



# GCSE Maths: Foundation paper improvements

A closer look at the  
improvements we're making for  
summer 2022 and beyond

v1.0





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# Contents

Introduction	4
Using this booklet	5
Assessment design	6
Notes	22
Contact us	24

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# At AQA, we strive to give all students the opportunity to realise their potential.

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That's why, as part of our commitment to continuously review our assessments, we've made some refinements to our GCSE Maths Foundation papers ready for summer 2022.

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To make sure our low demand questions are accessible to all students, including the lowest attainers, we've:

- adjusted the demand of our multiple choice questions
- adjusted the numbers used in some of the questions
- simplified the wording in some of the questions
- reviewed the number of steps in our multistep questions
- removed contexts from some questions.

This booklet looks at these improvements for some specific questions in detail, giving you a better understanding of why we've made them and how they'll have a positive impact on your students' exam experience.

## Remember:

- these changes only affect Foundation papers, and only the first 40% of each paper
- we haven't changed the Higher papers
- you don't need to change the way you prepare your students for their exams – the format and style of our Foundation papers are the same.

# Using this booklet

We've collated and annotated a selection of questions from the 2017 exam series to give you a better idea of the improvements we're making.

On each page, you'll find a question from the 2017 series with our review of the question, details of our improvements in summer 2022 and beyond and, where appropriate, an example.

**Review:** we outline the facility of the question. This is a measure of how students performed – it's the overall mean mark for the question as a percentage of the total mark, so a 2-mark question with an overall average for all students of 1.5, will have a facility of 75%.

**Summer 2022 and beyond:** we explain why the question might not have performed as expected previously and detail how we'd improve the question in the future to make sure it's more accessible.

**Example:** where possible, we've included an example to show you the style of question as it might look in summer 2022 and beyond. Of course, these won't be questions from the actual summer 2022 papers.

**Assessment design:** here, we've given you an insight into why the improvements work from an assessment design perspective. Assessment design is an important part of what we do as an exam board – you can find out more about what it is and why it's important on the next page.

## Question 2, Paper 1

2 Work out  $\frac{1}{4} + 0.$

Circle your answer.

0.30

### Review

Only 53% of students chose settling questions.

### Summer 2022 and beyond

We wouldn't use a question (conversion and then addition of a fraction as a decimal or give

### Example

What is  $\frac{1}{5}$  as a decimal?

Circle your answer.

0.25

### Assessment design

By reducing the number of steps, making sure lower attainers can understand too.

# Assessment design

## What is assessment design?

Assessment design is about crafting assessments that will allow students of all levels to demonstrate their knowledge and understanding in a particular subject – it's making sure every student has the opportunity to realise their potential.

That's why writing good quality exam questions and mark schemes is at the heart of AQA's purpose as an educational charity.

## Why is assessment design so important?

We need to create well written questions and mark schemes to make sure we can differentiate between students, mark reliably, maintain standards and award accurate grades. This is not only fundamental for us as an exam board, but also for the students taking our qualifications.

## Key assessment design principles

There are lots of key principles to assessment design but, for the Foundation paper changes, we're talking about **differentiation** and **validity**.

### Differentiation:

is achieved when an exam paper gives students across the ability range the opportunity to show what they know, understand and can do. This can be done:

- by **outcome**, where different students respond at different identifiable levels to the same task
- by **task**, where different students succeed on tasks pitched at different levels.

In the following examples, we've identified where we're improving the accessibility of our papers so that we can better differentiate between grades 1, 2 and 3.

### Validity:

in simple terms, is whether a question or assessment is testing what it's supposed to test.

In the following examples, we indicate how we're improving validity to make sure students aren't confused about what a question is asking them to do.

**All questions are taken from the 2017 summer exam series.**

**Facility** is the proportion of available marks scored by students on average (please see the 'Review' section on page 5).

**MCQ** stands for 'Multiple choice question'.

**Question 2, Paper 1**

2 Work out  $\frac{1}{4} + 0.5$

Circle your answer.

[1 mark]

0.30

0.6

0.75

0.9

**Review**

Only 53% of students chose the correct answer – this isn't what we want from our settling questions.

