Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9–1)

Exemplar Candidate Work

MATHEMATICS

J560
For first teaching in 2015

J560/03

Summer 2017 examination series

Version 1

Contents

Introduction

These exemplar answers have been chosen from the summer 2017 examination series.

OCR is open to a wide variety of approaches and all answers are considered on their merits. These exemplars, therefore, should not be seen as the only way to answer questions but do illustrate how the mark scheme has been applied.

Please always refer to the specification (http://www.ocr.org.uk/Images/168982-specification-gcse-mathematics-j560.pdf) for full details of the assessment for this qualification. These exemplar answers should also be read in conjunction with the sample assessment materials and the June 2017 Examiners' Report to Centres available on the OCR website http://www.ocr.org.uk/qualifications/.

The question paper, mark scheme and any resource booklet(s) will be available on the OCR website from summer 2018. Until then, they are available on OCR Interchange (school exams officers will have a login for this).

It is important to note that approaches to question setting and marking will remain consistent. At the same time OCR reviews all its qualifications annually and may make small adjustments to improve the performance of its assessments. We will let you know of any substantive changes.

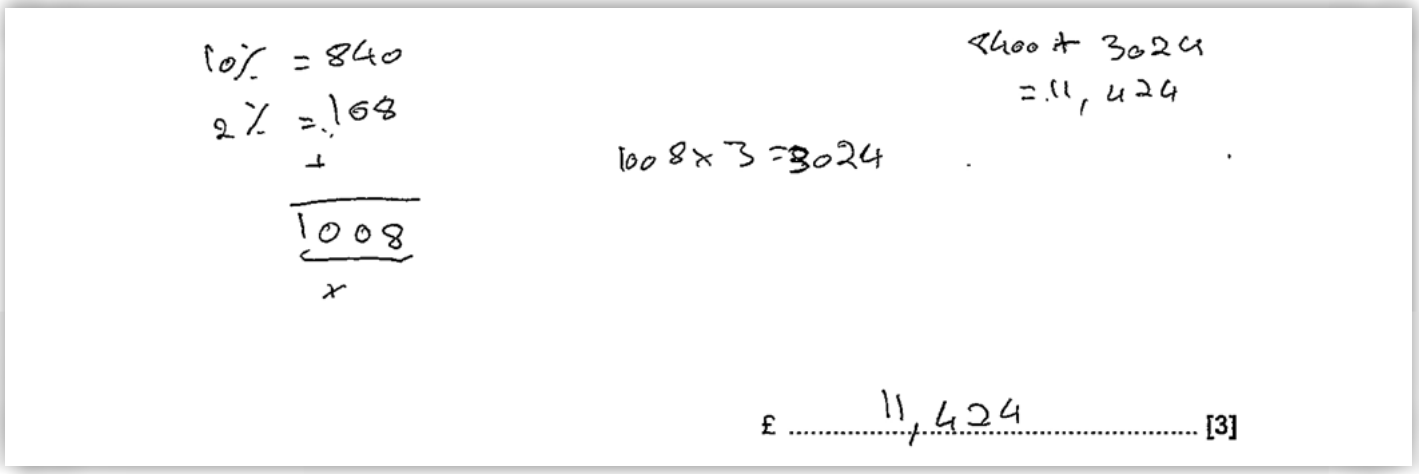
Question 2

Corinne invests £8400 at a simple interest rate of 12% per year.

Work out the value of the investment after 3 years.

£ ..... [3]

Exemplar 1 – Mark(s): 3



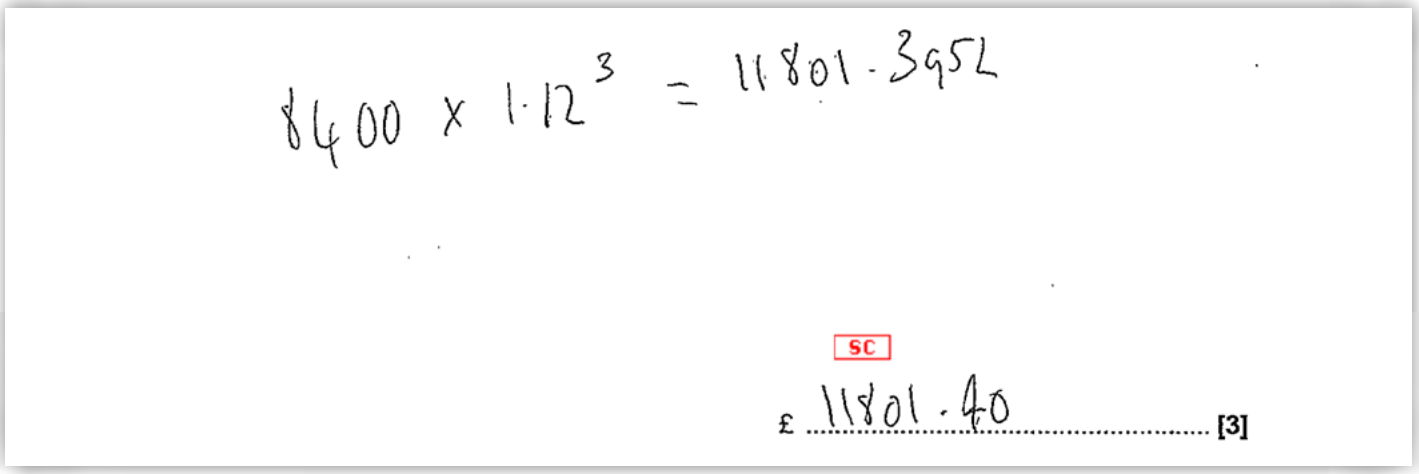
Examiner commentary

This candidate achieved the correct answer and was awarded 3 marks, however the method used is one more suited to a non-calculator paper and did not take advantage of the efficiency of the calculator. Many similar methods were seen and a significant number contained numerical errors.

8400 + 8400 × 0.12 × 3 would have been more efficient.

Had the candidate reached only [£]3024 then B2 would have been awarded.

Exemplar 2 – Mark(s): 1

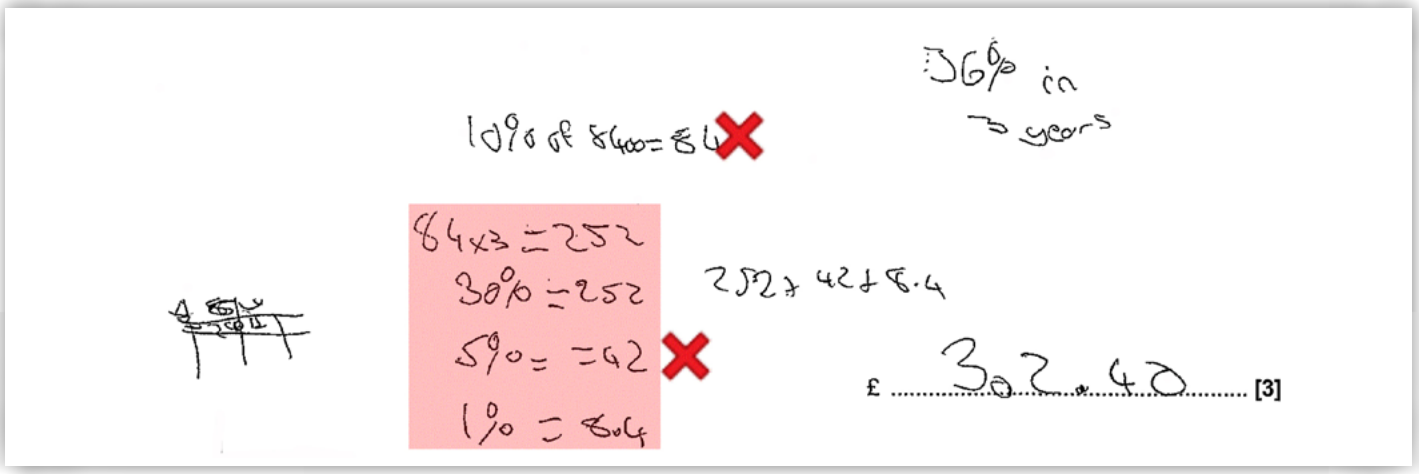


Examiner commentary

Although the question did state 'simple interest', this candidate has responded as though compound interest was requested. They were awarded 1 Special Case mark for doing this correctly, despite not being a correct response.

Candidates are advised to read the question carefully.

Exemplar 3 – Mark(s): 0



Examiner commentary

This is an example of a non-calculator method being applied (that contains an error) when a calculator method should be used.

An error was made in the first line above the red box. The candidate thought they had found 10% when in fact they had calculated 1%. Time was spent calculating the interim values in the red box, in which the error was followed through.

The first M1 was not awarded as the method was flawed. The second M1 was not awarded because the candidate did not attempt to add their interest to the original sum. If this had been attempted then 1 mark could have been awarded.

Candidates are advised to read the question carefully.

Question 3(b)

Find the values of z.

$z^2 = 196$

(b) $z =$ ..... or $z =$ ..... **[2]**

Mark(s): 1

(b) $z =$ 14 or $z =$ ..... **[2]**

Examiner commentary

The mark scheme allowed one mark for each correct answer, so B1 was awarded for a single correct value. No marks were deducted if the second root was missing or incorrect.

Many candidates found 14 but did not realise that values have a positive and a negative square root.

A number of candidates gave the second root as 13.99999 or 14^2, but many did not appreciate that two roots were possible.

Question 4(b)

Factorise fully.

$10x^2 + 6x$

(b) ..... [2]

Exemplar 1 – Mark(s): 1

$10x^2 + 6x$

$x^{10}(10x+6)$

B1

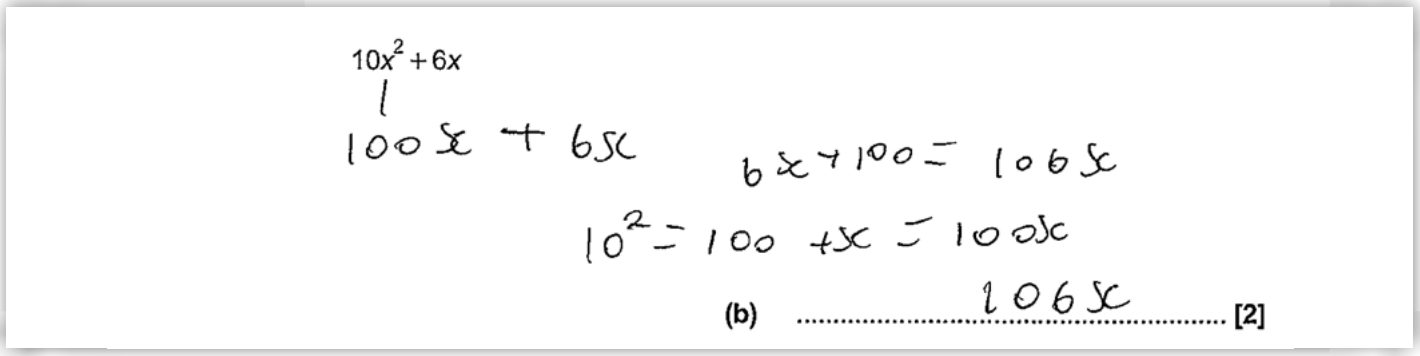
(b) $x(10x+6)$ [2]

Examiner commentary

B1 was awarded to responses that partially factorised the expression. The word 'fully' is included in the demand specifically to indicate that there is more than one factor to be extracted.

After taking out a single factor, candidates should examine the contents of brackets to see whether there is another common factor that could be extracted.

Exemplar 2 – Mark(s): 0



Examiner commentary

This candidate demonstrated many errors associated with the question. No evidence that could be awarded a mark is seen.

The candidate clearly thought that the 'square' referred to the number 10 and not the variable. Misconceptions such as '$100 + x = 100x$' and '$6x + 100 = 106x$' are seen.

Question 4(c)

Simplify.

$(x^5)^2$

(c) ..... [1]

Mark(s): 0

(c) x^7 ..... [1]

Examiner commentary

This response was not awarded the mark. Many candidates had clearly learned some rules for indices, but this question demonstrated the misconceptions that are often held. Some candidates gave the answer 10.

If candidates viewed this as $x^5 \times x^5$ then the correct answer might have been achieved.

Question 5(b)

Use the formula

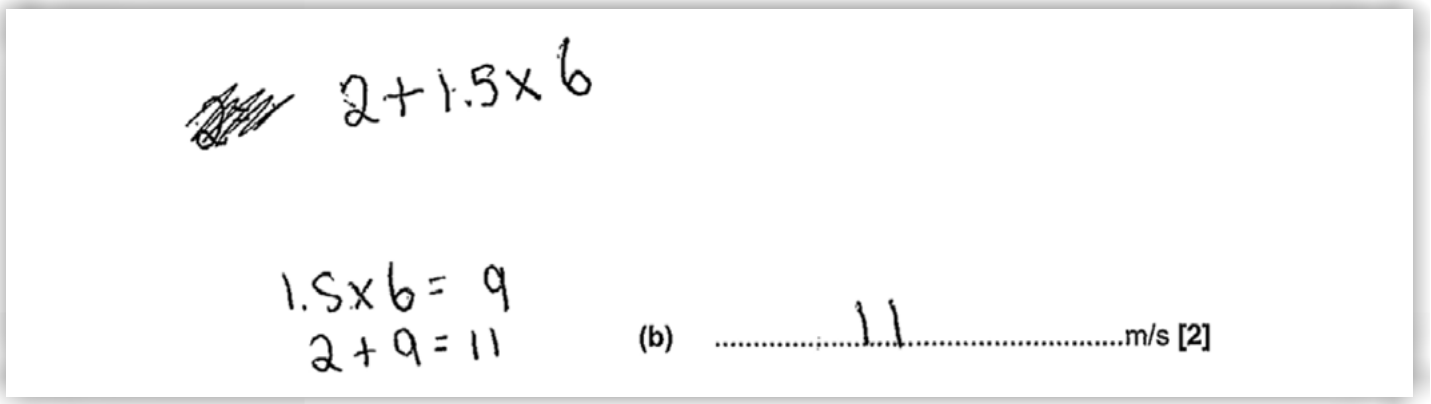
$$v = u + at$$

to find the final velocity, when

- the initial velocity is 2 m/s
- the acceleration is 1.5 m/s^2
- the time is 6 seconds.

(b) .....m/s **[2]**

Exemplar 1 – Mark(s): 2



Examiner commentary

This candidate achieved both marks with a clear solution. Correct substitution of the appropriate values for *u*, *a* and *t* is seen. The common error of working left to right was avoided through reducing the calculation to two steps (seen beside the answer line), although entering the calculation as seen into an appropriate calculator would have led to the correct answer of 11.

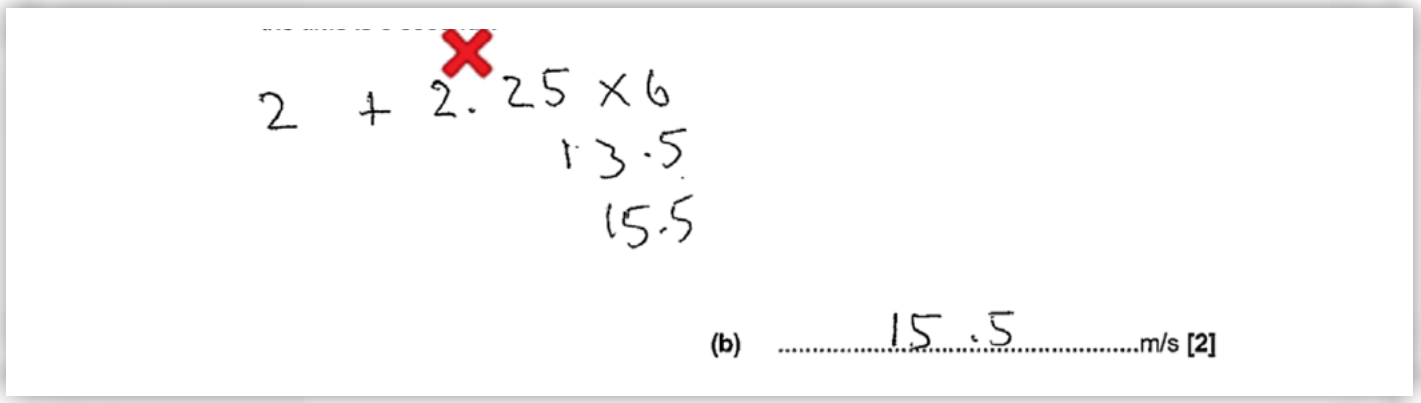
Exemplar 2 – Mark(s): 0

Examiner commentary

This candidate did not receive any marks. Although the candidate has understood which values to use for *u*, *a* and *t*, no full substitution was seen and they did not use the formula correctly, using × instead of +.

It is recommended that candidates show how the formula has been used with all values substituted and all operations shown.

Exemplar 3 – Mark(s): 0

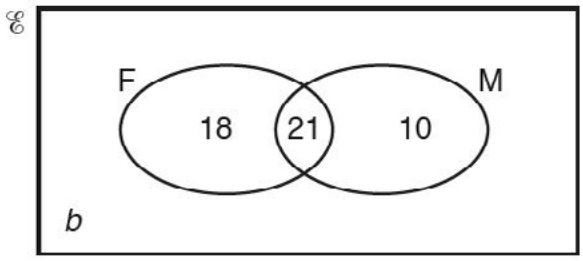


Examiner commentary

This candidate achieved no marks. No complete and correct substitution is seen to award the M1. The candidate demonstrated a common misconception that the unit m/s^2 requires 1.5^2 to be calculated.

Question 6(b)(ii)

(b) The Venn diagram shows the number of students who passed their examination in French (F) and those who passed their examination in Mathematics (M).
The number of students who did not pass either examination is *b*.



One of the 55 students is selected at random.

What is the probability that this student

(ii) passed both French and Mathematics,

(ii) ..... **[1]**

Mark(s): 0

(ii) ..... likely ..... **[1]**

Examiner commentary

Part (a) to this question involved words associated with likelihood and this candidate did not differentiate between that and the demand of this part, where a **probability** was requested.

Where a probability is required the answer should be a fraction, decimal or percentage (fraction or decimal are most commonly provided).

