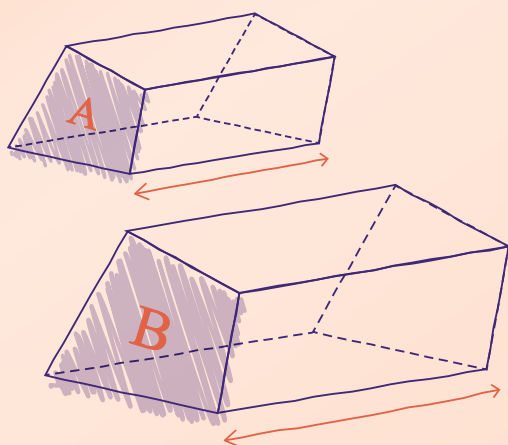


# GCSE Maths Focus on:

## Ratio

Build on your students' assessment performance using our self-guided, modular training pack



$$A:B=4:9$$

Pre-reading  
booklet





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Contents	Page
Using this pack	4
Introduction	5
Introduction to the intelligent practice approaches	6
Summary of activities	7
Ratio route map	8
Pre-session health check	9

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# Using this pack

This resource pack is intended to help you deliver a CPD session for teaching colleagues on the assessment of ratio in GCSE Mathematics, giving them the opportunity to explore how the area is tested, the strategies available for students and to consider implications for the classroom.

Using the completed Pre-session health check and Route map provided, you'll be able to design a bespoke session to focus learning on the areas that are most relevant for you and your colleagues.

If you decide to cover all activities in detail with plenty of discussion time, it is likely to take up to three hours delivery time.

## Before the session

- Ask your colleagues to each complete the Pre-session health check (page 9 in this booklet).
- Use the responses to the Pre-session health check to tailor the training session to the needs of your colleagues. The route map on page 8 will help you plan which activities to use in the session.
- Each colleague should have a copy of the *Activities booklet* and the *Handouts booklet*.
- The Post-session health check should be completed by everyone who took part.

## Running the session

- The session looks at a number of aspects of ratio content and considers the type of questions asked during a GCSE Maths exam. Colleagues are invited to discuss the questions and how well their current teaching approaches prepare students. Performance data on many questions has been provided to help highlight where the challenges are to be found.
- You will look at a number of classroom approaches that may work well for your students in approaching the content, either as revision or first teaching. The emphasis is on critically evaluating the approaches and then having a go at producing something as individuals, pairs or groups. If you wish, the design exercises can be completed outside the main session at a later time. This may permit more thoughtful exercises and richer discussion opportunities when the group comes back together. Therefore, one possible delivery model can include staging the session over a number of short meetings allowing attendees to accommodate other work commitments or implement knowledge over a staggered period of time. Whatever approach you use, it is vital colleagues work through the exercises provided in the pack as this is the only way to really appreciate them, especially the variation practice.
- In the final activity (Activity 5), decide which resources you want to use more in your teaching and start to plan how to do this.

## After the session

- Ask your colleagues to each complete the Post-session health check (*Activities booklet*) to ensure the training has been successful.
- As a group, discuss how you can support each other to embed the learnings in your teaching, and how you can broaden the approach to different areas of the curriculum.

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# Introduction

This pack has been developed to support mathematics departments working collaboratively when:

- considering the range and style of GCSE Maths questions on the topic
- looking at 'intelligent practice' approaches to support teaching of the topic
- embedding these approaches into their practice and looking at how this model can be applied to other content areas.

The pack is based on a number of conference sessions and workshops led by Craig Barton and Andrew Taylor (Head of Curriculum - Mathematics) in 2018 and 2019, which were in turn based on performance data from 2017 and 2018 AQA GCSE Mathematics exams as well as the content of Craig Barton's websites and book: *How I Wish I'd Taught Maths*, 1911382497, London, 2017.

It is not the intention of this pack to look deeply into the research that underpins intelligent practice approaches or to look at the wealth of classroom resources available. However, the approaches used are briefly described in the following pages with links to the relevant websites.

