA in planning for learning** ... planning from both QLA and from lesson observations;
- that **students seeing their individual QLAs** eliminates the 'I didn't know what to revise' excuse, and enables them to begin a sequence of 'considered' revision;
- because compiling a QLA for every student is so time consuming, **simply noting the questions for which students' answers contained mistakes, and what the mistakes were**, then using those notes to plan teaching;

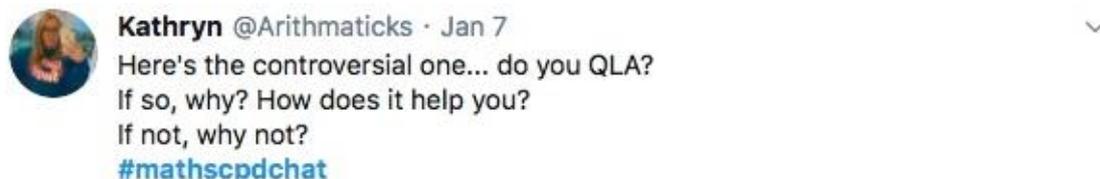
- **designing ‘bespoke’ lessons** after marking PPEs (Pen and Paper Exercises(!));
- when marking mock exams, **keeping a ‘running tally’ for each question**, and then using this to **inform lesson planning for the whole class and one-to-one work with individual pupils** ... displaying a chart showing the success-rate for each question, so that all students can see which topics were a whole-class weakness, and where they were individually better or worse than most of the class;
- **creating a ‘prompt-sheet’ for each question** in order to help students correct their mistakes themselves ... writing carefully designed prompts (such as ‘if it’s a right-angled triangle what two topics are you most likely to need to think about?’) ... helping pupils learn to ask themselves questions that the teacher would ask them (by repeatedly saying ‘What question would I ask you now?’);
- that when planning a DIRT (Directed/Dedicated Improvement/Intervention Reflection Time) lesson after the mock exams, it is **more effective to target students’ specific areas of weakness than to ‘go over’ the whole exam paper**;
- that **using ‘diagnostic questions’** provides more detailed and accurate information about gaps in learning and misconceptions than going through QLA procedures;
- that too often teachers **try to use summative assessments formatively, and neglect other forms of assessment**;
- using a system in which students themselves **input their marks-for-particular-questions on Google documents**, rather than using-up staff time for the task;
- **issuing QLAs to parents** at ‘parents’ evenings’;
- in addition to using QLA, also helping students to **develop effective ‘exam-strategies’**;
- **using QLA to identify** intervention lessons, individual teacher subject-knowledge weaknesses, weaker topics throughout the whole school in order to ‘think-about’ the teaching lower-down the school;

the most useful ways to use feed-back (derived from marking mock GCSE exams) to help students make progress:

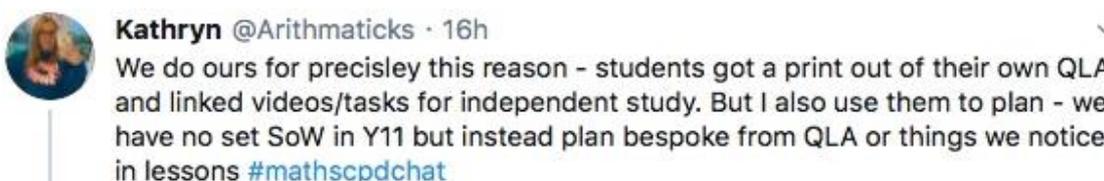
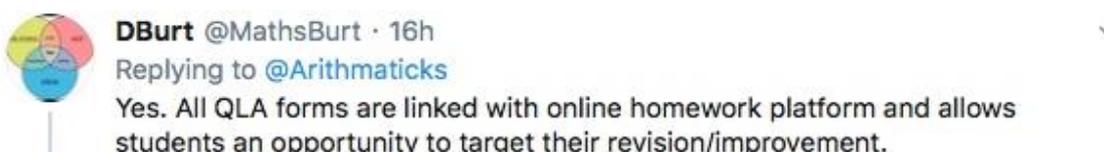
- **marking students’ exam papers a second time ignoring ‘face-palm’ errors** (‘silly’ errors such as writing ‘ $1 + 1 = 1$ ’);
- **challenging students to ask-themselves, reflect-on and discuss questions such as:** ‘What did I do to prepare for this mock exam?’, ‘Why couldn’t I access this question?’, ‘What will I do next time?’.

