

GCSE Maths

Foundation and Higher Tier paper improvements

Better maths assessment for you
and your students





The right assessment should give your students the best opportunity to get the results they deserve, so we've been working to further update and refresh our GCSE Maths papers.

From better understanding how students access the questions, particularly Foundation students, to the best use of multiple choice questions, our assessment and research experts are constantly applying what they find to make our assessment better.

Some of the updates came in summer 2022 but the majority were seen for the first time in the summer 2023 papers. We'll be continuing to make improvements to shape the future of maths assessments.

Here are the key improvements which have occurred in summer 2023

No multiple choice questions (MCQs) at the start of our papers

We no longer start our papers with MCQs. We haven't removed them entirely – MCQs will sometimes be the best way to assess something - but we will use them sparingly.

This is because we want students to gain confidence early in the paper, from a series of questions which most students will get correct, without second guessing themselves.

A better ramping of demand

We want our papers to have a gentle and consistent ramping of demand. We're working to ensure all questions are in order of difficulty so learners can go far in each paper without losing confidence.

Our commitment to accessibility

Many of you chose to work with us because of the accessibility of our papers and our commitment to that hasn't changed. We have fewer words in our papers and contexts are carefully considered to make sure we're giving students the best chance to show their maths skills, not their English comprehension.

Student experience

We're not making questions in exam papers easier, we're just making sure they're as clear as possible and fall in an order that fosters confidence. We want to avoid students losing hope in the middle of a paper because of a tricky start and these amendments will support that goal.

Looking at the Higher Tier papers, we're making similar changes, cutting down on multiple choice questions and ensuring language is straightforward, but these exams are performing well so it's about continuing that success. The majority of our focus has been on our GCSE Foundation exams, where far more adaptations have been introduced to improve the exam experience for all your students.

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

Here are the key principles we use to create valid assessments:

Consistency

This is about getting the fundamentals right; accurate marking, no errors, a recognisable style, no surprises for well-prepared students. It can mean steady grade boundaries but it also might mean making carefully controlled changes to achieve fairness.

Fairness

This is about assessing properly across the grade range so that all students are judged on what they can do. It's also about ensuring students don't fail because of language, layout, familiarity or other aspects that are irrelevant to what is being tested. This aspect was the driver for the changes we made to the start of our Foundation papers.

The importance of the subject

That's about more than just covering content; it's about ensuring the content that is most important is properly covered and that problem solving and reasoning skills are tested appropriately at all levels of difficulty. We want teachers to pick up our papers and think they're fair, as expected but also that they're a valid test of the skills and knowledge that you've worked so hard to teach.



All questions are taken from the summer 2023 GCSE Maths papers.

MCQ stands for 'Multiple choice question'.

Using this booklet

We've collated and annotated a selection of questions from the summer 2023 GCSE Maths papers, to give you a better idea of the improvements we've made for both Foundation and Higher Tier papers.

On each page in this guide, you'll find a question from the summer 2023 papers with our review of the question and details of how we improved it.

Review:

We outline our rationale behind how the questions might have appeared in an earlier series (where this is appropriate) and the thinking behind the way the questions will appear now.

Paper 3F

Questions 1a and 1b

1 (a) Solve $5x = 15$

$x =$ _____

1 (b) Solve $y + 7 = 50$

$y =$ _____

Review:

Again, rather than having a MCQ here, we have equations to solve, which even struggling learners can attempt. This is another example where the confidence in the paper. Not having the common misconception of dividing both sides by 5 allows learners to focus on solving the equations.

GCSE Maths:

**Foundation Tier questions
– early in the papers**

Paper 2F

Question 1a

1 (a) Here is a number line.



What number is at X?

[1 mark]

Answer _____

Review:

We've now removed the multiple choice questions (MCQs) with common errors listed as options. We now use something straight forward to settle students into the exam, here asking them to use a number line, and write down the value indicated by the letter. This is aimed to give success and confidence to even the lowest attaining students, and it succeeded with over 95% of students getting it right.

