Qualification Accredited

OCR
Oxford Cambridge and RSA

LEVEL 3 CERTIFICATE

Examiners' report

CORE MATHS A (MEI)

H868

For first teaching in 2016

H868/02 Summer 2024 series

Version 1

ocr.org.uk/maths

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Paper 2 series overview

Examiners saw many excellent descriptions and interpretations for the scenarios presented in this paper. Most candidates were able to work through extended calculations with confidence. The best responses to the more unfamiliar/open questions were characterised by clear assumptions and logical strategies.

Candidates successfully interpreted a wide range of diagrams and applied problem-solving skills and mathematical processes to both familiar and unfamiliar real-life contexts.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• worked confidently and accurately in a range of contexts, considering whether their answer was sensible • structured their calculations clearly • used sketches to support calculations where appropriate • gave clear explanations when asked to critique or justify given statements • demonstrated modelling skills in a variety of situations.	• only worked confidently in straightforward situations • did not present calculations clearly and made errors in their workings • did not support calculations with appropriate sketches • did not adequately explain or justify given statements • did not model unstructured questions effectively.

Question 1 (a)

1 **Fig. 1.1** shows the annual rate of inflation in the UK from 1981 to 2021.
Fig. 1.2 shows the annual rate of inflation in Slovenia from 1981 to 2021.

Fig. 1.1

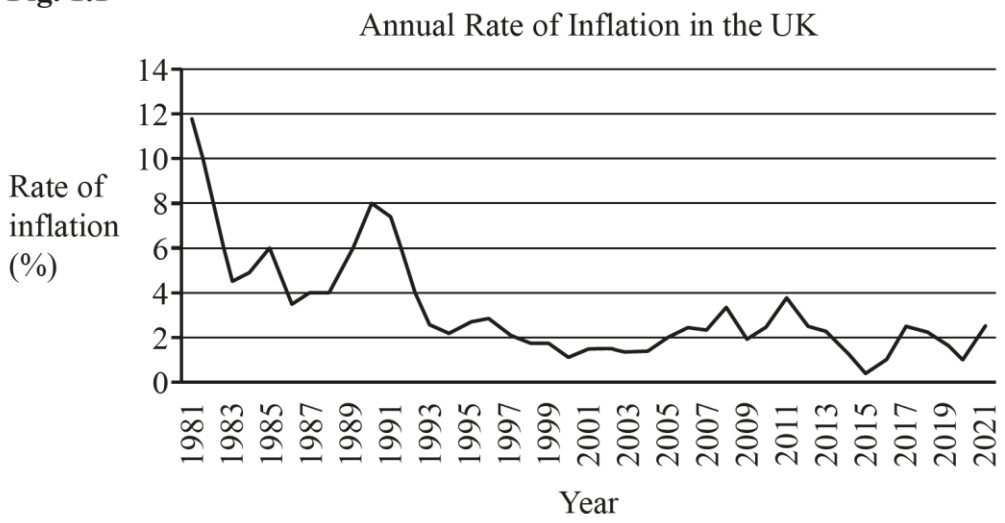
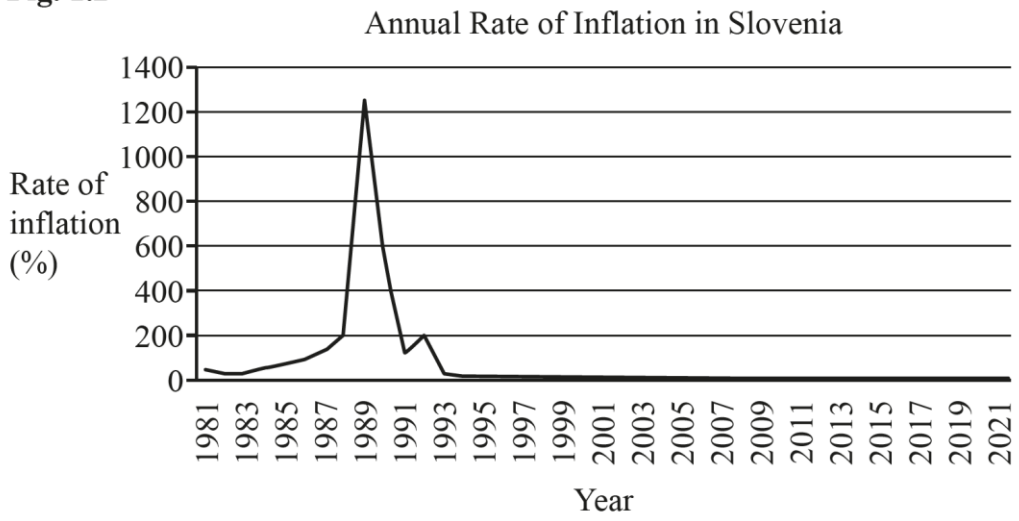