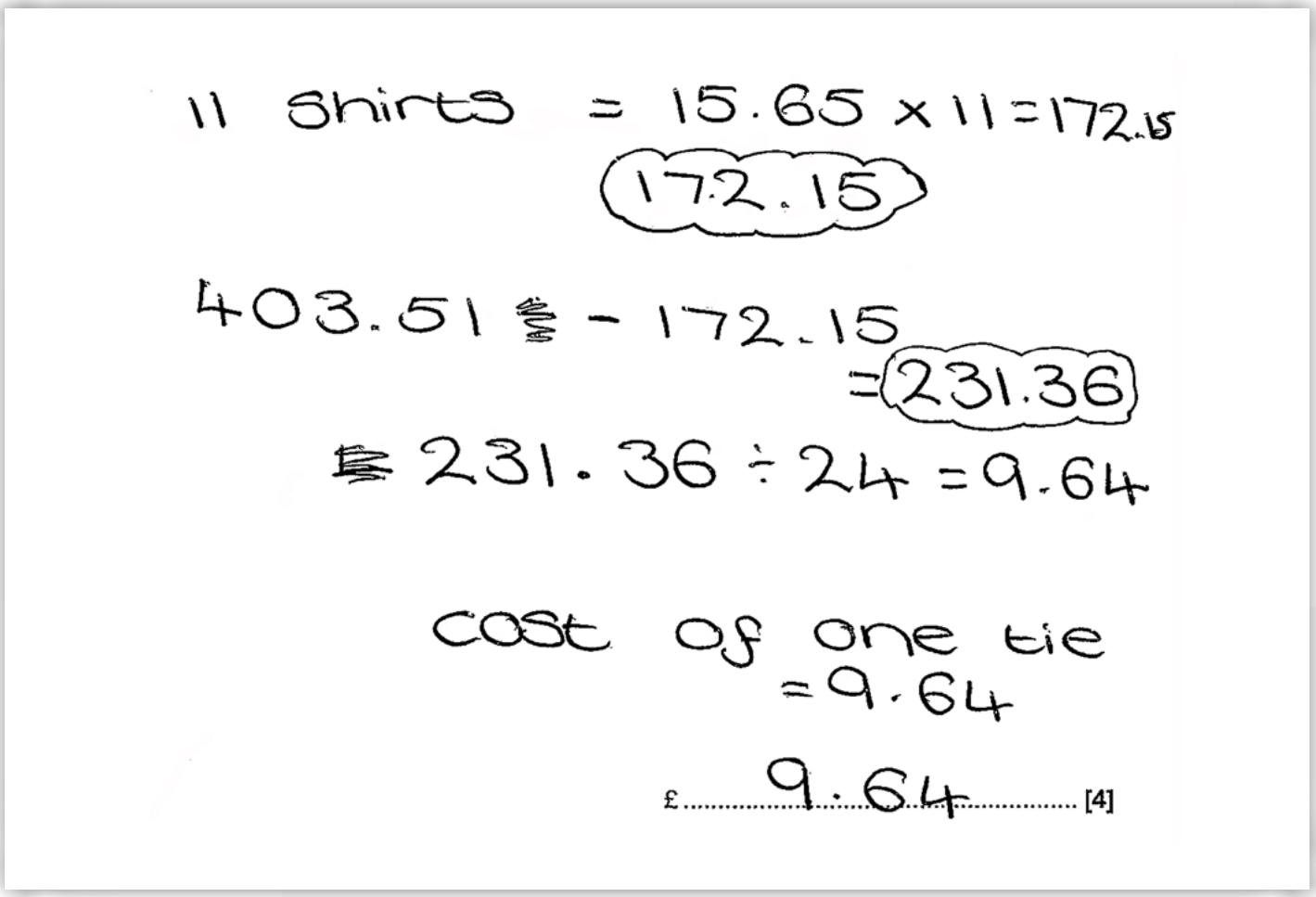
Question 7

Hardeep buys 11 identical shirts and 24 identical ties for £403.51.
The cost of a shirt is £15.65.

Find the cost of a tie.

£ ..... [4]

Exemplar 1 – Mark(s): 4

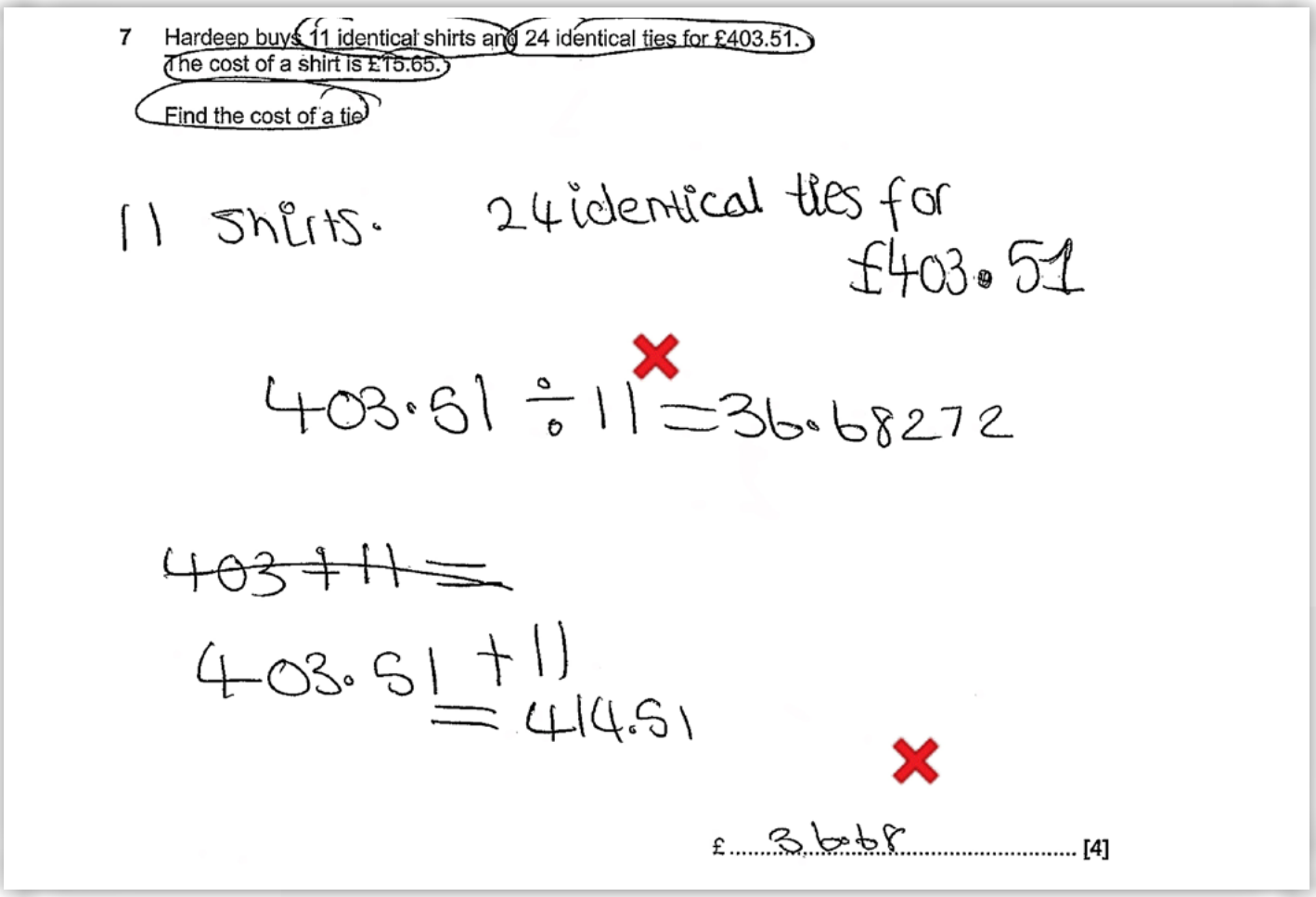


Examiner commentary

This is an example of a well structured response (though no money symbols are used, which can sometimes lead to unit confusion). The structure demonstrates clear thinking about the task. The cost of 11 shirts is found and the remaining money calculated. The division to find the cost of an individual tie is clearly set out. Even without annotation, the process is clear.

The only improvements recommended are to annotate each step and not just the first and last and also to use money notation throughout.

Exemplar 2 – Mark(s): 0



Examiner commentary

The candidate did not show any calculations sufficient to be awarded a mark. The candidate has clearly been shown some techniques for analysing questions (such as ringing information in the text), but this appears to have led to their misunderstanding that 11 shirts cost £403.51.

This is not intended as an algebraic question, but the candidate might have had greater success if they regarded the question as 11 shirts + 24 ties = £403.51.

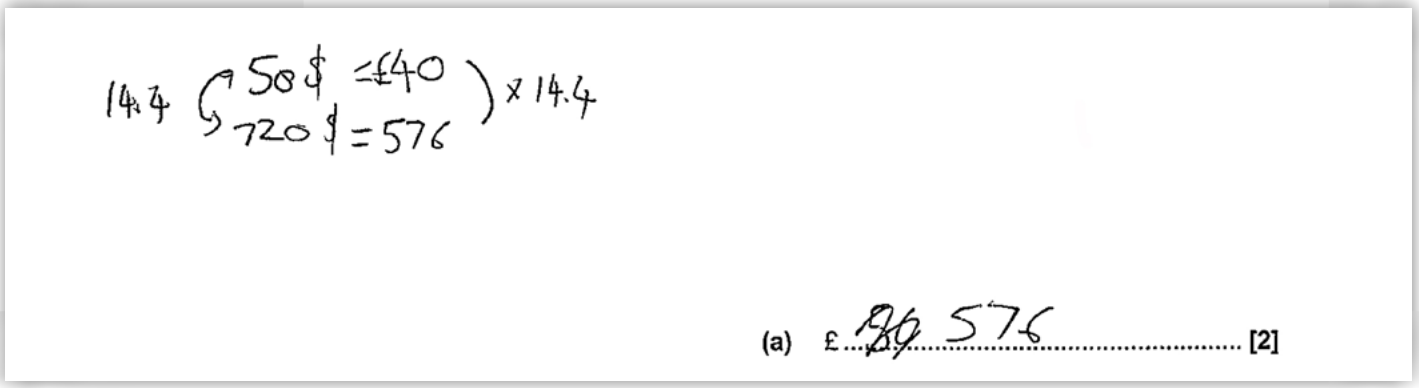
Question 8(a)

Harry needs dollars to go on holiday.
He can buy $50 for £40.

How much will $720 cost at the same rate?

(a) £ ..... [2]

Exemplar 1 – Mark(s): 2

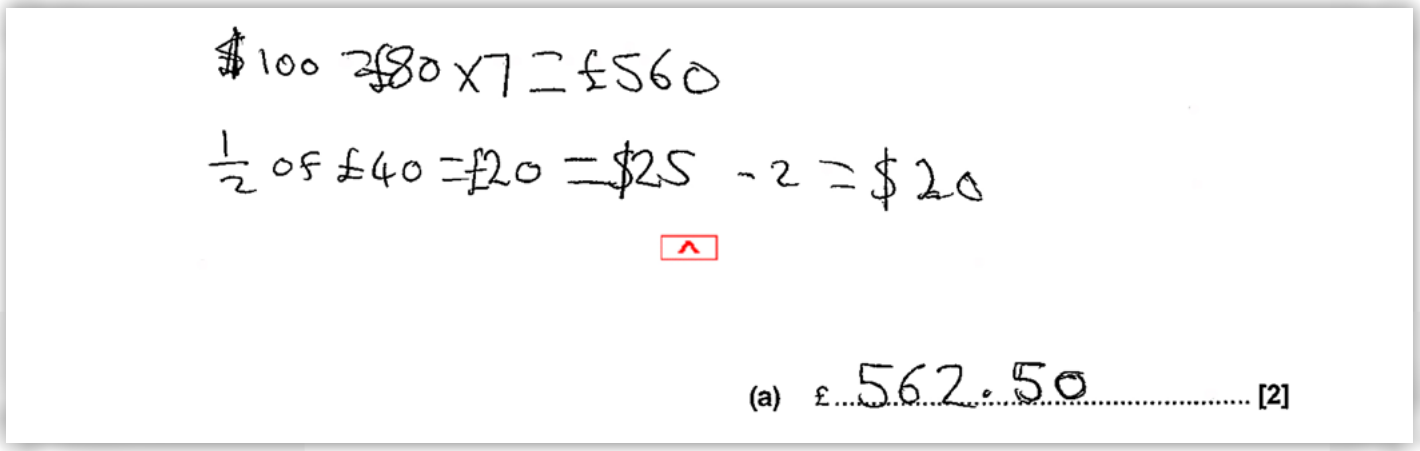


Examiner commentary

This candidate uses an efficient method to achieve both marks, although the method could be made clearer by showing 720 ÷ 50 = 14.4 to indicate how the multiplier was calculated. Showing 14.4 was sufficient to gain M1.

The candidate clearly understands that both sides in the equality are increased by the same multiplier.

Exemplar 2 – Mark(s): 0



Examiner commentary

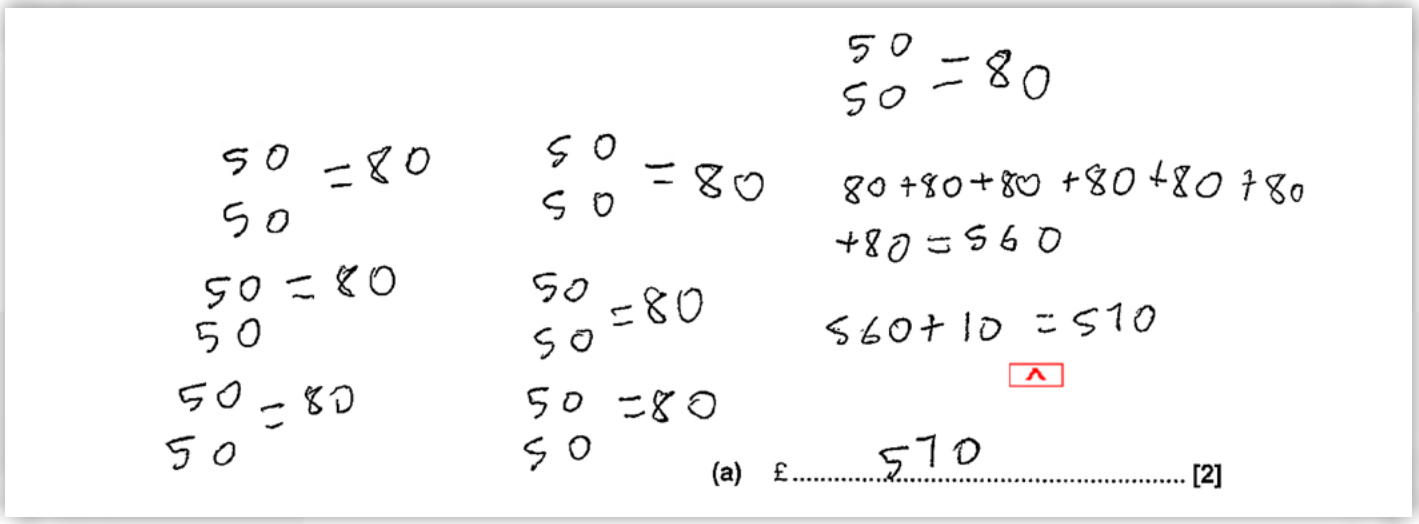
The mark scheme requires a method of proportion to be used, since this is the only way to successfully tackle such tasks.

This candidate demonstrated the common stumbling block of using a non-calculator method when they should have a calculator to use. Many candidates could scale $50 to $700, but this only postponed the critical step of changing $20 to pounds. At this point most candidates using these extended methods struggled, often simply added £20, or £25, or something similar, in an effort to come to an answer.

The answer would be improved by addressing the issue of finding the exchange rate for $1 to pounds.

Candidates need to understand the calculation and use of multipliers in proportion questions.

Exemplar 3 – Mark(s): 0



Examiner commentary

This candidate demonstrates all the flaws of the previous response, but in a more extreme form.

These methods are time consuming, which penalises the candidate as they have less time to tackle other questions and are frequently flawed. In this case, £10 is added at the point where the conversion of $20 is required.

Candidates need to understand the calculation and use of multipliers in proportion questions.

Question 8(b)

Tony returns from holiday with these notes.

Note	Number of notes
€50	2
€20	4
€10	9
€5	12

The exchange rate is £1 = €1.17.

Work out how much he will get in total when he changes these notes.

(b) £ ..... **[4]**

Exemplar 1 – Mark(s): 4

	Note	Number of notes
100	€50	2
80	€20	4
90	€10	9
60	€5	12
330		

The exchange rate is £1 = €1.17.

Work out how much he will get in total when he changes these notes.

4 50 ÷ 1.17 = 42.74 × 2 = 85.48

20 ÷ 1.17 = 17.09 × 4 = 68.38

10 ÷ 1.17 = 8.55 × 9 = 76.92

5 ÷ 1.17 = 4.27 × 12 = 51.28

282.06

330 ÷ 1.17 = 282.05

(b) £ 282.06 [4]

Examiner commentary

This correct answer scored 4 marks.

The values by the side of the table show that the number of euros in each denomination has been calculated to score the first M1. These are totalled (€330) for the third M1.

The final calculation in the response shows the calculation to convert this total into pounds to score the second M1 (the method marks could be scored in different orders, depending on the method used) and their answer is correct.

The four calculations below the table are a longer method and it's not clear which method the candidate completed first. Attempting to check or to confirm a method is always advised if the candidate has time.

Exemplar 2 – Mark(s): 4

Note	Number of notes
€50	2
€20	4
€10	9
€5	12

€100
€80
€90
€60
€330

The exchange rate is £1 = €1.17.

Work out how much he will get in total when he changes these notes.

€330 ÷ €1.17 = 282.05 ✓

(b) £ 282 ✓ [4]

Examiner commentary

This calculation is an efficient and effective response to the question.

Exemplar 3 – Mark(s): 2

Work out how much he will get in total when he changes these notes. M1

50 ÷ 1.17 = 42.7
20 ÷ 1.17 = 17.09
10 ÷ 1.17 = 8.5
5 ÷ 1.17 = 4.2

42.7
17
8.5 M1
4.2

(b) £ 72.40 [4]

Examiner commentary

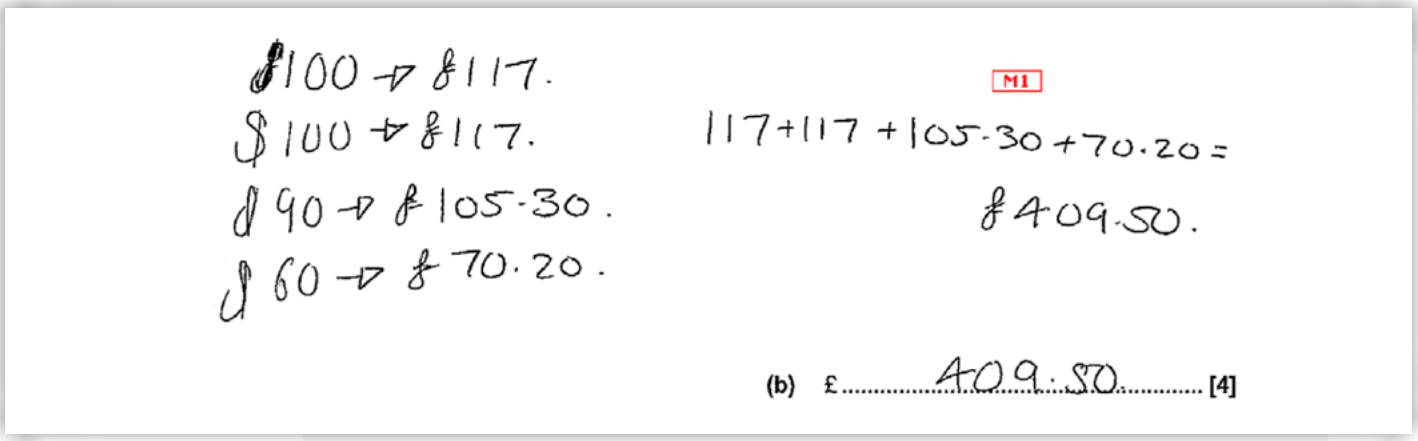
This is a partial solution to the question that scored 2 method marks.

