Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9–1)

Exemplar Candidate Work

MATHEMATICS

J560
For first teaching in 2015

J560/03 Summer 2018 examination series

Version 1

Contents

Introduction

These exemplar answers have been chosen from the summer 2018 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 https://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 2018 Examiners' report or Report to Centres available from Interchange https://interchange.ocr.org.uk/Home.mvc/Index

The question paper, mark scheme and any resource booklet(s) will be available on the OCR website from summer 2019. Until then, they are available on OCR Interchange (school exams officers will have a login for this and are able to set up teachers with specific logins – see the following link for further information http://www.ocr.org.uk/administration/support-and-tools/interchange/managing-user-accounts/).

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 (c)

(c) Write the following numbers in order of size, smallest first.

0.4 0.5 0.06 0.444 0.46

.... **[2]**

smallest

Exemplar 1 1 mark

(c) Write the following numbers in order of size, smallest first.

~~0.40~~ ~~0.50~~ ~~0.060~~ ~~0.444~~ ~~0.460~~

0.06 0.4 0.46 0.5 0.444 **[2]**

smallest

Examiner commentary

An exemplar of a common error. The candidate has added zeros to the given numbers BUT only one zero to each number rather than bringing each to three decimal places. This omission meant that all the numbers could easily be ranked but not 0.444. It was fairly common to see 0.444 regarded as the largest number.

Question 3 (b)

(b) $\sqrt{12.25^3}$
Give your answer correct to 1 decimal place.

(b) ..... **[2]**

Exemplar 1 — 0 marks

(b) $\sqrt{12.25^3}$
Give your answer correct to 1 decimal place.

(b) 1838.265625 **[2]**

Examiner commentary

This exemplar typifies errors that were commonly made. The candidate has found 12.25^3 but not the square root of this. They have also ignored the instruction to give the answer correct to one decimal place. No marks scored.

Question 5

5 *Tea Biscuits* can be bought in packets of 20 or packets of 24.
All biscuits are identical in size and quality.

20 *Tea Biscuits* for £1.50	24 *Tea Biscuits* for £1.80

Nada says

The packet of 24 biscuits is better value.

Is Nada correct?
Show how you decide.

Nada is ..... because.....

..... [3]

Exemplar 1

3 marks

Is Nada correct?
Show how you decide.

1·50 ÷ 20 = 0·075

1·80 ÷ 24 = 0·075

Nada is wrong because both biscuits are worth the same amount if you were to find out the value of one. [3]

Examiner commentary

This represents a clear solution that scores all 3 marks. No units were required with the answer, although the use of units is always to be encouraged. The working is clear and the conclusion correct.

Exemplar 2

2 marks

Is Nada correct?
Show how you decide.

$20 \div £1.50$
$= 13.3$ ✓

$24 \div 1.80$
$= 13.3$ ✓

✗

Nada is yes because the amount individual costs the same but get more biscuits in one of them. [3]

Examiner commentary

The candidate has correct working but did not draw the correct conclusion. A clear "incorrect", or the equivalent, was needed to score the final mark. Units were not required for the method marks which is probably as well as few incidences of "biscuits per £" or the equivalent, were seen.

Exemplar 3

2 marks

Is Nada correct?
Show how you decide.

$20 = £1.50$
$24 = £1.80$

4 m✗ - 30p

Nada is correct because you get an extra 4 biscuits for 30p so it's worth your money. [3]

Examiner commentary

This is a typical exemplar of a solution that scored 1 mark. The candidate clearly did not understand the concept of "value", in terms of a unit cost, and so answered in a very simplistic way. This is the beginning of a possible alternative method, where 30p and 4 biscuits are used to find the unit cost which is then tested for each packet. As such, it scored 1 mark.

Question 7 (a) (i) and (ii)

7 **(a)** Frances has three cards: Ace (A), King (K) and Queen (Q).
She shuffles these cards and deals them one at a time.

(i) List all the different orders in which she can deal the cards.
One possible order is already shown in the table.
You may not need to use all the rows.

First card	Second card	Third card
A	K	Q

[2]

(ii) Find the probability that, in the three cards Frances deals, the King (K) is dealt **immediately** after the Queen (Q).

(ii) ..... [1]

Exemplar 1

2 marks

(a) (i)

First card	Second card	Third card
A	K	Q
A	Q	K
K	A	Q
K	Q	A
Q	K	A
Q	A	K

[2]

(a) (ii)

(ii) $\frac{1}{6}$ ..... [1]

Examiner commentary

The candidate began with a good systematic listing in part (a)(i) that earned both marks. However, there was no indication on the table that there had been an attempt to identify cases of QK in any of the combination so no marks were scored for part (a)(ii).

Exemplar 2

2 marks

(a) (i)

First card	Second card	Third card
A	K	Q
K	A	Q
Q	A	K
K	Q	A
Q	K	A
A	Q	K

[2]

(a) (ii)

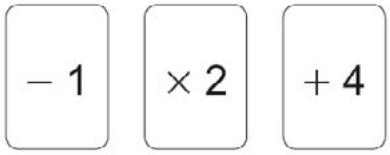
(ii) 2/18 [1]

Examiner commentary

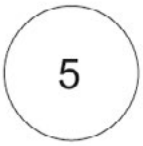
This candidate also began with a correct listing in part (a)(i) to score 2 marks. However, they exhibit a different error. The candidate clearly understood that QK occurred twice but then counted each entry as an outcome so no marks were scored for part (a)(ii).

Question 7 (b)

(b) A counter has 3 on one side and 5 on the other.
Lena flips the counter.
She then picks one of these three cards at random.



Lena puts the card next to the counter and works out the answer.

For example 

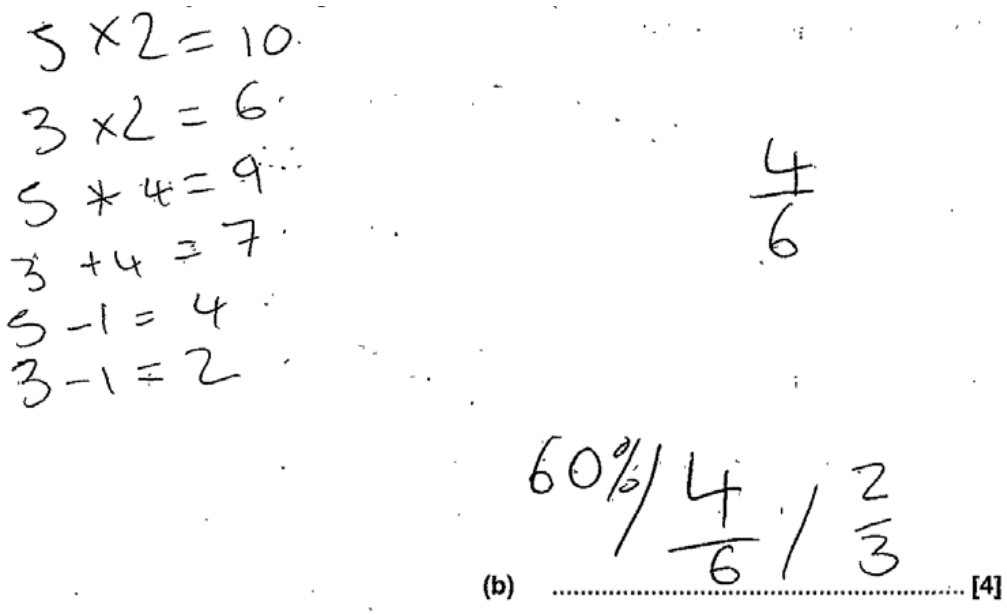
gives the answer 10.

Find the probability that Lena gets an answer **less than 8**.
You must show your working.

(b) ..... **[4]**

Exemplar 1

4 marks



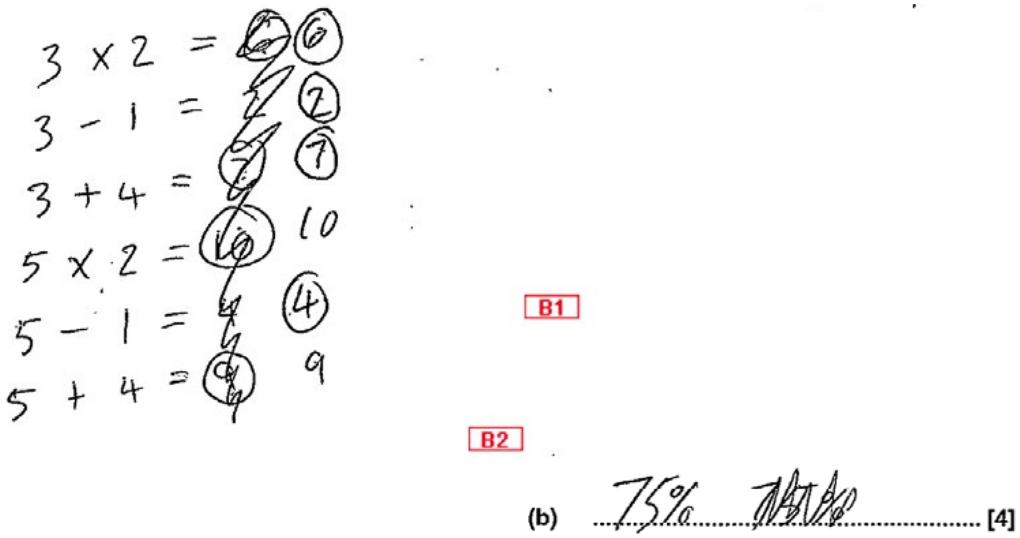
(b) ..... **[4]**

Examiner commentary

The candidate gave a completely correct listing, including repeating the example given in the text of the question. They identified the correct probability as a fraction, $\frac{4}{6}$, and so earned 4 marks. The mark scheme allowed that the final mark was given where the correct answer was first seen and that attempts to change form or cancel were ignored. Thus the incorrect change of form to 60% on the answer line (which would have been regarded as choice) was ignored.

Exemplar 2

3 marks

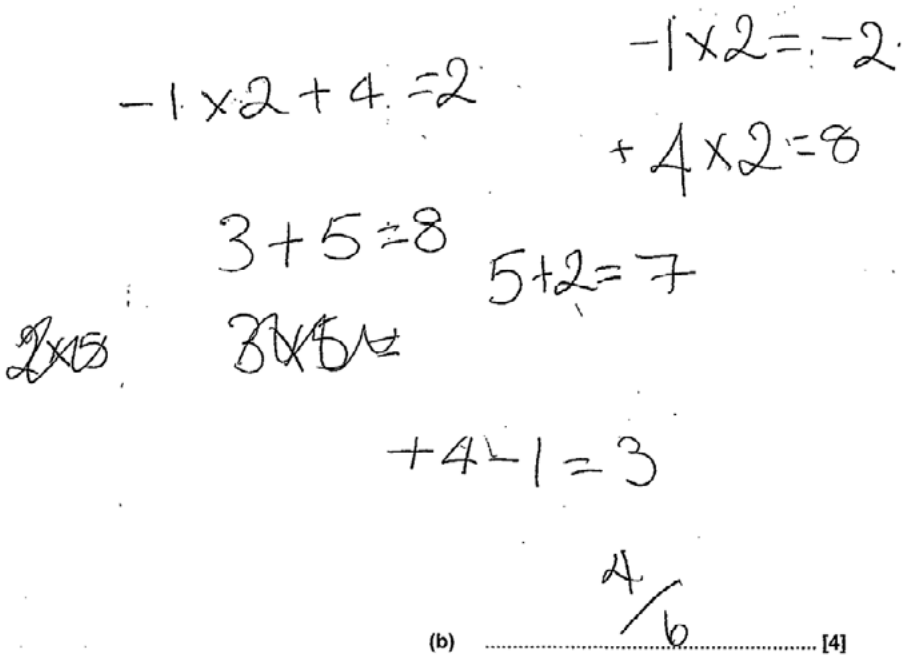


Examiner commentary

The candidate gave the correct outcomes but did not to give the correct probability. There was no working to show how 75% had been achieved. If $\frac{4}{6}$ had been seen first, 4 marks would have been credited.