Paper 3F

Questions 1a and 1b

1 (a) Solve $5x = 15$

[1 mark]

$x =$ _____

1 (b) Solve $y + 7 = 50$

[1 mark]

$y =$ _____

Review:

Again, rather than having a MCQ here, we have an open question with some basic equations to solve, which all learners can have success with. This is another example where the confidence of students is being built up early on in the paper. Not having the common misconceptions present as MCQ alternatives, allows learners to focus on solving the equations correctly. Each part was answered correctly by over 90% of students.

Paper 3F

Questions 2a, 2b and 2c

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2 Here is a list of numbers.

10 8 2 11 12 15 4 4

2 (a) Write down the mode.

[1 mark]

Answer _____

2 (b) Work out the median.

[2 marks]

Answer _____

2 (c) Work out the range.

[1 mark]

Answer _____

Review:

This question demonstrates basic use of measures of average and range without any context. This question should be a good source of marks for learners who know the meaning of these terms.

The median question has an odd number of terms to make it more likely that students can demonstrate their knowledge of the meaning of the median, at this part of the paper.

Paper 1F

Questions 3a and 3b

3 (a) Work out $(-4) \times (-3)$

[1 mark]

Answer _____

3 (b) Work out $6 \times (-5)$

[1 mark]

Answer _____

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Review:

These questions would previously have appeared as MCQs and would've therefore shown all the potential and common misconceptions that exist in this work. Straight forward open questions which ask the learners to write down or work out answers, are easier to focus on without the distraction. No need for context in this early part of the paper.

Paper 1F

Question 5

5

At a shop

the normal price of one pen is 24p

the normal price of one calculator is £7

The shop has these special offers.

<p style="text-align: center;">Pens</p> <p style="text-align: center;">Half the normal price</p>

<p style="text-align: center;">Calculators</p> <p style="text-align: center;">£1.50 less than the normal price</p>

Work out the **total** price of 5 pens and 1 calculator using the special offers.

[4 marks]

Answer £ _____

--

Review:

We know from experience that learners are more successful in basic problem solving if it includes money. We use all our knowledge of how to set out questions (using indents, boxing key information) to present this question as clearly as possible to do so.

Before this question, we've had 12 single mark questions and a 2-mark question, this is the first question which is higher tariff but is still one that we would expect to be a very good source of marks for students. It was pleasing to see that almost three quarters of students achieved full marks in this question.

Paper 2F

Question 6

6

A game has four cards labelled A, B, C and D.

Ellie picks two of the cards at random.

Complete the list of the **six** possible pairs of cards she could pick.

[2 marks]

AB

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Review:

Previously we wouldn't have indicated the number of pairs that are possible, but as this is not problem solving and the AO1 skill of listing outcomes, it's perfectly reasonable to make this as accessible as possible by doing so. Thus, learners have a better chance of exhibiting their listing skills as they are likely to realise that repeats etc are giving too many outcomes.




Paper 1F

Question 7

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- 7 Misha recorded the main type of weather each day for **55 days**.
The pictogram shows the results for rain, snow and cloud.

Key:  = 4 days

Rain	
Snow	
Cloud	
Sun	
Fog	

Sun was recorded on 1 **more** day than fog.

Complete the pictogram for the 55 days.

[4 marks]

Review:

This question is a good example of where accurate working with the given information can get the learner good marks before the problem solving itself kicks in. We've used limited but effective bolding of key information to support students in attempting the question.