Fig. 1.2



(a) Which of the following statements are **true** and which are **false**? **[2]**

Tick **(✓) one** box in each row.

	True	False
Prices in the UK were going down from 1981 to 1983.		
The highest prices in Slovenia were in 1989.		
It is difficult to compare the rates of inflation in the UK and Slovenia because the vertical axes on the two graphs are different.		
It is not possible to have a rate of inflation that is over 100%.		

Misconception

This opening true/false question was not answered well, with most candidates correctly identifying just two of the four statements, typically the 3rd and 4th points. Most candidates wrongly stated that when inflation was at its peak in Slovenia (1989) this meant prices were highest.

Question 1 (b)

(b) A student says that **Fig. 1.2** shows there was no inflation in Slovenia from 2003 to 2019.

Explain why this conclusion may **not** be correct. **[1]**

This question was answered well, with most candidates realising that the large vertical scale made it hard to see values close to zero.

Question 1 (c)

(c) In 1989, inflation in Slovenia was just over 1200% a year.
A journalist claims that 1200% a year is equivalent to prices doubling every month.

Decide whether the journalist is correct.
Show working to support your answer. **[4]**

Many candidates scored well in this question. The most effective strategy was to choose a starting value for prices, for example £100, and to keep doubling this every month. With this strategy it was easy to demonstrate that prices had increased by more than 1200% in just four months meaning that the journalist was wrong. Some correctly worked with multiplication factors, e.g. 2^{12}.

Question 1 (d) (i) and (ii)

(d) **Fig. 1.3** shows the inflation rates in Slovenia and the UK in 1996 and 1997.
The percentage **point** decrease and the percentage decrease for Slovenia are also shown.

Fig. 1.3

	1996 inflation	1997 inflation	Percentage point decrease	Percentage decrease
Slovenia	9.9%	8.4%	1.5	15.2
UK	2.9%	2.2%		

(i) Calculate the percentage **point** decrease for the UK. **[1]**

(ii) Calculate the percentage decrease for the UK.
Give your answer to **1** decimal place. **[2]**

Nearly all candidates obtained the 0.7 percentage point decrease and went on to calculate the percentage decrease correctly. A few missed rounding their answer as requested.

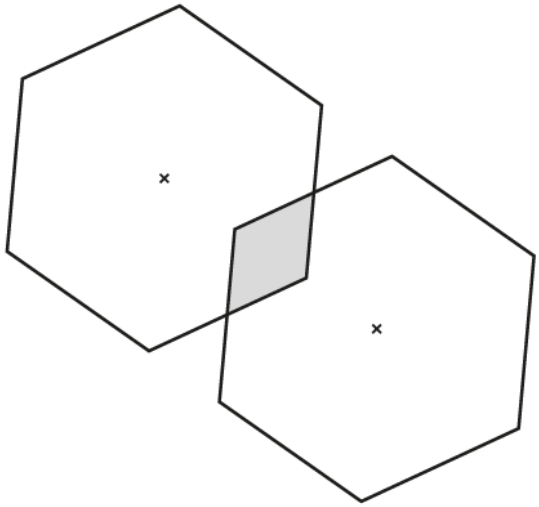
Question 2

2 **Fig. 2** shows two identical regular hexagons.

- The centre point of each hexagon is shown with a cross.
- The hexagons overlap at the midpoints of two adjacent sides.
- The overlap region is a rhombus. This is shaded grey in the diagram.