The second M1 is scored for converting each denomination from euros to pounds. Any single one of these divisions would be sufficient to be awarded the M1.

The final M1 is scored for adding the converted values (although this has to be deduced by looking at the answer given). The candidate would have been advised to show that addition was taking place as, if there was an error at this stage, the addition could not be deduced from an incorrect total.

This is an example of a commonly used inefficient method, i.e. converting each denomination individually to pounds, multiplying (although this stage was omitted by this candidate) and summing, rather than finding the total in euros and converting just once. Division is a process in which candidates frequently make errors.

Exemplar 4 – Mark(s): 1



Examiner commentary

This response scored 1 mark for the final addition of values in a common currency.

The first M1 is not scored as the candidate made an error in calculating the second number of euros (100 instead of 80). As no actual calculations (€20 × 4, etc) are shown, the method has to be deduced and as previously mentioned, method cannot be deduced from a wrong answer.

The candidate has multiplied, rather than divided, by 1.17 and so the mark for conversion is also not scored.

Candidates would be advised to write down the method being used, even placing '×' symbols in the table, to show what is taking place.

Question 9(b)(ii)

Round each number to 3 significant figures.

(ii) 0.006 137 02

(ii) ..... [1]

Exemplar 1 – Mark(s): 0

(ii) 0006·13702 [1]

Examiner commentary

This incorrect solution demonstrates a common misunderstanding about significant figures. The candidate has moved the decimal point three places and no rounding has taken place.

Exemplar 2 – Mark(s): 0

(ii) 0·006 [1]

Examiner commentary

This candidate has confused significant figures with decimal places, which is another common misunderstanding with significant figures.

Exemplar 3 – Mark(s): 0

(ii) 0·006140 00 [1]

Examiner commentary

This candidate has demonstrated a further common misunderstanding by incorrectly including trailing zeros, which suggests that the value given is to six significant figures. Candidates should understand the significance of zeros in approximated figures.

Question 10(b)

Here are the first four terms of another sequence.

5 9 13 17

Write an expression for the *n*th term of this sequence.

(b) ..... [2]

Exemplar 1 – Mark(s): 0

(b) add 4 [2]

Examiner commentary

This incorrect solution demonstrates a common misunderstanding about the difference between '*n*th term' and a term to term rule. Many candidates give this answer, which is just a step away from 4*n* that would have been awarded a mark.

Exemplar 2 – Mark(s): 0

(b) n+4 [2]

Examiner commentary

Here we see a further common misunderstanding with *n*th terms.

Many candidates use the common difference of 4 in this way (a variation on 'add 4') rather than 4*n*. B1 can only be scored for stating 4*n*, which demonstrates an understanding that the terms are related to the multiples of 4.

Question 11(a)

Grapes cost £2 per kilogram.

Calculate the cost of 380 g of grapes.

(a) £ ..... [2]

Exemplar 1 – Mark(s): 2

11 (a) Grapes cost £2 per kilogram. 1000g

Calculate the cost of 380 g of grapes.

380g = 0·38kg

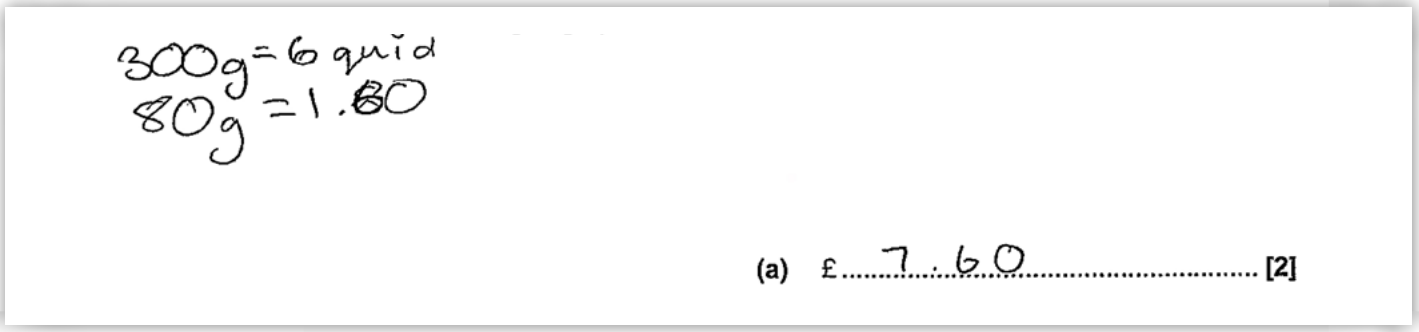
0·38×2=0·76

(a) £ 0·76 [2]

Examiner commentary

This is a clear and correct solution that uses a clearly shown multiplier to achieve the correct result and 2 marks.

Exemplar 2 – Mark(s): 1



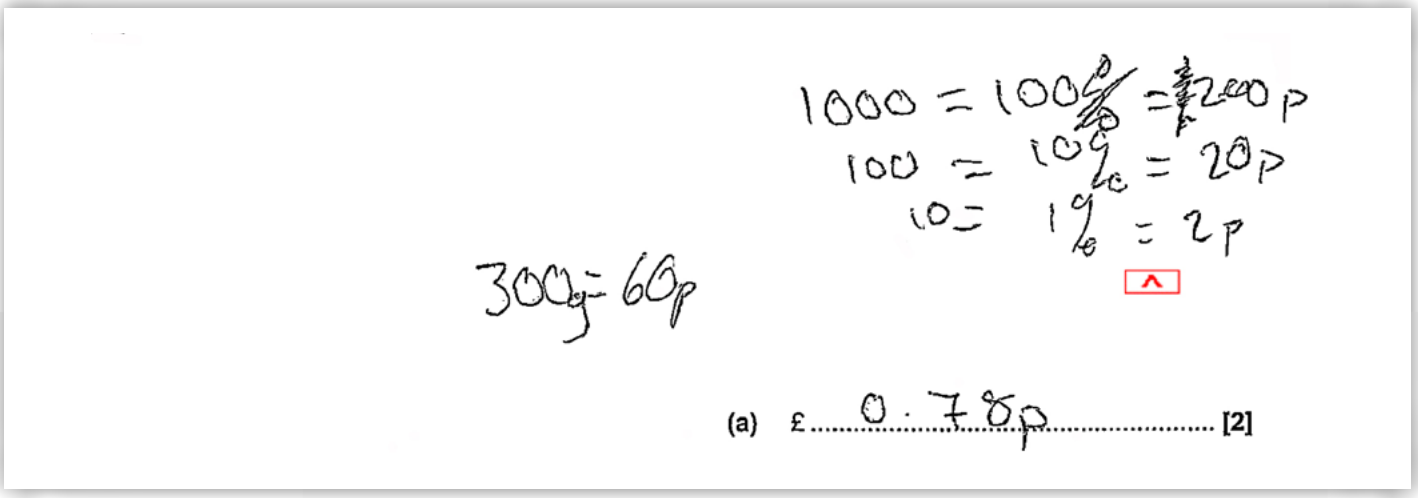
Examiner commentary

This candidate makes the error that there are 100g in 1 kilogram.

Intermediate values in the solution are shown, but not the processes used. The candidate scores a Special Case mark for the figures 76 in the answer.

Candidates need to understand the calculation and use of multipliers in proportion questions.

Exemplar 3 – Mark(s): 0



Examiner commentary

This candidate has used an incomplete non-calculator method linked to a percentage process.

If the efficient multiplier method is not used, the candidate must use a complete scaling method towards the answer, meaning that all processes must be present. This candidate has found the cost of 300g, but is not able to find the cost of the remaining 80g, which was a very common issue for candidates. From what is written it is not clear how the final answer has been achieved and so M1 cannot be awarded.

Candidates need to understand the calculation and use of multipliers in proportion questions.

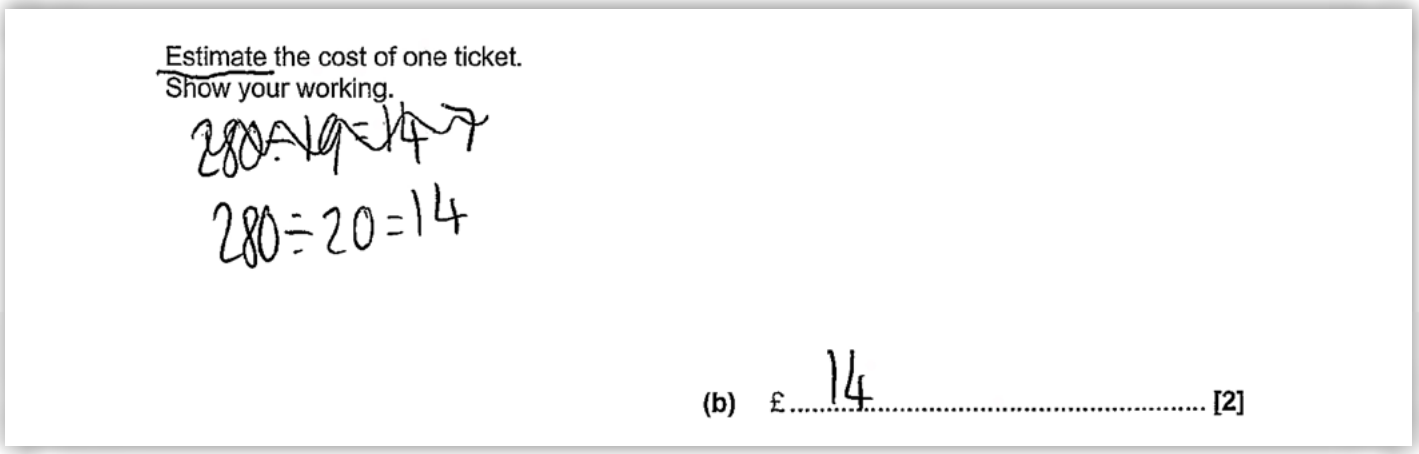
Question 11(b)

Ruth buys 19 identical tickets for £280.25.

Estimate the cost of one ticket.
Show your working.

(b) £ ..... [2]

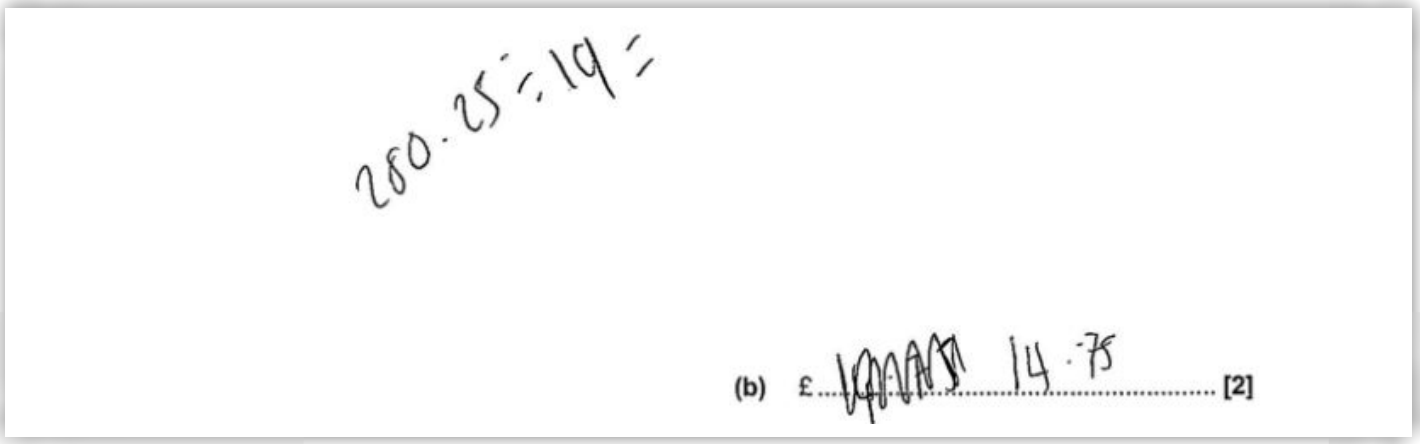
Exemplar 1 – Mark(s): 2



Examiner commentary

This question asks for an **estimate**. The candidate has understood this demand and highlights it by underlining. The two values are rounded to whole numbers that will readily divide.

Exemplar 2 – Mark(s): 0

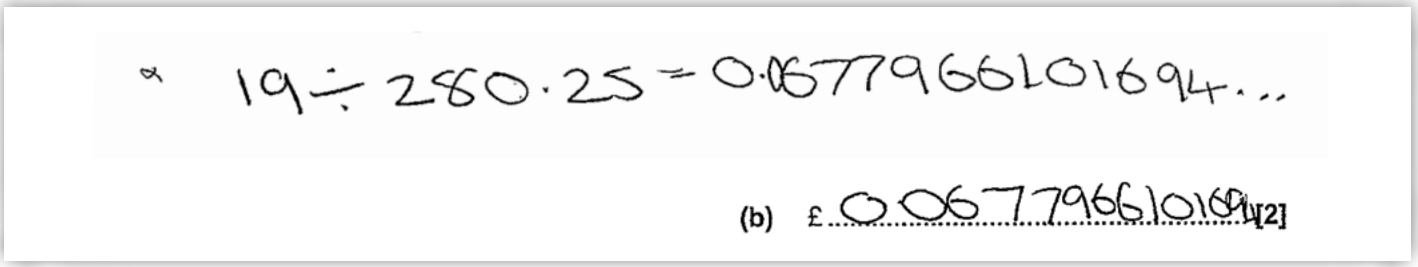


Examiner commentary

The question asks for an **estimate**. Many candidates provided an exact answer, or responded with a rounded version of their exact calculation. No marks are awarded for this, even for an answer of £15 when reached by this incorrect method.

Candidates should understand the implications of being asked to calculate an estimate.

Exemplar 3 – Mark(s): 0



Examiner commentary

As well as not providing an estimate, this response has the additional issue that the candidate has not been able to divide the quantities in the correct order.

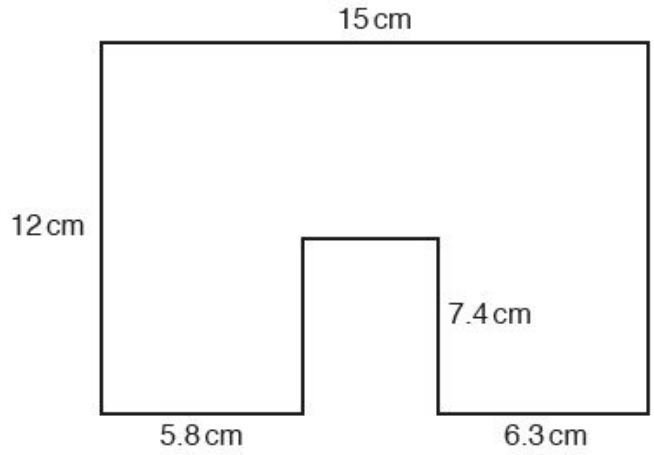
Even if the division had been done in the correct order, no marks would have been awarded. Candidates should always ask themselves "Is this answer sensible?".

Candidate should understand the implications of being asked to calculate an estimate.

Question 12

The shape below is formed from a rectangle measuring 12 cm by 15 cm from which a rectangle of length 7.4 cm has been removed.

Not to scale

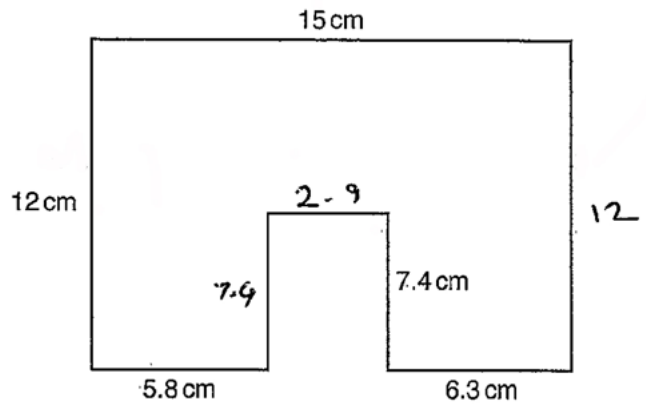


Work out the perimeter of the shape.

.....cm **[3]**

Exemplar 1 – Mark(s): 3

Not to scale



Work out the perimeter of the shape.

15 +
12
12
5.8
7.4
7.4
2.9
6.3

68.8

.....68.8..... cm [3]

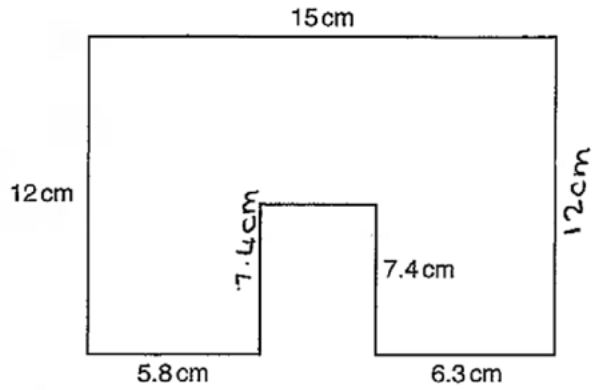
Examiner commentary

This is a complete and correct method to find the perimeter and scores 3 marks.

The candidate did not show how 2.9cm has been reached; this is not necessary to do, but would be advised in case a numerical error occurs. If 15 – 5.8 – 6.3 been wrongly calculated, the M1 could then still be awarded and, if this wrong value had been used in the perimeter method, the second M1 could also be awarded.

Exemplar 2 – Mark(s): 0

Not to scale



Work out the perimeter of the shape.

12+12+15+5.8+5.8+7.4+7.4
124 + 20.8 + 13.2 + 7.4
44.8 + 20.6

44.8 + 20.6 = 65.4

65.4 cm [3]

Examiner commentary

This candidate understands the concept of perimeter, but has not found the important missing dimension of the inset and uses 5.8 twice (missing 6.3). All the method marks require acknowledging the missing 2.9cm.

