AQA
Questions matter

GCSE Maths:

Foundation and Higher tier paper improvements

Better maths assessment for you
and your students: summer 2023

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 those updates were included in the papers your students sat this summer, and next year, you'll see some bigger changes.

Here are the key improvements you'll see for summer 2023:

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

We'll no longer start our papers with MCQs from summer 2023. We're not removing 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. Students will now see questions in order of demand so they can go as far as they can without losing confidence or slowing down.

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 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. We chose fairness over consistency to improve the students' experience.

- **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 new 2023 Practice Papers.

MCQ stands for 'Multiple choice question'.

Using this booklet

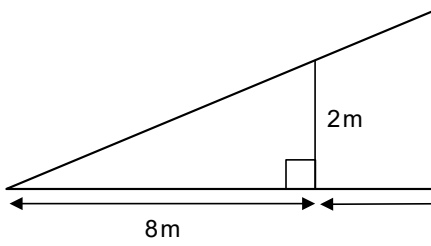
We've collated and annotated a selection of questions from the new 2023 Practice Papers to give you a better idea of the further improvements we're making, for both Foundation and Higher tier papers.

On each page, you'll find a question from the new 2023 Practice Papers with our review of the question and details of how we improved the question for next year's exams.

Review:
We outline our rationale behind how the question appeared as it did in the Practice Papers, occasionally referencing what we were going to do and, where appropriate, how that aligns with our commitment to continuously review and improve our assessments.

Question 14

14 The diagram shows a small triangle which is al



Work out the value of x.

Answer _____

Review:
This question's been replaced with a simila
area but of lower demand than the original
point in the paper.
Some of the remaining questions are refres
In particular, we aim to give students the o
without excessive complexity or other facto
in the way. The main emphasis of our chan
to get the ramping of questions right accor
example, Q21 is later than it originally was

Foundation Paper 1

Question 1a

1 (a) Write $\frac{1}{10}$ as a percentage.

[1 mark]

Answer _____ %

Review:

We've removed the multiple choice question (MCQ) with common errors listed as options. We've replaced it with one of the easiest possible percentages on this occasion as a very straightforward, 'settling' question giving success and confidence for even the lowest attaining students.

Question 1b

1 (b) Write 0.9 as a percentage.

[1 mark]

Answer _____ %

Review:
This is changed from an MCQ but we kept the same question as an open-response question so the previous wrong answers in the MCQ options are not a distraction.

Question 2

2 Write $\frac{8}{10}$ as a fraction in its simplest form.

[1 mark]

Answer _____

Review:

As well as making this open-response, we've removed the context which significantly reduces the reading required and makes this a single step for one mark.

Question 3

3 Simplify $7y + 4x - 2y + 3x$

[2 marks]

Answer _____

Review:

As an MCQ, we were effectively asking for two simplifications for only 1 mark so we've now given 2 marks as there are clearly two things for students to do. We've also made the process slightly simpler by using x and y not x and numbers.

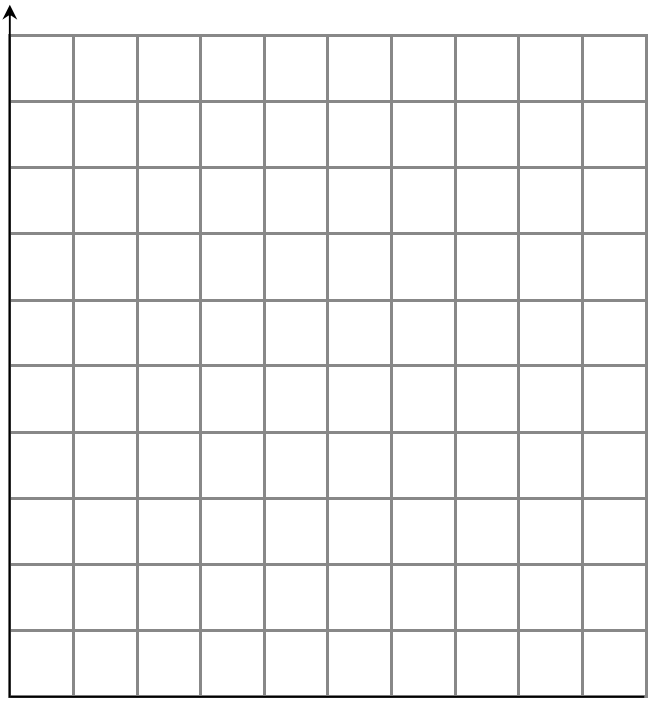
Question 4

4 This table shows what 20 students do for lunch.

Sandwiches	School dinner	Go home
7	5	8

Draw a bar chart to show this information.