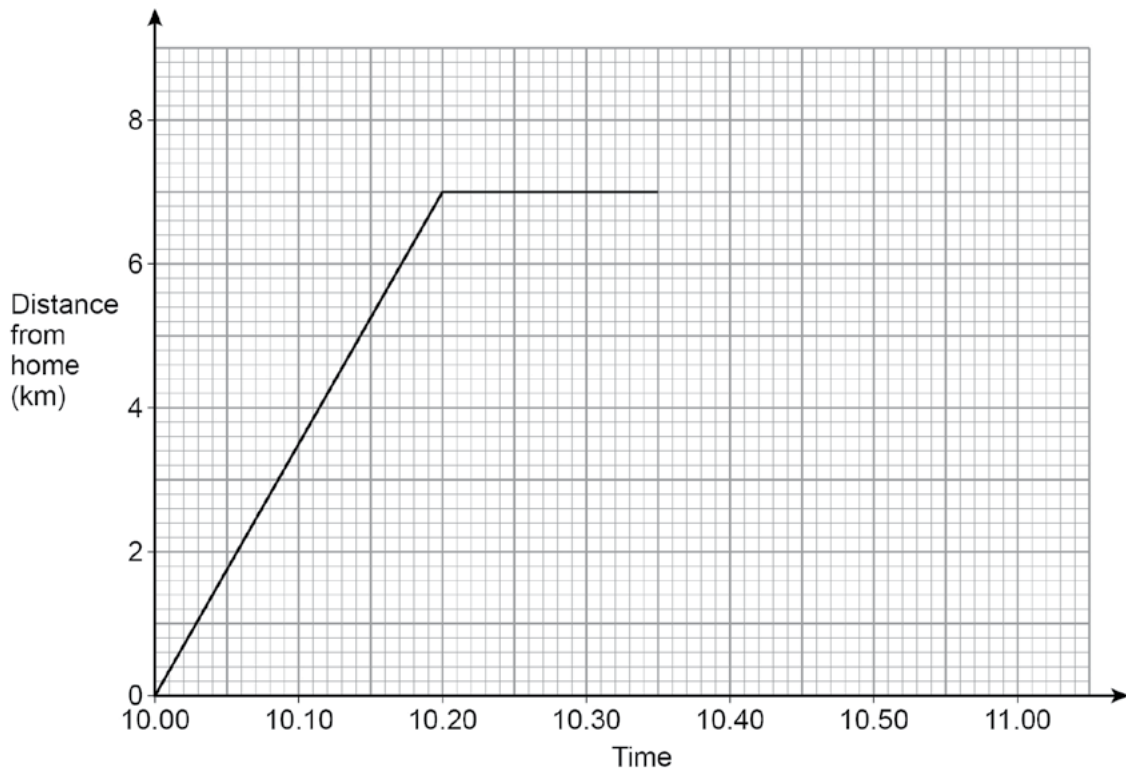
As we hoped, this question was well answered, with over 60% of students getting all the marks, and over 90% gaining some credit.

Paper 3F

Questions 6a and 6b

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- 6 Scarlett leaves home at 10.00 to cycle to the supermarket.
Here is part of a distance-time graph of her trip to the supermarket.



- 6 (a) She arrives at the supermarket at 10.20
How far is the supermarket from her home?

[1 mark]

Answer _____ km

- 6 (b) She leaves the supermarket at 10.35
How long does she stay at the supermarket?

[1 mark]

Answer _____ minutes

Paper 3F

Question 6c

6 (c) Scarlett cycles home at a constant speed using the same route.
It takes her 3 minutes longer than her journey to the supermarket.
Complete the distance-time graph.

[2 marks]

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Review:

We won't set questions with anything but the most simple of diagrams in the first 10-15 marks so this is the first question with a diagram in paper 3 after 18 marks have passed.

To enable learners to access the question as well as possible, we designed parts (a) and (b) to be answered by a good proportion of students, so that as many as possible felt confident to attempt the more challenging part (c). In the past we may not have used two very accessible parts to this question.

GCSE Maths:

**Foundation Tier questions
– rest of the papers**

Paper 1F

Questions 11 and 16

11

Convert 7 gallons to litres.

Use 1 gallon = 4.5 litres

[2 marks]

Answer _____ litres

16

Liz travels 18 miles in 20 minutes.