How many times greater is the area of **one** hexagon than the area of the grey rhombus?
You must show clearly how you have arrived at your answer. **[5]**

Fig. 2



Many good strategies were seen in response to this question. The best solutions divided one of the hexagons into smaller congruent shapes, for example twelve small rhombuses identical to the grey rhombus, thereby allowing them to explain clearly that with twelve of these filling the hexagon the area was twelve times greater.

Question 3 (a) and (b)

3 1% of pound coins are fake.

A machine in a car park rejects pound coins which it identifies as fake.

If a fake pound coin is inserted into the machine, there is a 99.5% chance that it will be rejected.

If a genuine pound coin is inserted into the machine, there is a 2% chance that it will be rejected.

(a) 20 000 random pound coins are tried in the machine.

Complete the table in the answer space to show the expected numbers of coins. **[4]**

Number of coins	Fake	Genuine	Total
Accepted			
Rejected			
Total			20 000

(b) Calculate the percentage of rejected coins that are fake. **[2]**

Nearly all candidates used the information correctly to complete the table for full marks, and presented a correct calculation using the appropriate cells to determine the percentage of rejected coins that were fake.

Question 3 (c)

(c) The manufacturer of the machine can increase the likelihood of a fake coin being rejected, but this would also increase the likelihood of a genuine coin being rejected.

Would you advise the owners of the machine to make this change?
Explain your reasoning. **[1]**

Most candidates presented a clear argument about why the machine manufacturer should not make the proposed change.

Question 4 (a) (i), (ii) and (iii)

4 A dance competition has 6 couples competing.
5 judges give each couple a mark out of 10.

Table 4.1 shows the marks awarded.

Table 4.1

Couple	Judge A	Judge B	Judge C	Judge D	Judge E
Amaya and Alex	6	6	6	6	6
Beth and Ben	8	9	9	8	7
Casey and Charlie	7	9	8	8	7
Darcie and Dev	8	6	7	7	6
Finley and Felix	7	7	7	5	6
Heidi and Henry	7	7	7	5	5

(a) The median mark for each couple is used to decide who is in first place.

(i) Complete **Table 4.2** to show the median scores for each couple. **[2]**

Table 4.2

Couple	Median
Amaya and Alex	
Beth and Ben	
Casey and Charlie	
Darcie and Dev	
Finley and Felix	
Heidi and Henry	

(ii) Name the couple or couples in first place. **[1]**

(iii) State **one** problem with using this method to decide who is in first place. **[1]**

Nearly all candidates correctly identified the median scores for each dance couple and went on to identify the joint winners of the competition and critique the use of the median in this situation.

Question 4 (b) (i), (ii) and (iii)

(b) Suggest a different rule to find an overall score for each couple from the judges' scores, which can be used to decide who is in first place.

(i) State your rule clearly. **[1]**

(ii) Complete **Table 4.3** to show the overall scores for each couple.
Use your rule and the judges' marks in **Table 4.1**. **[3]**

Table 4.3

Couple	Overall score
Amaya and Alex	
Beth and Ben	
Casey and Charlie	
Darcie and Dev	
Finley and Felix	
Heidi and Henry	

(iii) Name the couple or couples in first place. **[1]**

The most common rules chosen were to create a total score for each couple or to use the mean of the judges' scores to determine which couple would win the competition. In nearly all cases, candidates went on to calculate their scores correctly and determine the winning couple.

Question 5 (a)

5 A researcher carries out a trial to investigate whether a new medication is effective at improving symptoms of a particular illness.

Those taking part are allocated to one of two groups:

- a group who get the new medication
- a control group who are given a placebo.

The two groups are of equal size.

To allocate the participants to a group, each person is given a random number on a spreadsheet.

The random numbers are sorted into order and the participants with smaller numbers go in one group and those with larger numbers go in the other group.

(a) Which **one** of the following terms gives the fullest description of this method of allocating the participants to each group?
Circle **one** of the options in the answer space. **[1]**

Blind **Randomised** **Controlled** **Experiment**

Most candidates correctly interpreted the sampling method as randomised.

Question 5 (b)

(b) The trial is a double blind trial.

