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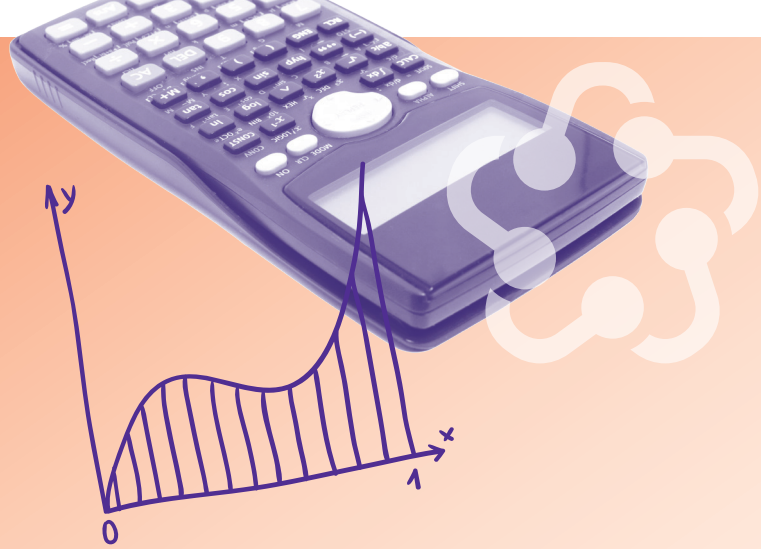
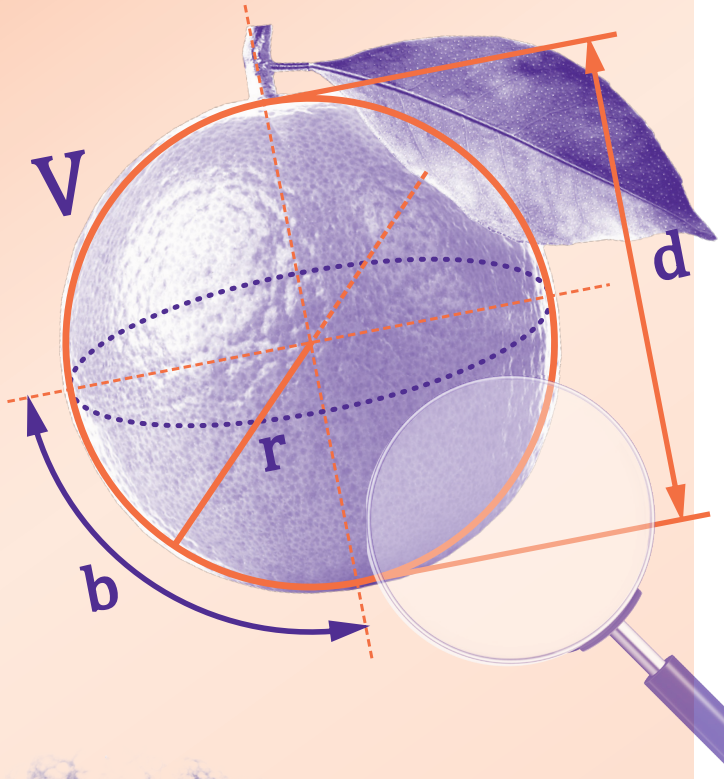


GCSE Maths Focus on:

A03 exam questions

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



Pre-reading booklet

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Using this pack

This pack is designed to enable you to deliver a CPD session on AO3 for your teaching colleagues.

Using the completed pre-session health checks and provided route map, you'll be able to design a bespoke session to focus learning on the areas your colleagues are less confident teaching.

This resource pack is intended to help you deliver a CPD session for teaching colleagues on GCSE Maths Assessment Objective 3 (AO3), giving them the opportunity to explore how it is assessed and consider implications for the classroom.

Before the session

- Ask your colleagues to each complete the pre-session health check (page 10 in this booklet).
- Use the responses to the health check to tailor the training session to the needs of your colleagues. The route map on page 6 will help you plan which activities to use in the session.
- Each colleague should have a copy of the Activities booklet and the Handout booklet.
- The post-session health check should be provided for each colleague.

Running the session

- Establish why focusing on problem solving questions is beneficial to students and how these questions are assessed.
- Remind teachers that problem solving questions will be asked at all levels of demand and that marks are available for progress made and not just complete solutions.
- The presentation will provide guidance and discussion questions to move you through your bespoke session.

After the session

- Ask your colleagues to each complete the post-session health check (page 11 in this booklet) to ensure the training has been successful.
- As a group, discuss how you can support each other to embed the learning in your teaching.
- A certificate of attendance can be created and printed for each delegate.

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Summary of activities

Activity 1

Most teachers are aware that Assessment Objective 3 (AO3) refers to problem solving, but may not be aware of the different facets of problem solving which we are required to assess in our papers and how the necessary skills can be developed in class. This initial activity is designed to develop a deeper understanding of what AO3 covers and start the process of formulating ideas about how this understanding can be used in lesson design. The activity is as follows:

- Using the Ofqual strand document for AO3, read the different strands and elements and highlight the skills students need to develop in lessons.
- The strand tables have been provided to your colleagues within the Handout booklet.

Some suggested key points have been highlighted on slides 5 and 6.

Activity 2

- Talk through slide 7 to establish the context of AO3 questions in exams.
- Using the Ofqual strand document from Activity 1, identify which strand these questions are targeting.
- It is worth noting that some questions will assess more than one strand of AO3. Indeed, it is a regulatory requirement to ask such questions. Questions which target strand AO3.2 in particular will frequently also feature AO3.1 marks.
- The answers are given on slide 9.
- Slide 10 contains further features of problem solving questions.