Exemplar 3

0 marks



Examiner commentary

This candidate has the correct answer but from completely wrong working. In such cases, no marks can be credited. This candidate clearly misunderstood the question and worked out some combinations from the numbers on the cards only. As there were 7 combinations (including the one given in the question), the final SC could not be credited.

Question 8 (a)

8 Two groups of students go on a water sport holiday.
Each student chooses one activity.

Students in **Group A** choose from Diving, Swimming, Paddleboarding and Kayaking.
Their choices are to be shown in a pie chart.

(a) Complete this table for Group A.

Activity	Number of students	Angle of sector
Diving	5	60°
Swimming		120°
Paddleboarding		
Kayaking	9	108°

[4]

Exemplar 1

4 marks

Activity	Number of students	Angle of sector
Diving	5	60°
Swimming	10	120°
Paddleboarding	6	72°
Kayaking	9	108°
	30	360

=360°

7 44

[4]

Examiner commentary

A completely correct solution was given. There is even some supporting evidence to show how the values were calculated. This was not often evident in the work of candidates.

Exemplar 2

3 marks

Activity	Number of students	Angle of sector
Diving	5	60°
Swimming	10 ✓	120°
Paddleboarding	8	72° ✓
Kayaking	9	108°

5

[4]

Examiner commentary

The candidate has given two correct entries and gained 3 marks. Once again, there is no supporting evidence and so we cannot know why the incorrect "8" was given.

Exemplar 3

2 marks

Activity	Number of students	Angle of sector
Diving	5	60°
Swimming	13	120°
Paddleboarding	~~48~~	72
Kayaking	9	108°

B2

288 - 360 = 72 + all up - 360

[4]

Examiner commentary

The candidate only found one value correctly to score 2 marks. There is evidence that the correct method was used to find the missing 72° but there was no evidence to support the incorrect values.

Exemplar 4

2 marks

Students in **Group A** choose from Diving, Swimming, Paddleboarding and Kayaking.
Their choices are to be shown in a pie chart.

(a) Complete this table for Group A.

Activity	Number of students	Angle of sector
Diving	5	60°
Swimming		120°
Paddleboarding	6 ✓	140°
Kayaking	9	108°

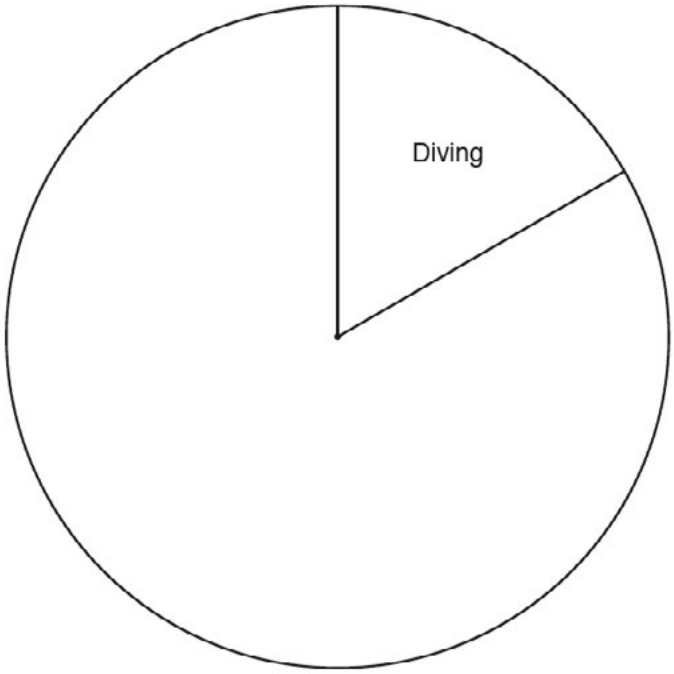
[4]

Examiner commentary

This candidate also gained 2 marks for one correct entry. There was no supporting evidence and so it is unclear why an angle of 140° was given.

Question 8 (b)

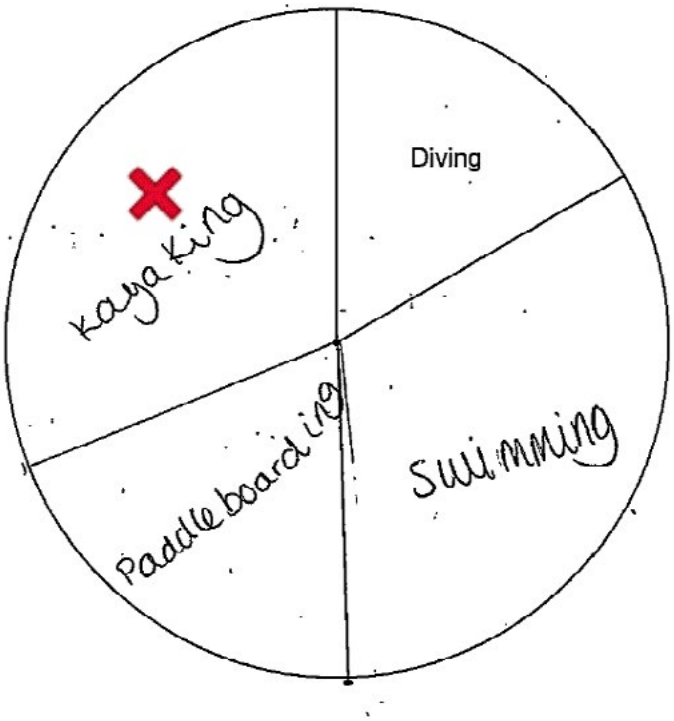
(b) Complete the pie chart for Group A.



[2]

Exemplar 1

1 mark



[2]

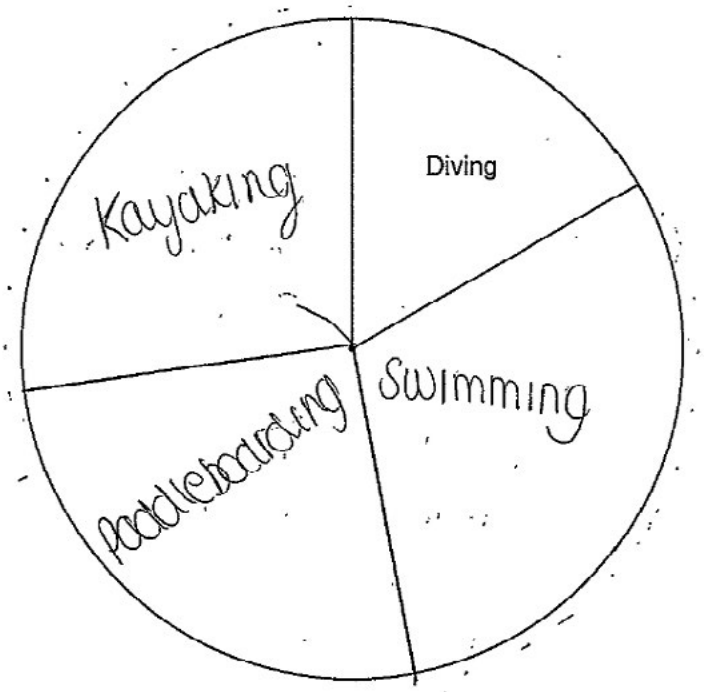
Examiner commentary

Following a completely correct table in part (a), the angle here has been incorrectly drawn for Kayaking and is outside the 2 degrees tolerance.

Exemplar 2

0 marks

(b) Complete the pie chart for Group A.



[2]

Examiner commentary

Following one error in part (a), these angles appear to have been drawn without the use of a protractor, although there are dots around the outside to indicate some form of counting. Even without the correct answer for Paddleboarding, candidates should have been able to draw a correct pie chart using the given angles.

Question 9

9 The length, a, of a pencil is 15.3 cm, correct to 1 decimal place.

Complete the error interval for the length of the pencil.

..... $\leqslant a <$ .....[2]

Exemplar 1

0 marks

15·3 $\leqslant a <$ 15·5 [2]

Examiner commentary

This question was poorly answered indicating that candidates had little understanding of the topic. This candidate clearly did not understand the concept of "half a unit error". There were no clear patterns to the many incorrect responses seen.

Question 10 (b)

10 4 people take 3 hours to paint a fence.

Assume that all people paint at the same rate.

(b) How long would it take 5 people to paint the same fence?
Give your answer in hours and minutes.

(b) ..... hours ..... minutes **[4]**

Exemplar 1

4 marks

1 = 12 hours

10 = 1.2 hours

5 = 2.4 hours

2.4 hours = 120 + 24 = 144

$\frac{2}{5}$ of 1 hours = 24

144 = 2 hrs 24 mins

(b) 2 hours 24 minutes **[4]**

Examiner commentary

This is a rare example of a completely correct method.

Exemplar 2

2 marks

180×5=900

15÷5=3

900÷60=15

12÷4=3

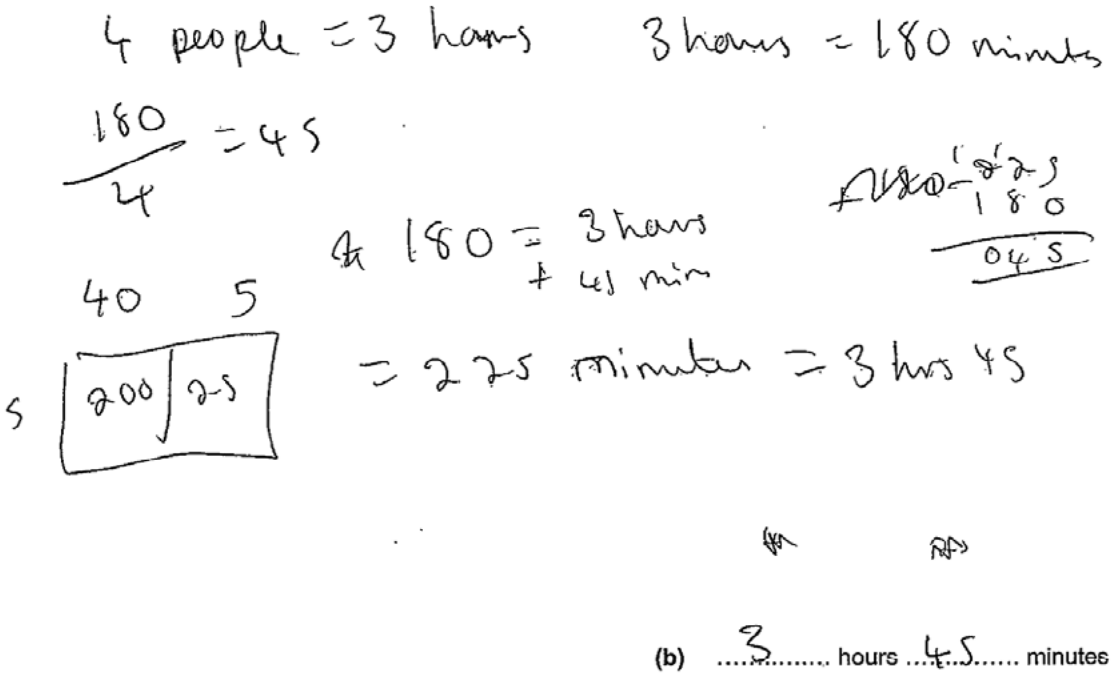
12÷5=2.4 B2

(b) 2 hours 40 minutes **[4]**

Examiner commentary

This candidate employed a correct method to reach 2.4 hours and score 2 marks. However, they did not show any working to change the time, demonstrating the inability shown by many candidates to change between hours and hours and minutes.