[4 marks]



Review:

The question is very similar to the original, though we've removed one value. This still tests everything it did before, but there is now less repetition in the work required.

Question 7 (Q5 originally)

7 Here are three events for an ordinary fair dice.

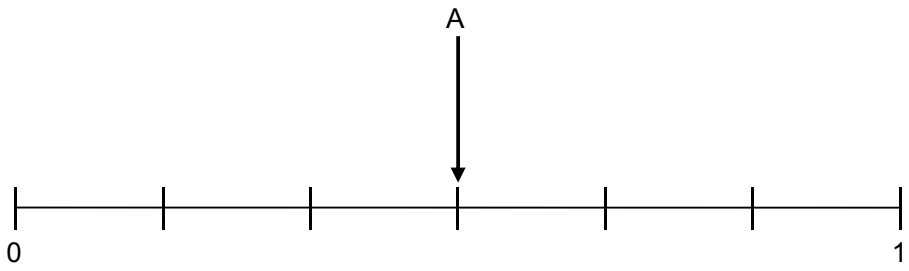
A Roll an odd number

B Roll a number greater than 6

C Roll a 3

Draw and label arrows to show the probabilities of events B and C on the probability scale.

[2 marks]



Review:

This question has been simplified slightly but has moved back a couple of questions as it is slightly more demanding than the new Q5 and Q6.

Question 6

6 Work out $46 - 2.5 \times 4$

[2 marks]

Answer _____

Review:

This previously tested order of operations, decimal multiplication and decimal subtraction, all for 2 marks. Now, this just tests 2 of these for 2 marks as the final subtraction should now be trivial with the friendlier numbers chosen.

Question 5 (originally Q7)

5 Write these numbers in order, starting with the smallest.

[1 mark]

7.1 7.11 7.01

Answer _____ _____ _____

Review:

As there is just one mark for this, it seems that the reduction from 4 numbers to list in order to 3 numbers is reasonable. It has also been moved a little earlier in the paper as we believe this improves the ramping of demand.

Question 10 (previously Q8)

10 There are 10 discs in a bag.

5 are red, 3 are green and the rest are blue

A counter is chosen at random.

Work out the probability that it is blue.

[2 marks]

Answer _____

Review:

We've simplified the numbers so students can concentrate on understanding the probability. We also moved it to later in the paper as we have evidence from previous papers that contextual probability questions like this have proven more difficult than we anticipated.

Question 9

9 68 students go on a school trip.

Each student will be given a bottle of water.

Bottles are available in packs of 10.

How many of these packs are needed?

[3 marks]

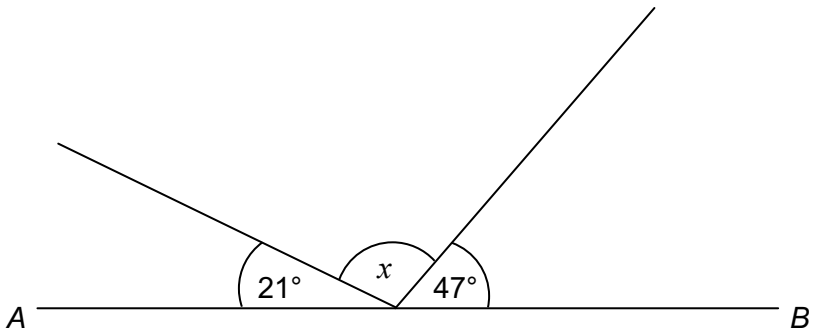
Answer _____

Review:

To ensure that this is able to test the mathematical reasoning as much as the arithmetic, we simplified the numbers. Also, we didn't feel the diagram was particularly valuable and may distract as much as help.

Question 8 (previously Q10)

8



AB is a straight line.