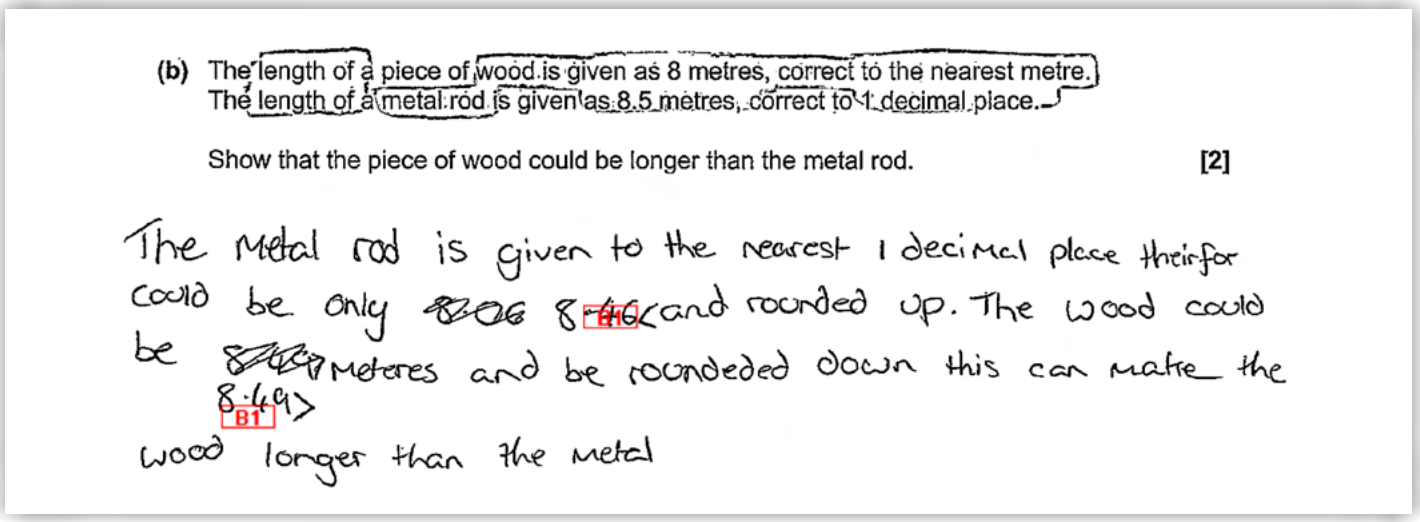
Although the other 7.4cm side of the rectangle was not given in the diagram, identifying it was not awarded a mark on its own.

Question 13(b)

The length of a piece of wood is given as 8 metres, correct to the nearest metre.
The length of a metal rod is given as 8.5 metres, correct to 1 decimal place.

Show that the piece of wood could be longer than the metal rod. **[2]**

Exemplar 1 – Mark(s): 2



(b) The length of a piece of wood is given as 8 metres, correct to the nearest metre.
The length of a metal rod is given as 8.5 metres, correct to 1 decimal place.

Show that the piece of wood could be longer than the metal rod. [2]

The Metal rod is given to the nearest 1 decimal place therefor could be only 8.46 8 B1 and rounded up. The wood could be 8.49 meteres and be rounded down this can make the 8.49 B1 wood longer than the metal

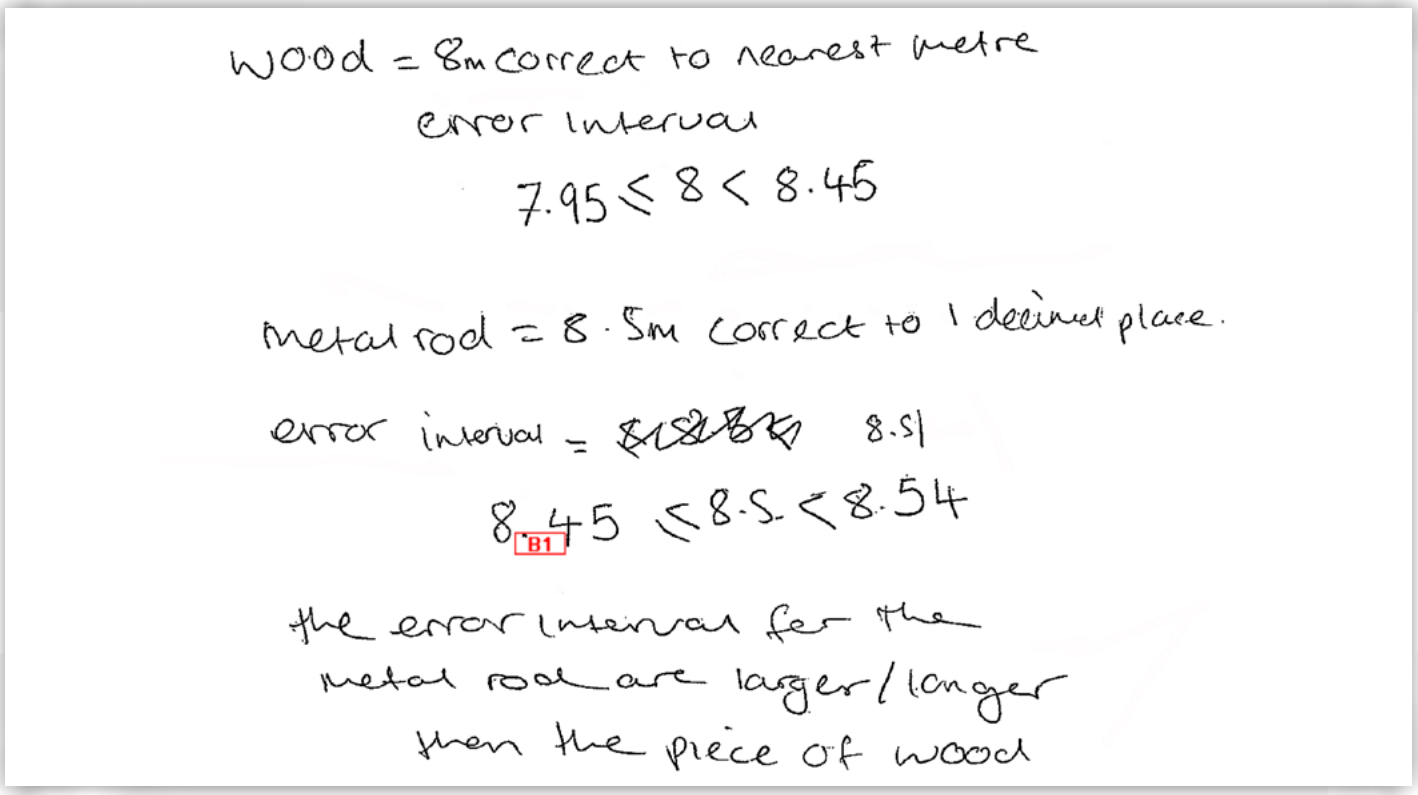
Examiner commentary

This candidate was one of the few to understand the effect of rounding to produce given values.

The solution has the key values and explains the implications of these. There are more words than necessary here but they do reveal the candidate's thinking. 'The metal could be 8.46. The wood could be 8.49. (So the wood could be longer)' would be enough to score both marks.

Other values are possible, as can be seen from the mark scheme.

Exemplar 2 – Mark(s): 1

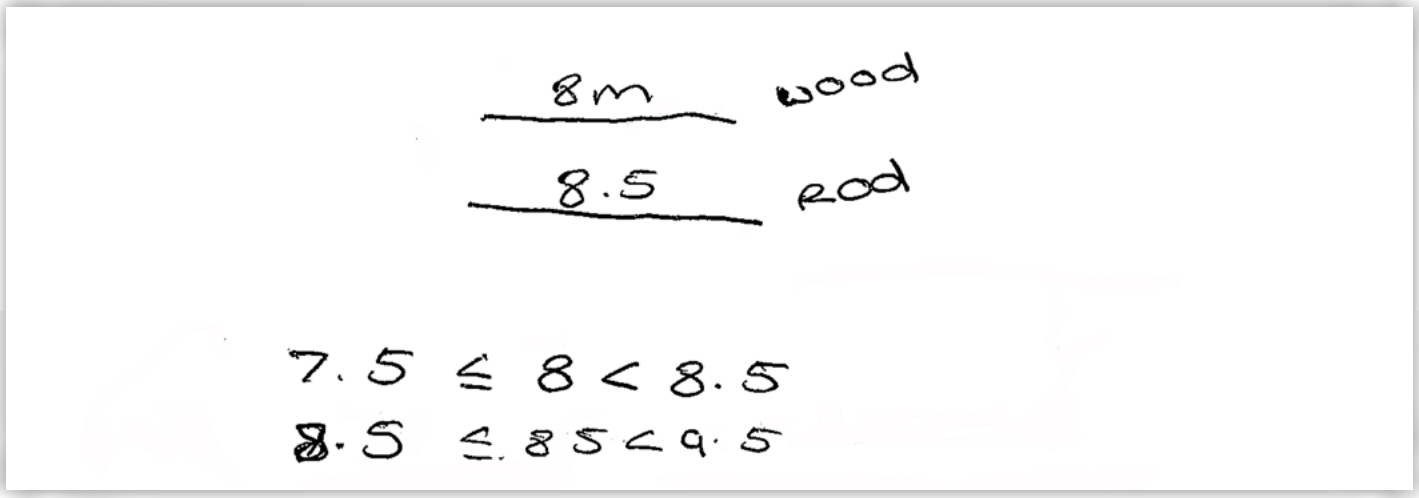


Examiner commentary

This candidate has misunderstood error intervals.

The interval is incorrect in both cases, however one relevant value (8.45) is given in the solution and so despite its ambiguity B1 can be awarded.

Exemplar 3 – Mark(s): 0



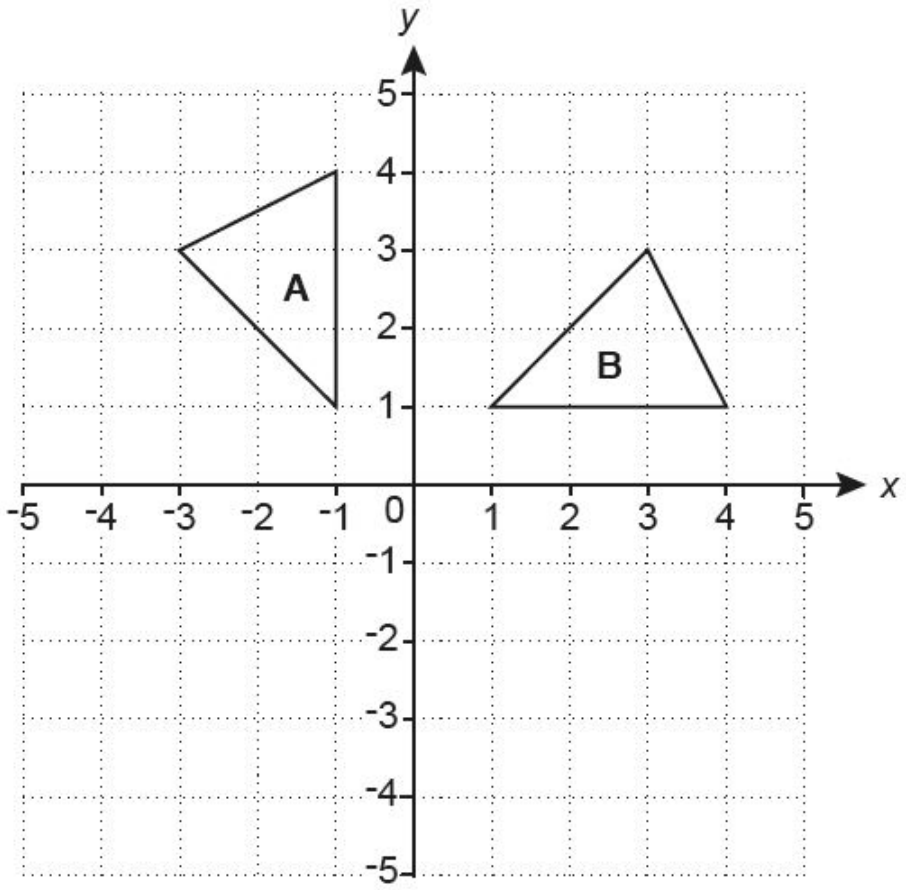
Examiner commentary

This solution scored no marks and revealed a basic misunderstanding about the meaning of rounding to different accuracies.

No figures are given that could be rewarded from the mark scheme.

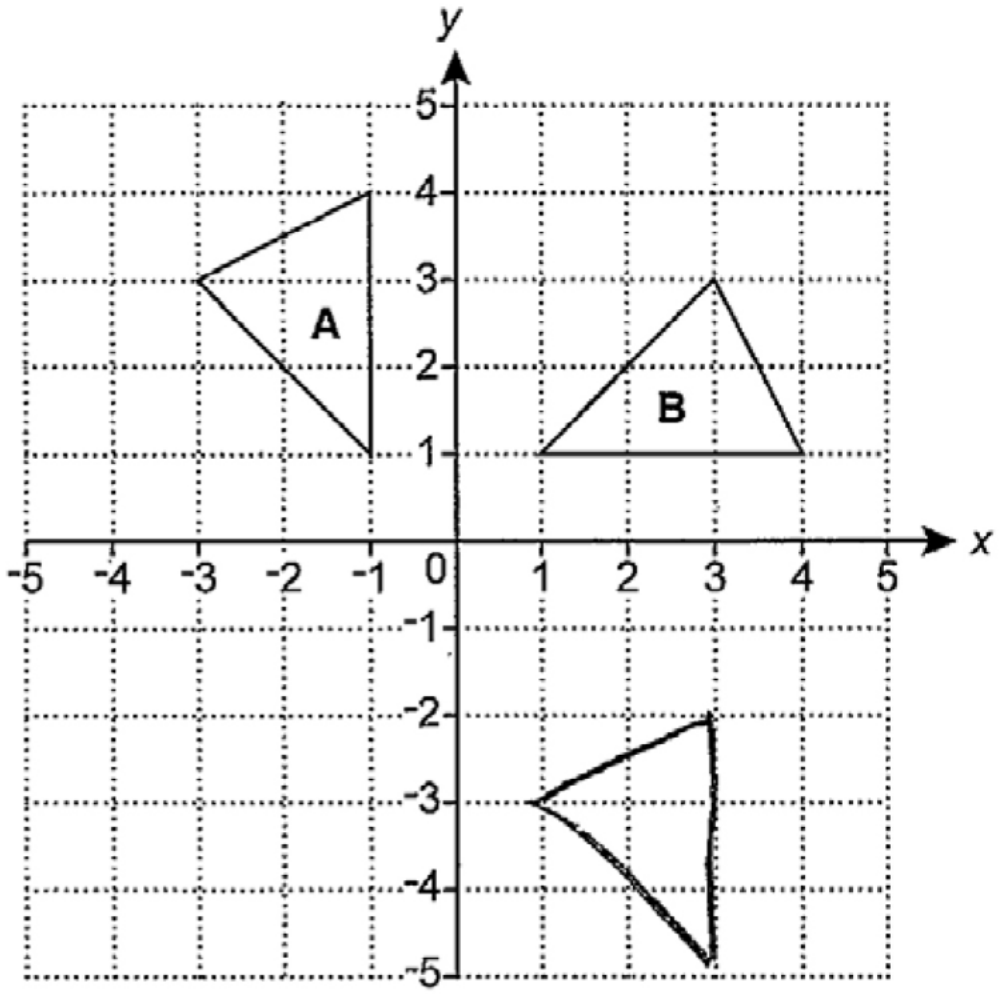
Question 14(a)

Triangle **A** and triangle **B** are drawn on the coordinate grid.



(a) Translate triangle **A** by vector $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$. **[2]**

Mark(s): 0



Examiner commentary

This solution has been included as it demonstrates a common error, that many candidates translated by 1 too many units in each direction. Here the triangle is translated by $\begin{pmatrix} 4 \\ -6 \end{pmatrix}$ rather than $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$.

Question 14(b)

Describe fully the **single** transformation that maps triangle **A** onto triangle **B**.

.....

..... [3]

Exemplar 1 – Mark(s): 3

rotation at Point 0,0, 90°, clockwise

..... [3]

Exemplar 2 – Mark(s): 2

rotate anti clockwise 90°
above the origin ..... [3]

Exemplar 3 – Mark(s): 0

rotate 90° and and move
right 2 places ..... [3]

Examiner commentary

The first solution is completely correct and scores 3 marks, despite the omission of brackets around the coordinates.

The second solution scores 2 marks as the correct transformation (rotation) is identified for B1 and so too is the centre (origin), also for B1. Using 'origin' or '(0, 0)' are equally acceptable. The sense of the rotation is incorrect however, as it should be clockwise.

The final solution scores no marks as two transformations are mentioned. Even if the rotation had been correct, the inclusion of a second transformation would have rendered this void.

Question 15

Students at a school must choose one subject from Option 1 and one from Option 2.
The school offers two languages, French and Spanish.

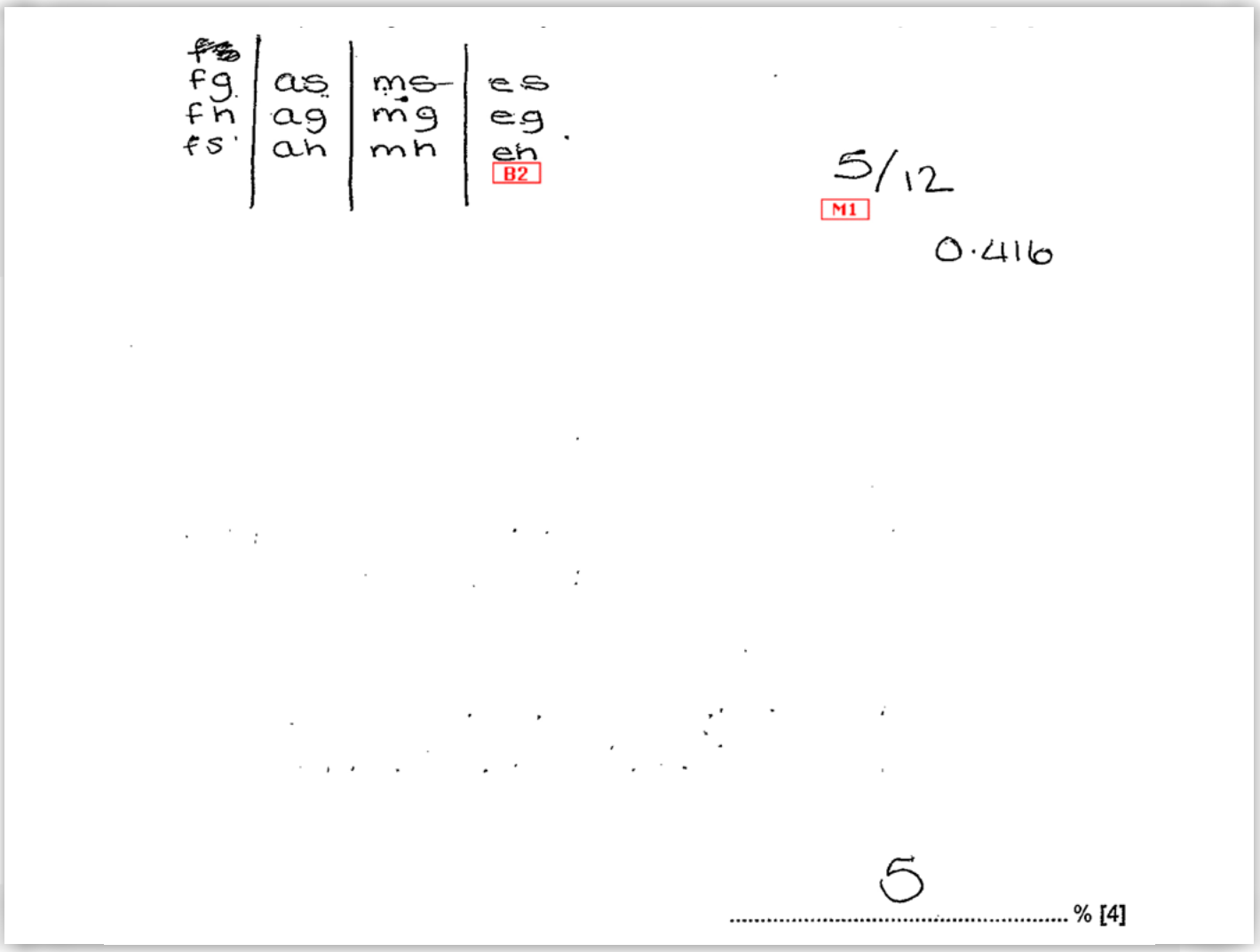
The subjects are given in this table.