Exemplar 3 — 1 mark

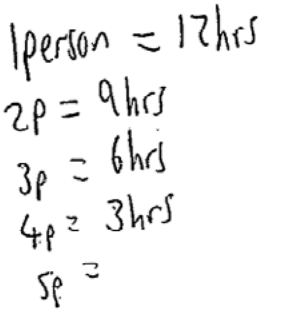


(b) 3 hours 45 minutes [4]

Examiner commentary

The candidate did not use a correct method to solve the problem and appeared to consider that five people would take longer than four people to complete the task. This was quite common amongst candidates. One method mark was gained for correctly changing their number of minutes to hours and minutes.

Exemplar 4 — 0 marks



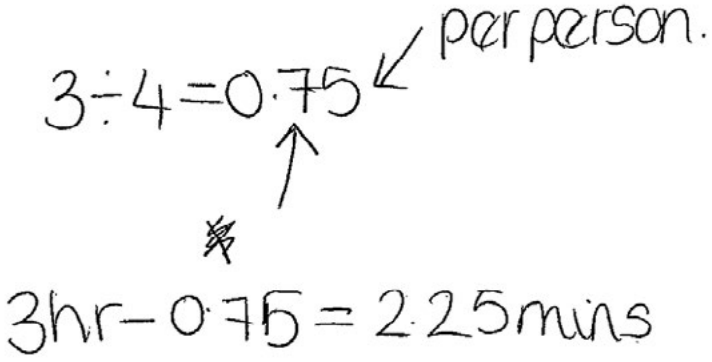
(b) ..... hours ..... minutes [4]

Examiner commentary

Despite a correct answer to part (a) (by no means a common occurrence) the candidate did not appreciate the nature of proportion. Consequently, some form of sequence has been used that includes 1 person and 12 hours and 4 people and 3 hours, rather than doubling the number of people and halving the time taken and so on.

Exemplar 5

0 marks



(b) ..... 2 ..... hours ..... 25 ..... minutes **[4]**

Examiner commentary

This candidate thinks that it takes 1 person 0.75 of an hour to do something. They do understand that the time should be decreased by the inclusion of another worker. However, the oft seen "2.25 hours is equivalent to 2 hours 25 minutes" appears and so no marks are credited for changing a time in hours to a time in hours and minutes.

Question 11 (a)

11 A recipe for flapjacks uses only oats, butter and syrup, in the ratio 3 : 2 : 1.

(a) Pirin makes 1.5 kg of flapjacks.
He uses 600 g of butter.

Has Pirin followed this recipe?
Show how you decide.

..... [4]

Exemplar 1

4 marks

11 A recipe for flapjacks uses only oats, butter and syrup, in the ratio 3 : 2 : 1.

(a) Pirin makes 1.5 kg of flapjacks.
He uses 600 g of butter.

Has Pirin followed this recipe?
Show how you decide.

1kg = 1000g

1.5 x 1000 = 1500

3+2+1 = 6

1:6

1500 ÷ 6 = 250

1:250

250 x 2 = 500

no he has not, as 1:250, 2x250 is 500g and Pirin used 600g of butter, which shows that he has used 100g of butter extra.

..... [4]

Examiner commentary

The candidate presents a correct solution. The quantity is correctly converted from kg to g and this is then used in the solution (1500 ÷ 6) to find the value of one "part" in the ratio. A correct comparison is made between the 600 g used and the 500 g that should have been used and the conclusion drawn is also correct.

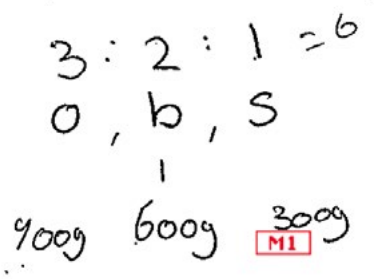
Exemplar 2

2 marks

11 A recipe for flapjacks uses only oats, butter and syrup, in the ratio 3 : 2 : 1.

(a) Pirin makes 1.5 kg of flapjacks.
He uses 600 g of butter.

Has Pirin followed this recipe?
Show how you decide.



I do not think he has as 600g butter (2) means syrup (1) 300g and (3) 900g oats = 1800 = he has more than 1.5kg of flapjacks. M1 ✗

[4]

Examiner commentary

The candidate has not changed 1800 to kg in order to make a comparison with 1.5 kg so B1 is not earned. M1 has been implied by 300 g of syrup. The final M1 is earned for 1800. For the response to be valid, the candidate would need to compare like with like, in this case, 1.8 kg with 1.5 kg.

Candidates must realise that "Show..." means all necessary evidence must be shown.

Exemplar 3

0 marks

11 A recipe for flapjacks uses only oats, butter and syrup, in the ratio 3 : 2 : 1.

(a) Pirin makes 1.5 kg of flapjacks.
He uses 600 g of butter.

Has Pirin followed this recipe?
Show how you decide.

1500 − 600 = 900

900 ÷ 4 = 225
225 × 3 = 675

675 : 600 : 225

Pirin followed the recipe. If you take the 600g butter from the 1.5kg flapjacks, you get the 900g of oats and syrup. If you put that into a ratio of 3 : 1, you get 675 : 225. This is proportional to the 600g of butter, making the ratio 3 : 2 : 1

[4]

Examiner commentary

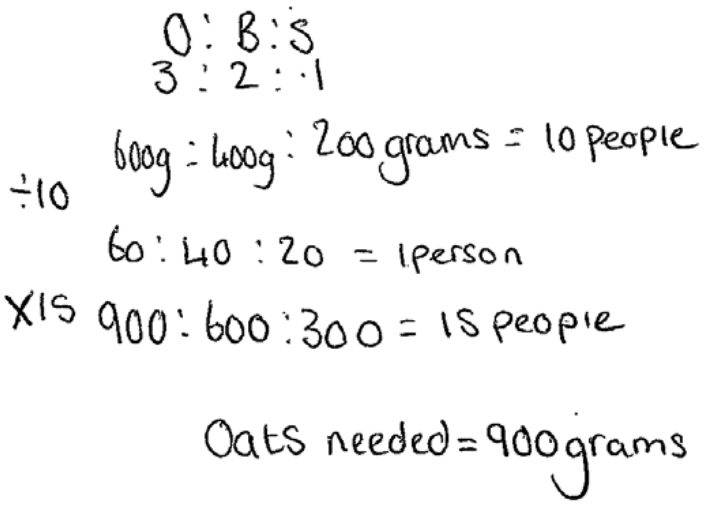
No marks are scored. 1500 does appear but it is not associated with grams. The method is incorrect and so is the conclusion.

Question 11 (b)

(b) Using this recipe, 200 g of syrup are needed to make 10 flapjacks.
Find the mass of **oats** needed to make **15** of these flapjacks.

(b) ..... g **[3]**

Exemplar 1 — 3 marks



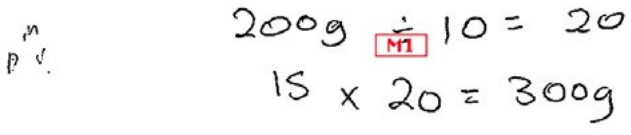
(b) 900 g **[3]**

Examiner commentary

Not all evidence is shown but this is not a "Show that..." question, where all evidence would need to appear to support the finding of a given result.

However, the multiplier is clearly shown in the form "÷ 10, × 15" and the masses for each ingredient appears in the first list, under O : B : S. With a correct answer, full marks are scored.

Exemplar 2 — 1 mark



(b) 300g g **[3]**

Examiner commentary

The candidate gains M1 for using a multiplier, in stages (÷ 10, × 15 is equivalent to × 1.5).

Question 12 (b)

(b) Find the values of h and k.

$$\begin{pmatrix} h \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ k \end{pmatrix} - \begin{pmatrix} 3 \\ 3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

(b) $h =$ .....

$k =$ ..... **[2]**

Exemplar 1

1 mark

(b) Find the values of h and k.

$$\begin{pmatrix} h \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ k \end{pmatrix} - \begin{pmatrix} 3 \\ 3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

7 9 3 = 0

0

3 x 3 = 9

9 - 9 = 0

(b) $h =$ ..... 1 .....

$k =$ ..... 2 ..... **[2]**

2 x 6 = 12

5 x 4 = 20

20 + 12 = 32

5 x 1 = 5

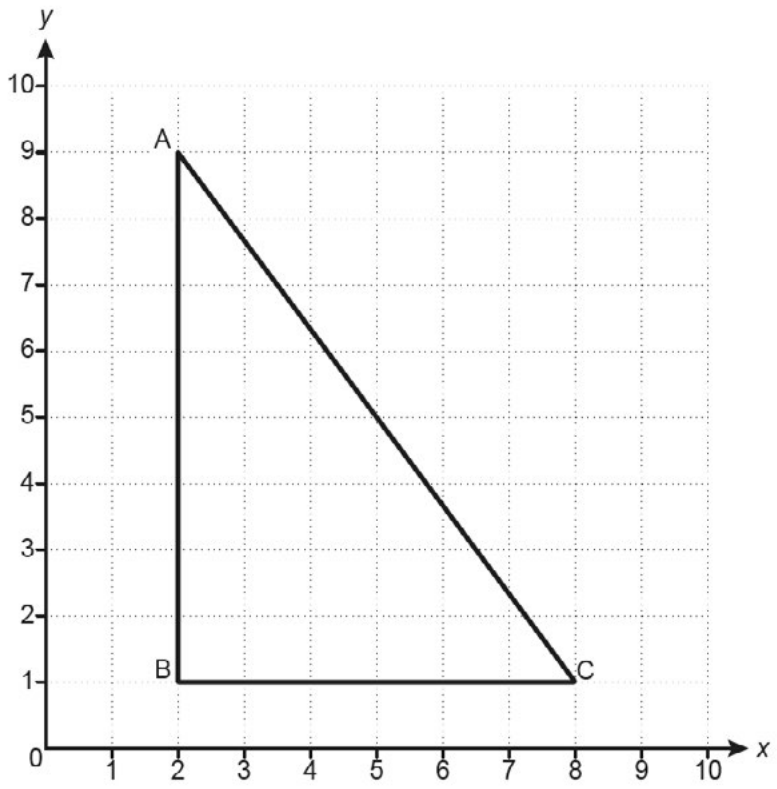
2 x 2 = 4

Examiner commentary

This exemplar has been included to demonstrate that candidates commonly used numerical strategies, rather than algebra, to solve this question. Few candidates wrote two equations from the vectors. There is some working by the question but nothing that seems to lead directly to the answer. As such, the one correct value of $h = 1$ can stand.