Work out the size of angle x

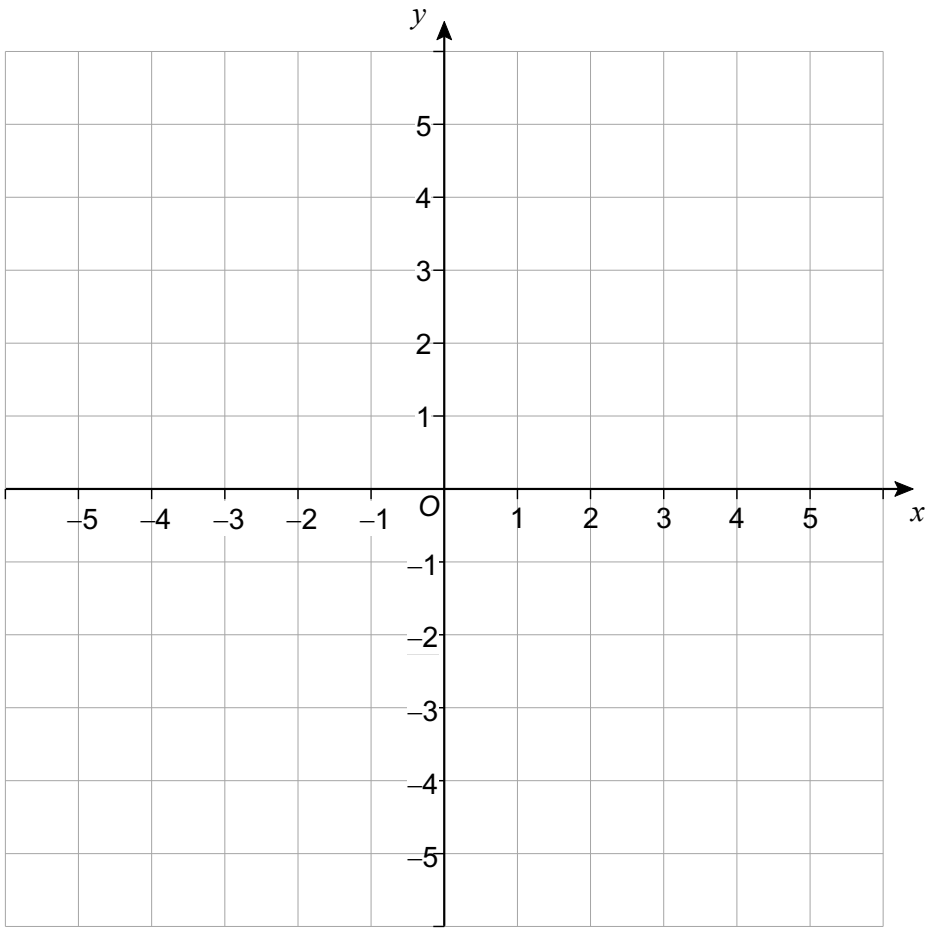
[2 marks]

$x =$ _____ °

Review:
We haven't changed the difficulty of this question just moved it. Based on expected responses we've also given two additional working lines.

Question 11

11 Here is a centimetre grid.



A (5, 3), *B* (5, –3) and *C* (–5, 0) are three points.

What type of triangle is *ABC*?

You **must** show your working, which may be on the diagram.

[2 marks]

Review:

We've changed the position of the triangle to try to make the thing we're testing easier to see so that the question is more accessible.

Question 12

12 (a) Work out the value of 2^3

[1 mark]

Answer _____

12 (b) Work out the value of 10^4

[1 mark]

Answer _____

12 (c) Work out the value of $\sqrt{144}$

[1 mark]

Answer _____

Review:

In all parts of this question we changed the question from multiple choice to open response. At this place in the paper, we don't want to test that students can reject common misconceptions but we do want to see that they can understand and use index notation.

Question 14

14 Ian has 80p.

Sam has £4.

Sam gives Ian some money so that they both have the same amount.

How much does Sam give to Ian?

[2 marks]

Answer £ _____

Review:

We've made the values easier to work with; this doesn't change the reasoning required but may enable more students to show their reasoning without arithmetic getting in the way.

In many of the remaining questions we've changed the contexts to refresh the questions. Occasionally, values have been simplified a little, but the main emphasis in the second half of the paper is to get the ramping of questions right according to their expected difficulty.

Continued...

Question 16

16 A small theatre has:

21 rows of seats

9 seats in each row

Adult tickets are £8 each.