In what follows, click on any screenshot of a tweet to go to that actual tweet on Twitter.

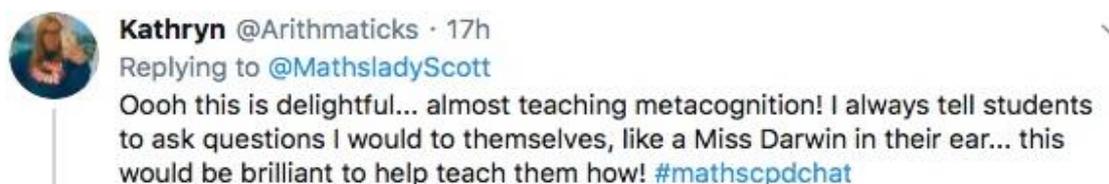
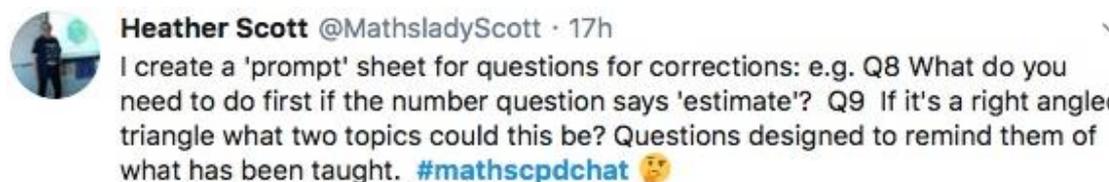
This is a small part of a long conversation about using, or not using, QLA (Question Level Analysis) to support learning. The conversation was generated by this tweet from [Kathryn Darwin](#):



and included these from [Simon Ball](#), [D Burt](#), [Kathryn Darwin](#) and [Heather Scott](#):



and these from [Heather Massey](#), [Heather Scott](#) and [Kathryn Darwin](#):





Heather Scott @MathsladyScott · 17h

#mathscpdchat - the only downside is that I need a different prompt sheet for each class depending on what they have achieved and what they need to know so I mostly write one for each exam we do.

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

Among the links shared were:

[An Audience with the GCSE Exam Boards](#) which is an article in the NCETM Secondary Magazine 150. It is an illustrated summary of the content of the NCETM podcast (the link to which is provided) in which Gwen Tresidder (NCETM) talks to Andrew Taylor (AQA), Graham Cumming (Edexcel) and Neil Ogden (OCR) about how students performed in the 2018 Mathematics GCSE exam. It was shared by [Mary Pardoe](#)

[It Stands to Reason](#) which is an article in the NCETM Secondary Magazine 125. It suggests ways in which students can achieve the kind of familiarity with rotation that enables them to use that transformation when constructing problem-solutions and proofs (in GCSE exams). It was shared by [Mary Pardoe](#)

[Maths Medicine](#) which is where you will find the *Maths Medicine* pocket books and other excellent material by [Professor Smudge](#). Challenging your students to solve these interesting problems will help them develop the ability to tackle 'non-routine' problems with confidence. It was shared by [Mary Pardoe](#)

[ERRR podcast about assessment](#) which is an interview with Daisy Christodoulou about 'getting assessment right and comparative judgment'. It was shared by [Partridge Maths](#)

[Test-scores record spreadsheet](#) which is a 'Parent Support' spreadsheet from Framwellgate School, Durham. It was shared by [AS](#)