Question 12 (c) (i)

(c) Triangle ABC is drawn on a coordinate grid.



$\overrightarrow{AB} = \begin{pmatrix} 0 \\ -8 \end{pmatrix}$

(i) Use the diagram to complete this vector sum.

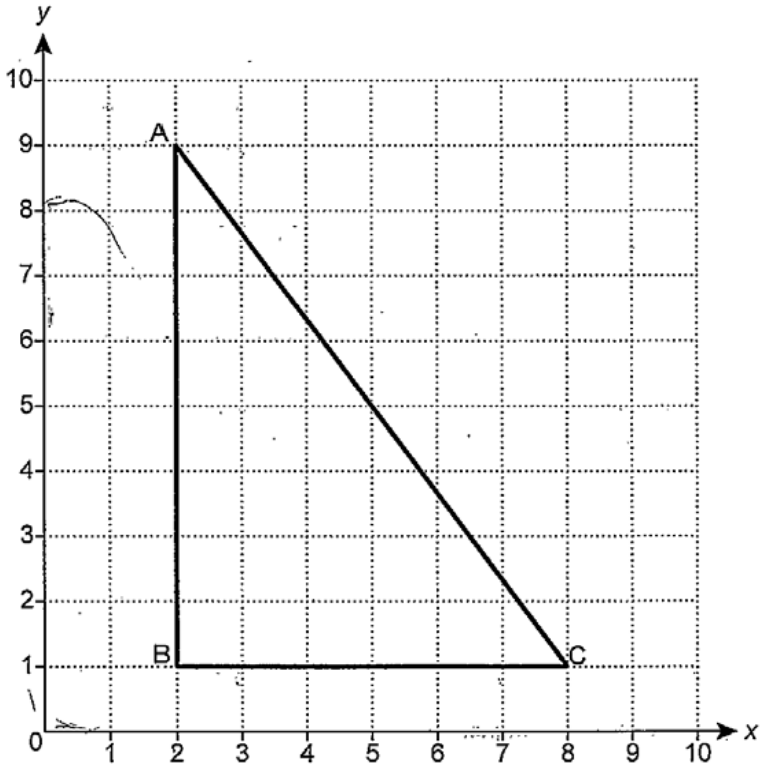
$$\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \begin{pmatrix} 0 \\ -8 \end{pmatrix} + \begin{pmatrix} \quad \\ \quad \end{pmatrix} + \begin{pmatrix} \quad \\ \quad \end{pmatrix} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$$

[2]

Exemplar 1

0 marks

(c) Triangle ABC is drawn on a coordinate grid.



$\overrightarrow{AB} = \begin{pmatrix} 0 \\ -8 \end{pmatrix}$ BC = $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$ CA $\begin{pmatrix} 6 \\ 8 \end{pmatrix}$

(i) Use the diagram to complete this vector sum.

$\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \begin{pmatrix} 0 \\ -8 \end{pmatrix} + \begin{pmatrix} 0 \\ -6 \end{pmatrix} + \begin{pmatrix} 6 \\ 8 \end{pmatrix} = \begin{pmatrix} 6 \\ -6 \end{pmatrix}$ **[2]**

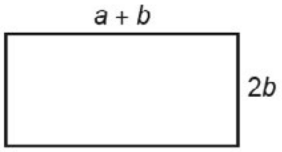
Examiner commentary

This single exemplar is included to demonstrate how poorly candidates understood vectors. This question was often not attempted but, where it was, the component forms of the vectors were often incorrect. This candidate has not consistently understood that the top component of the vector is the horizontal move and also has misused the + and – to indicate the direction of movement. No marks are scored, even though the vector sum is correct for their values. This is because the diagram clearly indicates that the sum of the three vectors is $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$.

Question 13 (a) (i)

13 In this question, assume all dimensions are in centimetres.

Jess and Pete have many rectangular tiles.
Each tile has length $a + b$ and width $2b$.



Not to scale

(a) Jess joins three tiles together to make a larger rectangle, as shown.

Not to scale

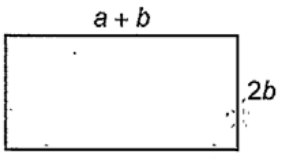
(i) Write an expression for the perimeter of her rectangle.
Give your answer in its simplest form.

(a)(i) ..... **[2]**

Exemplar 1 — 0 marks

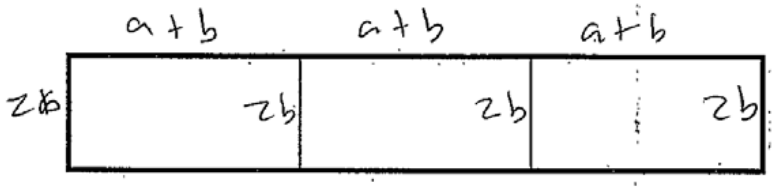
13 In this question, assume all dimensions are in centimetres.

Jess and Pete have many rectangular tiles.
Each tile has length $a + b$ and width $2b$.



Not to scale

(a) Jess joins three tiles together to make a larger rectangle, as shown.



Not to scale

(i) Write an expression for the perimeter of her rectangle.
Give your answer in its simplest form.

3a + 3b x 8b

(a)(i) 3a + 3b x 8b ..... **[2]**

Examiner commentary

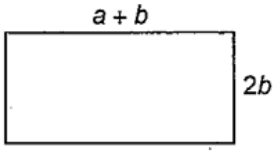
This is reasonably typical of many responses. Correct lengths are marked on the diagram but the candidate does not know how to proceed. The working suggests that the candidate thinks the perimeter is the sum of the horizontal lengths multiplied by the sum of the vertical lengths.

Exemplar 2

0 marks

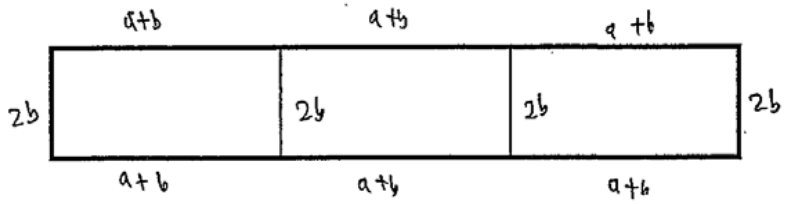
13 In this question, assume all dimensions are in centimetres.

Jess and Pete have many rectangular tiles.
Each tile has length $a + b$ and width $2b$.



Not to scale

(a) Jess joins three tiles together to make a larger rectangle, as shown.



Not to scale

(i) Write an expression for the perimeter of her rectangle.
Give your answer in its simplest form.

(a)(i) ~~2b×4~~ ~~2b~~ $2b^4 + ab^6$ ..... **[2]**

Examiner commentary

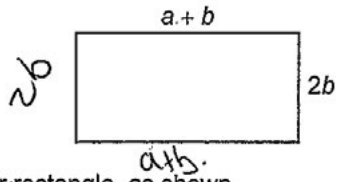
This is reasonably typical of many responses. Correct lengths are marked on the diagram but the candidate does not know how to proceed. The answer reveals complete misunderstanding of algebraic processes and notation.

Exemplar 3

0 marks

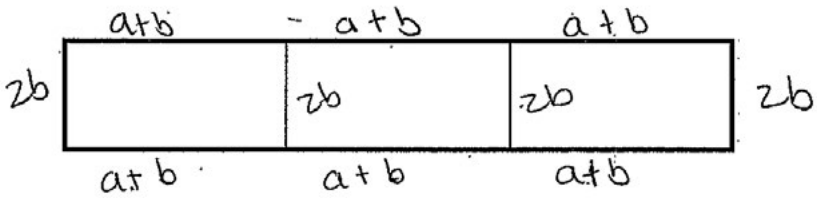
13 In this question, assume all dimensions are in centimetres.

Jess and Pete have many rectangular tiles.
Each tile has length $a + b$ and width $2b$.



Not to scale

(a) Jess joins three tiles together to make a larger rectangle, as shown.



Not to scale

(i) Write an expression for the perimeter of her rectangle.
Give your answer in its simplest form.

$3a+3b = 6ab = 12ab$
$3a+3b = 6ab$
$2b+2b+2b+2b = 8b$

$12ab + 8b = 20ab^2$

(a)(i) $12ab + 8b$ ..... **[2]**

Examiner commentary

The candidate has little appreciation of algebraic processes. $3a + 3b = 6ab$ (or $9ab$ or...) was often seen in scripts. These errors in combining terms were then repeated in the solution. The underlying strategy appeared flawed as it seemed to require the summing of all the lengths in the diagram.

Question 13 (a) (ii)

(ii) An expression for the **area** of her rectangle is $6ab + 6b^2$.

Factorise this expression fully.

(ii) ..... **[2]**

Exemplar 1 — 1 mark

(ii) An expression for the **area** of her rectangle is $6ab + 6b^2$.

Factorise this expression fully.

$b(6a + 6b)$

(ii) $b(6a + 6b)$ **[2]**

Examiner commentary

The candidate has extracted one factor successfully and so scores 1 mark. Candidates need to appreciate that factorising requires the extraction of all common factors.

As a "standard method" this question was better answered than other parts that involved a problem solving element. However, a significant number of candidates who could factorise often did so partially to achieve 1 mark rather than 2.

Exemplar 2 — 0 marks

(ii) An expression for the **area** of her rectangle is $6ab + 6b^2$.

Factorise this expression fully.

$6ab + 12b$

(ii) $6ab + 12b$ **[2]**

Examiner commentary

The candidate does not understand the meaning of "factorise". This is just one of a series of incorrect attempts to answer the question.

Question 13 (b)

(b) Pete joins some tiles together to make a different rectangle.
The area of his rectangle is $8ab + 8b^2$.

Draw a possible arrangement of tiles for Pete's rectangle.
Write down expressions for the length and for the width of the rectangle.

length = ...

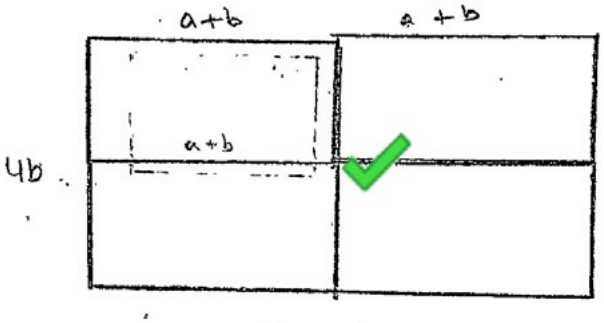
width = ... **[5]**

Exemplar 1

5 marks

(b) Pete joins some tiles together to make a different rectangle.
The area of his rectangle is $8ab + 8b^2$.