Child tickets are £5 each.

The theatre has sold tickets for every seat.

The manager estimates that £1250 was raised from these tickets.

90 child tickets were sold.

Check whether the manager's estimate was close to the exact amount of money raised.

[6 marks]

Higher Paper 1

Question 1

1 (a) Write down a number with value greater than 2.33 and less than $2.\dot{3}$

[1 mark]

Answer _____

1 (b) Write down a fraction with value between $\frac{1}{5}$ and $\frac{1}{4}$

[1 mark]

_____

_____

Answer _____

Review:

In the original practice paper it could be argued that parts (a) and (b) for Q1 tested very similar things. Certainly there was a lot to do checking all the values and finding the largest or smallest. In the new Q1 it is now an open response each time offering the students a mark for just identifying one appropriate value each time.

Question 2

2 Here is a sequence.

15 19 23 27 31

Work out an expression for the nth term of the sequence.

[1 mark]

Answer _____

Review:

An open-response question has replaced the multiple choice question (MCQ) based on finding the nth term. This remains at one mark as it's now an easier example.

Question 3

Do n
outs

3 Work out the value of 300^2

Give your answer in standard form.

[2 marks]

Answer _____

Review:

The original question was a great deal of work for one mark. The replacement open-response question requires the same type of skills but now there are two marks which is more appropriate.

Question 4

4 Work out $64.5 \div 0.15$

[2 marks]

Answer _____

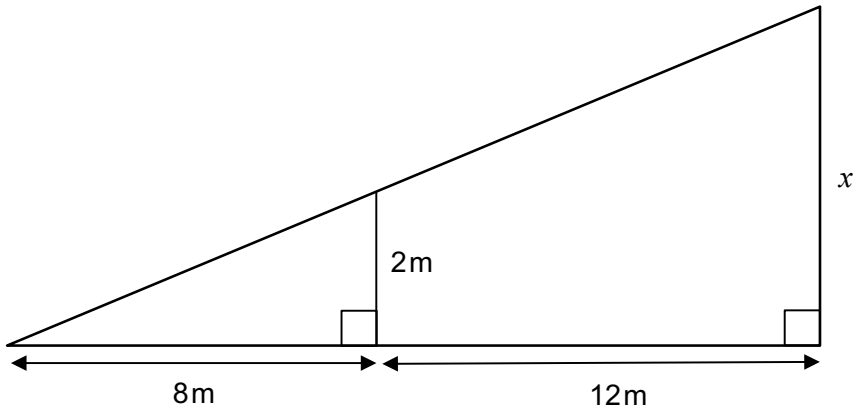
Review:

This is a very similar non-context question to the original.

The few new questions are common with Foundation. They have been kept in the same order but there are two non-common questions amongst them (Q8 which is now an open response rather than an MCQ and Q9 for which the numbers have been simplified but all the reasoning remains the same). These insertions are to improve the ramping of demand of the early part of the paper.

Question 14

14 The diagram shows a small triangle which is also part of a large triangle.



Work out the value of x.

[2 marks]

Answer _____

Review:

This question's been replaced with a similar question in the same mathematical area but of lower demand than the original which we felt was too hard for this point in the paper.

Some of the remaining questions are refreshed with more straightforward numbers. In particular, we aim to give students the opportunity to show AO2 and AO3 skills without excessive complexity or other factors, such as arithmetic demand, getting in the way. The main emphasis of our changes in the second half of the paper is to get the ramping of questions right according to their expected difficulty. So, for example, Q21 is later than it originally was and Q18 is earlier than it originally was.

Foundation Paper 3

Question 1

Do not write outside the box

1 Write $\frac{4}{5}$ as a decimal.

[1 mark]

Answer _____

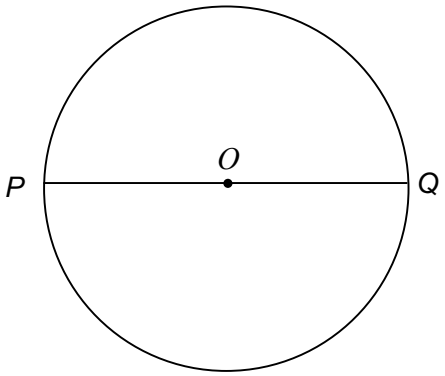
Review:

We've changed this question so that it asks for the same knowledge as the original but not in a multiple choice (MCQ) format. Thus, students are not being faced with well-known misconceptions to think about when starting the paper. We would hope that most students will get this correct and know that they have got this correct, moving on with a little more confidence.