Option 1	Option 2
French	Spanish
Art	Geography
Music	History
Economics	

Work out the percentage of all the subject combinations which have exactly one language.

..... % [4]

Exemplar 1 – Mark(s): 3



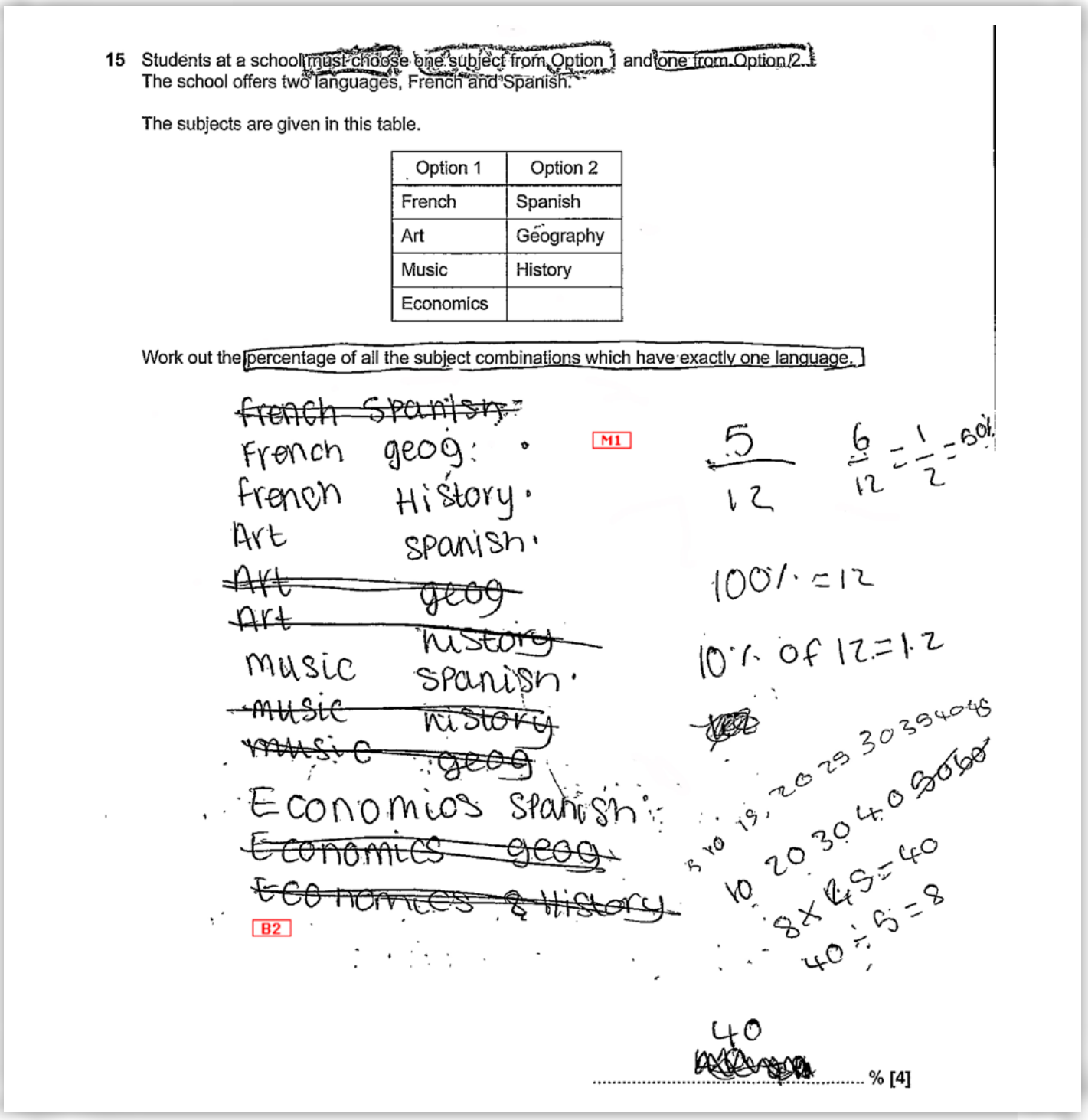
Examiner commentary

This candidate has used single letter abbreviations to shorten listing. The use of a table organises the results well and B2 is scored for this.

The candidate shows $\frac{5}{12}$ to score M1, but only converts this to a decimal and not a percentage.

Candidates are recommended to check the question to see whether their answer matches what is asked.

Exemplar 2 – Mark(s): 3



15 Students at a school must choose one subject from Option 1 and one from Option 2.
The school offers two languages, French and Spanish.

The subjects are given in this table.

Option 1	Option 2
French	Spanish
Art	Geography
Music	History
Economics	

Work out the percentage of all the subject combinations which have exactly one language.

French Spanish
French geog.
French History.
Art Spanish.
Art geog
Art history
music Spanish.
music history
music geog
Economics Spanish.
Economics geog.
Economics & History

M1

B2

5/12

6/12 = 1/2 = 50%

100% = 12

10% of 12 = 1.2

10 20 30 40 50 60

8 x 5 = 40

40 ÷ 5 = 8

40

..... % [4]

Examiner commentary

This solution is messy, but quite well structured. The task assesses the ability to generate results and find a percentage from these.

The candidate lists the 12 possible subject combinations for B2.

Within these, the 5 combinations that show a single subject are placed over 12 for M1.

The final conversion to a percentage is incorrect and so only 3 marks are scored.

The notes at the side suggest that an attempt to convert to percentage has been made without use of a calculator.

Candidates should be more aware of what they can use a calculator for and also consider using single letter abbreviations to shorten listing tasks.

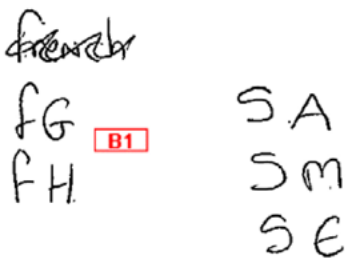
Exemplar 3 – Mark(s): 1

Students at a school must choose one subject from Option 1 and one from Option 2.
The school offers two languages, French and Spanish.

The subjects are given in this table.

Option 1	Option 2
French F	Spanish S
Art A	Geography G
Music M	History H
Economics E	

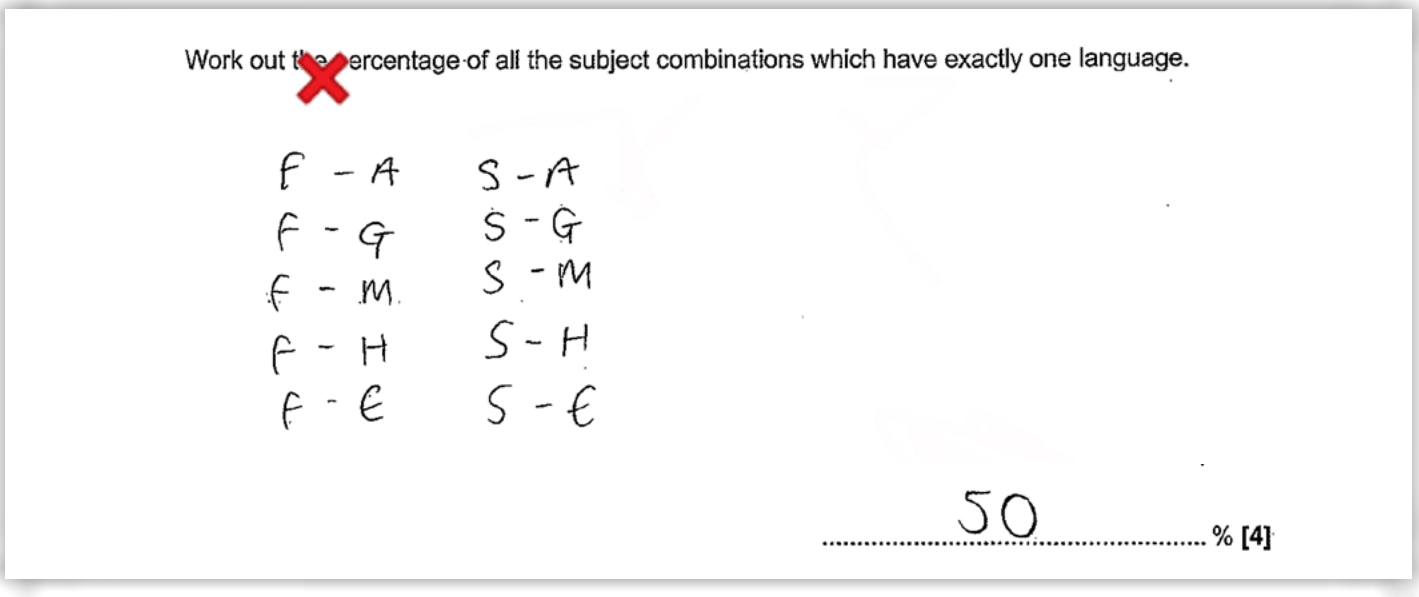
Work out the percentage of all the subject combinations which have exactly one language.



Examiner commentary

This candidate has only listed the 5 single language combinations to score B1 from the second group of B marks in the scheme.

Exemplar 4 – Mark(s): 0



Work out the percentage of all the subject combinations which have exactly one language.

F - A
F - G
F - M
F - H
F - €

S - A
S - G
S - M
S - H
S - €

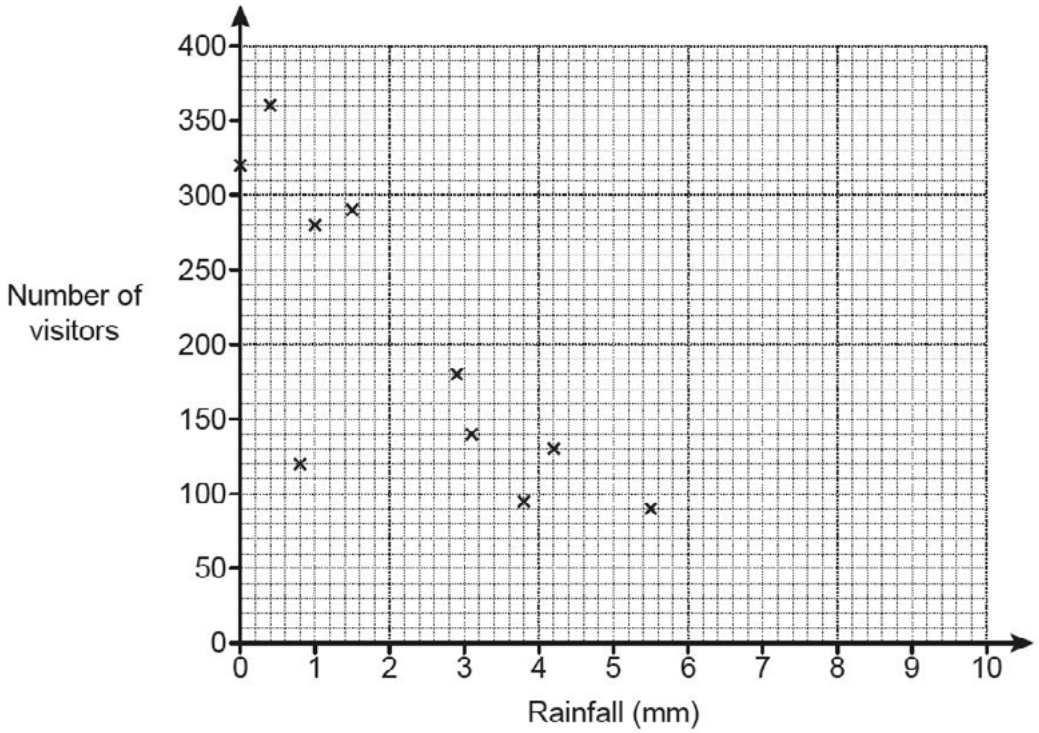
50 ..... % [4]

Examiner commentary

This candidate has used single letter abbreviations to shorten listing, but has listed within and across columns. No evidence that can be awarded a mark has been shown.

Question 16(a)(ii)

The owner of a tourist attraction records the amount of rainfall, in millimetres, and the number of visitors each day.
The results for 10 days are shown in the scatter diagram.



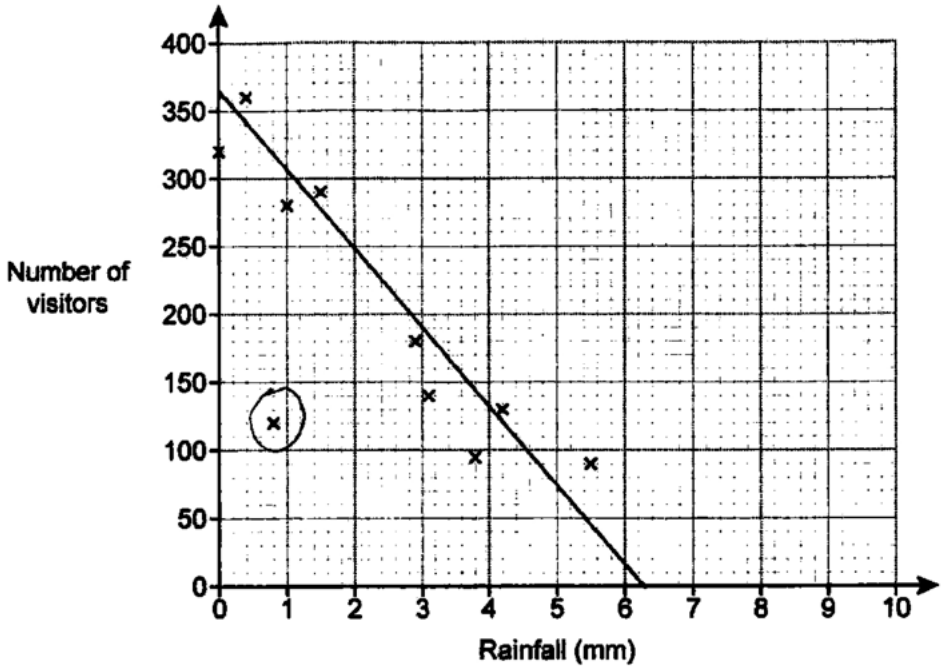
(ii) The owner claims that he would expect around 320 visitors on a day with 2 mm of rainfall.

Does the scatter diagram support his statement?
Explain how you made your decision.

.....

..... **[2]**

Exemplar 1 – Mark(s): 2



No with a line of best fit it shows that 2mm of rainfall would make 250 visitors [2]

Examiner commentary

The question did not specify that a line of best fit should be drawn and it is for candidates to realise that this is the most appropriate tool to use for this question.

This candidate has decided that the value is incorrect and used their line to justify the value that should be expected. This scores 2 marks.

Exemplar 2 – Mark(s): 1

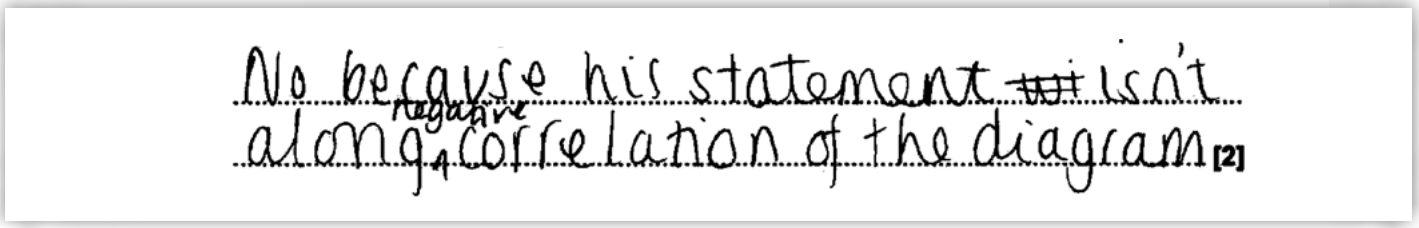
No because there were 320 visitors B1
on a day with 0 rainfall and 280 with 1mm. [2]

Examiner commentary

This candidate scores B1 for the second line of evidence in the mark scheme. By showing that 320 is associated with 0mm of rainfall (and 280 with 1mm) they have used supporting values.

The solution would be improved by using a line of best fit and suggesting appropriate values within the expected range.

Exemplar 3 – Mark(s): 1

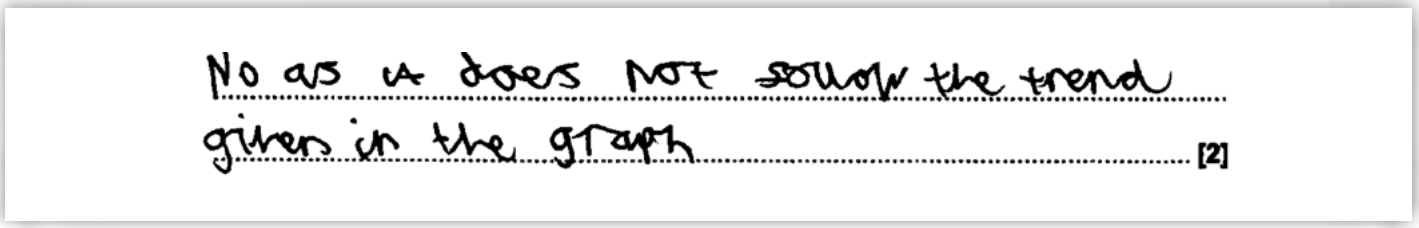


Examiner commentary

The candidate did not draw a line of best fit but has identified that there is negative correlation within the diagram. This scores a part mark of B1 (fourth line of evidence in the mark scheme).