Activity 3

- Discuss the use of AO3 in the curriculum. Every topic area in the curriculum could be assessed through questions which also target AO3. Therefore consideration should be given to these skills when preparing lessons for each and every topic.
- A notes page is included in the Activities booklet.

Activity 4

This activity is designed to develop a deeper understanding of each strand of AO3 with further explanation, exemplification and ideas for the classroom for each strand. The activity is as follows:

- Examine assessment tasks students might be required to do for each strand of AO3 and list actions/reminders of things to do in lessons to help students develop these skills. Add any strategies students could use to access the questions more successfully.

Some suggestions are provided within the presentation following the explanation of each strand.

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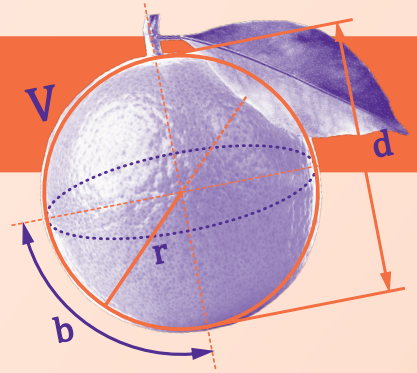
A03 exam questions route map



Area for development

- Does the team know what A03 is designed to assess?
  - Activity 1 Slides 3-6
    - Ofqual GCSE Subject Level Guidance for mathematics June 2015
- Does the team know which strand A03 questions target?
  - Activity 2 Slides 7-10
- Does the team understand the relationship between A03 and the curriculum?
  - Group Discussion Activity 3
    - Embedding A03 into the classroom Slides 15-23
- Does the team require a deeper understanding of each strand of A03?
  - Activity 4
- Does the team possess ideas for embedding strands into delivery?
  - Embedding A03 into the classroom Slides 15-23

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Introduction to AO3 questions

AO3 covers the skill of problem solving. This can be in both mathematical and non-mathematical contexts where students are required to translate the problems into mathematical processes. As well as using these mathematical processes in order to find solutions, AO3 also covers other less obvious aspects of problem solving such as:

- evaluating the methods used
- evaluating the results obtained
- evaluating the effect of any assumptions made.

These aren't necessarily skills which come naturally to students and so it is important to give them plenty of opportunities in class to explore different approaches to problem solving and to ask questions along the way.

AO3 questions will often have very little scaffolding and so students need to be resilient and should learn to 'have a go.' Of course, solving problems with little help can be even more rewarding, but it may be necessary to provide some ideas or pointers to begin with.

25% of the marks are allocated to AO3 at Foundation Tier and for Higher Tier the figure is 30%. In addition, many problem solving questions will also include AO1 marks where the problem has resolved into routine procedure. This means that the proportion of marks allocated to problem solving questions is even higher and teachers should consider reflecting this in the time given over to problem solving in the classroom.

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What each strand of AO3 means in terms of exam questions

Strand 1 is perhaps the typical view of what constitutes problem solving: converting problems into mathematical processes in order to arrive at solutions to those problems. It is important to note that the processes required should not be clear from the question (otherwise this would be routine and therefore AO1). Strand 1 is the most common of all the strands and will often also feature in multi-strand questions.

Strand 2 requires students to make links between different parts of mathematics. Again these links should not be explicit in the question and students have to make the links for themselves. Whilst these questions are not as common as Strand 1 they must feature in every series and so should not be overlooked.

Strand 3 could perhaps be seen as the reverse of Strand 1: converting the mathematical solution back into the context of the original problem. Often, students will have already completed some problem solving to get to this point and questions assessing Strand 3 can therefore also feature marks at Strand 1.

Strand 4 requires students to evaluate either the method used or the result obtained. This can involve identifying an error in or an improvement to a given method. In terms of evaluating results this could involve ruling a result out which is impossible in the context, stating whether an estimate is high or low, or stating whether an answer is sensible or not.

Strand 5 relates to assumptions made within a problem and requires students to understand how these assumptions can affect the solutions. It has obvious connections to mathematical modelling but not exclusively.

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How to include the different strands in class work

Strand 1: The mathematical processes required to solve problems will not be stated in the question so it is important that students regularly meet unfamiliar problems and learn to 'have a go', as previously mentioned. Students may require scaffolding to begin with, but at some point this should be taken away since this is how problems will be presented in exams.

Strand 2: Since mathematics is usually taught as a series of separate topics, making links between topics can easily be overlooked. Past question papers can provide examples, and these include ratio and algebra, similarity and percentages, Pythagoras and quadratic equations, and equation of a line and area, but the possibilities are endless so do try and link topics together yourself whenever you can. Problems which link previous topics together are also a good way to consolidate learning.

Strand 3: Students should be reminded to check the original question and make sure that their answer makes sense in the context of the original problem. Answer the question!

Strand 4 and 5: Both of these strands require students to be evaluative, something which may not necessarily come naturally. This can be encouraged in the classroom by asking students to work together and explain methods, results and assumptions to each other. When a student goes wrong, it is good practice to get them to explain where they have gone wrong. Often, these will be misconceptions which could even feature on an exam question at some point!

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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.

Area of development	Grading 0-5	Reasons/notes/previous training
I can accurately assign exam questions to each strand of AO3.		
My teaching involves student engagement with, and effective practice of, problem solving questions.		
I understand how and when to include each strand of AO3 in my teaching.		
I know what I need to do to help improve students' ability to respond appropriately to the different types of AO3 questions on different topics.		

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Post-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.

Area of development	Grading 0-5	Reasons/notes
I can accurately assign exam questions to each strand of AO3.		
My teaching involves student engagement with, and effective practice of, problem solving questions.		
I understand how and when to include each strand of AO3 in my teaching.		
I know what I need to do to help improve students' ability to respond appropriately to the different types of AO3 questions on different topics.		

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Notes

Notes

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