Question 2

2 Write down the word that describes the straight line PQ.

[1 mark]



Answer _____

Review:

The original question asked for knowledge of the chord of a circle which is quite difficult for this part of the paper. It was also an MCQ. We now have an open response question simply testing knowledge of the diameter.

Question 3

3 Round 2445 to the nearest 100

[1 mark]

Answer _____

Review:

The new question asks for a value to be rounded. Whilst the understanding required is no different to the original, the open response format makes it simpler to see what is required.

Question 4

4 Work out one quarter of 5 hours.

Give your answer in minutes.

[2 marks]

Answer _____ minutes

Review:

The original MCQ was a time calculation, the new question is also a similar time calculation but is now an open response question for two marks. The amount of work required is worth two marks.

Question 5

Do not write outside the box

5 Simplify $7c + 5d - 4c + 3d$

[2 marks]

Answer _____

Review:
The question has been eased somewhat to reflect its position in the paper, mainly by reducing the number of negative terms.

Question 6

6 Lin uses these three cards to make 3-digit numbers.

How many **different** 3-digit numbers can she make that are greater than 500?

[2 marks]

Answer _____

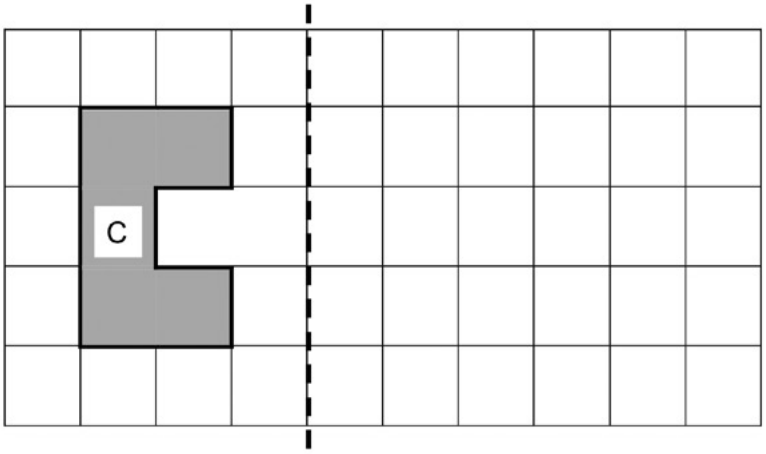
Review:

This question has been eased by removing a card to leave just the three. The maths being tested remains unchanged, but the reduced number of cards reflects more accurately a low demand question on this topic.

Question 8a

8 (a) Reflect shape C in the mirror line.

[1 mark]