Explain what this means. **[1]**

Nearly all candidates gave a very clear description of a double-blind trial.

Question 5 (c) (i), (ii) and 5 (d)

(c) At the end of the trial, 144 participants say that their symptoms have improved.

The researcher wants to compare the proportions of people who say their symptoms have improved after taking the medication, with the proportion who say their symptoms improved but were given the placebo.

The researcher's working hypothesis is that these proportions are the same (and so the medication has no effect).

Imagine lots of groups of 144 people who say their symptoms have improved. A Normal distribution is used to model the number of people who actually took the medication.

This is based on the researcher's working hypothesis.

Use the Normal distribution to work out:

(i) The mean number who took the medication. **[1]**

(ii) The standard deviation of the number who took the medication. **[2]**

(d) 81 people out of the 144 whose symptoms improved had taken the medication.

Is this sufficient evidence that the new medication does make a difference (and so the working hypothesis in part **(c)** is **not** justified)? **[2]**

Responses to modelling the trial as a Normal distribution were mixed. Candidates who were familiar with the specification, confidently calculated the mean and standard deviation and went on to use these appropriately in drawing a conclusion about the researcher's hypothesis. Some candidates intuitively obtained the mean but did not model the situation using the Normal distribution as required. Often without an attempt at mean and/or standard deviation, candidates incorrectly presented a simplistic conclusion based on the proportions who did/did not have improved symptoms.

Question 6

6 A bookcase has three shelves.
Each shelf is 90 cm long.
Each shelf is filled with one layer of paperback books, standing vertically.
A paperback book contains an average of 100 000 words.
Ivan is going to read all the books in the bookcase.

Estimate how long it will take for Ivan to read all the books.
Show your working clearly and state any assumptions you make.
Give your answer in suitable units. **[6]**

Assessment for learning

The best solutions to this problem broke the task down into clear elements: estimating the number of books per shelf and therefore the total number of books; making judgements about reading speeds and using these to calculate the time to read a single book and then all the books; choosing sensible units, e.g. working towards days/hours for total reading time; making sensible assumptions about how much time could be dedicated to reading per day.

Common errors included badly misjudging the thickness of a typical paperback book, not using the word-count at all, and not making any sensible assumptions about time dedicated to reading.