The solution would be improved by using a line of best fit and suggesting an appropriate value within the expected range.

Exemplar 4 – Mark(s): 0



Examiner commentary

This scores nothing as no values are used and, although mentioned, the trend of the graph is not described. If the word 'negative' had been inserted before 'trend' then B1 would have been scored.

The solution would be improved by using a line of best fit and suggesting appropriate values within the expected range.

Question 16(a)(iii)

Explain why the scatter diagram should not be used to estimate the number of visitors on a day with 9 mm of rainfall.

.....

..... [1]

Exemplar 1 – Mark(s): 1

Because there are no results from 6mm onwards, of visitors. [1]

Examiner commentary

Although a more precise answer would be appreciated, this response was regarded as enough to show that the candidate understood that the value at 9mm would require extrapolation and so should not be made.

'Because the value 9mm is outside the range of the data' would be a better response.

Exemplar 2 – Mark(s): 0

~~There is no~~ You can't estimate how many people would visit and ~~that~~ it doesn't show a clear answer. [1]

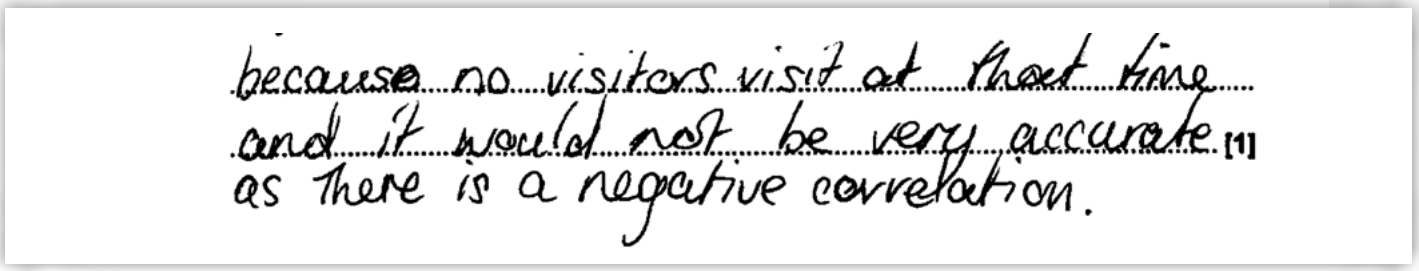
Examiner commentary

This scores 0 as the statement is essentially just restating the demand.

The expected answer is that 9mm of rainfall is 'outside the range of data' (extrapolation).

The candidate needs to be specific and show an understanding that the trend shown in the given data may not continue into areas where data has not been collected.

Exemplar 3 – Mark(s): 0

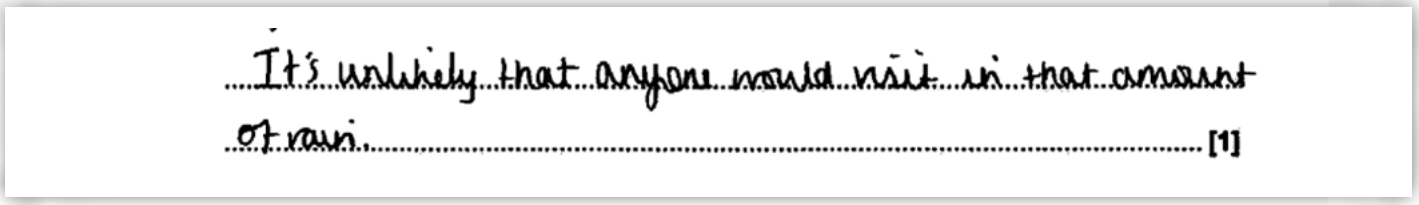


Examiner commentary

This is a misunderstanding of the situation. A number of candidates gave answers related to missing data; 'there is no data there', 'no visitors at that time', etc, but did not note that no data had been collected at that point.

This candidate mentions negative correlation, but does not go further to indicate that this may not continue or would lead to a negative number of visitors.

Exemplar 4 – Mark(s): 0



Examiner commentary

A number of candidates went down the practical route; 'No-one would visit when it is so wet' was a common response.

Candidates need to concentrate on **mathematical** justifications.

Exemplar 5 – Mark(s): 0

Examiner commentary

Again, the answer does not deal with the mathematical justification that the value is outside the range of the data.

Question 17(a)(ii)

The scale of a map is 1 cm represents 25 m.

(ii) The scale 1 cm represents 25 m can be written in the form 1 : k.

Find the value of k.

(ii) k = ... [1]

Exemplar 1 – Mark(s): 1

2500cm

100cm in a M

(ii) k = 2500 [1]

Examiner commentary

This is a correct response to this part. Such responses were rare.

Exemplar 2 – Mark(s): 0

25 ÷ 10 = 2.5m

×10 (1cm = 25m) ×10

÷1 (1cm = 250cm) ÷1

1 = (ii) k = 250 [1]

Examiner commentary

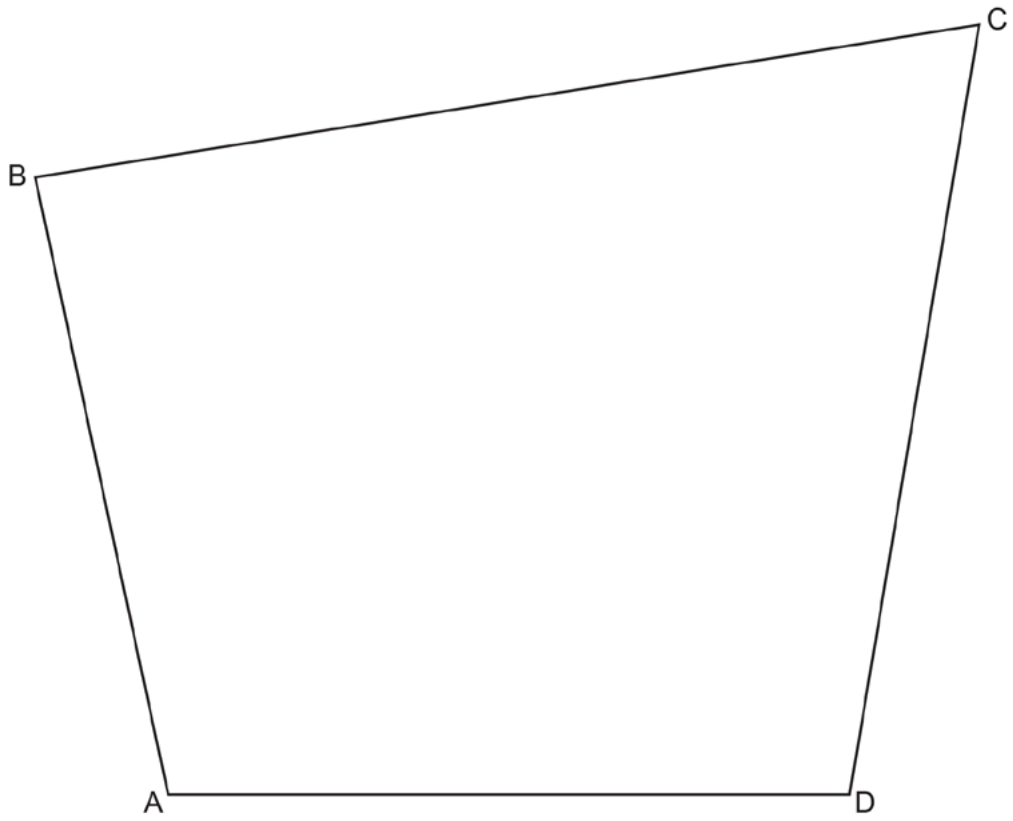
Many incorrect responses were due to errors in the number of centimetres in a metre. The most common error was an answer of 25, although in this case 250 has been reached.

Candidates should ensure they know that there are 100cm in one metre.

Question 17(b)

The scale drawing represents a park.

Scale: 1 cm represents 25 m

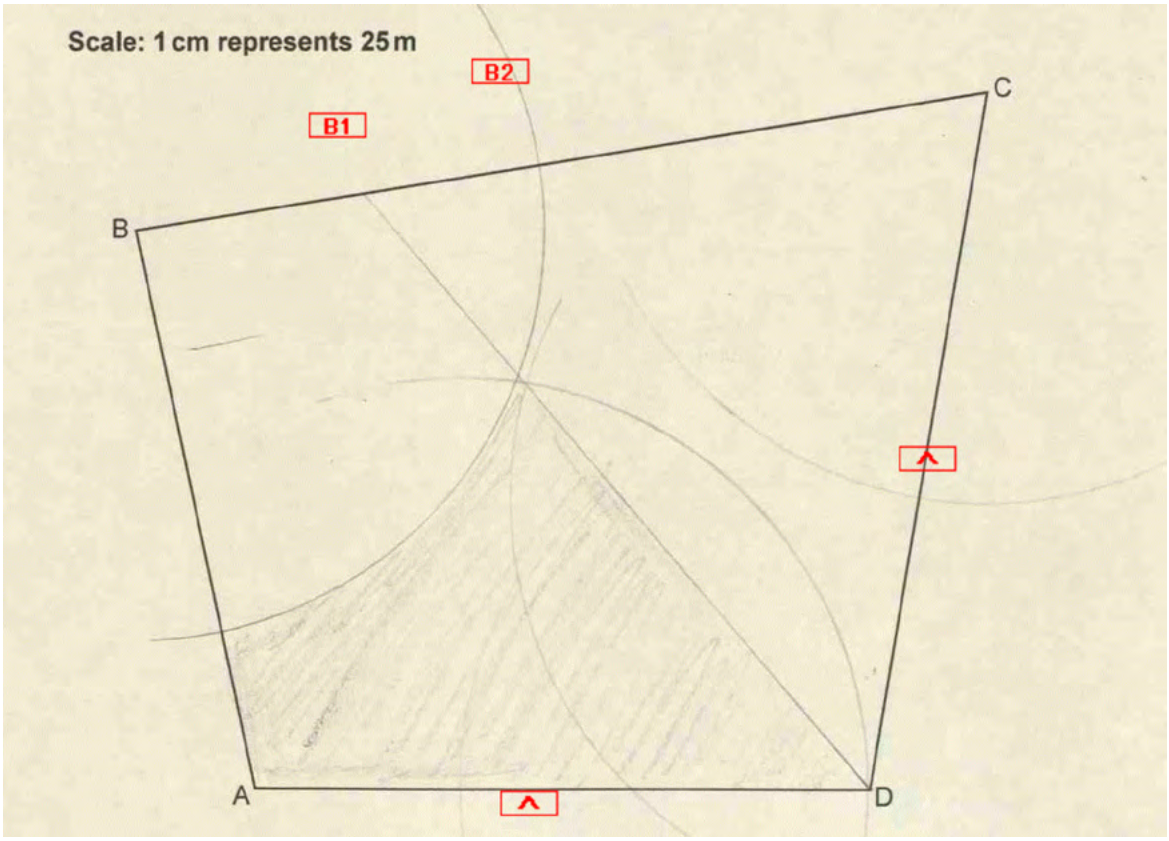


A new play area must be

- no more than 150 m from B
- closer to AD than to CD.

Construct and shade the region where the play area can be positioned.
Show all your construction lines. **[5]**

Exemplar 1 – Mark(s): 3



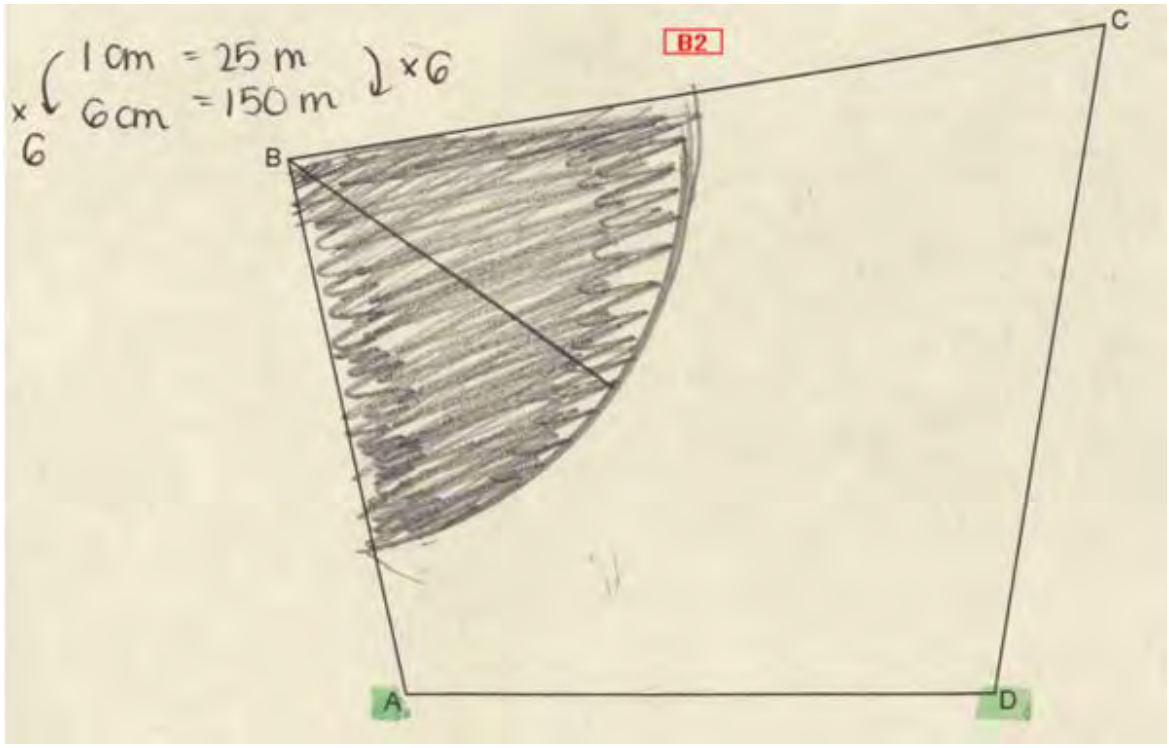
Examiner commentary

This solution was well drawn and scored 3 of the available marks. The first B2 was for the arc at point B. The bisector of angle ADC is drawn, but the marks on AD and DC are missing and so the construction is incomplete and only scores B1.

After this, the incorrect region is shaded however and so B0 is scored for this mark.

To improve the solution, candidates should show ALL construction lines in each construction.

Exemplar 2 – Mark(s): 2



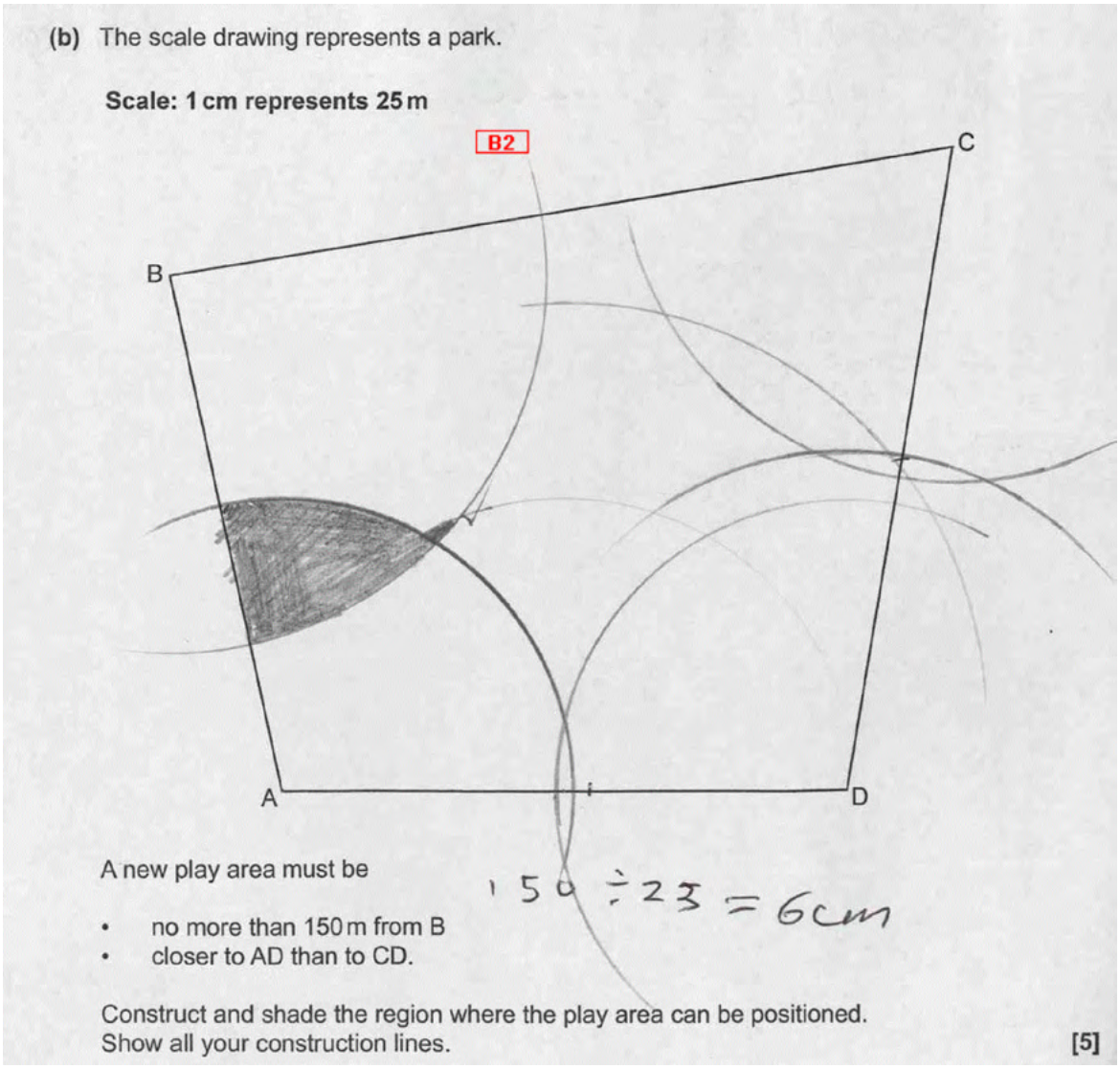
Examiner commentary

This candidate answered the first part of the demand to score B2, which was the most common response that scored more than 1 mark. In cases where candidates did not draw this arc, seeing the value 6cm was awarded SC1.