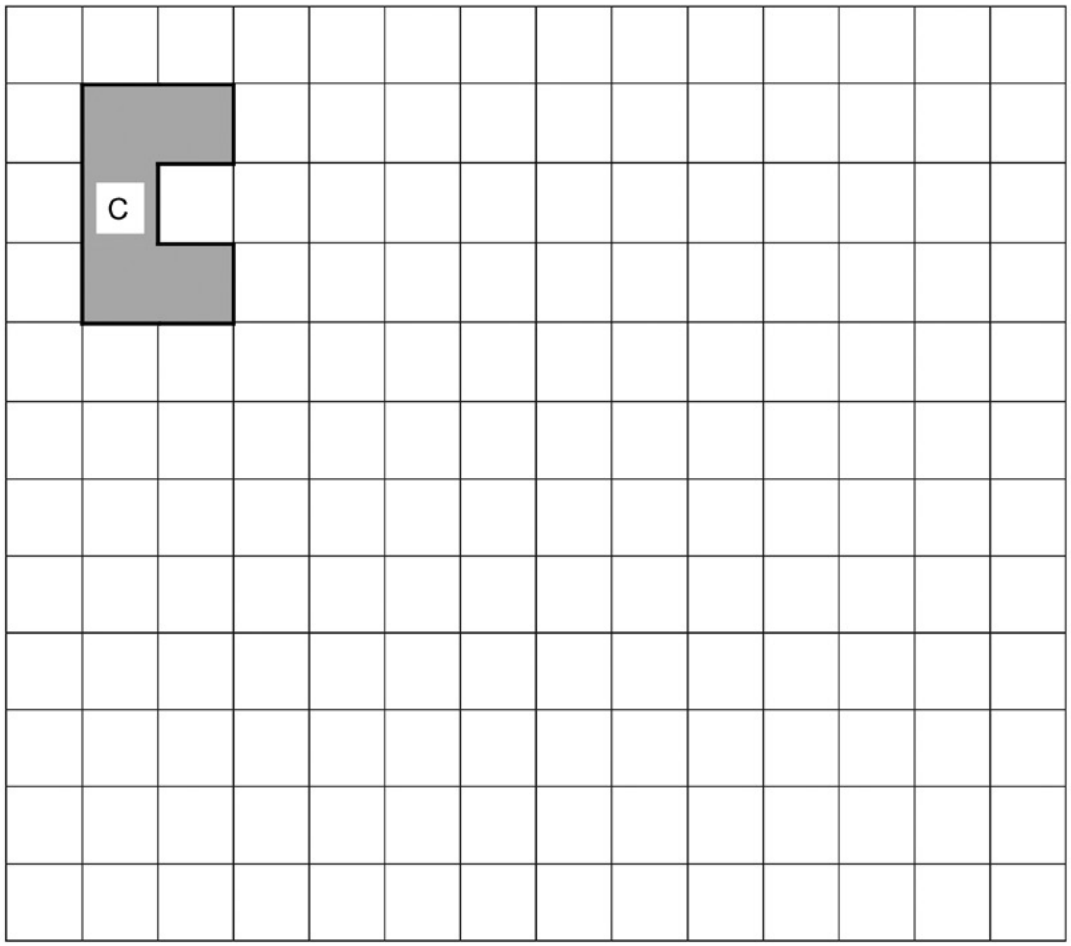
Review:

In the original question, students were asked to choose their own mirror line, adding complexity and possible anxiety. Here, we've given a mirror line so that students can just focus on carrying out the reflection without having to ponder where the mirror line might be.

Question 8b

8 (b) On this grid draw a shape that is an enlargement, scale factor 2, of shape C.

[1 mark]



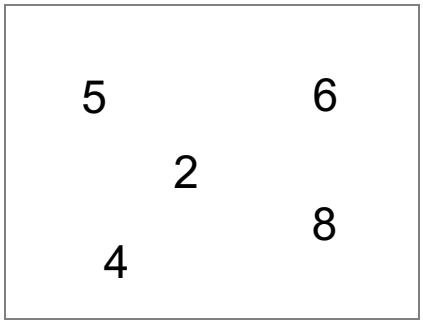
Review:

In a similar vein, there was no scale factor given for the original enlargement, so to focus more clearly on the skill of enlarging, and eliminate too much novelty early in the paper, the new question has the scale factor given.

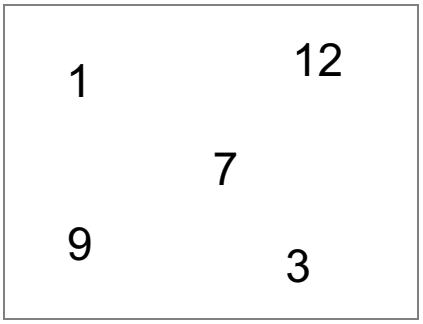
Question 10

10

Box A



Box B



One of the numbers moves from Box A to Box B.

The total of the numbers in Box B is now **two** times the total of the numbers in Box A.

Which number moves?

[2 marks]

Answer _____

Review:

The thinking required on this early problem solving question can still be tested whilst requiring just one number to be moved between the boxes. Thus, the new version of this question just requires this, rather than moving two numbers as in the original.