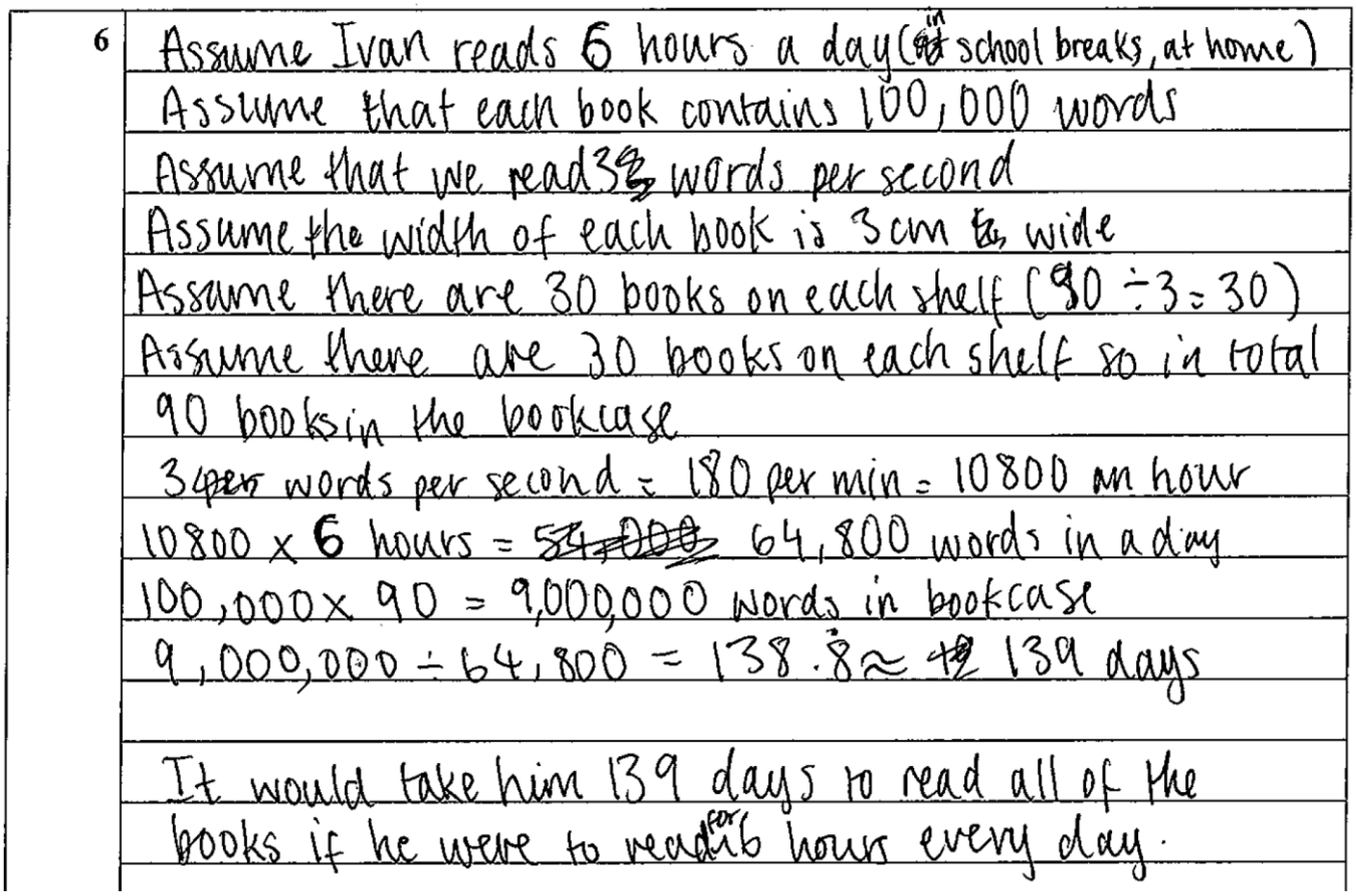
Candidates should be provided with opportunities through their course to tackle challenging open-ended questions such as this. They could work with others to plan strategies that draw on everyday measures in a range of real-world contexts. By discussing and comparing their attempts, they can become more confident about setting a suitable framework/scaffold for an unfamiliar problem.

OCR support

A topic exploration pack to help develop strategies for answering open-ended problems can be downloaded from Teach Cambridge:

Topic exploration pack Fermi estimation and Learner activity Fermi estimation

Exemplar 1



6

Assume Ivan reads 6 hours a day (in school breaks, at home)
Assume that each book contains 100,000 words
Assume that we read 3 words per second
Assume the width of each book is 3cm wide
Assume there are 30 books on each shelf (90 ÷ 3 = 30)
Assume there are 30 books on each shelf so in total 90 books in the bookcase
3 words per second = 180 per min = 10800 an hour
10800 x 6 hours = ~~54,000~~ 64,800 words in a day
100,000 x 90 = 9,000,000 words in bookcase
9,000,000 ÷ 64,800 = 138.$\dot{8}$ ≈ 139 days