Draw a possible arrangement of tiles for Pete's rectangle.
Write down expressions for the length and for the width of the rectangle.



length = 2a + 2b

width = 4b **[5]**

Examiner commentary

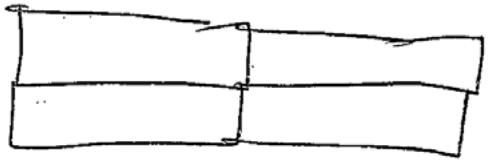
The candidate demonstrates no algebraic strategy to answer the question and the solution appears after limited working. However the expressions for length and width are correct and the arrangement of tiles matches these expressions. All 5 marks are credited.

Exemplar 2

3 marks

(b) Pete joins some tiles together to make a different rectangle.
The area of his rectangle is $8ab + 8b^2$.

Draw a possible arrangement of tiles for Pete's rectangle.
Write down expressions for the length and for the width of the rectangle.



length = 2ab

width = 2b² [5]

Examiner commentary

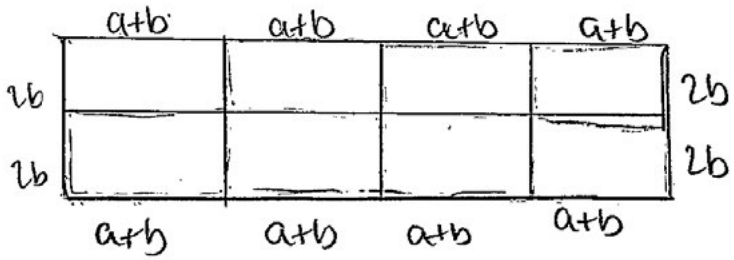
The candidate has no strategy to answer the question that involves algebra, such as identifying factors that are multiples of $2b$, but has created a possible arrangement of tiles to earn B3.

Exemplar 3

2 marks

(b) Pete joins some tiles together to make a different rectangle.
The area of his rectangle is $8ab + 8b^2$.

Draw a possible arrangement of tiles for Pete's rectangle.
Write down expressions for the length and for the width of the rectangle.



length = 4ab

width = 4b B2 [5]

Examiner commentary

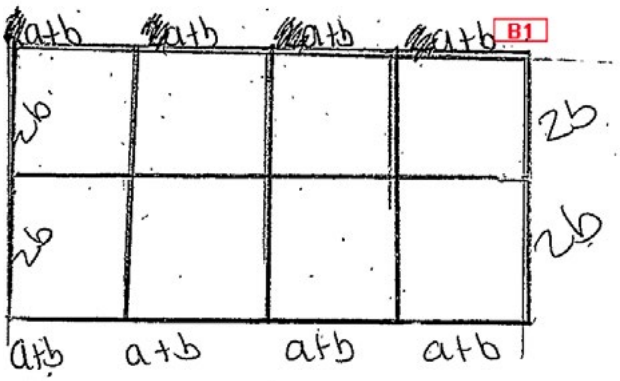
The candidate has no algebraic strategy to answer the question but has labelled their drawing correctly and created a correct expression for width ($4b$) to earn B2.

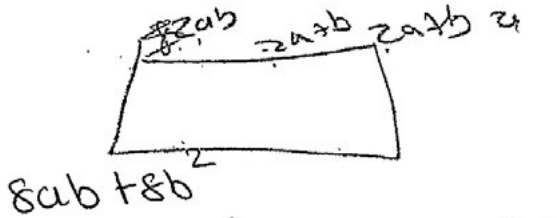
Exemplar 4

1 mark

(b) Pete joins some tiles together to make a different rectangle.
The area of his rectangle is $8ab + 8b^2$.

Draw a possible arrangement of tiles for Pete's rectangle.
Write down expressions for the length and for the width of the rectangle.





length = 8ab

width = 2b² [5]

Examiner commentary

The candidate has no strategy to answer the question but has labelled the perimeter of the tiles to earn B1.

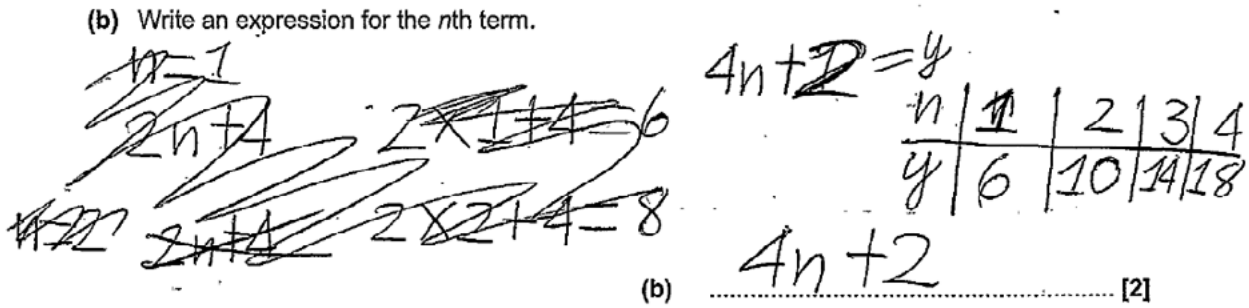
Question 14 (b)

(b) Write an expression for the *n*th term.

(b) ..... **[2]**

Exemplar 1 — 2 marks

(b) Write an expression for the *n*th term.



(b) 4n + 2 **[2]**

Examiner commentary

The candidate has repeated the sequence in the working space and has clearly experimented with different rules before settling on the correct *n*th term. The preliminary work does not contribute to the answer but obviously helped the candidate succeed.

Exemplar 2 — 1 mark

(b) Write an expression for the *n*th term.

4n − 2

B1

(b) 4n − 2 **[2]**

Examiner commentary

The score of 1 mark was not commonly credited. However, this candidate has been able to achieve 1 mark for 4*n* but the inclusion of – 2 prevented the second mark being scored.

Exemplar 3 — 0 marks

(b) Write an expression for the *n*th term.

(b) 4 + nth **[2]**

Examiner commentary

This is an unusual take on a reasonably common error. The candidate has realised that the terms increase by 4 but has been unable to translate this into an algebraic form. Other variants are + 4 and *n* + 4. In each of these cases 0 marks are scored.

Question 14 (d)

(d) Find the term in the sequence that is nearest to 511.

(d) ..... **[3]**

Exemplar 1

3 marks

$4 \times 20 = 80$

$4 \times 100 = 400 \ (+2) = 402$

$4 \times 110 = 440 \ (+2) = 442$

$4 \times 120 = 480 \ (+2) = 482$

$4 \times 127 = 508 \ (+2) = 510$

(d) 510 ..... **[3]**

Examiner commentary

The evidence is completely correct using the *n*th term and trial and improvement.

Exemplar 2

0 marks

$18 \times 3 = 54$

$54 \times 3 = 162$

$162 \times 3 = 486 + 4 = 490 + 4 = 494 + 4 = 498 + 4 = 502 + 4 = 506 + 4 = 510$ ✗

each number x by 3 is in the sequence.

(d) 510. ..... **[3]**

Examiner commentary

The answer is correct but it clearly comes from an incorrect method. The *n*th term given in part (b) was incorrectly given as *n*th term = 2 + 4. Multiplication by 3 and adding 4 has nothing to do with appropriate method. General marking guidance does not allow marks to be credited when achieved by the wrong method.

Question 15

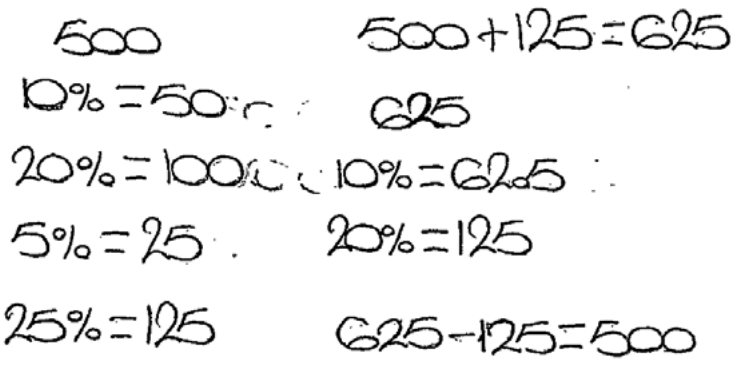
15 In July the price of a holiday is £500.
In August the price increases by 25%.
In September the price drops to £500 again.

Work out the percentage decrease from the August price to the September price.

..... % **[4]**

Exemplar 1

4 marks



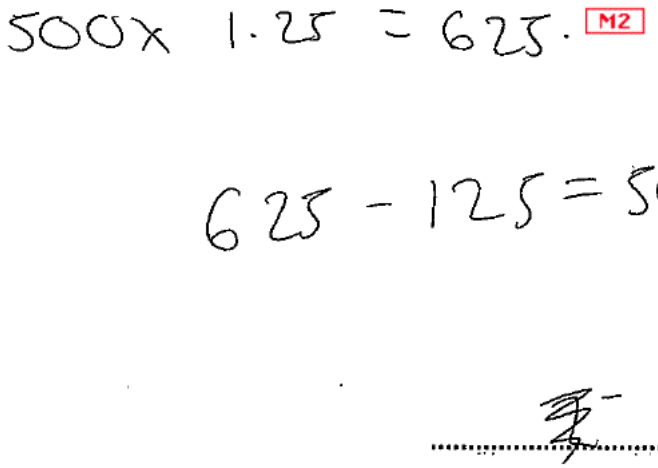
20 % **[4]**

Examiner commentary

The candidate uses non-calculator methods but there are no errors and the answer is correct to earn full marks.

Exemplar 2

2 marks



..... % **[4]**

Examiner commentary

This response is typical of many. A standard procedure has been applied to reach [£]625 and gain M2. However, the candidate is then unsure how to carry on.

Exemplar 3

2 marks

15 In July the price of a holiday is £500.
In August the price increases by 25%.
In September the price drops to £500 again.

Work out the percentage decrease from the August price to the September price.

=> $\frac{25}{100} \times £500 = £125$

500 + 125 = 625 M2

.....25..... % [4]

Examiner commentary

The candidate applies their standard procedure to raise an amount by 25%. They then do not know how to continue.

Exemplar 4

1 mark

25% of 500 = 125 M1
10% of 500 = 50
20% of 500 = 100
5% of 500 = 25

August = 375
September =

.....4..... % [4]

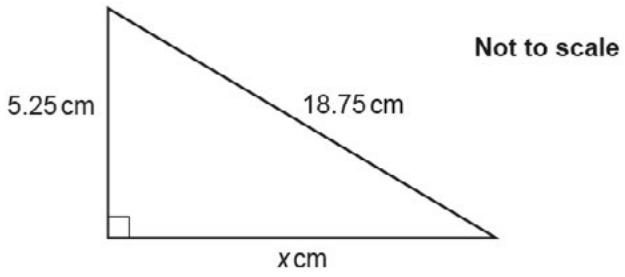
Examiner commentary

It is surprising to see the number of candidates employing non-calculator methods on a calculator paper. These inefficient methods represent a time penalty to the candidate when a calculator could be used.