If you or your colleagues want to learn more about the research that underpins the approaches in this pack, or to view the available resources, an ideal jumping off point is [Mr Barton Maths](#) which has links to Craig Barton's websites, CPD, books and podcasts. If you decide to have a go at writing your own resources, the 'get involved' page on each site is invaluable.

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# Introduction to the ‘intelligent practice’ approaches

## Intelligent Variation (Reflect, Expect, Check)

This is an approach to writing sequences of questions with care so that each question is related to the one that precedes it, as opposed to being a random collection of questions on a topic.

Because of this relationship, students are able to form expectations of a result before carrying out the procedure, leading them to engage more actively when working through an exercise. It also allows them to think more deeply about the processes involved. To find out more about creating sequences of questions with variation and how to use them in the classroom, please go to:

[variationtheory.com](http://variationtheory.com)

## Same Surface, Different Deep (‘ssdd’) problems

Students are often presented with a series of problems based on the same topic, but set in different contexts. Same Surface, Different Deep (‘ssdd’) problems take a different approach by presenting problems that appear similar at first glance (same surface) but have a different underlying structure (different deep). Students are challenged to engage in the problems and recognise how they are different and what mathematics needs to be applied to solve each one. To find out more about creating and using ‘ssdd’ problems, please go to: [ssddproblems.com/about-the-site](http://ssddproblems.com/about-the-site)

## ‘Goal-free’ problems

This approach removes the goal or specific question from a problem and replaces it with a much more open question such as ‘find out everything you can’. This stops students fixating on the end-point and frees them to explore all the maths within the situation. Longer, previous GCSE Maths exam questions provide excellent source material for ‘Goal-free’ problems and some teachers use mock exam papers derived entirely of ‘Goal-free’ questions with their students. For more explanation and examples, please go to: [goalfreeproblems.blogspot.com/](http://goalfreeproblems.blogspot.com/)

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# Summary of activities

## Activity 1

This activity focuses on switching between representations of fractions and ratio, stimulated by a range of GCSE exams questions across the attainment range. Colleagues will consider how carefully planned exercises using 'Reflect, Expect, Check' routines may help, and will have an opportunity to create their own exercises. Finally, the idea of 'ssdd' problems is introduced.

## Activity 2

This activity looks at questions that require the combination of ratios and asks colleagues to critically evaluate a number of exercises. They are also invited to create their own set of 'ssdd' problems on this topic.

## Activity 3

This activity looks at problem-solving questions involving ratio with a broad range of questions to discuss in depth. 'Goal-free', 'ssdd' and 'scaffolding' approaches are considered as ways of supporting students.

## Activity 4

The focus here is on dividing in a given ratio and the emphasis on the different methods that can be used in these problems. Colleagues are challenged to work together in finding an effective and adaptable common approach to the issue.

## Activity 5

This activity looks at thinking about how you will take the ideas from this session forward and build aspects of this knowledge into your teaching practice.



# Ratio route map

## Area for development

Switching relationships  
between ratios and  
fractions

Exam questions

'Intelligent practice'  
approaches. Design own  
variation exercises

Activity 1

Combining ratios

Exam questions

'Intelligent practice'  
approaches. Design own  
'ssdd' exercises

Activity 2

Ratio problems?

Exam questions

Supporting students'  
problem solving and  
consideration of materials

Activity 3 and Activity 4

Embedding the  
'intelligent practice'  
approaches in teaching

Activity 5

Planning and  
further reading



# Pre-session health check

Grade the area of development statements according to your confidence where 0 is not confident at all and 5 is very confident.

Be sure to hand back to your Head of Department or nominated deliverer.

Area of development	Grading 0-5	Reasons/notes/previous training
I am familiar with the way ratio content is assessed in GCSE Maths.		
I am familiar with the resources on Craig Barton's various websites.		
I understand the principles of variation theory and apply them in my teaching.		
I have good strategies to support students in developing problem-solving skills.		
I have good subject knowledge in this area of content and understand the most effective way to teach all aspects of this content.		

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# Notes

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