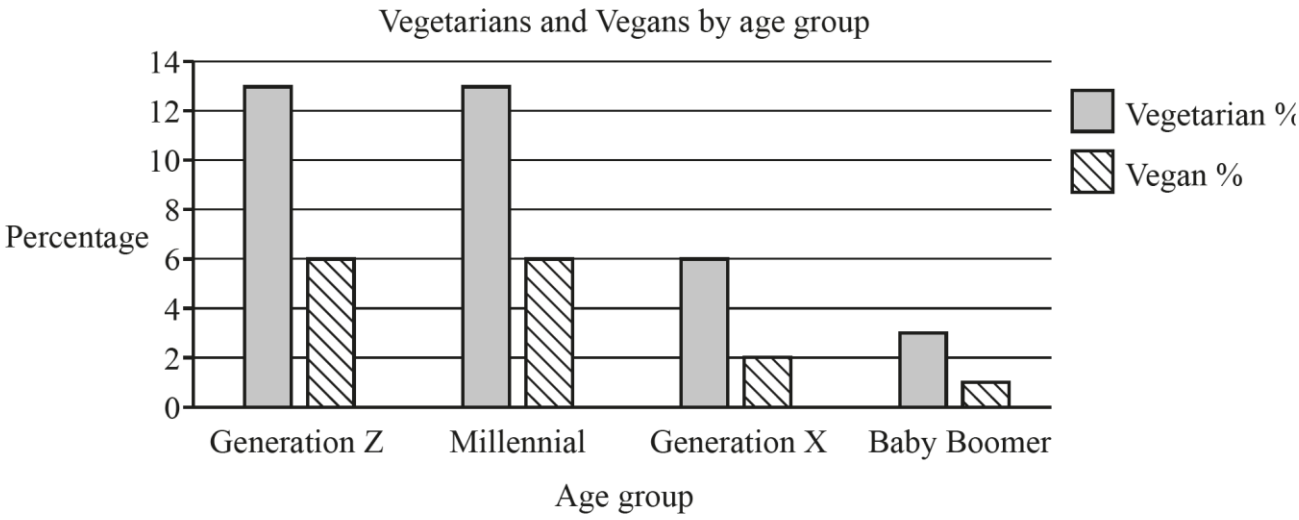
It would take him 139 days to read all of the books if he were to read for 6 hours every day.

In Exemplar 1, the candidate makes all their assumptions very clearly, before going on to present calculations that are consistent with these assumptions.

Question 7 (a), (b) and (c)

7 This question refers to article A in the pre-release material, "Vegetarians and Vegans in the USA".
You can find the article on the Insert accompanying this paper.

The bar chart below is copied from the Insert.



(a) The youngest possible people surveyed were 18.

What **two** years were they born in? **[2]**

(b) Some Baby Boomers were too old to be included in the survey.
This means the survey does not include people born in all the years 1946 to 1964.

Work out the possible birth years for Baby Boomers included in the survey. **[2]**

(c) Vegetarians and vegans do not eat meat.
In 2022, a newspaper wrote a headline about the survey results for Generation Z and Millennials combined.

Fill in the missing numbers in the headline. **[2]**

In the USA about 1 in _____ people aged 18 to _____ do not eat meat.

Most candidates used the information in the insert to correctly work out the required years for Question 7 (a) but were less successful in using this information for 7 (b) and 7 (c).

Question 7 (d)

(d) A student suggests presenting the information from the bar chart as a pie chart.

Give **two** reasons why a pie chart would **not** be a suitable way to present the data. **[2]**

Most candidates were able to suggest at least one appropriate reason.

Question 8 (a) (i), (ii) and (iii)

8 This question refers to article B in the pre-release material, "Gift Aid".
You can find the article on the Insert accompanying this paper.

(a) A taxpayer gives a charity a donation of £300.
The taxpayer Gift Aids the donation.

(i) Calculate how much Gift Aid the charity claims from HMRC for this donation if the Basic Rate of income tax is 20%. **[2]**

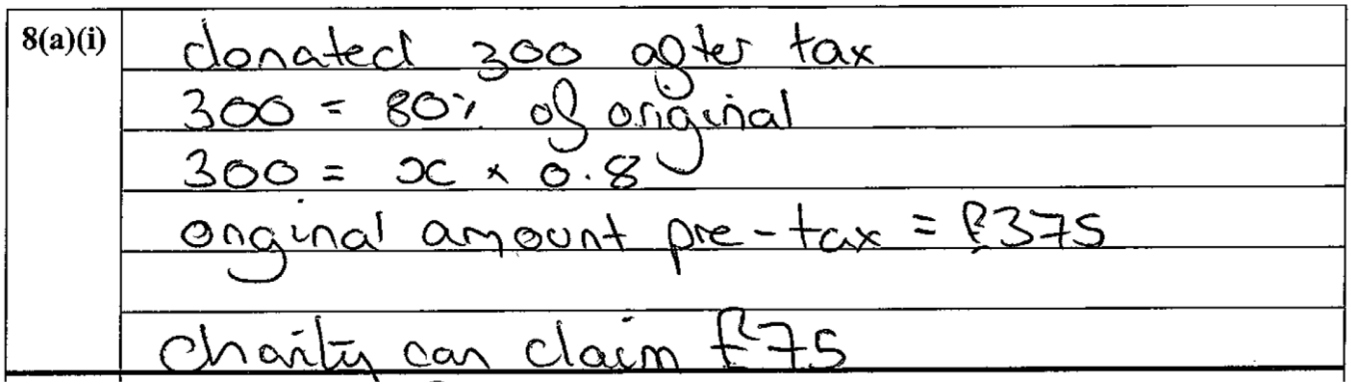
(ii) Calculate how much Gift Aid the charity would get from HMRC for this donation if the Basic Rate of income tax was 19%.
Assume there is **no** transitional relief.
Give your answer to the nearest penny. **[2]**