**Summer 2022 and beyond**

We wouldn't use a question like this, which requires two steps for one mark (conversion and then addition), in the first four MCQs. We'd either test what is the fraction as a decimal or give two simple decimals for students to add up.

**Example**

What is  $\frac{1}{5}$  as a decimal?

Circle your answer.

0.25

0.20

0.75

0.5

[1 mark]

**Assessment design**

By reducing the number of steps needed for students to complete the task, we're making sure lower attainers are given the opportunity to demonstrate their understanding too.

## Question 4, Paper 1

4 Solve  $x - 3 = 0$

Circle your answer.

[1 mark]

$x = -3$

$x = 0$

$x = \frac{1}{3}$

$x = 3$

### Review

This performed well at 85% and questions of this style could continue to appear in the first four MCQs.

### Summer 2022 and beyond

Having said the above, in future it would be more likely to appear in Paper 2 or 3 as we would like to concentrate more (but not all) of the non-calculator Paper 1 questions on simple arithmetic and number to give students a good settling start and to focus on the basic skills and knowledge that all students need.



## Question 5, Paper 1

5 Work out  $58 \times 73$

[3 marks]

### Review

This question had a facility of 66% which isn't high enough for the first non-MCQ. We would try to make sure we have a higher performing question as Question 5.

### Summer 2022 and beyond

Any long multiplication would use much more accessible values if this remained as Question 5, otherwise this level of question would be moved several questions later in the paper.

### Example

Work out  $32 \times 24$

[3 marks]

### Assessment design

We only need to test whether students are able to complete long multiplication – by providing more accessible values, we're making sure that students of all abilities have the opportunity to demonstrate this skill.

## Question 9, Paper 1

9 Work out  $25.68 \div 12$

[2 marks]

### Review

The facility of this question was only 43%. It's a harder version of long division than we would now want to set at this early part of the paper.

### Summer 2022 and beyond

The numbers could be amended to remove the decimal and have fewer figures or, if it was a decimal, division by a single digit value. Then it would be more appropriate for this part of the Foundation paper.

### Example

Work out  $256 \div 12$

[2 marks]

### Assessment design

We only need to test whether students are able to complete long division – by providing values that don't have any decimal places, we're making sure that students of all abilities have the opportunity to demonstrate this skill.

This improves the validity of the question by only testing what we intend to test – in this case long division, not decimals.

**Question 10, Paper 1**

**10** Work out  $\frac{3}{8} \times 11$

Give your answer as a mixed number.

**[2 marks]**

**Review**

Some may argue that students should be far better at questions like this, but the facility was only 22%. It's clearly causing greater difficulty than the original expected demand.

**Summer 2022 and beyond**

This question wouldn't now be set in the first half of a Foundation paper. Even with smaller numbers, the major misconception will still be realised by many. This question simply needs to be much later in the paper as it isn't low demand.

## Question 12, Paper 1

**12** A football team has  $P$  points.

$$P = 3W + D$$

$W$  is the number of wins

$D$  is the number of draws

**12 (a)** A team has 6 wins and 2 draws.

How many points does the team have?

[1 mark]

### Review

With a facility of 64%, this feels within a reasonable range for this position in the paper.

### Summer 2022 and beyond

This type of (relatively) simple substitution feels appropriate for this part of the paper. However, on a separate issue, we now feel the context may favour some students over others, so we would reconsider using football in this context.

### Example

A team has  $P$  points.

$$P = 3W + D$$

$W$  is the number of wins

$D$  is the number of draws

A team has 6 wins and 2 draws.

How many points does the team have?

[1 mark]

### Assessment design

Context is an important consideration in assessment design. We need to think about the diversity of students taking our exams including the life experiences they may, or may not, have had.

While some students might be comfortable with the reference to football in this question, others might not – they might spend more time worrying about the relevance of football to the question, than to the question itself.

As it's irrelevant to the question, the specific reference to 'football' team is an unwelcome distraction that isn't needed.



## Question 1, Paper 3

1 Circle the lowest of these temperatures.

[1 mark]

$-4.9^{\circ}\text{C}$

$0^{\circ}\text{C}$

$-7^{\circ}\text{C}$

$0.1^{\circ}\text{C}$

### Review

A great start for students with a return of 93%, which is just what we would want to settle students at the beginning of the paper.