This candidate has correctly found 25% of £500 (although they could just have divided by 4). It is not clear how the answer 4 was reached.

Question 16

16 Here is a right-angled triangle.

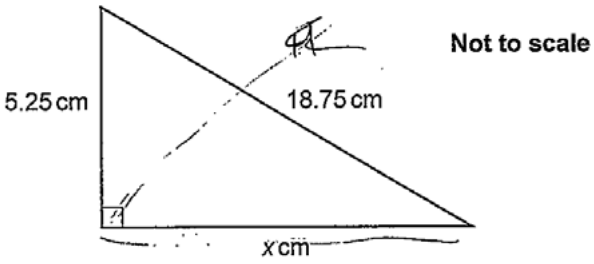


Work out the value of x.

$x =$ ..... **[3]**

Exemplar 1 — 0 marks

16 Here is a right-angled triangle.



Work out the value of x.

18.75 − 5.25
x = 13.5 cm

$x =$ 13.5 ..... **[3]**

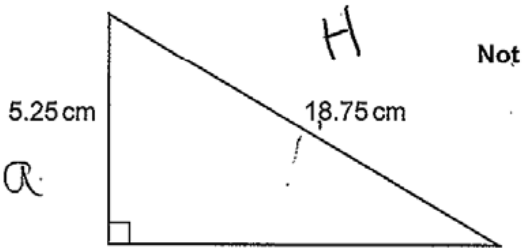
Examiner commentary

The exemplar shows a fairly common error. The candidate remembered something of Pythagoras but not the rather crucial need to square components and take roots. No marks scored.

Exemplar 2

0 marks

16 Here is a right-angled triangle.



Trig

Work out the value of x.

$x =$ ..... 21.8 ..... **[3]**

Examiner commentary

The candidate attempted to solve the problem using trigonometry. This was an inefficient method but it could have yielded results. Using trigonometry, the candidate would have had to reach an angle to score a method mark, to be comparable with the Pythagoras method. This candidate attempts trigonometry twice, both inconclusive and both deleted. The examiner then has to choose between two partial methods and, as neither reached an angle, no mark is credited.

Question 17

17 Ping chooses four numbers.

The mode of these four numbers is 8, the range is 7 and the mean is 11.

Find Ping's four numbers.

..... , ... , ... , ... **[3]**

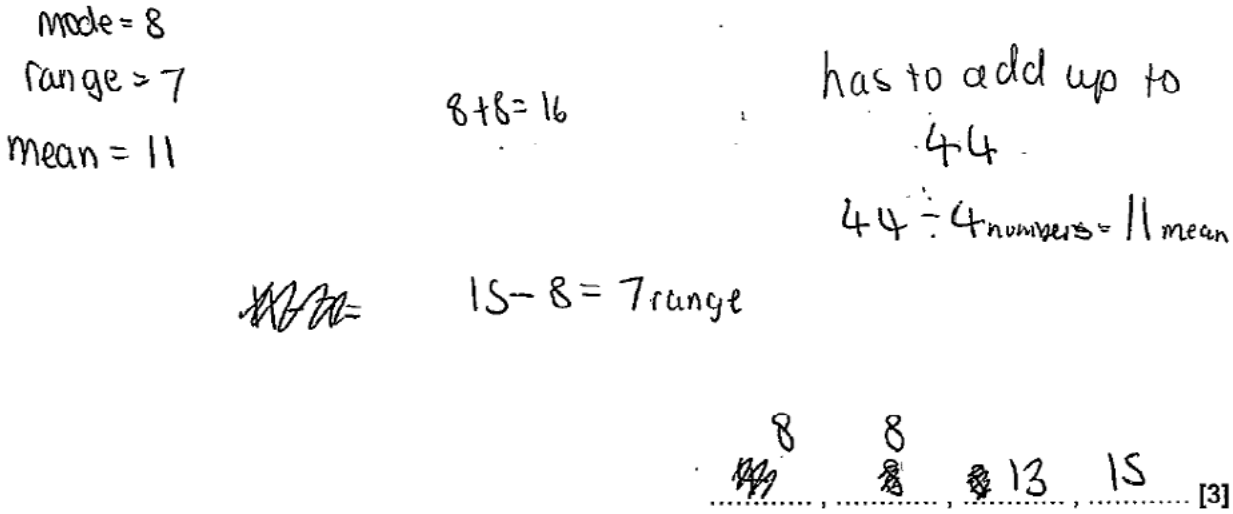
Exemplar 1

3 marks

17 Ping chooses four numbers.

The mode of these four numbers is 8, the range is 7 and the mean is 11.

Find Ping's four numbers.

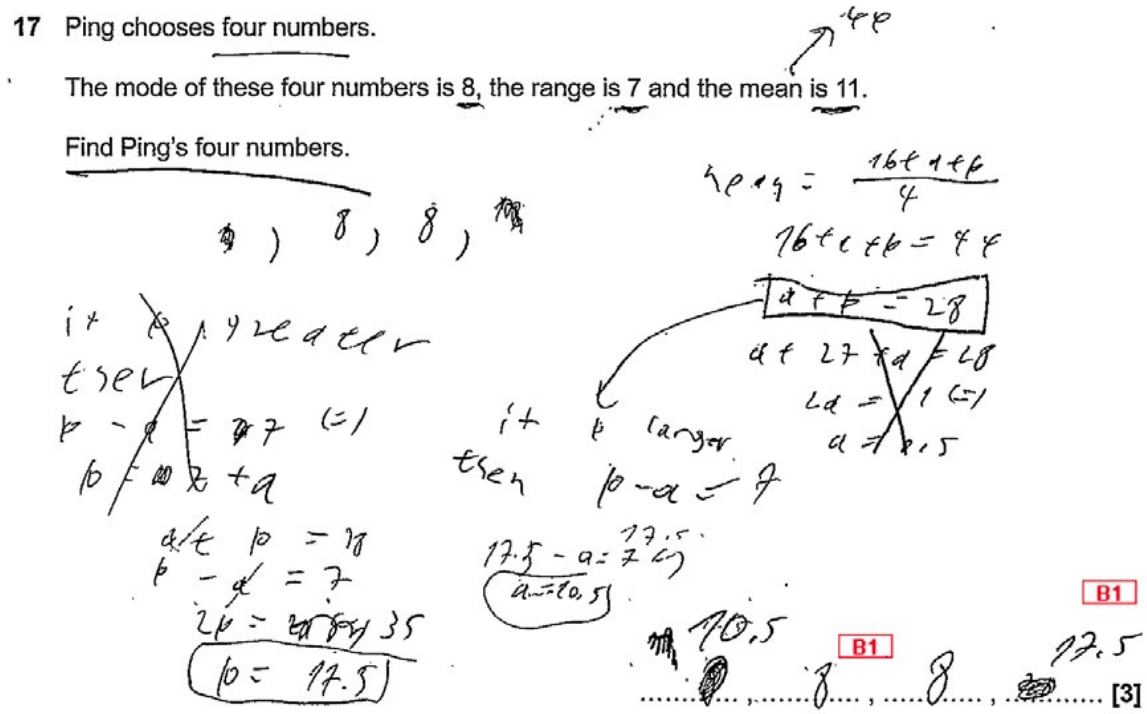


Examiner commentary

The candidate has employed an efficient strategy that recognises that the total must be 44. After realising that 8 must appear more than once, a fully correct solution is presented.

Exemplar 2

2 marks

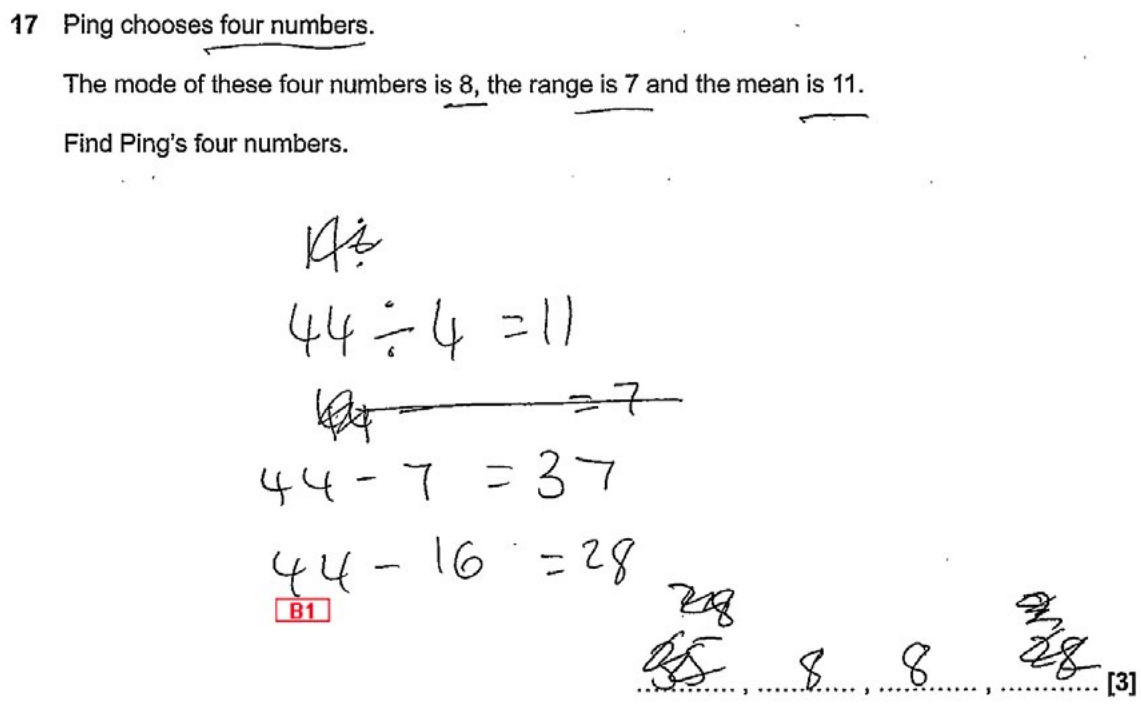


Examiner commentary

The candidate realises that the total must be 44 and that the number 8 must appear more then once. The solution gains B1 for each of these. They also realise that the range must be 7 and so place 10.5 and 17.5 on each end of the answer line. They do not realise that 8 is lower than 10 and so their range is 9.5. Only 2 marks earned.

Exemplar 3

1 mark



Examiner commentary

The candidate realises that the total must be 44 and that the number 8 must appear more than once. However, there are only two definite entries on the answer line and a minimum of three need to be shown for them to be credited B2. B1 is credited for 44 appearing in the solution.

Question 18

18 A box contains only red, blue and green pens.
The ratio of red pens to blue pens is 5 : 9.
The ratio of blue pens to green pens is 1 : 4.

Calculate the percentage of pens that are blue.

..... % **[4]**

Exemplar 1

4 marks

18 A box contains only red, blue and green pens.
The ratio of red pens to blue pens is 5 : 9.
The ratio of blue pens to green pens is 1 : 4.