Work out her average speed in miles per hour.

[3 marks]

Answer _____ mph

9

Review:

For AO1 questions we don't use context if it isn't needed. We feel this is crystal clear and as word free as possible, whilst testing the maths we intend it to. Question 16 is another good example of this, there is a context but it uses minimum words for clarity.

Paper 3F

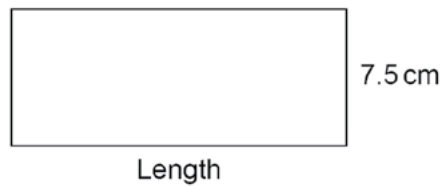
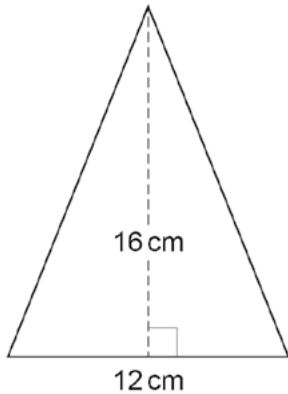
Question 16

16

The rectangle and the triangle have the same area.

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accurately



Work out the length of the rectangle.

[3 marks]

Answer _____ cm

Review:

To avoid unnecessary words we will sometimes allow diagrams to speak for themselves. There is no need to repeat the information on the diagram in sentences. The key information is all there with the focus of the words all on the key additional information and what we want learners to work out.

Paper 3F

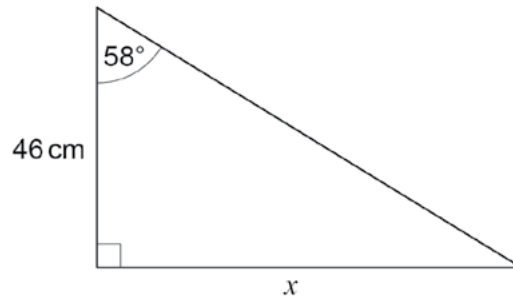
Question 23

23

Use trigonometry to work out the value of x .

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Not drawn
accurately



[3 marks]

$x =$ _____ cm

Review:

This type of trigonometry question is nearly always AO1. We therefore will tell students it's a trigonometry question, as we want to know if they can do it. If they have to select the maths to use in a question, it probably isn't AO1.

We have also increased the tariff for trigonometry to 3 marks in recent series, as this allows us to differentiate better between the different quality of attempts we see at this work. In this question, we awarded the first mark for recognising that 'Tan' was needed. This approach led to 14% more students picking up a mark on this question.

Paper 1F

Question 25

25

Work out $2\frac{1}{3} \div \frac{4}{5}$

Give your answer as a mixed number.

[4 marks]

Answer _____

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Review:

We've worked very hard looking at the performance of previous questions in live papers. As a result, we now order questions differently to get the best possible ramping of questions, where we aim for a steady rise in demand throughout the paper.

We know that despite how it might look, Foundation students will find this type of question very challenging so we put it last. Questions that are common to both Foundation and Higher Tiers now come in the same order in both papers. Just over 20% of Foundation Tier students got full marks which is a good performance for a last question but also suggests it was in about the right place in the paper.

GCSE Maths:

Higher Tier questions

Paper 1H

Questions 1a and 1b

1 (a) Work out 0.7×0.5

[1 mark]

Answer _____

1 (b) Work out $\frac{5}{6} \div 3$

[1 mark]

Answer _____

Review:

These questions would previously have been MCQs. Even at Higher Tier, students may sometimes be nervous and the presence of the common misconceptions is likely to be off-putting for them. Asking open questions allows students to show what they know and about 75% of students were successful with each part.

Paper 2H

Question 2

2

Four consecutive triangular numbers are 6 10 15 21

Write down the next triangular number.

[1 mark]

Answer _____

Review:

Another question that would have been an MCQ yet doesn't require the use of options. Learners will hopefully find this a good settler and achieve the answer without the need to then find it in a list of options.