### Summer 2022 and beyond

This question would still be suitable for a Question 1 or for any of the first four MCQs.

### Assessment design

From an assessment design perspective, this question works really well. We've only given students one thing to do ie order four numbers, and this tests what it's intended to test ie their knowledge of positive and negative numbers.

In this instance, the context of 'temperature' isn't distracting and will actually assist some students as negative numbers are often introduced in the context of temperature to help students' understanding.

## Question 3, Paper 3

3 Circle the fraction **greater** than  $\frac{3}{10}$

[1 mark]

$$\frac{1}{3}$$

$$\frac{3}{11}$$

$$\frac{4}{15}$$

$$\frac{29}{100}$$

### Review

This is a question we've really learned from. Though the maths is relatively simple and a calculator is available, there is far too much to do here for one mark. The return of 60% is too low for the first four questions.

### Summer 2022 and beyond

We would concentrate on a single step. This could involve choosing the decimal equivalent of a single fraction or vice versa.

### Example

Circle the decimal that is equal to  $\frac{3}{5}$

0.3

0.35

0.5

0.6

[1 mark]

### Assessment design

Like Question 2 Paper 1, the accessibility of this question is improved by reducing the number of steps needed. We only need students to complete one step to accurately assess their understanding of converting fractions to decimals this early on in the paper.

## Question 5a, Paper 3

**5 (a)** Simplify  $a \times a \times a + b + b$

**[2 marks]**

### Review

The facility of 66% for this question is much lower than we would want for the first non-MCQ when students are still settling in.

### Summer 2022 and beyond

We could move this question back in the paper a few questions, or we could reduce the complexity by, for example, removing the third  $a$ .

### Example

Simplify  $a \times a + b + b$

**[2 marks]**



**Question 5b, Paper 3****5 (b)** Simplify  $5(x + 3) - x + 2$ **[3 marks]****Review**

This is definitely more complex than it needs to be at this level and at this position in the paper. The facility of 53% shows it should be further towards the middle of the paper.

**Summer 2022 and beyond**

If we wanted to ask this question involving expanding a bracket followed by further simplification, it would be much later in the paper. We could ask a pair of single step simplifications early in the paper, though we would probably put even this later than Question 5.

**Example**

- (a) Simplify  $5(x + 3)$   
(b) Simplify  $2x + 9 + x - 1$

**[3 marks]****Assessment design**

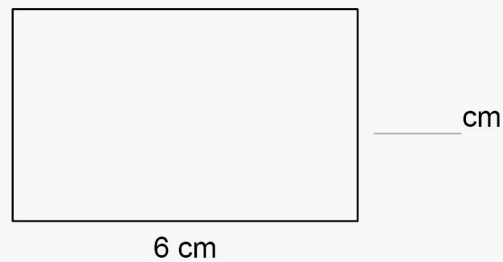
In these two questions, we're simplifying the question to give more students an opportunity to demonstrate their understanding of algebra. In the second example, by splitting the question into two parts, students can focus on each skill separately.

### Question 10, Paper 3

- 10 Each shape below has an area of  $24 \text{ cm}^2$   
Complete the missing lengths.

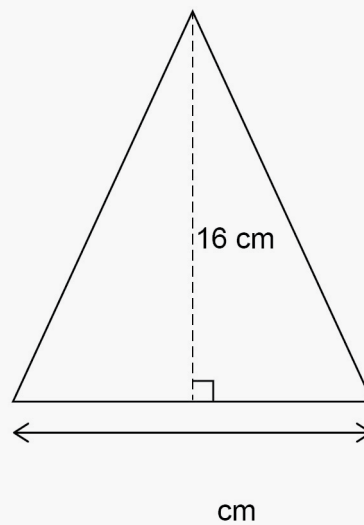
[3 marks]

Rectangle



Not drawn accurately

Triangle



#### Review

The facility for this question was 60% with, as expected, the triangle causing more problems than the rectangle.