Although a line radiates from point B, this seems to serve no purpose and is not correct for the required angle bisector.

To improve the solution, candidates should learn the basic constructions for loci such as these and realise that the boundary for points no closer to AD than to CD is the bisector of the angle ADC.

Exemplar 3 – Mark(s): 2



Examiner commentary

The candidate answered the first part of the demand to score B2. The shading scores no marks as it is necessary to have an attempt at the bisector of angle ADC to go beyond the first B2.

The random arcs from A, D and C are ignored.

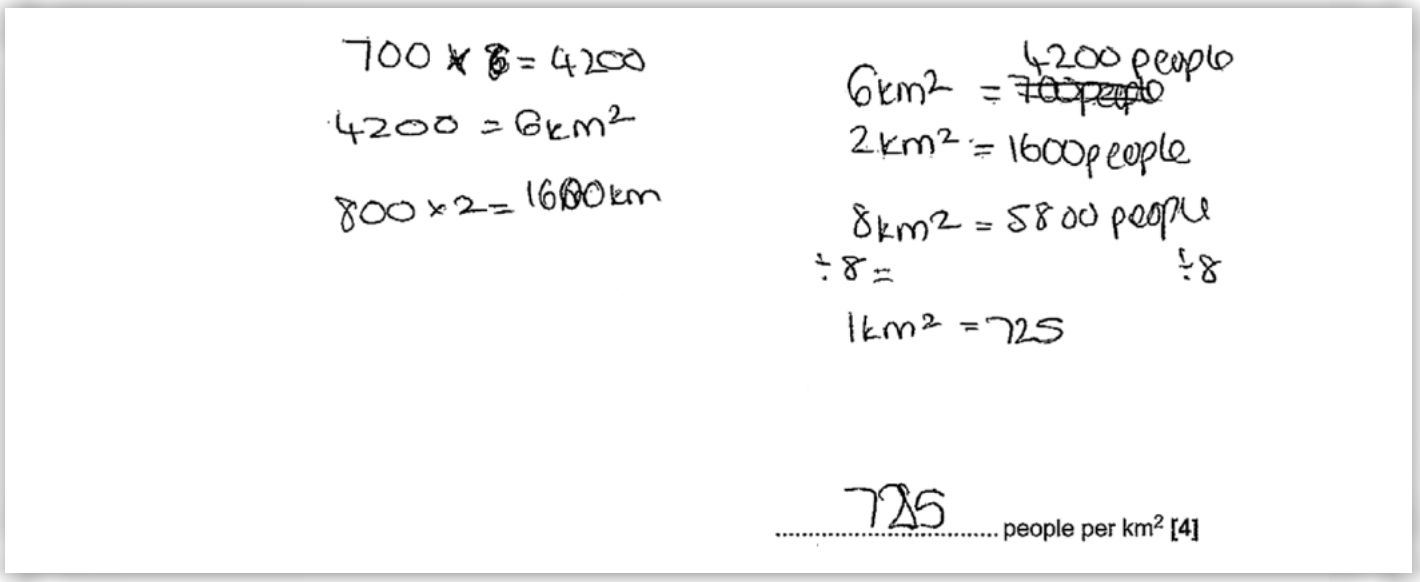
Question 18

A village has a population of 4200 and a population density of 700 people per km^2.
An estate is built next to the village.
The estate has an area of 2 km^2 and a population density of 800 people per km^2.

Work out the population density for the village and the estate together.

..... people per km^2 **[4]**

Exemplar 1 – Mark(s): 4



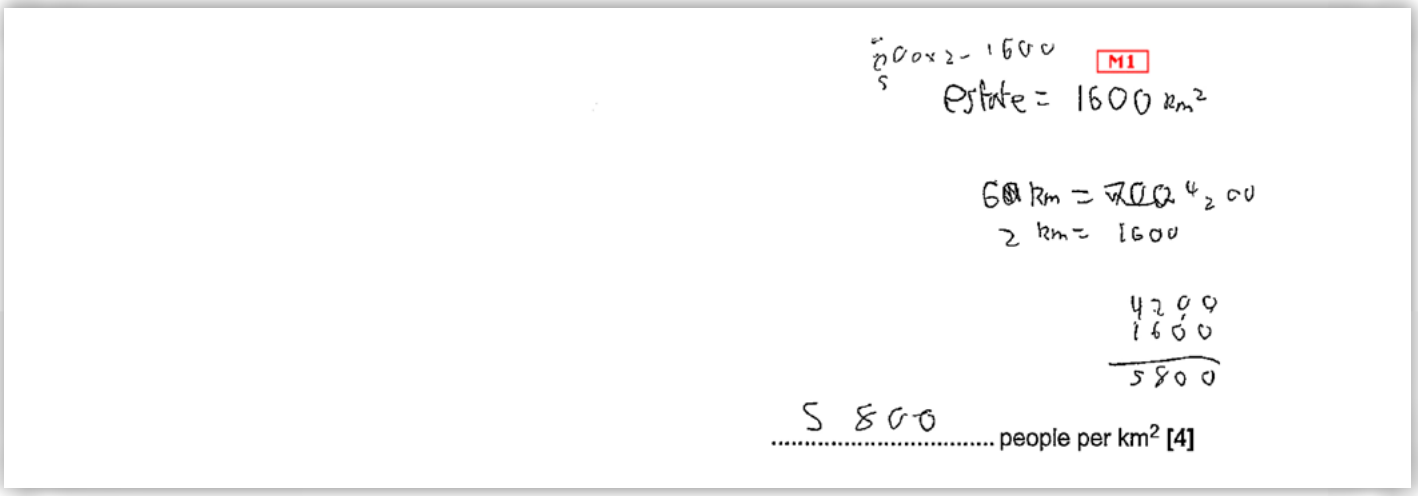
Examiner commentary

This candidate has presented a reasonably well annotated solution in which the process can be followed.

Candidates are advised to cross out numbers they wish to amend rather than overwriting them, as this can lead to responses becoming unclear and marks may not be awarded. The answer given on the answer line here is unclear; the clear 725 in the working is used to confirm the answer, but the candidate should have crossed out the numbers on the answer line and re-written them above or to the side.

The incorrect units of 1600**km** appear in the working, but the value is correctly used on the right.

Exemplar 2 – Mark(s): 1



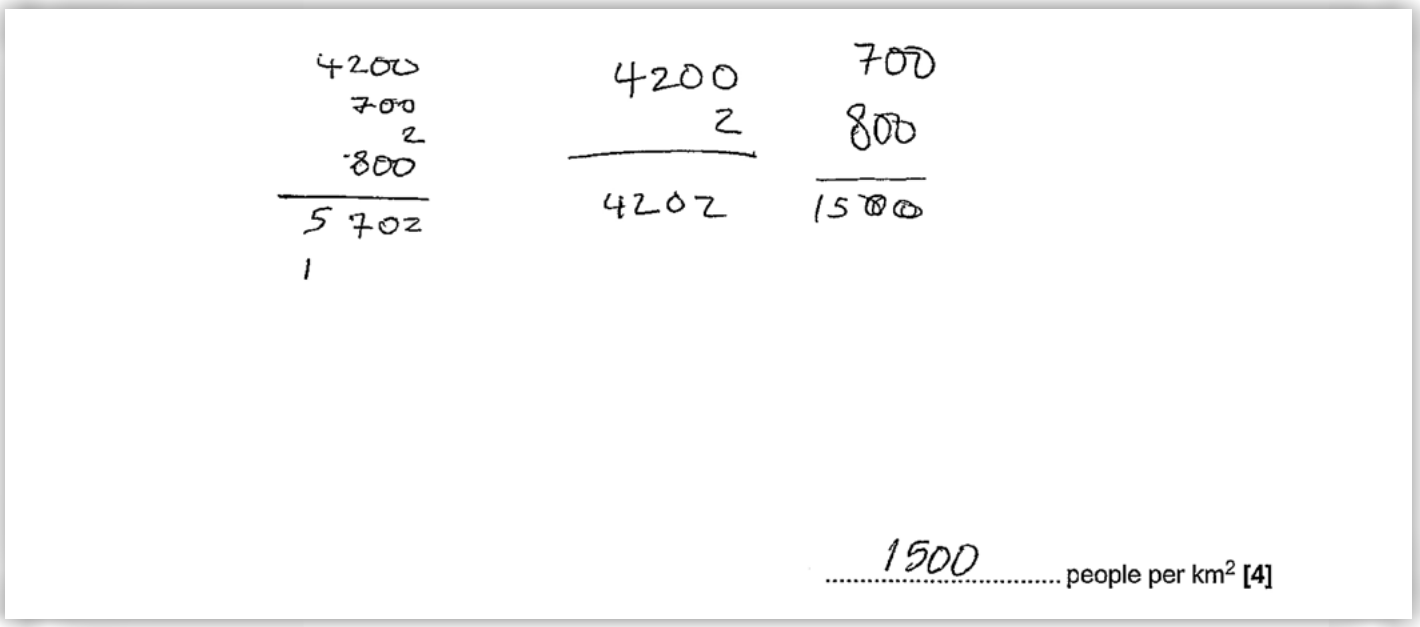
Examiner commentary

There were two ways that this question could be answered. The vast majority of candidates took the route outlined first in the mark scheme. The first two critical values (6 and 1600) implied the working and the M1 leading to each.

This candidate found and used the value 1600 for M1 (despite the incorrect units). An indistinct 6 did appear in their working, but this was not used in the final solution and so was not awarded M1.

If the candidate had gone on to complete the method and divide the total population by the total area (there is a hint in the compound unit), then the second and third M marks could have been scored (and, of course, the final A1 for a correct answer).

Exemplar 3 – Mark(s): 0



Examiner commentary

This candidate has tried an unfortunately frequent tactic, to combine as many numbers in as many ways as possible and choose one that looks like it could be right. In the final answer, the two population densities are added to score 0 marks.

This was a common wrong answer, suggesting that many candidates did not understand the topic.

Question 19

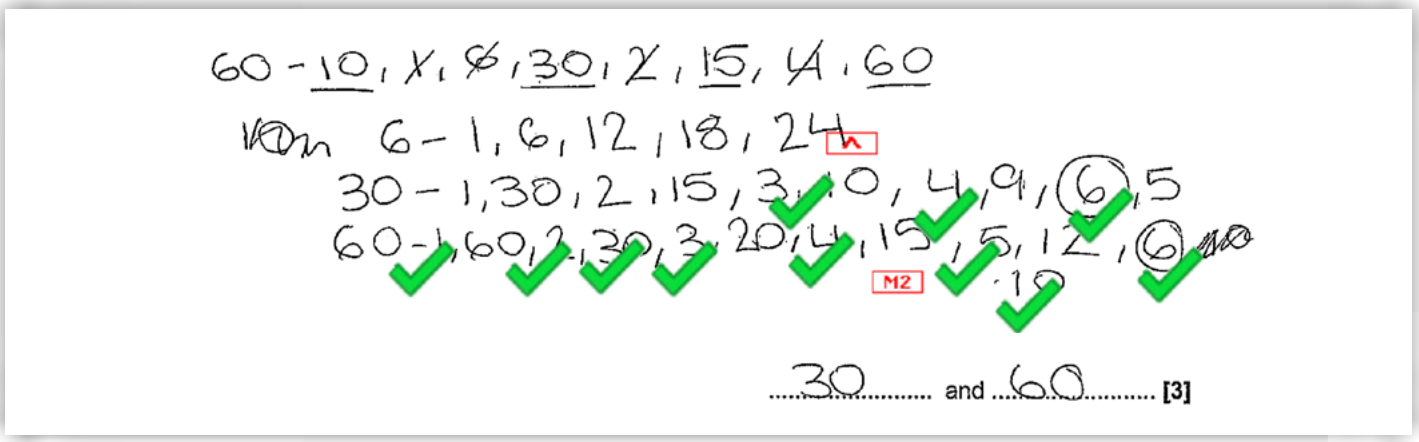
Two numbers have these properties.

- Both numbers are greater than 6.
- Their highest common factor (HCF) is 6.
- Their lowest common multiple (LCM) is 60.

Find the two numbers.

..... and ..... [3]

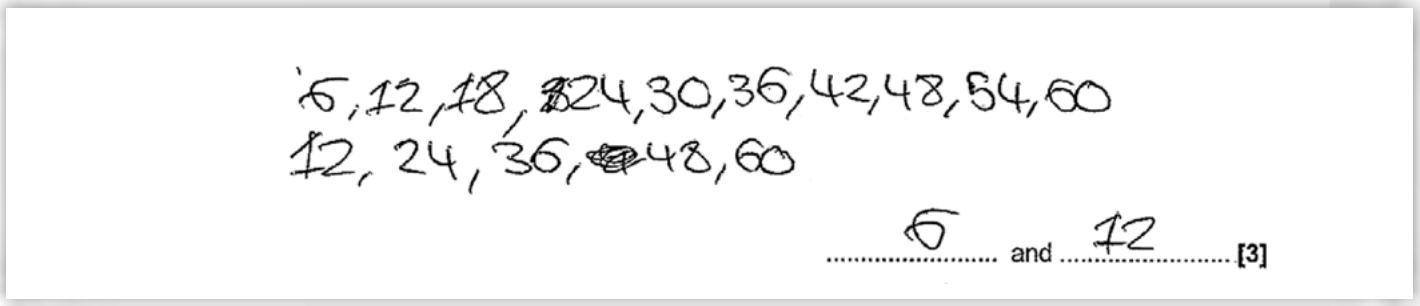
Exemplar 1 – Mark(s): 2



Examiner commentary

This candidate decided to list the multiples of 6, but stopped short of the critical 30. They did list the factors of 60 however, for which M2 was awarded. Unfortunately, they chose 60 (giving an HCF of 30) as the second number and not 12.

Exemplar 2 – Mark(s): 1



Examiner commentary

This was a challenging question involving understanding of HCF and LCM.

A route that led to success for some candidates was to list the multiples of 6, however success depended on realising that the lower of the two numbers could not be 6. Within the list, the only numbers that had an LCM of 60 were 12 and 30.

This candidate achieved M1 for the list of multiples (or alternatively, B1 could have been awarded for two numbers that met the final two bullet points).

Candidates are advised to reread the question to check that their answer meets all the requirements.

Question 20(a)(i)

This is a fair 5-sided spinner.

Ciara spins the spinner twice and records the product of the two scores.

(i) Complete the table.

First spin

Second spin	x	1	2	2	3	4
	1	1				
	2			4		
	2					
	3					
	4				12	

[2]

Mark(s): 2

First spin

Second spin	x	1	2	2	3	4
	1	1	2	2	3	4
	2	2	4	4	6	8
	2	2	4	4	6	8
	3	3	6	6	9	12
	4	4	8	8	12	16

Examiner commentary

This is a typical correct solution to the question.

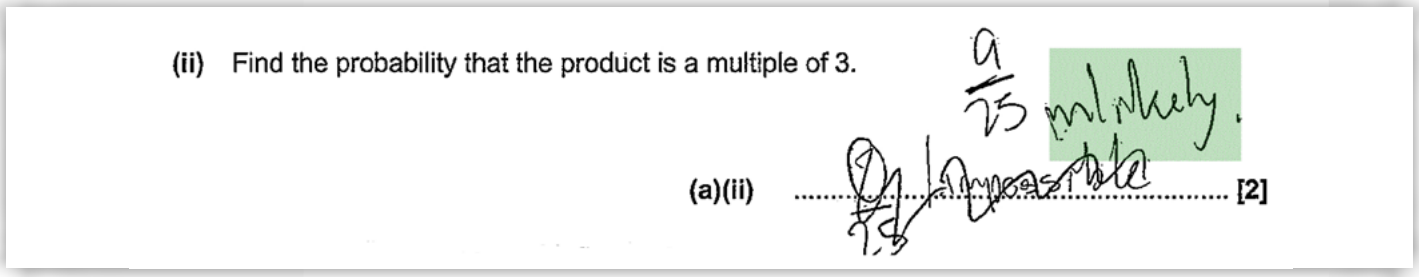
The numbers are clear despite appearing to have been written in pencil before settling on the final figures.

Question 20(a)(ii)

Find the probability that the product is a multiple of 3.

(a)(ii) ..... [2]

Exemplar 1 – Mark(s): 2



Examiner commentary

This part follows on from the table in part (i).

The answer of $\frac{9}{20}$ is correct, but the added word ('unlikely') should not have been given. In this case it was condoned as it did not contradict the correct answer. If the deleted 'impossible' had been left on the answer line however, this would have contradicted the answer and no marks would have been scored.

Candidates are advised not to use words when a probability is demanded.

Exemplar 2 – Mark(s): 1

(ii) Find the probability that the product is a multiple of 3.

28%

(a)(ii) 0.28 [2]

First spin

Second spin	x	1	2	2	3	4
	1	1	2	2	3	4
	2	2	4	4	6	8
	2	2	4	4	6	8
	3	3	6	6	9	12
	4	4	8	8	12	16

7 are multiples of 3

7/25 B1

7/25 × 100 = 28%

Examiner commentary

In this response the candidate has a correct table, however they have not recognised that 3 is a multiple of 3 and only include 7 favourable outcomes (seen ringed in the table).

B1 is awarded here as they show use of 25 as the denominator in their working (if this working had not been seen then M0 would be awarded, as how 28% was reached would not have been clear).

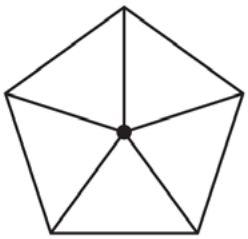
Question 20(b)

Ciara makes a different fair 5-sided spinner.
She spins the spinner twice and records the product of the two scores.

Ciara says

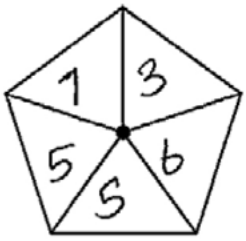
The probability that the product is negative is 0.48.

Write numbers on the spinner below so that Ciara's statement is correct.



[3]

Mark(s): 0



$\frac{48}{100}$

Examiner commentary

Very few candidates showed method when answering this question. Even fewer associated 0.48 with $\frac{48}{100}$ and hence $\frac{12}{25}$ (as there are 25 possible combinations using the spinner).

This was a typical response that scored 0 marks.