Calculate the percentage of pens that are blue.

r, b, g

r : b = 5 : 9

b : g = 1 : 4

14 × 5 = 70 ✓

14 × 9 = 126 ✓ = 70 : 126

b : g = 126 × 4 = 504 (g) ✓

total = 504 + 126 + 70

= 700

b = $\frac{126}{700}$ ✓

= 18%

18 ✓

..... % **[4]**

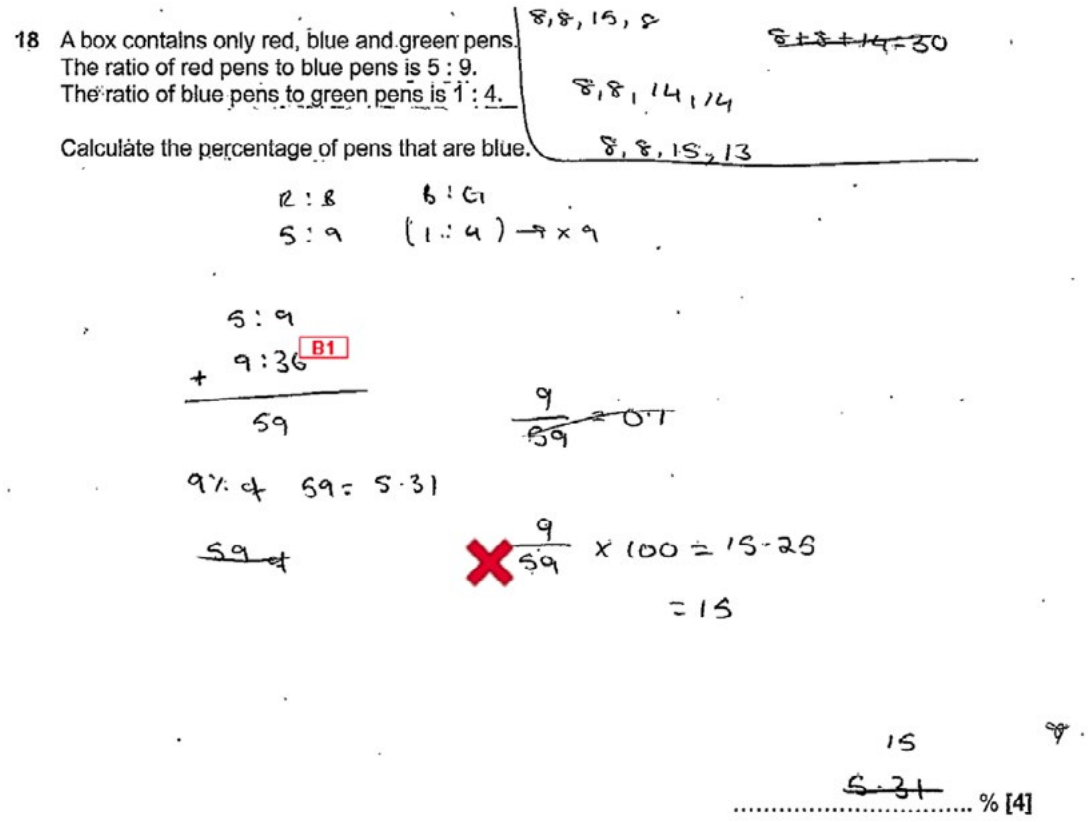
Examiner commentary

This is an unusual solution which effectively achieves a common term of 126. The ratios are rewritten as 70 : 126 and 126 : 504 (though not shown). The sum of the red, blue and green terms is 70 + 126 + 504 = 700. From there the solution is worked in a standard way to reach the correct solution of 18%.

It was more usual to see 9 as the common term in the ratios.

Exemplar 2

1 mark

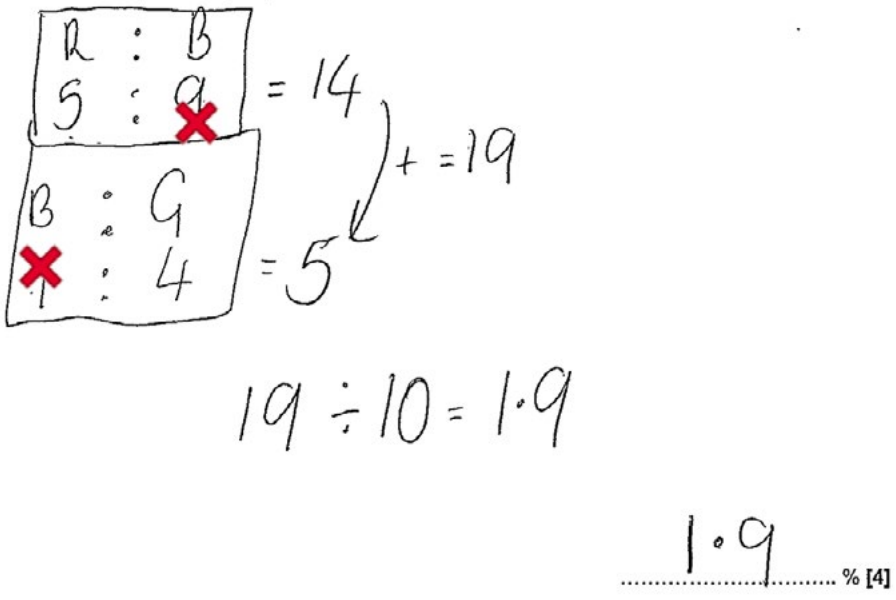


Examiner commentary

The candidate realises that a common term is needed and this is achieved (9) and the second ratio rewritten as 9 : 36 to score B1. They added 5 + 9 + 9 + 36 and so M1 is not earned as the common term is repeated.

Exemplar 3

0 marks



Examiner commentary

This is a typical response as seen from many candidates. There was no meaningful attempt to relate the two ratios. 19 is simply the sum of the components in the two ratios. Candidates needed to multiply the elements of the second ratio by 9 in order to obtain a common term and begin the solution.

Question 19

19 Asha worked out $\dfrac{326.8 \times (6.94 - 3.4)}{59.4}$.

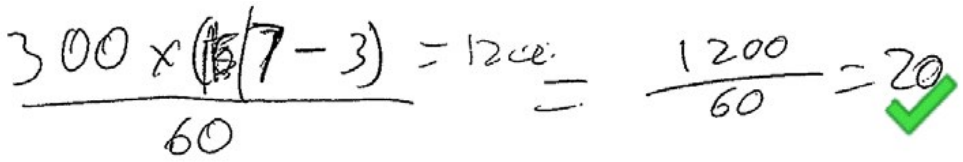
She got an answer of 19.5, correct to 3 significant figures.

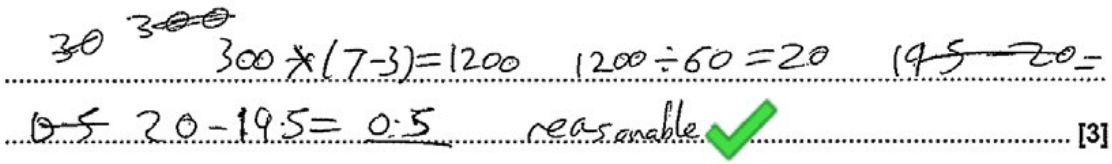
Write each number correct to 1 significant figure to decide if Asha's answer is reasonable.

.....

..... [3]

Exemplar 1 — 3 marks



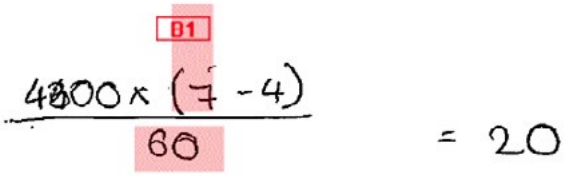


Examiner commentary

The candidate read the instructions clearly and rounded each value correct to one significant figure. This left a simple calculation that had the answer 20.

The conclusion relates to the demand. The repeated working on the answer line is unnecessary as the evidence is all contained in the working above.

Exemplar 2 — 1 mark



.....

..... [3]

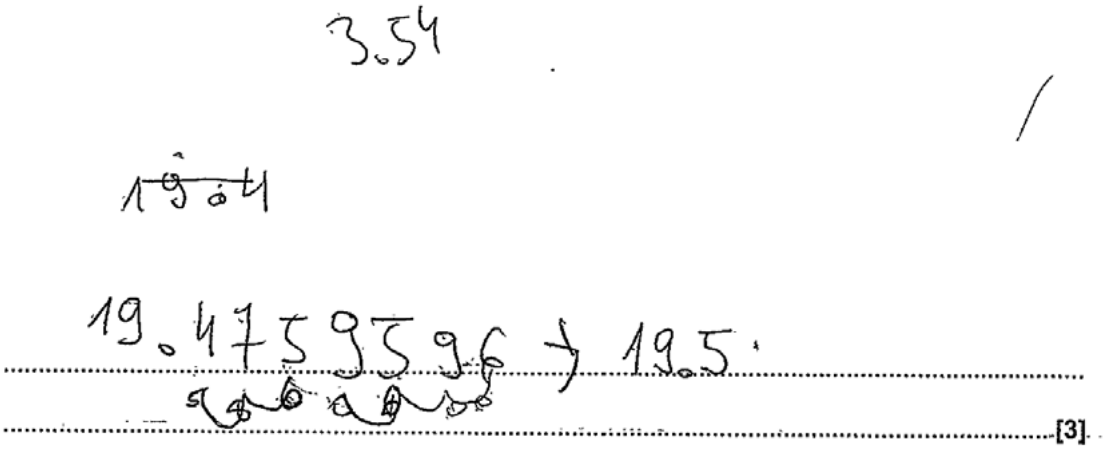
Examiner commentary

The candidate achieved 1 mark for correctly rounding two of the values to 1 significant figure. A result of 20 was achieved and so, if a judgement on the suitability of the assessment had been made, another B1 could have been credited.

It is always recommended that candidates check back to see if the question has been correctly answered.

Exemplar 3

0 marks



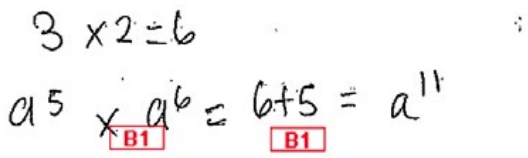
Examiner commentary

The candidate did not read the instructions and focussed only on "3 significant figures". There were no marks available once the calculation had been worked exactly on the calculator as this question was not assessing calculator skills. The response was typical of many attempting this question.

Question 20 (a)

20 (a) Show that $a^5 \times (a^3)^2$ can be expressed as a^{11}. **[2]**

Exemplar 1 — 2 marks



Examiner commentary

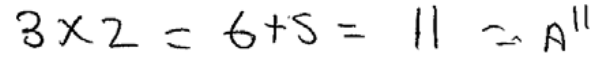
The solution gained full marks. a^6 was seen in the solution and the process of adding indices was also elaborated.