### Summer 2022 and beyond

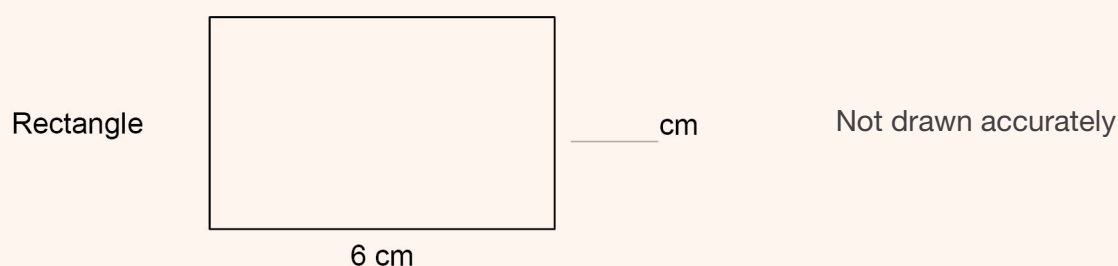
For this place in the paper, we would want questions that achieve a slightly higher facility. We could split these into two parts (without affecting what is being tested). Students would then possibly find the second shape easier to handle. We could also make the measurement for the triangle part of the question a smaller value.

### Example

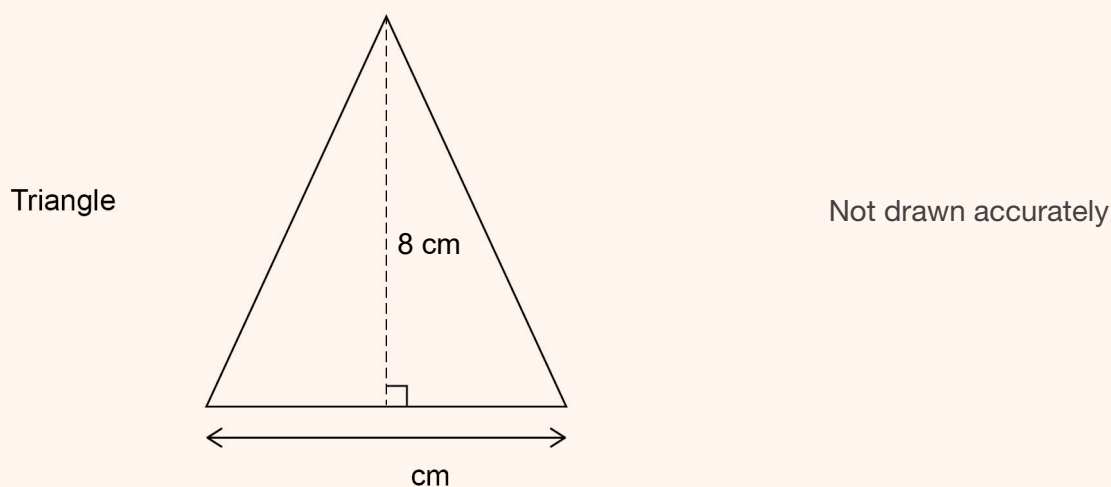
Each shape below has an area of  $24\text{cm}^2$

Complete the missing lengths

10a)



10b)



[3 marks]

## Assessment design

Students might try to connect the two parts when they're drawn together. By breaking the question up into two sections, we're encouraging students to separate their thinking about the two shapes.



## Question 12, Paper 3

**12** Put these probabilities in order, starting with the least likely.

44%

 $\frac{1}{4}$ 

0.404

 $\frac{4}{10}$ **[2 marks]****Review**

There's some unnecessary complication with this question, and this may have contributed to the facility of 54% which is too low for a low demand question.

In appearance, this is too similar to an MCQ which may have troubled some students.

**Summer 2022 and beyond**

We could remove the probability context and reduce to three values. This should improve the facility to something acceptable for Question 12 (60%-70%).

**Example**

Put these in order, starting with the smallest value

44%

 $\frac{1}{4}$ 

0.404

**[1 mark]****Assessment design**

By reducing the number of steps needed for students to complete the task, we're making sure lower attainers are given the opportunity to demonstrate their understanding too.

# Contact us

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Our team of subject experts are here to help and support you as you deliver our specifications.

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We're here to provide advice when you need it and respond to queries you might have to make sure you feel confident about guiding your students to fulfil their potential.

We understand the trust you put in us to provide great assessments for your students and we are committed to delivering on this.

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