Question 17

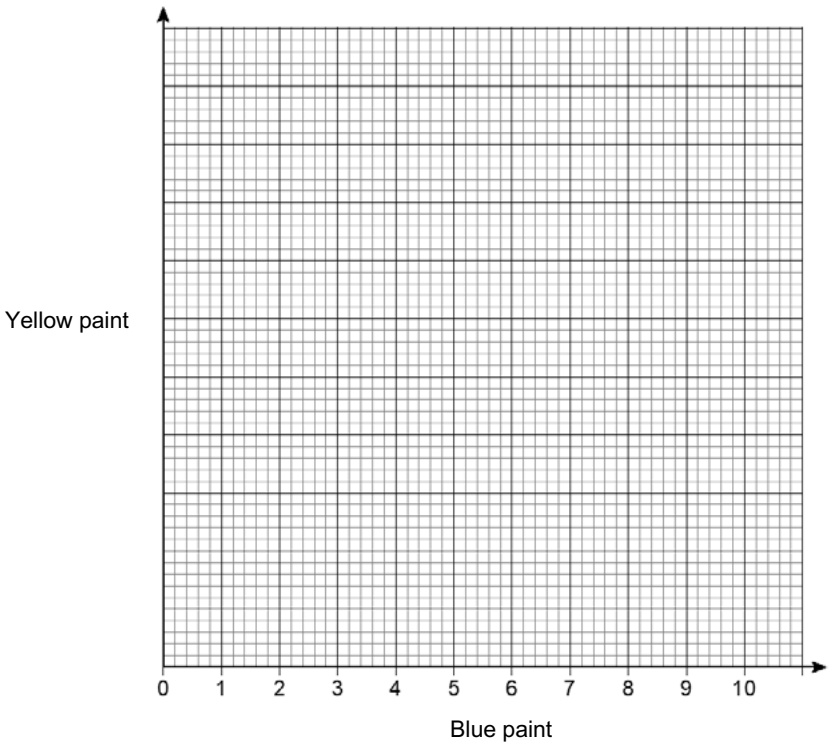
Do not write outside the box

17 Blue paint and yellow paint are mixed together in the ratio 2 : 1

17 (a) Draw a graph that can be used to work out the amount of yellow paint needed given the amount of blue paint.

Your graph **must** show up to 10 litres of blue paint.

[3 marks]



17 (b) How much yellow paint needs to be mixed with 9 litres of blue paint?

[1 mark]

Answer _____ litres

Review:

Quite a tricky mix of graphical and ratio work, this question has been eased for its position in the paper by simplifying the ratio involved. This should make it work at a more appropriate level of demand, enabling more students to access the question.

We have altered the order of some of the questions to achieve better ramping through the paper.

Higher Paper 3

Question 1

We've replaced the opening 3 MCQs with appropriate open response questions.

Do
ou

1 The ratio of $x : y$ is 3 : 4

What fraction of y is x?

[1 mark]

Answer _____

Review:

The original question 1 has moved to question 4 so that we don't now start with an MCQ. In its place is an open response question with a simple connection between a ratio and a fraction. It is similar to the original question 4 with simpler wording and no multiple choice.

Question 2

2 The probability that a biased coin lands on heads is $\frac{2}{5}$

The coin is spun twice.

Work out the probability of two heads.

[2 marks]

Answer _____

Review:

The original question had too much work for a one mark MCQ. Thus, this is now a 2-mark question to reflect the work needed by students.

Question 3

3 Work out the next term of this quadratic sequence.

[2 marks]

5 6 9 14 _____

Answer _____

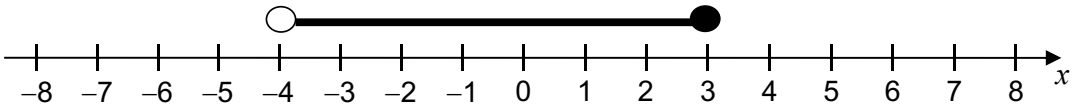
Review:

This is now the first of the common questions which are now ordered in the same order as the common questions in Foundation.

Question 4

4 Circle the inequality shown by the diagram.

[1 mark]



$-4 < x < 3$ $-4 \leqslant x < 3$ $-4 < x \leqslant 3$ $-4 \leqslant x \leqslant 3$

Review:

This still felt as though an MCQ was the most appropriate way to test this for one mark. It does not require more than one mark's worth of work to identify the correct double inequality to go with the number scale and diagram.

The remainder of the paper is a refreshed version of the original paper with quite a number of changes in question order to achieve a smoother ramping of the paper. In a couple of questions numbers have been eased a little to reflect that we don't want to make values and arithmetic (which students often attempt in their heads even on a calculator paper) a barrier to students showing their knowledge on a particular topic.

Questions matter

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.

E: maths@aqa.org.uk

T: 0161 957 3852

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