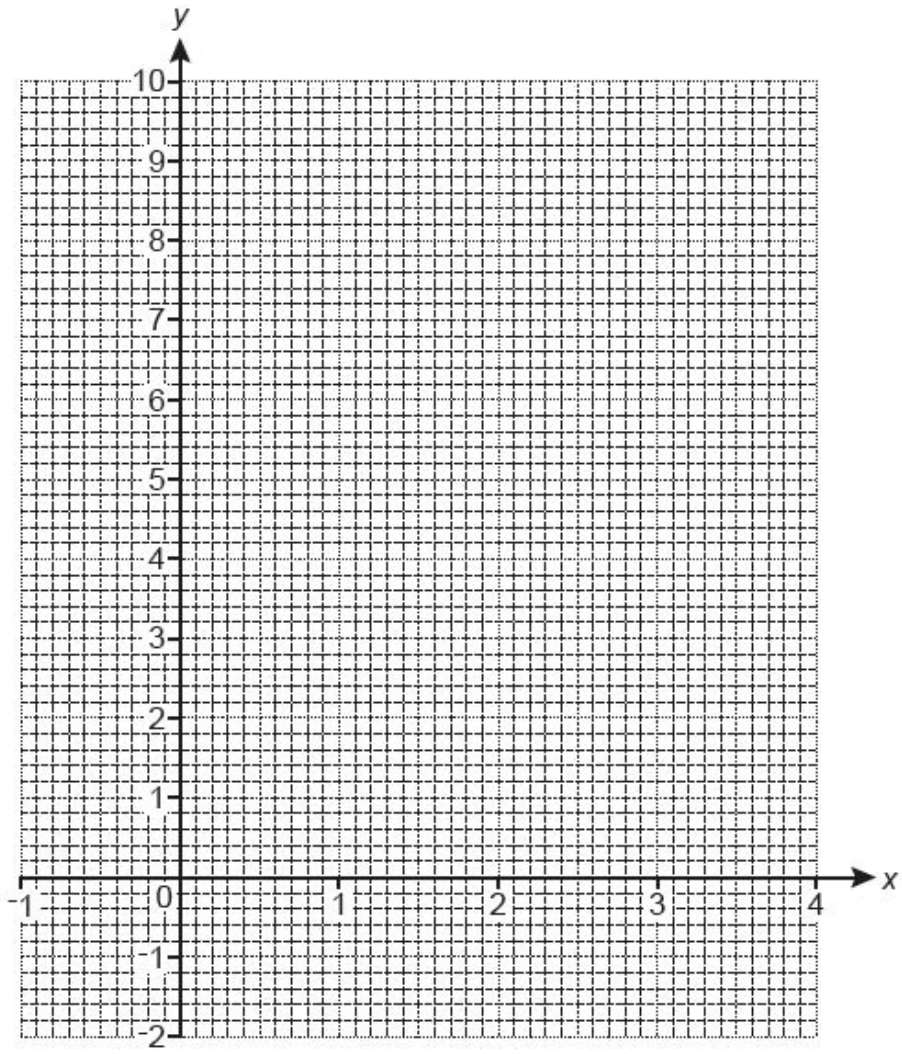
As the question involved negative products, it seemed surprising that many candidates did not include at least one negative number on the spinner.

Question 21(b)

x	-1	0	1	2	3	4
y	3	0	-1	0	3	

[1]

Draw the graph of $y = x^2 - 2x$ for $-1 \leqslant x \leqslant 4$.



[2]

Exemplar 1 – Mark(s): 2

(a) Complete the table for $y = x^2 - 2x$.

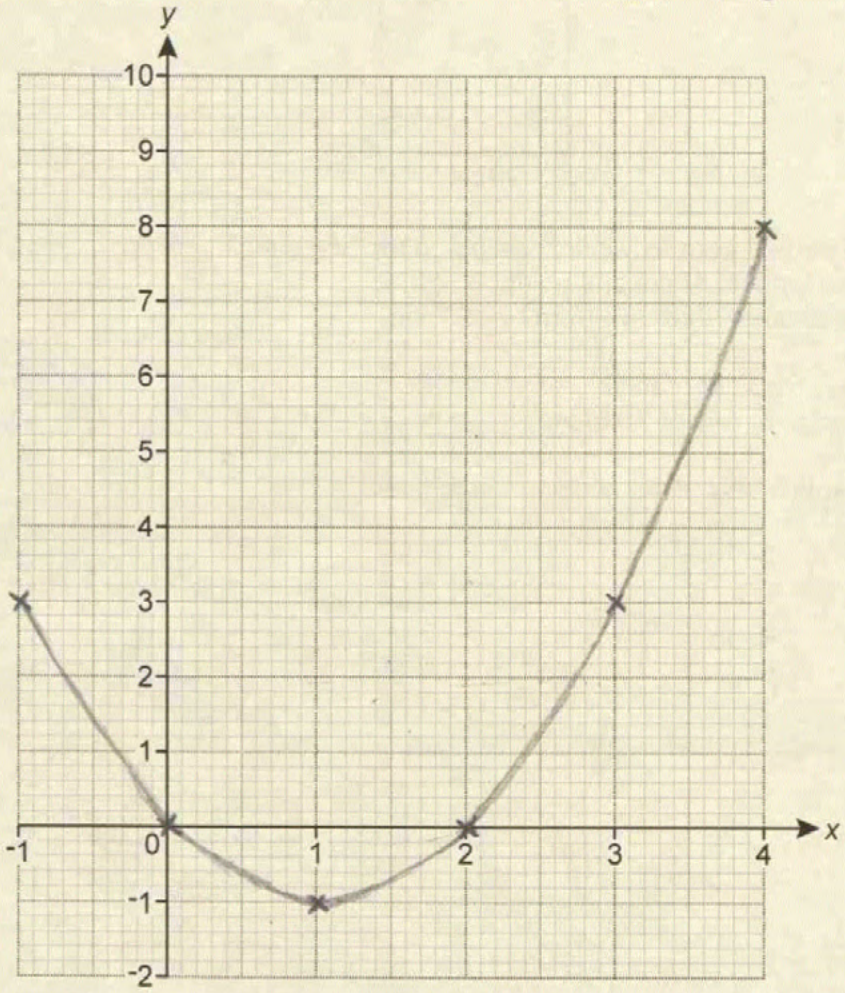
x	-1	0	1	2	3	4
y	3	0	-1	0	3	8

[1]

$4^2 = 16 - 8 = 8$

$2 \times 4 = 8$

(b) Draw the graph of $y = x^2 - 2x$ for $-1 \leqslant x \leqslant 4$.



[2]

Examiner commentary

This candidate has correctly worked out the value of y when $x = 4$ in part (a). Each point has been carefully and correctly plotted in (b) and, although their pencil could have been sharper, the line is within a half square of tolerance.

This is a good example of a curved graph.

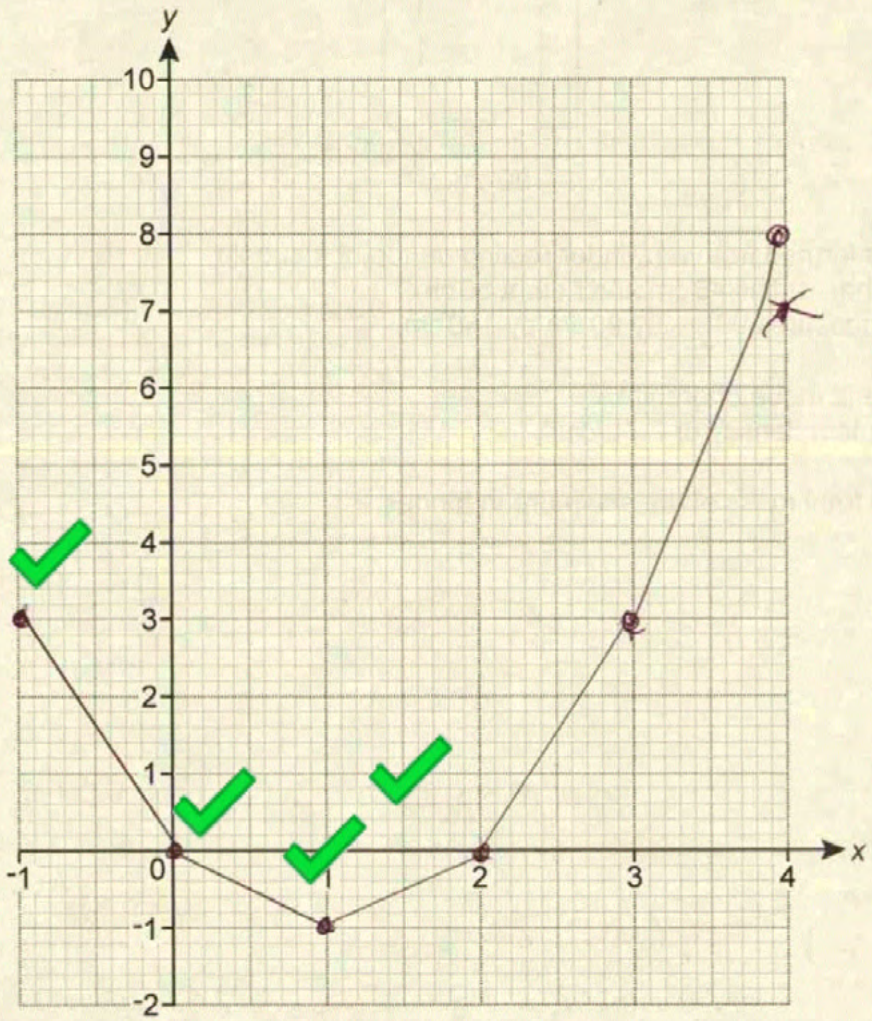
Exemplar 2 – Mark(s): 1

(a) Complete the table for $y = x^2 - 2x$.

x	-1	0	1	2	3	4
y	3	0	-1	0	3	8

[1]

(b) Draw the graph of $y = x^2 - 2x$ for $-1 \leqslant x \leqslant 4$.



[2]

Examiner commentary

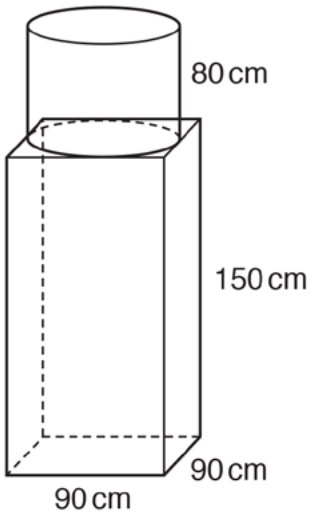
This candidate has plotted each point correctly (after a false start with (4, 8)), scoring B1.

It is strongly recommended that candidates use small crosses, clearly centred on the point, to plot points.

The candidate has made an error in joining their points with straight lines, which automatically loses the mark for the curve.

Candidates should appreciate that because the plotted points do not form a straight line then neither would the unknown points between them.

Question 22



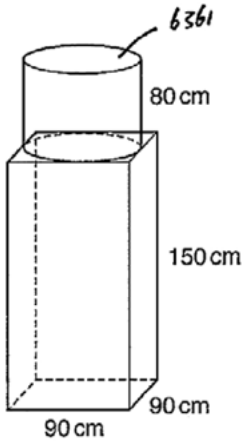
A sculpture is formed from a cylinder resting on top of a cuboid.
The cylinder has radius 45 cm and height 80 cm.
The cuboid measures 90 cm by 90 cm by 150 cm.

The sculpture is made of granite.
The granite has a density of 2.7 g/cm^3.

Calculate the total mass of the sculpture in tonnes.

.....tonnes **[5]**

Exemplar 1 – Mark(s): 4



A sculpture is formed from a cylinder resting on top of a cuboid.
The cylinder has radius 45 cm and height 80 cm.
The cuboid measures 90 cm by 90 cm by 150 cm.

The sculpture is made of granite.
The granite has a density of 2.7 g/cm^3.

Calculate the total mass of the sculpture in tonnes.

Cyl

$\pi \times 45^2$ M1 = 6361

$6361 \times 80 = 508,938.01$

AREA = $508,438.01\ cm^3$

M1

TOTAL AREA = 1723438.01

cuboid

$90 \times 90 = 8100$ M1

$8100 \times 150 = 1,215,000$

AREA = $1,215,000\ cm^3$

Weight (mass)

M1

$2.7_g \times 1723438.01$

$= 4136251.224_g$

$4136251.224 \div 1000 = 4136.25$

4136.25 .....tonnes [5]

Examiner commentary

This candidate has used correct methods to find each volume (despite calling each one an area) and multiplied by 2.7 so all the processes are correct. However, a numerical error has prevented the final answer being correct. 4 method marks are awarded.

Candidates are advised to check their solutions.

Exemplar 2 – Mark(s): 3

A sculpture is formed from a cylinder resting on top of a cuboid.
The cylinder has radius 45 cm and height 80 cm.
The cuboid measures 90 cm by 90 cm by 150 cm.

The sculpture is made of granite.
The granite has a density of 2.7 g/cm^3

Calculate the total mass of the sculpture in tonnes.

volume of cylinder
$\pi r^2 h$

M1
Cylinder = $\pi \times 45^2 \times 80 = 508938$
Cuboid: ~~$90 \times 90 \times 150$~~ $90 \times 90 \times 80 = 121\,500$ M1

$508938 + 121\,500$

$121\,500$ M1
508938
$1265938 \div 2.7 =$

46884496

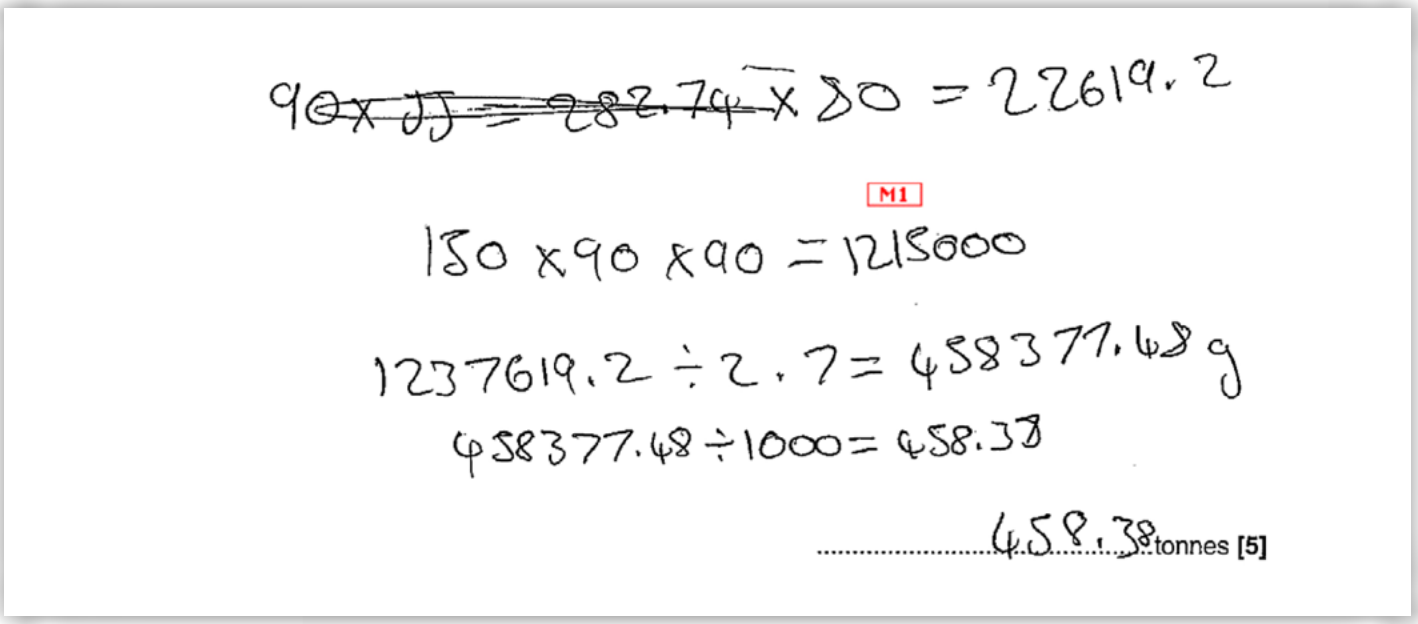
.....tonnes [5]

Examiner commentary

This candidate has used the correct method to find the volume of the cylinder (annotated to the left) and the cuboid (also annotated) and added these for a total volume.

Unfortunately they then divide by 2.7 rather than multiply, so just M3 is awarded. Division at this stage was a common error amongst candidates. Candidates should consider the clues in compound units. With density, 2.7g/cm^3 implies, through the use of 'per', that there is 2.7g for every cm^3 and so a **product** is required.

Exemplar 3 – Mark(s): 1



Examiner commentary

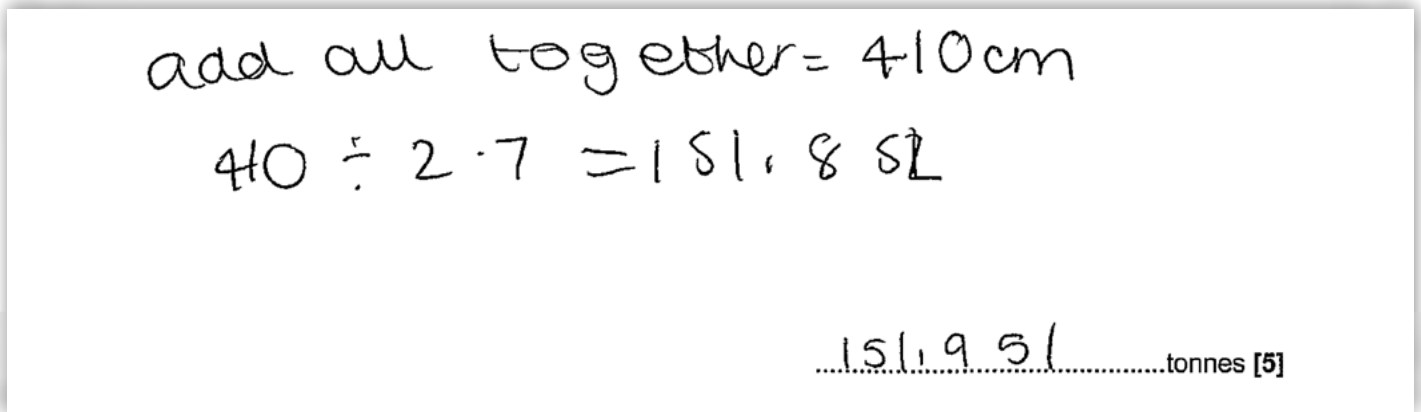
The final question of the paper involved the calculation of three volumes (the cuboid, the cylinder and then their total), each for M1. The final method mark was for finding a mass and could occur at any point in the solution, from multiplying volume by 2.7.

This candidate has correctly carried out one step (finding the volume of the cuboid) to receive M1.

This then appears to have been used (through addition to the incorrect value in the first line) in further working towards an answer, however none of these other processes are correct.

Candidates are advised to show each step in their working and, where possible, to annotated these, e.g. vol cuboid =, etc.

Exemplar 4 – Mark(s): 0



Examiner commentary

This candidate makes an attempt by summing all the given dimensions and dividing by the density.

No marks were awarded. Totalling the dimensions was a popular method of making an attempt.

Very few candidates attempted to calculate surface area in this question, which was pleasing.

The small print

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