95% of students achieved this mark.

Paper 1H

Question 18

18

$$6 < \sqrt[3]{x} < 7$$

Circle the possible value of x .

1.9

20

45

290

[1 mark]

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Review:

Notice that we haven't completely removed MCQs from our papers. If we feel an MCQ is the best way to test something, we will continue to use them as this piece of understanding is required.

Paper 3H

Question 13

13

Charlie is driving 293 miles home.

He

- leaves at 9.00 am
- travels the first 176 miles at an average speed of 48 mph
- drives the rest of the way at an average speed of 65 mph

Will he be home by 2.30 pm?

You **must** show your working.

[4 marks]

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Review:

The nature of some problem solving and AO2 questions are simply that there will be a fair amount of information to get across to students. In thinking carefully about our wording and contexts, we'll now use bullet points if we feel it helps students get to grips with all the required information more easily.

You'll notice how, even at Higher Tier, we use simple language wherever possible. We hope this encourages all learners to at least make a start on the question and the 'non-attempt' rate of under 0.5% suggests students weren't daunted by layout here.

Paper 1H

Question 14

14

Here is a list of 11 whole numbers in numerical order.
The lower quartile, median, upper quartile and highest value are missing.

5	8		13	19		25	28		34	
---	---	--	----	----	--	----	----	--	----	--

- median = $2 \times$ lower quartile
- upper quartile = $2.5 \times$ lower quartile
- range = $2 \times$ interquartile range

Complete the list.

[2 marks]

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Review:

Even for Higher Tier problem solving, it's not necessary to load the question with additional difficulty of an arithmetical nature. Using small values allows students to focus on solving the problem we've set, without getting bogged down in numerical manipulation.

Paper 2H

Question 23

23

Here are three sets of cards.

Set A

1	1	3	5	5	5	6	8
---	---	---	---	---	---	---	---

Set B

1	2	4	6	8	8	9
---	---	---	---	---	---	---

Set C

3	4	5	6
---	---	---	---

In a game, a player has two options.

Option 1
Pick two cards from Set A

Option 2
Pick one card from Set B
and
pick one card from Set C

The cards are picked at random.

The player wins if the total of their two cards is exactly 10

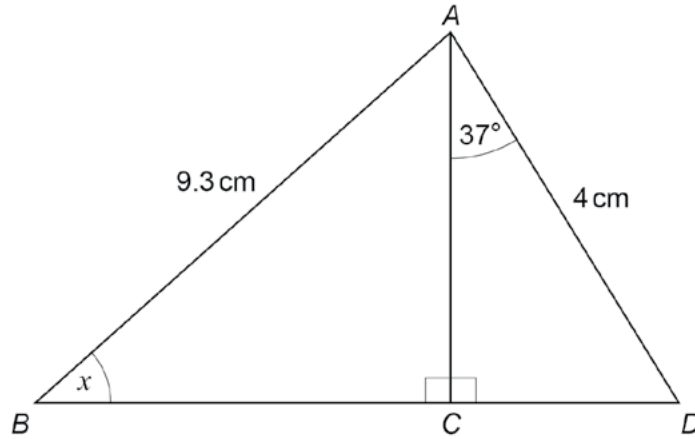
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Paper 2H

Question 17

17

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accurately

Work out the size of angle x .

[4 marks]

$x =$ _____ °

Review:

Note how clean and accessible this question is even if the maths may be quite challenging. We don't need to clutter the page with descriptions of shapes when the diagram does all the work for us.

Whilst it's essential nothing is left in doubt for students, it's also vital that we don't confuse with unnecessary wording which distracts from the task in hand.

We've worked very hard to improve this facet of our question writing – in previous years we would've probably listed much of the information on the diagram, but it isn't needed.

Over 50% of students were able to achieve full marks here, and only 14.5% failed to score anything.

Contact us

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

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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