Exemplar 2 — 1 mark

Examiner commentary

The candidate has written $(a^3)^2 = a^6$ and earns B1. For the second mark an intent to add the indices needs to be seen e.g. $a^6 + a^5 = a^{11}$.

Exemplar 3 — 0 marks



Examiner commentary

The solution presented contains all the elements of a correct answer except indices. As this is an indices question, it is necessary to show how the laws of indices relate to this explanation.

If the candidate had included notes, "When multiplying numbers with indices, add the indices" and so on, this would have gained the marks. However, a better response would have been to express the answer in index form, $(a^3)^2 = a^{2\times3}$ and $a^5 \times a^6 = a^{5+6} = a^{11}$.

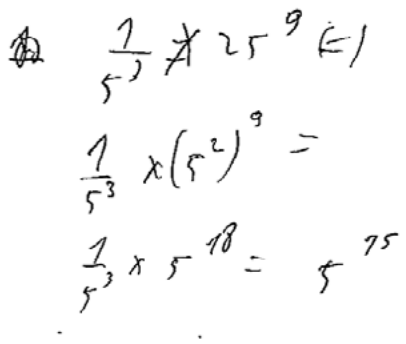
Question 20 (b)

(b) Write $\frac{1}{125} \times 25^9$ as a power of 5.

(b) ..... **[3]**

Exemplar 1

3 marks



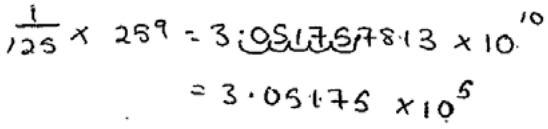
(b) ..... **[3]**

Examiner commentary

This is a very rare case of a completely correct response.

Exemplar 2

0 marks



(b) ..... **[3]**

Examiner commentary

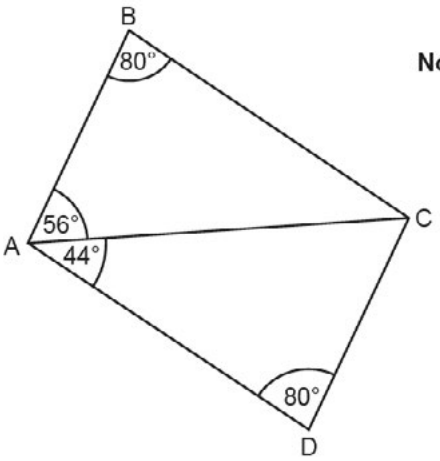
Many candidates attempted to solve this problem using their calculators. The reference to "as a power of 5" was clearly not understood but led to the index "5" being used in the answer.

Part (a) was supposed to suggest index rules but 25^9 was almost never seen as $(5^2)^9$ and certainly not as 5^{18}. Likewise, $\frac{1}{125}$ almost never appeared as $\frac{1}{5^3}$ and certainly not as 5^{-3}. The application of index rules beyond the simplest cases was rarely understood by the candidates.

The most common mark for this question was "Not Attempted".

Question 21

21 The diagram below shows two triangles.



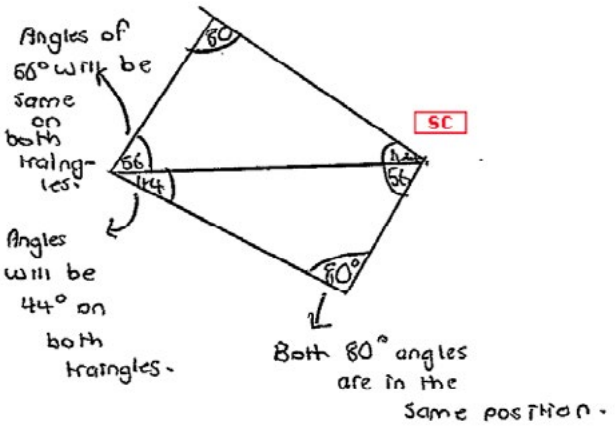
Not to scale

Prove that triangle ABC is congruent to triangle ACD.

..... [4]

Exemplar 1

2 marks



Triangle ABC = 80° + 56° + 44° = 180°

Triangle ACD = 44° + 80° + 56° = 180°

Both traingles are congruent to each other because all angles on both traingles are the same.

SC

..... [4]

Examiner commentary

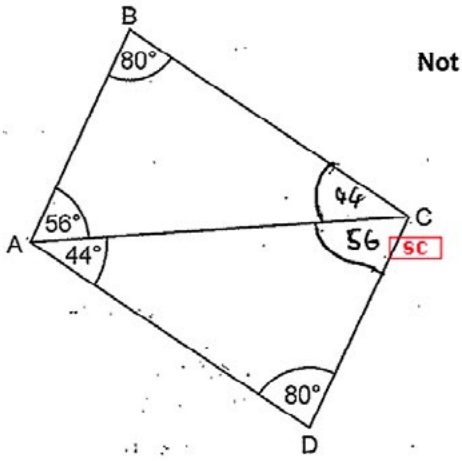
This response is typical of candidates who gained a reasonable mark on this question. Both Special Case marks are credited. The first for correctly marking the two missing angles on the diagram and the second mark for the slightly ambiguous statement that the angles in each triangle are the same.

It was clear from the response to this question that most candidates did not know how to construct a geometric proof.

Exemplar 2

1 mark

21 The diagram below shows two triangles.



Prove that triangle ABC is congruent to triangle ACD.

you
If you add the angles up for example
the 56° + 80° = 180° this is the same
for 44 triangle ABC is congroent to
triangle ACD because when you add angles
AD AD ABC it equals 180° and so
does ACD

[4]

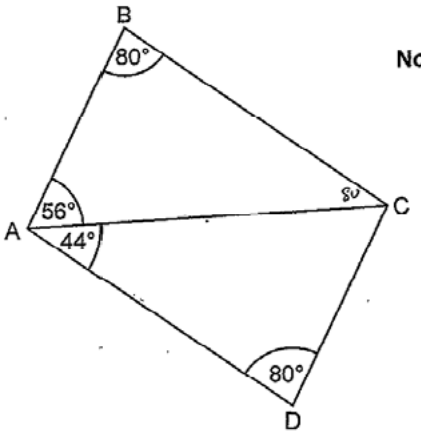
Examiner commentary

The candidate scores a Special Case mark for correctly marking both missing angles on the diagram. The written answers do not contribute to the proof.

Exemplar 3

0 marks

21 The diagram below shows two triangles.



Prove that triangle ABC is congruent to triangle ACD.

Triangles add up to 180

$56 + 80 = 136$

$180 - 136 = 44°$

$44 + 80 = 124$

$180 - 124 = 54°$

$44 + 54 = 98°$

..... [4]

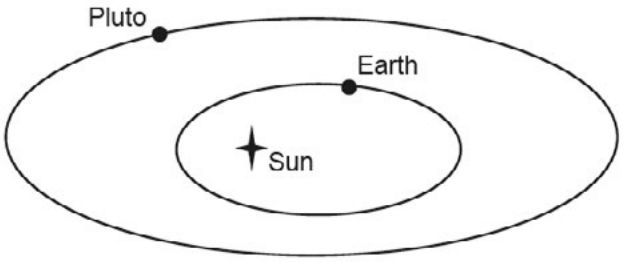
Examiner commentary

This candidate has some elements of a solution but, in a "Prove..." question, these are not sufficient to score marks. Many responses contained similar elements of manipulating the given angles with the hope that something would fall out.

The candidate works out a missing angle from a triangle but, crucially, does not identify the angle. In geometric questions, it is essential that candidates can use three letter notation for angles. Had the candidate stated that angle BCA = 44°, then a mark would have been earned. (The mark scheme allowed a Special Case mark if both of the missing angles had been *correctly* filled in on the diagram.)

Question 22 (a)

22 Earth and Pluto go around the Sun.
Their distance to the Sun varies.



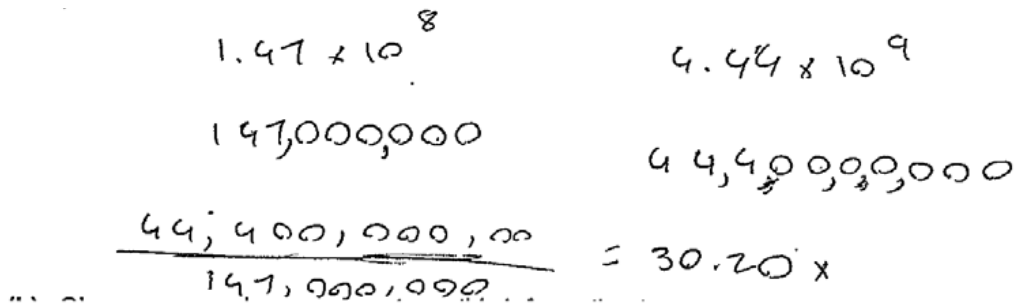
Not to scale

The table shows the closest distance that Earth and Pluto get to the Sun.

	Closest distance to the Sun (km)
Earth	1.47×10^8
Pluto	4.44×10^9

(a) Show that the closest distance of Pluto to the Sun is roughly 30 times the closest distance of Earth to the Sun. **[2]**

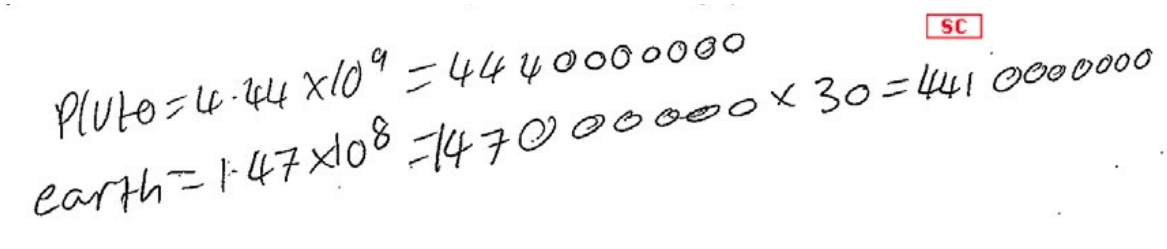
Exemplar 1 — 2 marks



Examiner commentary

The candidate used the values in the table and, through division, showed that the greater distance is roughly 30 (30.2) times greater than the shorter distance. The answer 30 was not assumed.

Exemplar 2 — 1 mark

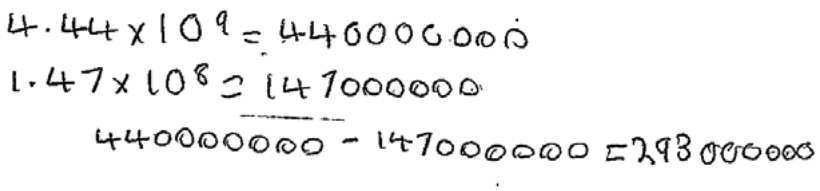


Examiner commentary

The candidate scored the Special Case mark for using the value they were asked to show in their response. Candidates should be aware that they need to perform calculations with the given values to arrive at the value they are asked to show.

Exemplar 3

0 marks



Examiner commentary

The candidate, in common with many others, changed the standard form numbers to ordinary numbers. This was an unnecessary stage and gained no reward. The clue in the question, "30 times", was missed and a difference was found. No marks were scored.

The small print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