(iii) How much transitional relief would the government have given to the charity for this donation if the new 19% tax policy had been implemented **with** transitional relief? **[1]**

Misconception

Many candidates did not recognise that this context required reverse percentage skills, and therefore did not present any relevant calculations in Questions 8 (a) (i) or 8 (a) (ii).

Exemplar 2



In Exemplar 2, the candidate has set up their solution very clearly to identify the reverse percentage scenario, with £300 representing 80% of an unknown original amount. They have then divided 300 by 0.8 to obtain this original amount. The £375 represents the original amount of earnings, and the charity can claim back the difference of £75 as Gift Aid.

Question 8 (b)

(b) In the tax year ending April 2022:

- the Basic Rate of income tax was 20%
- charities received a total of £1.34 billion in Gift Aid from HMRC
- there were 32.2 million taxpayers in the UK.

Calculate the mean amount of Gift Aided donations that each taxpayer gave that year.
(A billion is a thousand million). **[3]**

Those candidates who had done well in the earlier parts of this question were able to build on their approach here.

OCR support

A transition guide with checkpoint tasks to help candidates move from key stage 4 to Core Maths when working with percentages can be downloaded from Teach Cambridge:

Transition guide: Percentages, Checkpoint task: Percentages and Teacher instructions

Copyright information

Supporting you

Teach Cambridge

Make sure you visit our secure website **Teach Cambridge** to find the full range of resources and support for the subjects you teach. This includes secure materials such as set assignments and exemplars, online and on-demand training.

Don't have access? If your school or college teaches any OCR qualifications, please contact your exams officer. You can forward them this link to help get you started.

Reviews of marking

If any of your students' results are not as expected, you may wish to consider one of our post-results services. For full information about the options available visit the OCR website.

Keep up-to-date

We send a monthly bulletin to tell you about important updates. You can also sign up for your subject specific updates. If you haven't already, sign up here.

OCR Professional Development

Attend one of our popular CPD courses to hear directly from a senior assessor or drop in to a Q&A session. Most of our courses are delivered live via an online platform, so you can attend from any location.

Please find details for all our courses for your subject on **Teach Cambridge**. You'll also find links to our online courses on NEA marking and support.

Signed up for ExamBuilder?

ExamBuilder is a free test-building platform, providing unlimited users exclusively for staff at OCR centres with an Interchange account.

Choose from a large bank of questions to build personalised tests and custom mark schemes, with the option to add custom cover pages to simulate real examinations. You can also edit and download complete past papers.

Find out more.

You will need an Interchange account to access our digital products. If you do not have an Interchange account please contact your centre administrator (usually the Exams Officer) to request a username, or nominate an existing Interchange user in your department.

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on
01223 553998

Alternatively, you can email us on
support@ocr.org.uk

For more information visit
ocr.org.uk/qualifications/resource-finder
ocr.org.uk
facebook.com/ocrexams
twitter.com/ocrexams
instagram.com/ocrexaminations
linkedin.com/company/ocr
youtube.com/ocrexams

We really value your feedback

Click to send us an autogenerated email about this resource. Add comments if you want to. Let us know how we can improve this resource or what else you need. Your email address will not be used or shared for any marketing purposes.

I like this **I dislike this**

Please note – web links are correct at date of publication but other websites may change over time. If you have any problems with a link you may want to navigate to that organisation's website for a direct search.

CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT