Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9–1)

Exemplar Candidate Work

MATHEMATICS

J560
For first teaching in 2015

J560/02 Paper 2

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 1(a)

George recorded all the different types of tree in a wood.

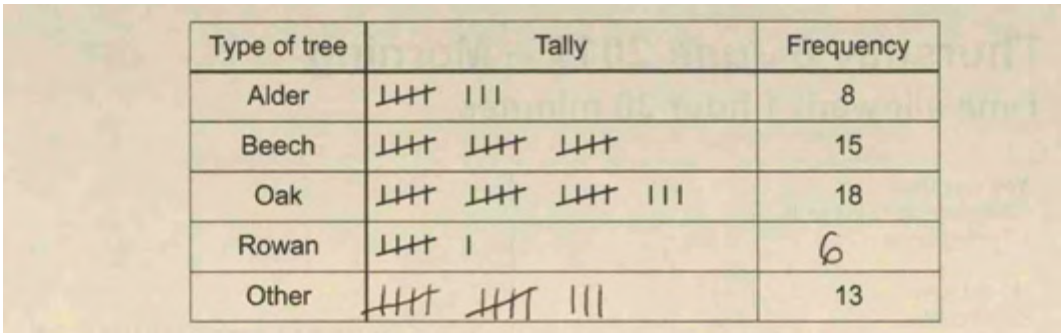
(a) His results are shown in this table.

Complete the table.

Type of tree	Tally	Frequency
Alder	𝍸 III	8
Beech	𝍸 𝍸 𝍸	15
Oak	𝍸 𝍸 𝍸 III	18
Rowan	𝍸 I	
Other		13

[2]

Mark(s): 2



Type of tree	Tally	Frequency
Alder	𝍸 III	8
Beech	𝍸 𝍸 𝍸	15
Oak	𝍸 𝍸 𝍸 III	18
Rowan	𝍸 I	6
Other	𝍸 𝍸 III	13

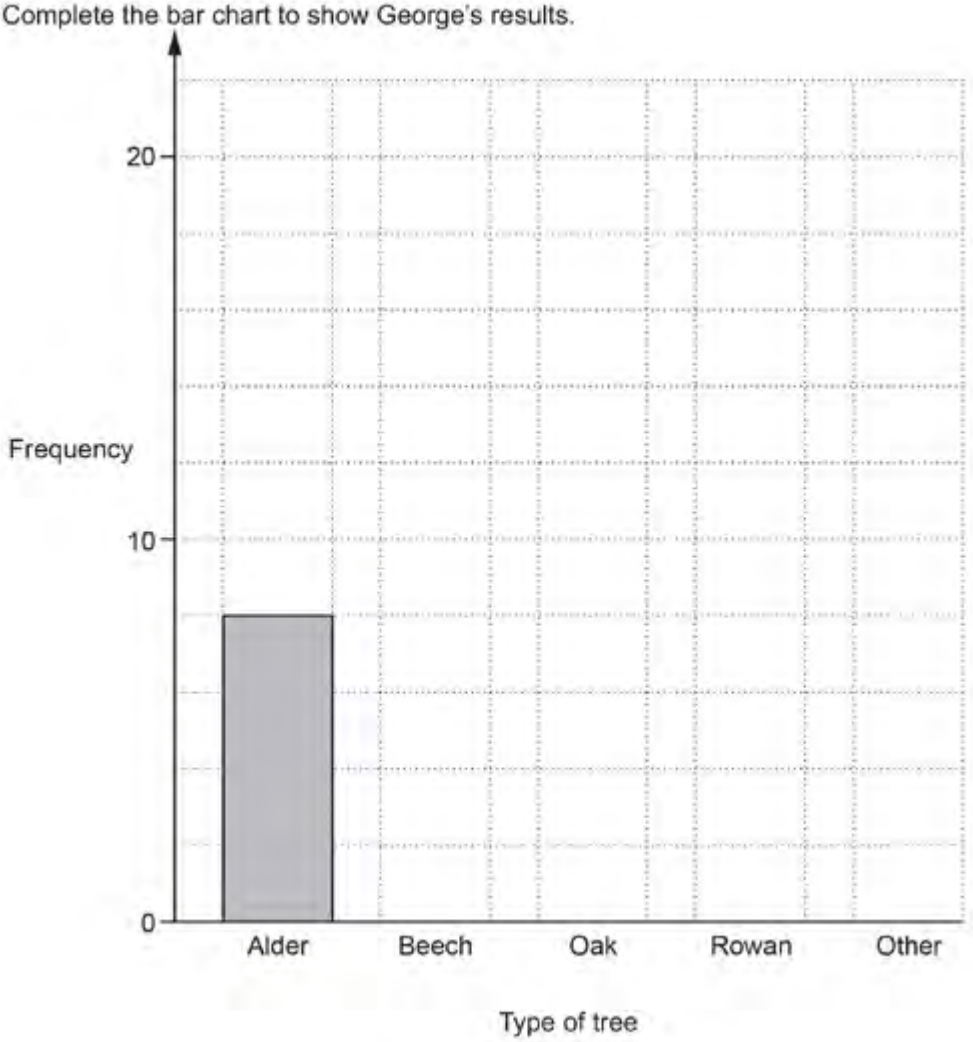
Examiner commentary

Both the frequency of 6 and the tally of 13 are clearly and correctly completed so 2 marks are awarded.

In answers that were not fully correct, candidates made a mistake with the number of tally marks required to indicate 13 or they only filled in one of either 6 or the 13 tally marks.

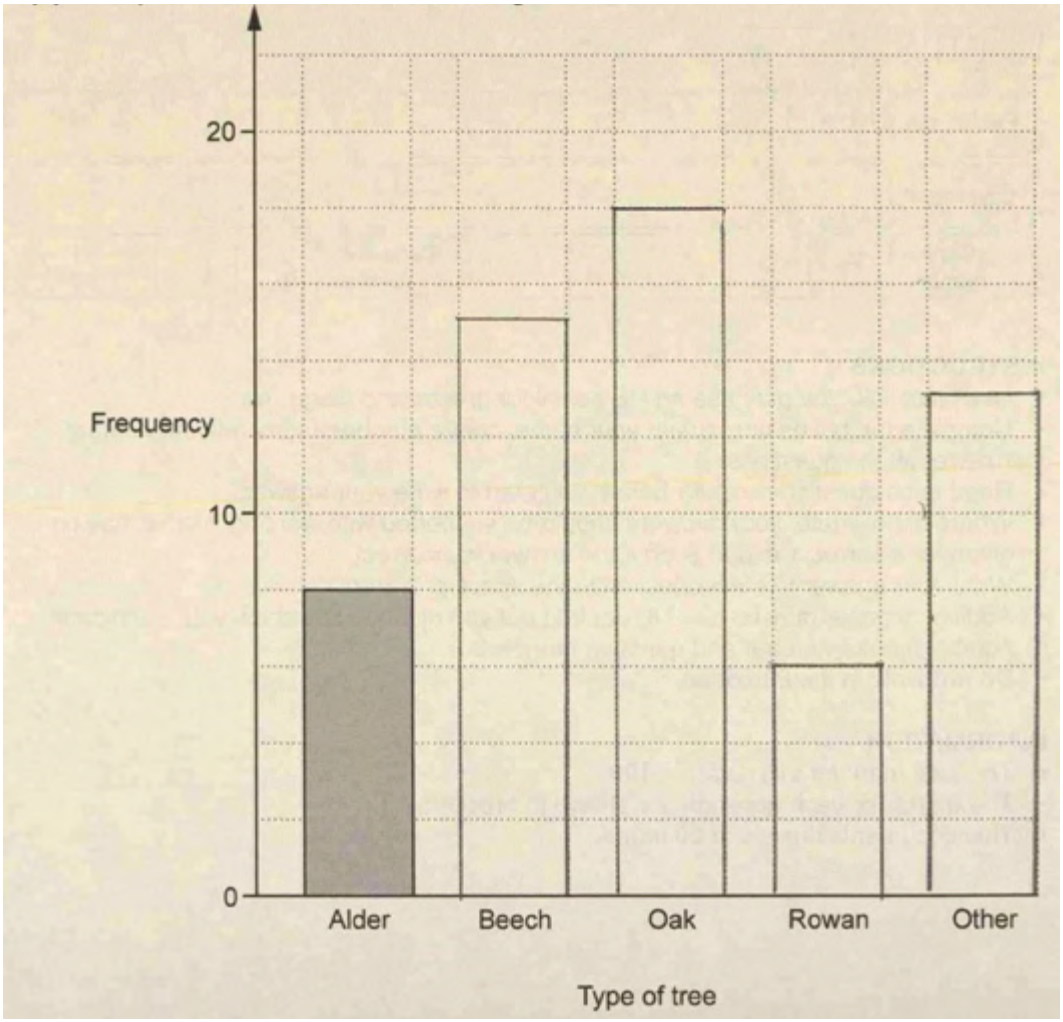
Question 1(b)

(b) Complete the bar chart to show George's results.



[2]

Mark(s): 2



Examiner commentary

This bar chart has been correctly completed with all heights correct and all bars correctly placed, so the full 2 marks are scored.

Incorrectly drawn heights for the odd frequencies of 15 for Beech and 13 for Other was a common error.

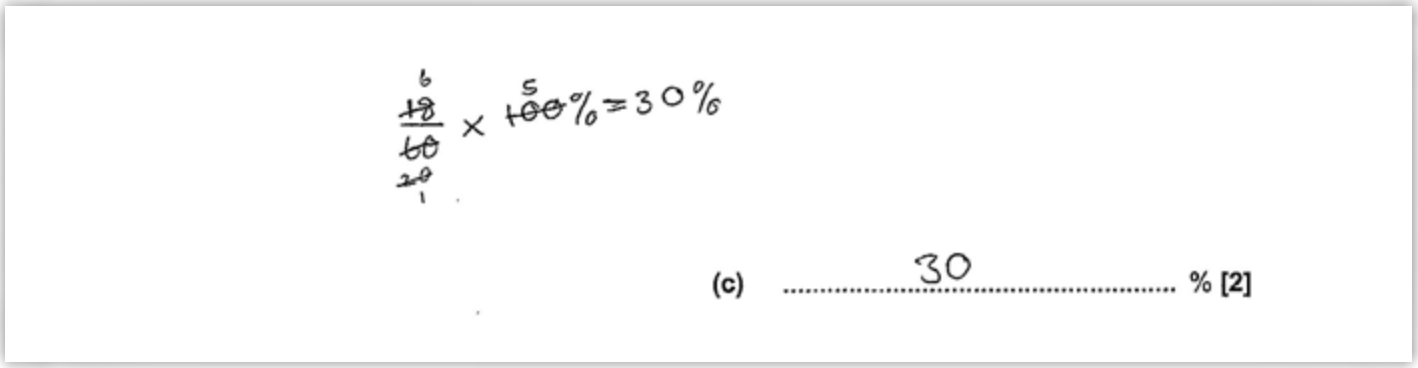
Question 1(c)

(c) George found 60 trees altogether in the wood.

What percentage of the trees were oak trees?

(c) ..... % [2]

Mark(s): 2



Examiner commentary

The correct answer of 30% is seen on the answer line so 2 marks are given. The answer is supported with a clear method of identifying the fraction as $\frac{18}{60}$ and showing how this is converted to a percentage.

Candidates scoring just M1 showed the correct fraction but made errors in converting this to a percentage.

Question 2(a)(ii)

(a) Work out.

(ii) $\frac{4}{7}$ of 63

(ii) ..... [2]

Mark(s): 2

(ii) $\frac{4}{7}$ of 63

$\frac{1}{7} = 9$ $4 \times 9 = 36$

$63 \div 7$

7 14 21 28 35 42 49 56 63

36

(ii) ..... [2]

Examiner commentary

The correct answer of 36 is seen on the answer line so 2 marks are awarded, and the 2 calculation steps, $63 \div 7$ and 4×9, are shown as supporting working.

Some candidates made arithmetical errors in attempting to divide 63 by 7 but if the calculation of $63 \div 7$ was written down then M1 could be awarded.

Question 2(b)

(b) Show that $\frac{4}{5}$ is bigger than $\frac{7}{9}$.

.....

..... [2]

Exemplar 1 – Mark(s): 2

(b) Show that $\frac{4}{5}$ is bigger than $\frac{7}{9}$.

$\frac{4}{5} = 0.8$

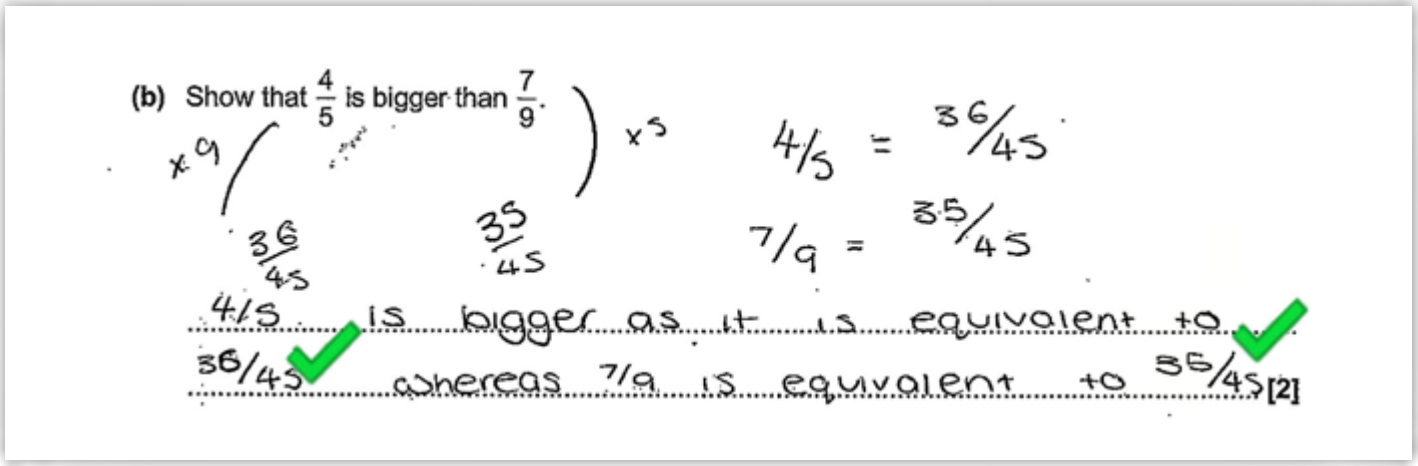
$\frac{7}{9} = 0.\dot{7}$

0.8 which represents 4/5 is bigger than $0.\dot{7}$ which represents 7/9. [2]

Examiner commentary

This answer uses conversion of fractions to decimals to make a comparison. $\frac{4}{5}$ is correctly converted to the decimal of 0.8 and $\frac{7}{9}$ is correctly converted to the decimal of $0.\dot{7}$ so the full 2 marks are given. This candidate also adds a clarifying statement that 0.8 is bigger than $0.\dot{7}$.

Exemplar 2 – Mark(s): 2



Examiner commentary

This answer uses equivalent fractions to make a comparison, converting both fractions so they have a common denominator of 45. The fractions of $\frac{36}{45}$ and $\frac{35}{45}$ are clearly stated so 2 marks are scored. An additional clarifying statement is also correct.

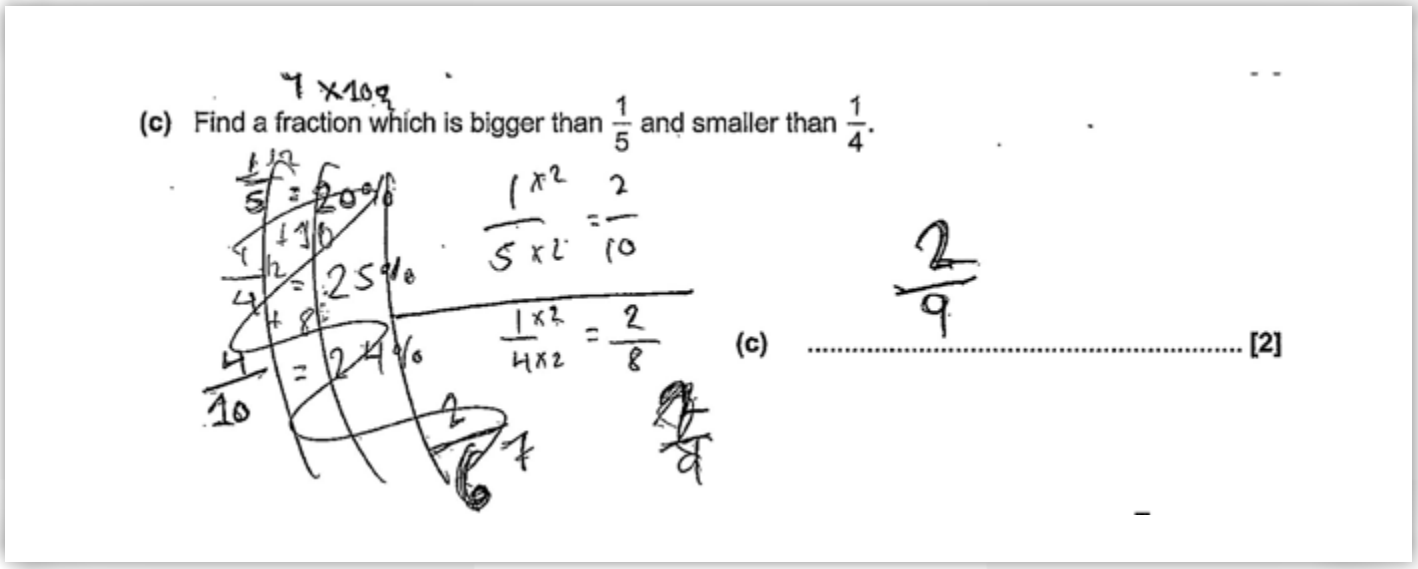
M1 was often awarded to candidates who were able to convert $\frac{4}{5}$ but found the conversion of $\frac{7}{9}$ more difficult.

Question 2c

(c) Find a fraction which is bigger than $\frac{1}{5}$ and smaller than $\frac{1}{4}$.

(c) ..... [2]

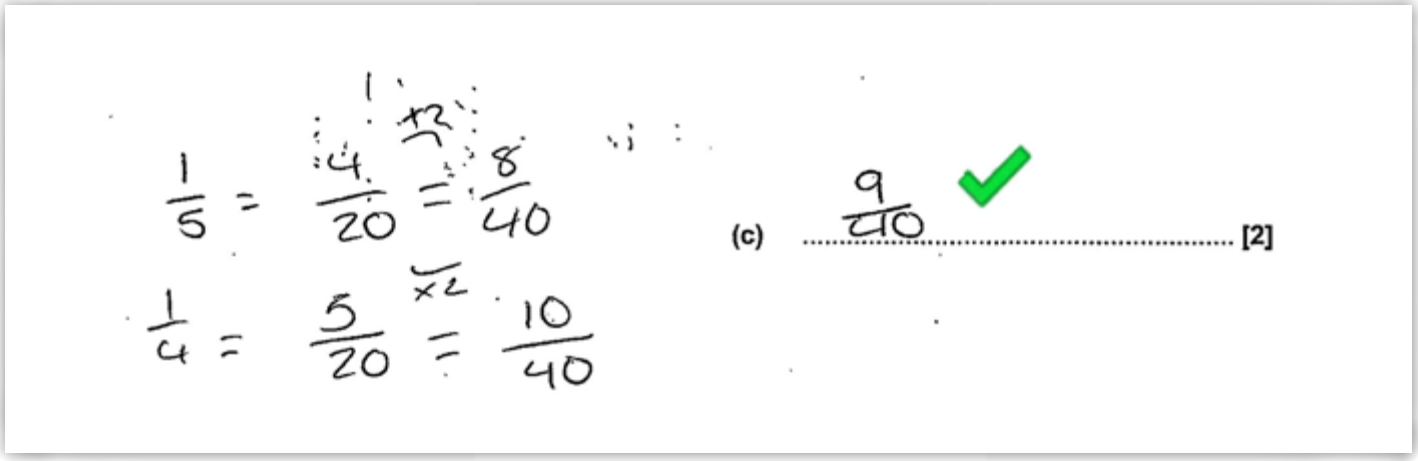
Exemplar 1 – Mark(s): 2



Examiner commentary

$\frac{2}{9}$ stated on the answer line is a fraction between 0.2 and 0.25 so 2 marks are achieved. Here it is supported by the working of finding an equivalent fraction to $\frac{1}{5}$ and to $\frac{1}{4}$ where the numerators are the same. Then it is easier to see that $\frac{2}{9}$ would be a fraction between $\frac{2}{8}$ and $\frac{2}{10}$.

Exemplar 2 – Mark(s): 2



Examiner commentary

Here a correct fraction of $\frac{9}{40}$ stated on the answer line is supported with working where equivalent fractions to $\frac{1}{5}$ and to $\frac{1}{4}$ are converted to have the same denominator. The full 2 marks are gained. Again it is easier to see that $\frac{9}{40}$ would be a fraction between $\frac{8}{40}$ and $\frac{10}{40}$.

Some methods of converting lead to answers that were not fractions, such as $\frac{4}{20}$ and $\frac{5}{20}$ leading to an answer of $\frac{4.5}{20}$. In these cases M1 could be scored for a fraction equivalent to 0.2 and a fraction equivalent to 0.25.

Question 3(a)

(a) Nathan works out 23×12.4 without a calculator.

This is Nathan's working.

$10 \times 12.4 = 12.40$

$20 \times 12.4 = 24.80$
$3 \times 12.4 = 37.2$

$23 \times 12.4 = 24.80 + 37.2 = 62$

Nathan's working is incorrect.

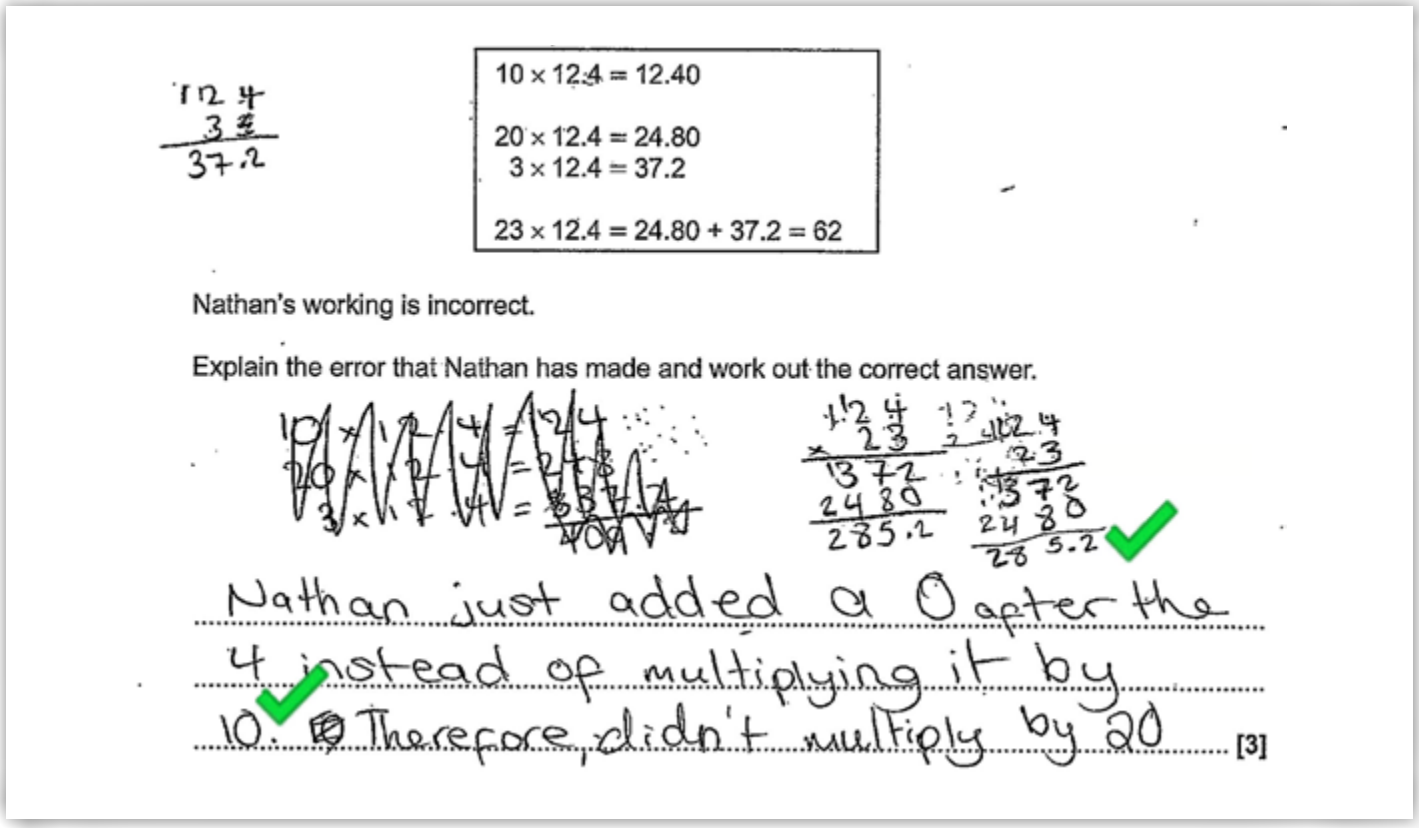
Explain the error that Nathan has made and work out the correct answer.

.....

.....

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

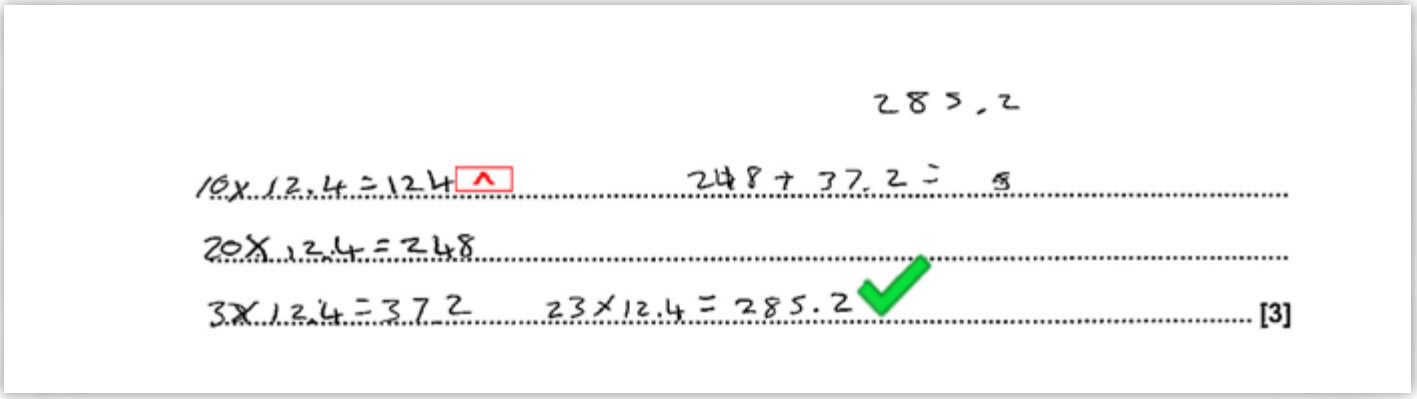
Exemplar 1 – Mark(s): 3



Examiner commentary

The statement 'Nathan just added a 0 after the 4 instead of multiplying it by 10' scores the first mark as it identifies the error and states what should have been carried out instead. 285.2 is seen in the working space so the final 2 marks are also awarded, the long multiplication is shown as supporting work.

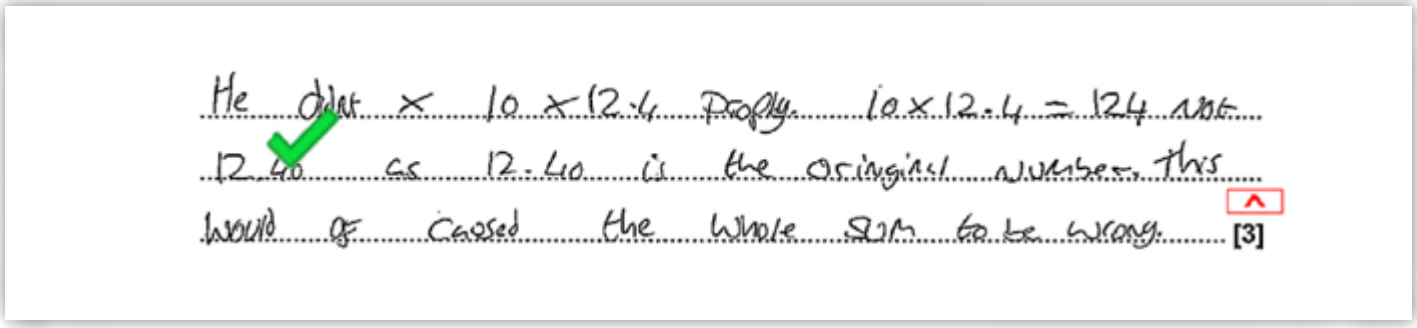
Exemplar 2 – Mark(s): 2



Examiner commentary

No statement explaining the error is given, so the first mark is not awarded. 2 marks are scored for 285.2, the supporting working shown is a correction of the method suggested in the question.

Exemplar 3 – Mark(s): 1



Examiner commentary

'He didnt × 10 × 12.4 proply' identifies the error and '10 × 12.4 = 124 Not 12.40' corrects the error so the first mark is scored. As there is no attempt to complete the calculation correctly no further marks can be awarded.

If this candidate had continued further to state 20 × 12.4 = 248, they would have gained a further M1.

Question 3(b)

(b) Four friends buy cinema tickets using this offer.

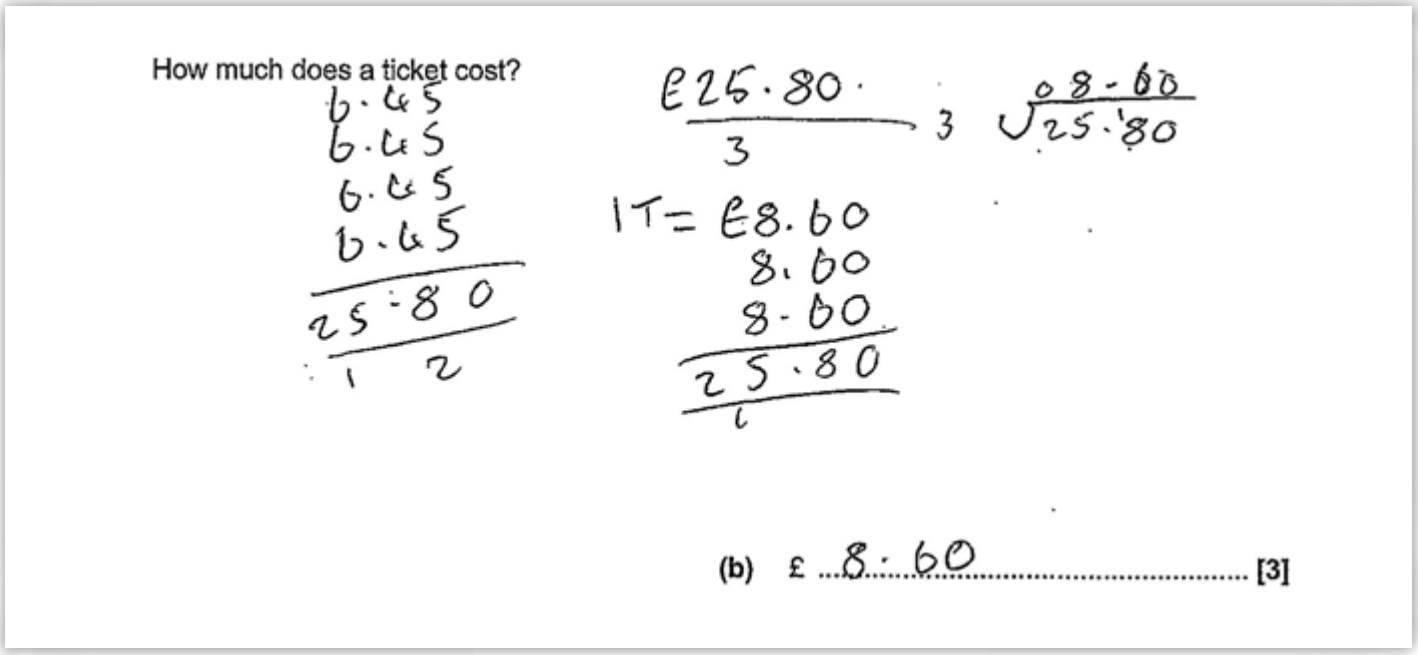
Cinema tickets
Buy 3 tickets and get a ticket **free**

They **each** pay £6.45.

How much does a ticket cost?

(b) £ ..... **[3]**

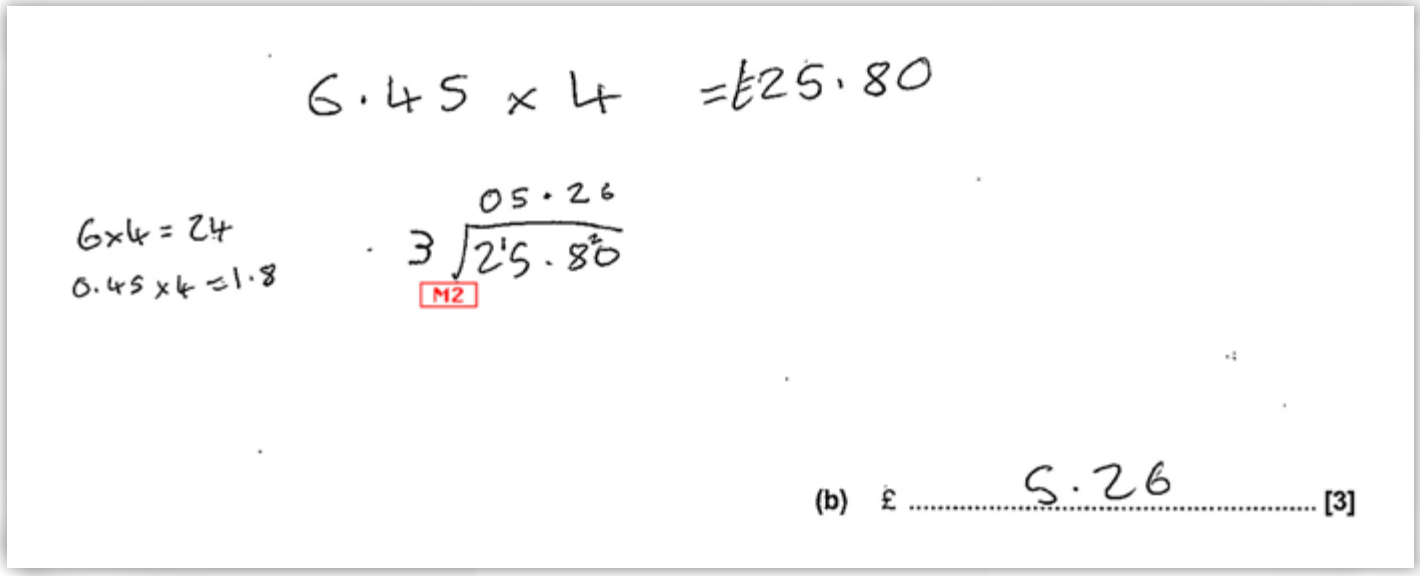
Exemplar 1 – Mark(s): 3



Examiner commentary

A correct answer of £8.60, gaining all 3 marks, is accompanied with clear working that shows the addition of 6.45 four times which is equivalent to 6.45 × 4. The correct answer, £25.60, to this part calculation is then divided by 3 using the bus stop method. The method leading to the answer line is equivalent to 6.45 × 4 ÷ 3.

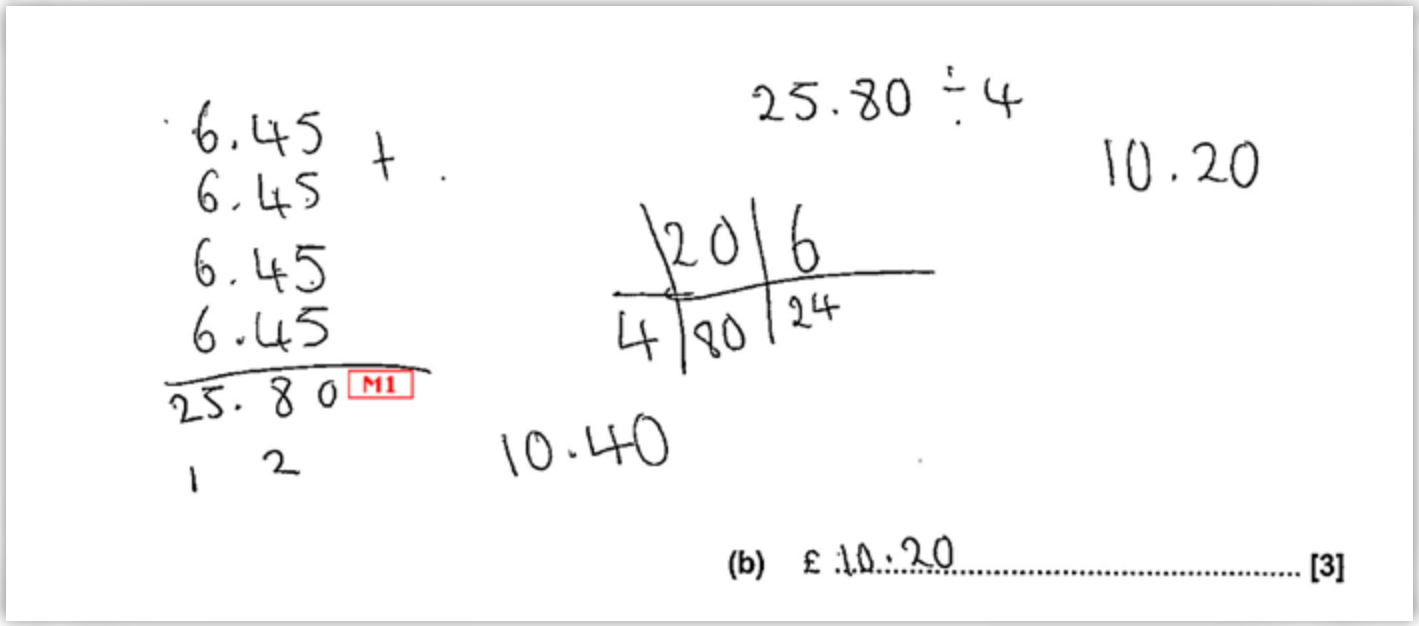
Exemplar 2 – Mark(s): 2



Examiner commentary

6.45 × 4 is seen and the answer to this, £25.80, is divided by 3 using the bus stop method. The only error is in performing the division (a carry figure of 1 instead of 2 onto the 5 of the 25.80), the method for 6.45 × 4 ÷ 3 is clearly set out so M2 is awarded.

Exemplar 3 – Mark(s): 1

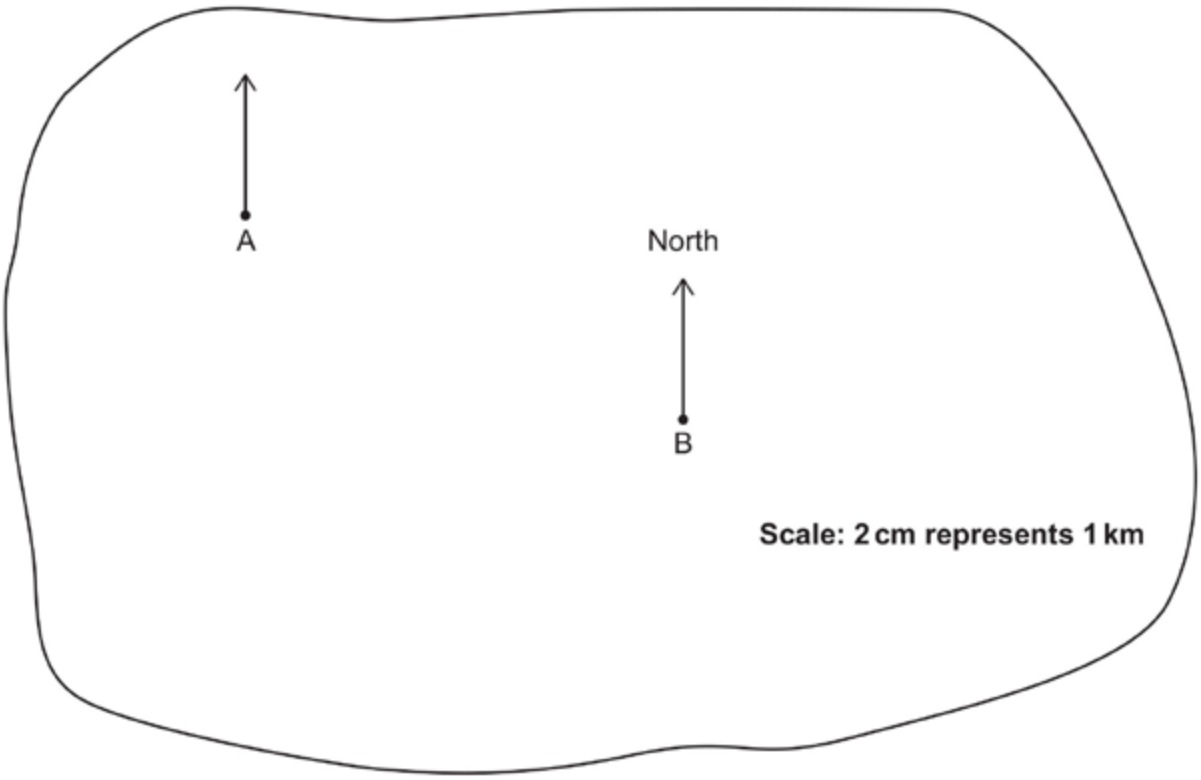


Examiner commentary

The repeated addition of 6.45 four times is equivalent to 6.45 × 4 so M1 awarded, supported by 25.80 seen as the result of this calculation. The next step shown is 25.80 ÷ 4 which would lead back to the value of 6.45 if correctly performed so no further marks are gained.

Question 4(a)(i)

A and B are two farms on this map.



Use the map to complete these sentences.

(a) (i) The distance from A to B is ..... km. **[2]**

Mark(s): 2

6.5 cm = 3.25

Use the map to complete these sentences.

(a) (i) The distance from A to B is 3.25 km. **[2]**

Examiner commentary

The answer of 3.25 is in the acceptable range of 3.1 to 3.3 so 2 marks are attained. Supporting working is the measurement of 6.5 cm shown.

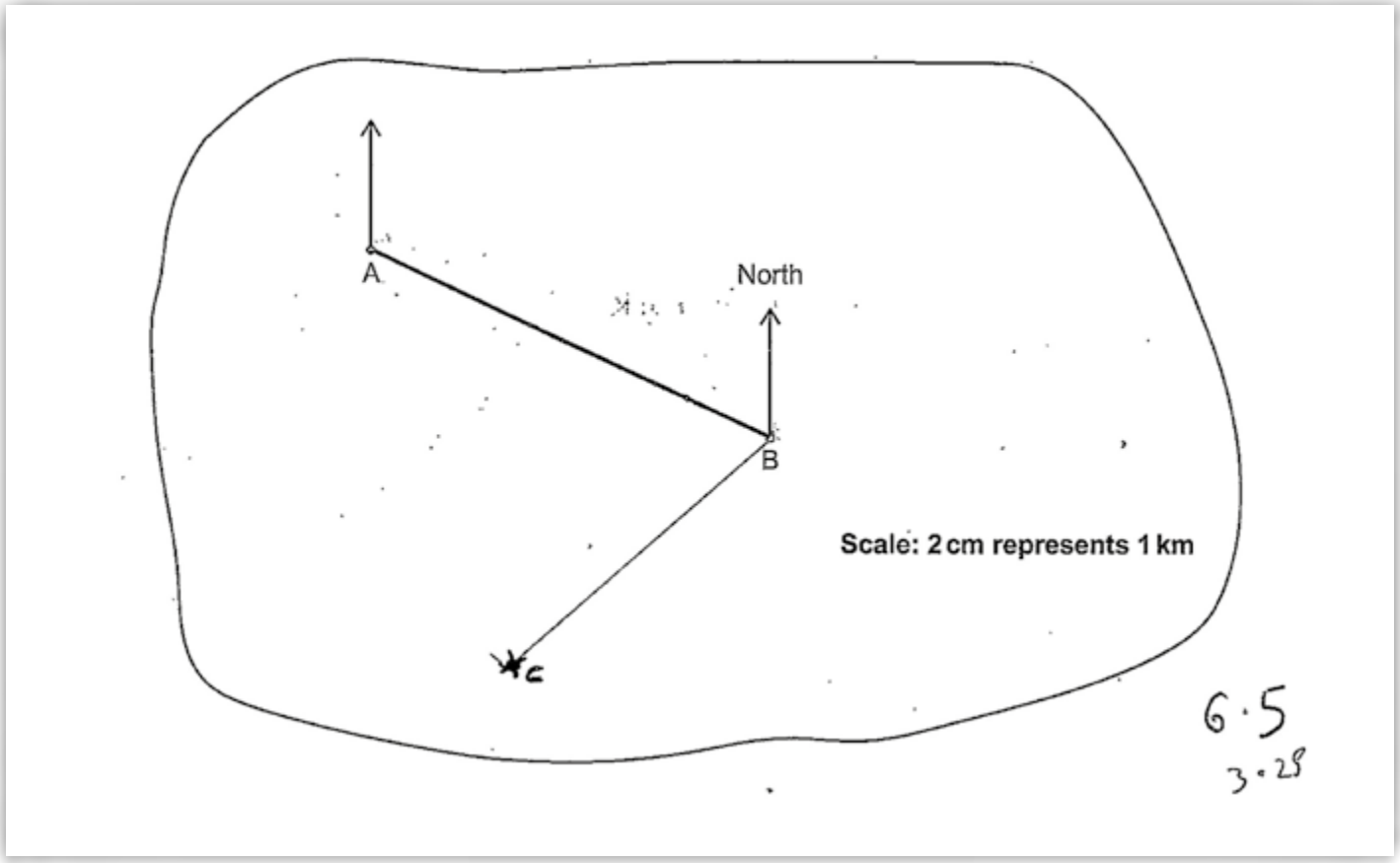
An incorrect answer of 3.5 was common. Candidates who struggled to divide 6.5 by 2 gained M1 if their measurement was shown.

Question 4(b)

(b) C is another farm.
C is 2.5 km from B on a bearing of 230°.

Mark and label the position of C on the map with a cross. **[2]**

Mark(s): 2



Examiner commentary

C is clearly marked and labelled. The accuracy of the length is within 4.8 to 5.2 cm. The accuracy of the bearing is within 226° to 234°. This earns the candidate 2 marks. A construction line from B to C is also seen.

Some answers scoring B1 were just outside tolerance on one of the measurements so taking care with accuracy is very important. Answers not clearly indicating point C with a cross were often indicated by a line so C could be accepted at the end of it. Others with a letter C written but no point marked made it difficult to assess the exact intention of point C.

Question 5(a)

(a) Multiply out.

$3x(x+2y)$

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

Mark(s): 2

Examiner commentary

Arcs show the order in which the bracket has been multiplied out, with both terms correctly written on the answer line. This correct final answer scores 2 marks.

B1 is awarded for a correct term of $3x^2$ or $6xy$ seen, but marking the final answer means attempts to combine these two expressions results in no more than B1 scored.

Question 5(b)(ii)

(b) Solve.

(ii) $\frac{x}{3} - 2 = 9$

(ii) $x =$ ..... **[2]**

Mark(s): 2

$\frac{x}{3} = 9 + 2$

$\frac{x}{3} = 11$

$x = 11 \times 3$

$x = 33$

(ii) $x =$ 33 **[2]**

Examiner commentary

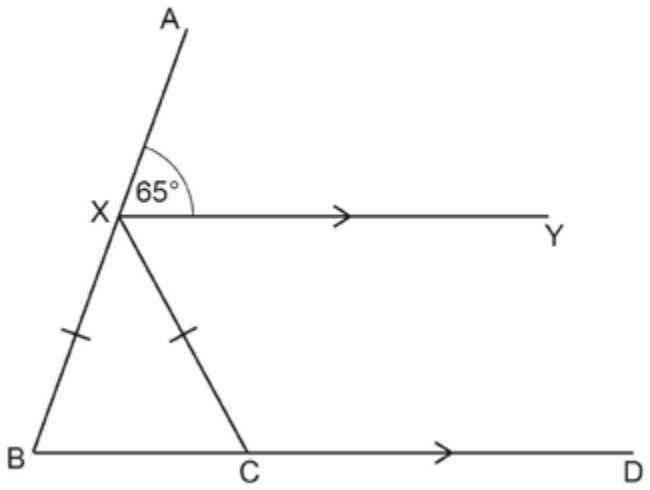
In this response, a correct answer of 33 scoring 2 marks is fully supported with very clear steps of how the equation was solved.

Candidates not scoring full marks could attain M1 for the first correct step of $\frac{x}{3} = 9 + 2$ or better, or after an error made in their first step M1 could come from a correct follow through i.e. $x = 29$ following $x - 2 = 27$.

It is difficult to award method marks if setting out of steps is not algebraic. For example, showing that $9 + 2 = 11$ but not equating this to $\frac{x}{3}$ does not score a mark.

Question 6(b)

XY and BD are parallel lines.
X is a point on AB and C is a point on BD.
XB = XC.

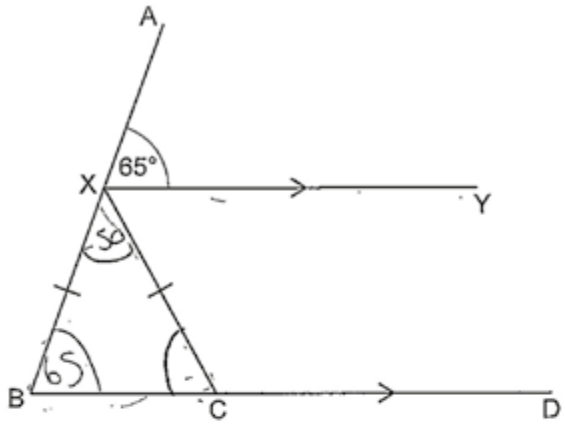


Not to scale

(b) Work out angle BXC.
Give a reason for each angle you work out.

(b) ..... ° **[4]**

Exemplar 1 – Mark(s): 4



Not to scale

(b) Work out angle BXC.
Give a reason for each angle you work out.

- angle BCX is 65° because base angles in an isoceles triangle are equal
- Angle BxC is 50° because angles in a triangle total 180°

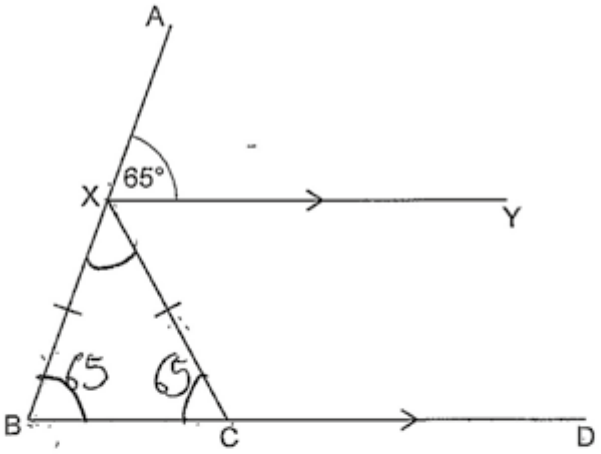
65+65 = 130
180-130=50

(b) 50 ..... ° [4]

Examiner commentary

50 written on the answer line is awarded 2 marks. A further mark is awarded for 'isoceles [triangle]' within a correct statement that refers to base angles being equal. The final mark is also earned for the reason 'because angles in a triangle total 180°'. Supporting working shows the two base angles added together, 65 + 65 = 130, and then this result subtracted from the total sum of angles in a triangle, 180 – 130 = 50.

Exemplar 2 – Mark(s): 3



Not to scale

(b) Work out angle BXC.
Give a reason for each angle you work out.

180 − 65 − 65
= 115 − 65 = 50

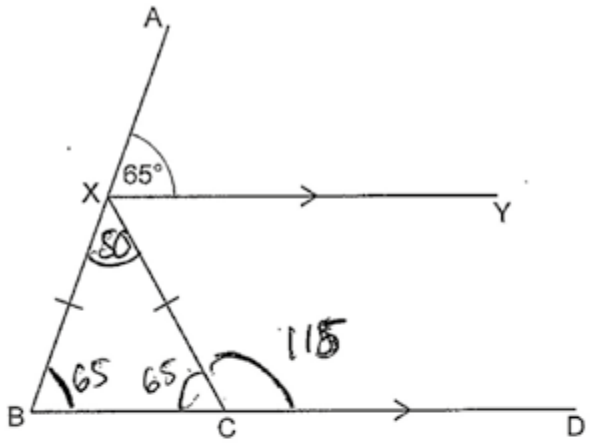
- Angle C is 65° because its an equalatral triangle.
- Angle X is 50° because angles in a triangle add to make 180°.

(b) 50° **[4]**

Examiner commentary

50 written on the answer line is awarded 2 marks. The first reason does not score a mark as the candidate has incorrectly stated that the triangle is 'equalatral' rather than the correct isosceles. However a mark is also awarded for the correct reason 'angles in a triangle add to make 180.' Supporting working shows the two base angles subtracted from 180, 180 – 65 – 65.

Exemplar 3 – Mark(s): 2



Not to scale

(b) Work out angle BXC.
Give a reason for each angle you work out.

B = 65° because alternate angles are equal

C = 65 because isosceles triangle, base angles equal the same.

65 + 65 = 130

180 − 130 = 50

~~65~~ 180 − 65 = 115°

(b) ..... ° **[4]**

Examiner commentary

Although 50 is seen as the result of the calculation 180 – 130 = 50, the final line of working is 180 – 65 = 115. BXC = 50 is not seen and the answer line is blank so 2 marks cannot be awarded. B1 however is scored for C = 65 seen in working as C can be accepted for XCB. The reason 'isosceles [triangle]' within a correct statement referring to 'base angles equal the same' scores one mark but the other reason does not score as it is not correct. It does not explain how BXC is found, the candidate should have stated 'angles in a triangle add up to 180°'. The first statement is incorrect as the reason for angle B = 65 is that it is a corresponding angle, not an alternate angle.

Question 7

There are **20 coins** in a pot.
The coins are 1p, 2p, 5p and 10p.

A coin is taken at random from the pot.

- The probability that it is a 1p coin is $\frac{3}{10}$.
- The probability that it is a 2p coin is $\frac{2}{5}$.

The total value of the coins in the pot is 57 pence.

Work out how many of each type of coin there are in the pot.

1p ..... , 2p ..... , 5p ..... , 10p ..... **[4]**

Exemplar 1 – Mark(s): 4

- The probability that it is a 2p coin is $\frac{2}{5}$. $\frac{4}{10}$
- This coin is put back

The total value of the coins in the pot is 57 pence.

Work out how many of each type of coin there are in the pot.

20 coins ÷10 = 2 coins = $\frac{1}{10}$

1p = $\frac{3}{10}$ ≡ 2x3 = 6 coins

14 coins left

2p = $\frac{4}{10}$ ≡ 4x2 = 8 coins

6 coins left

57
- 16
6
41
- 06
35

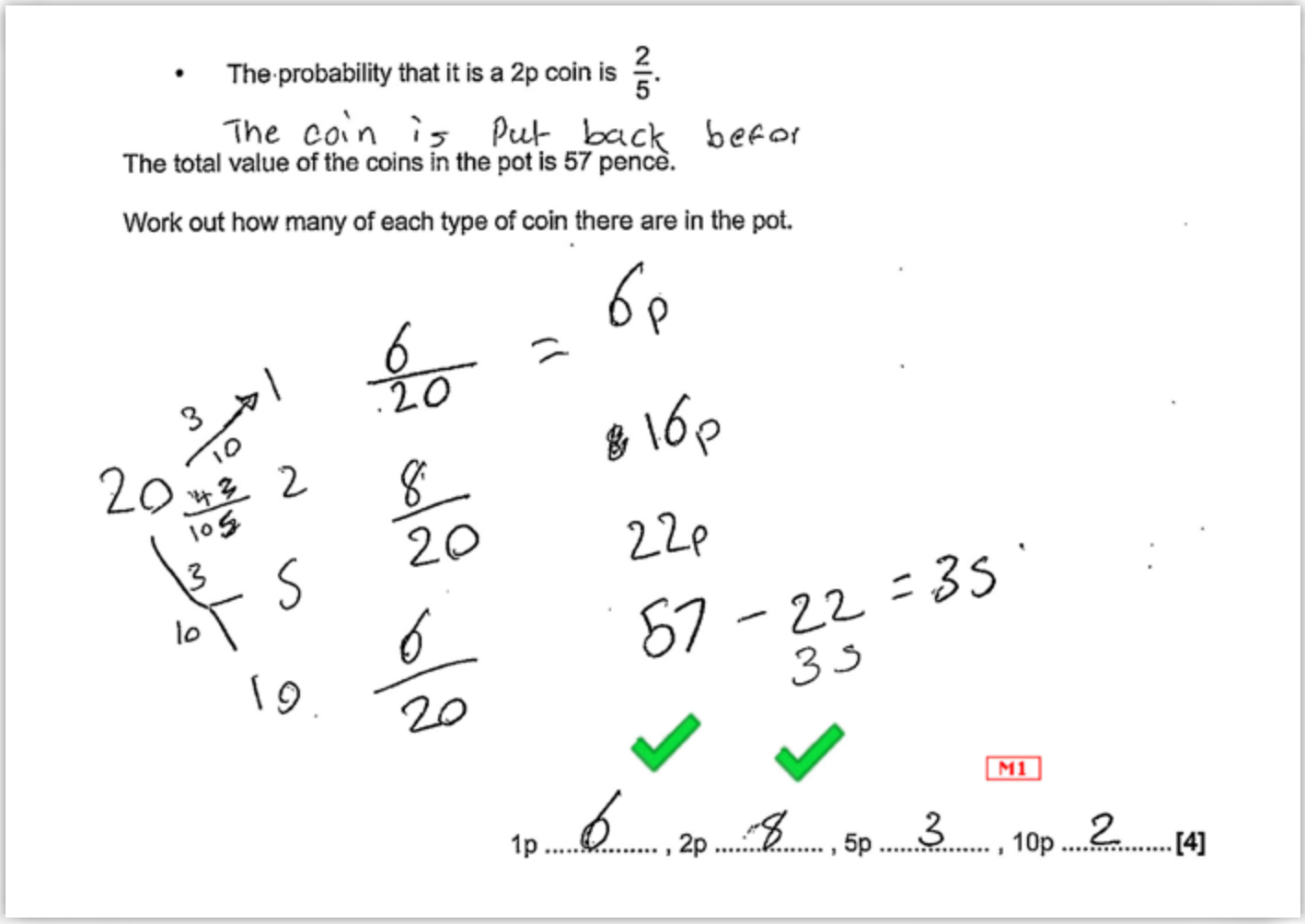
35
5,5,5,5,5
10,

1p 6 , 2p 8 , 5p 5 , 10p 1 **[4]**

Examiner commentary

The correct amount of 1p coins (6) scores 1 mark, the correct amount of 2p coins (8) scores 1 mark and the correct amount of 5p coins (5) and 10p coins (1) scores 2 marks. Supporting working shows that $\frac{1}{10}$ of 20 coins will be 2 coins and so 1p = $\frac{3}{10}$ = 3 × 2 = 6 coins leaving 14 coins. 2p = $\frac{4}{10}$ = 4 × 2 = 8 coins leaving 6 coins. The working then shows 57 – their '8' × 2 – their '6' × 1 resulting in 35p being the total value for the remaining 6 coins.

Exemplar 2 – Mark(s): 3



Examiner commentary

The correct amount of 1p coins (6) scores 1 mark, and the correct amount of 2p coins (8) scores 1 mark. Supporting working shows use of equivalent fractions: $\frac{3}{10}$ is converted to $\frac{6}{20}$ giving a value of 6p and $\frac{4}{10}$ is converted to $\frac{8}{20}$ giving a value of 16p. The value of the 5p and 10p coins totals 35p but the final answer uses only 19 coins so full marks are not earned as the correct answer requires 20 coins. The subtraction of 57 – 22 scores M1 for 57 – their '6' × 1 – their '8' × 2.

Exemplar 3 – Mark(s): 1

- The probability that it is a 2p coin is $\frac{2}{5}$. This Coin is Put back

The total value of the coins in the pot is 57 pence.

Work out how many of each type of coin there are in the pot.

14 coins = 22p + 5p = 27 + (10x3)

= 57

1p = 8 2p = 7 5p = 3 10p = 2

1p ..8.., 2p ..7.., 5p ..3.., 10p ..2.. [4]

M1

Examiner commentary

The candidate has not made any reference to the probability fractions in the question. However, they have correctly stated 14 coins = 22p and written the values of 6 for the number of 1p coins and 8 for the number of 2p coins. They have continued by showing + 5p = 27 + (10 × 3) = 57. As their chosen 4 values give 18 coins rather than 20 coins the candidate has replaced them with 4 values that will make 20 coins. In their replaced answer the number of 1p and 2p coins are both incorrect so the first 2 marks are not awarded. M1 is given for the 5p and 10p coins total value being 35p. The candidate would have gained more marks by keeping the correct values of 6 1p coins and 8 2p coins and investigating different ways to make 35p from 5p coins and 10p coins.

Question 8(b)

(b) Work out.

$(9 - 3 \times 2)^2$

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

Mark(s): 2

(b) Work out.

B
I
D
M
A
S

$(9-3\times2)^2$
$(9-6)^2$
$\therefore 3^2$
$3\times3=9$

(b) 9 **[2]**

Examiner commentary

The correct of answer of 9 scores 2 marks, supported by clear steps of working. The candidate wrote the word BIDMAS on their paper and has applied it correctly, focusing on the bracket first and using order of operations within this by doing the multiplication 3×2 before the subtraction. Then the square of the result of the bracket has been correctly calculated.

Candidates scoring M1 for $(9 - 6)^2$ went on to make errors in squaring, incorrectly stating $3^2 = 6$. Following no marks awarded an SC1 was given if an answer of 144 was attained from working through the calculation within the bracket left to right.

Question 9(a)

Lillian works 7 hours each day for 5 days a week.
She earns £420 each week.

(a) How much does she earn per hour?

(a) £ ..... **[3]**

Exemplar 1 – Mark(s): 3

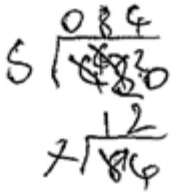
9 Lillian works 7 hours each day for 5 days a week.
She earns £420 each week.

(a) How much does she earn per hour?

420 ÷ 5 = 84

£84 = A day

84 ÷ 7 = 12

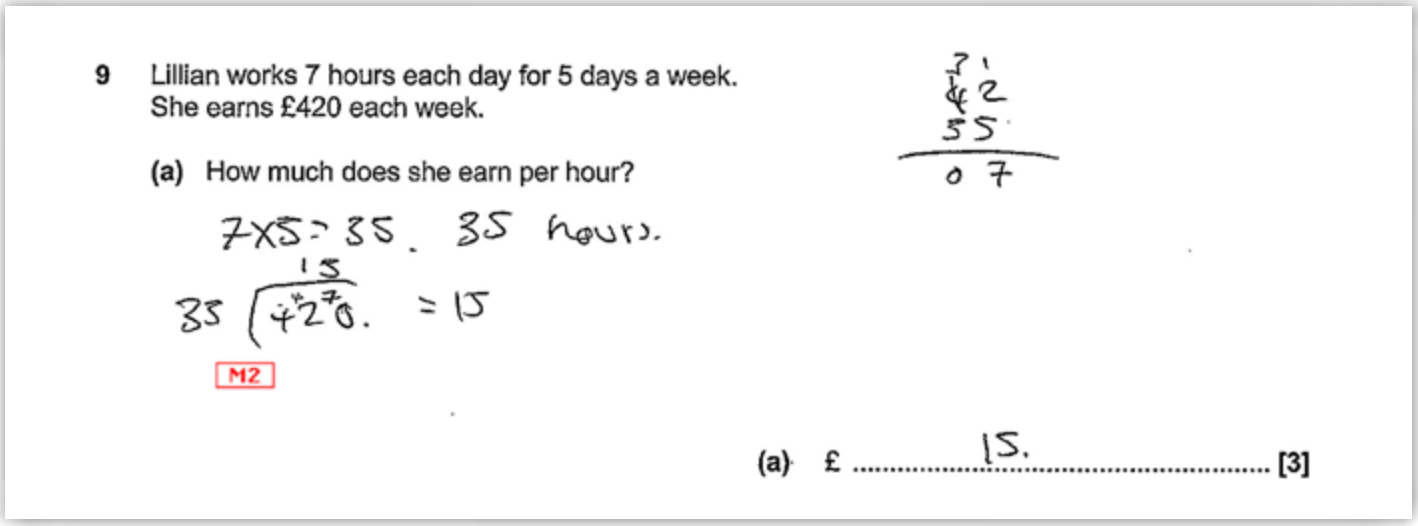


(a) £ 12 **[3]**

Examiner commentary

A correct answer of 12 scores 3 marks, supported by the working of 420 ÷ 5 to find the amount earned per day of £84 and then 84 ÷ 7 to find the amount earned per hour. Working out has been shown using the bus stop method for division.

Exemplar 2 – Mark(s): 2



9 Lillian works 7 hours each day for 5 days a week.
She earns £420 each week.

(a) How much does she earn per hour?

7 × 5 = 35. 35 hours.

35 | 420. = 15

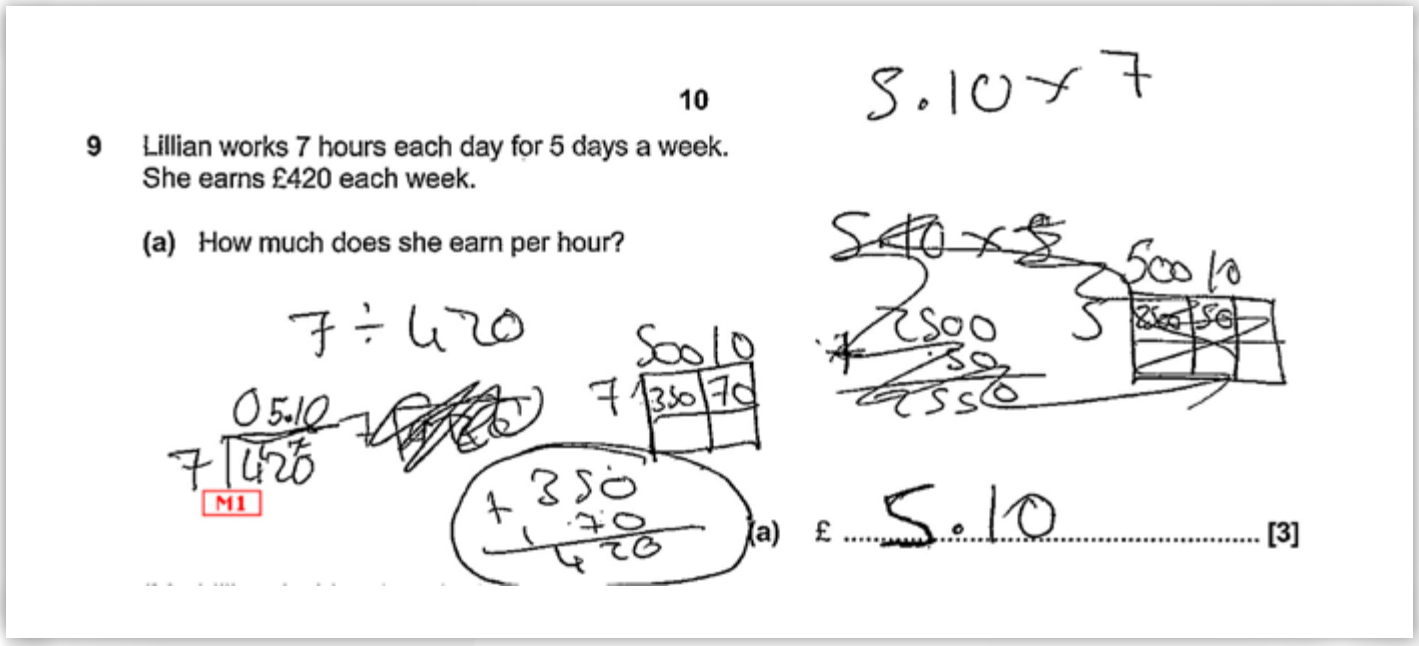
M2

(a) £ 15. [3]

Examiner commentary

The number of hours worked per week has been calculated, 7 × 5 = 35, and the correct division 420 ÷ 35 is seen within the bus stop method. This division scores M2. An error has been made in the calculation of 70 ÷ 35 stating it is 5 rather than 2, so the final answer is incorrect. Checking this part of their answer by doing 35 × 5 would have highlighted their error.

Exemplar 3 – Mark(s): 1



10

9 Lillian works 7 hours each day for 5 days a week.
She earns £420 each week.

(a) How much does she earn per hour?

7 ÷ 420

05.10

7 | 420

M1

(a) £ 5.10 [3]

Examiner commentary

Although there is evidence that the division has been written the wrong way around, 7 ÷ 420, the answer of 5.10 comes from the bus stop method where the correct division of 420 ÷ 7 is seen. This division scores M1. There is an error in attempting to divide of only carrying 1 rather than 4 over to the 2 of 420. The candidate has stopped at the amount earned each day and has not gone on to divide by 5 to find the amount earned per hour.

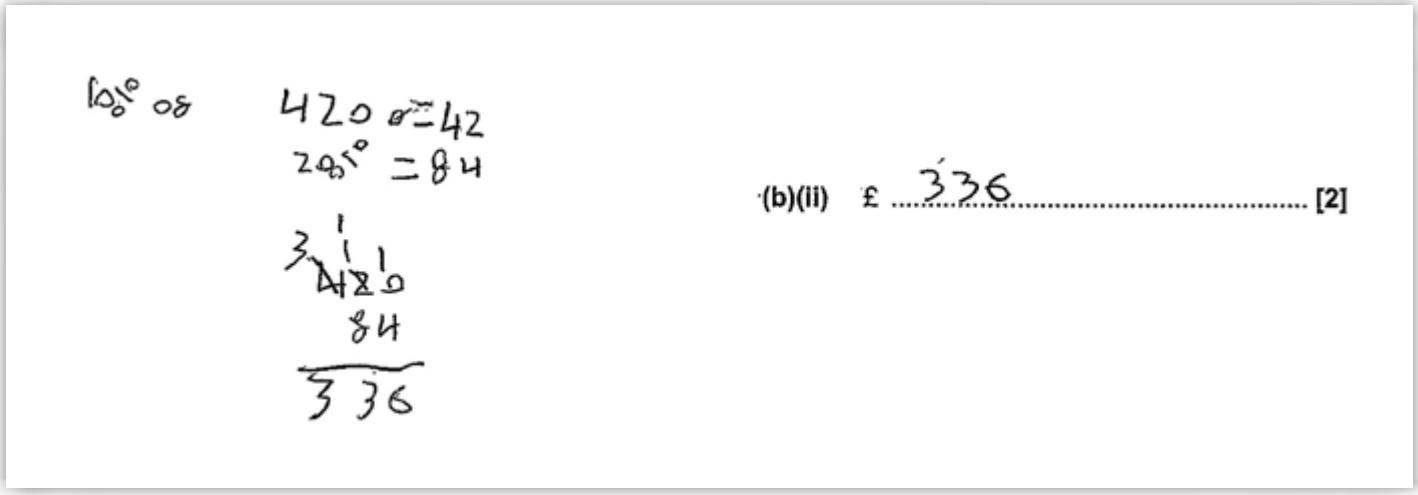
Question 9(b)(ii)

(b) Lillian decides that she is going to work 7 hours each day for **only 4 days** a week.
Her earnings are to be reduced by 20%.
Lillian thinks that this reduction is reasonable.

(ii) How much will Lillian earn working 4 days a week?

(b)(ii) £ ..... [2]

Mark(s): 2



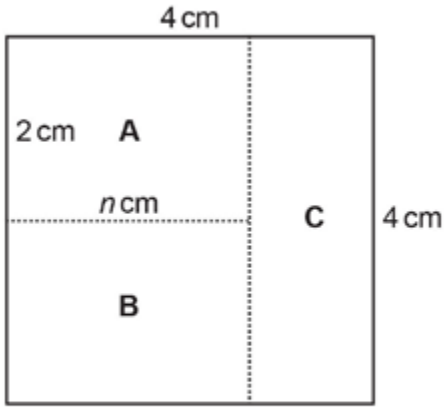
Examiner commentary

The answer of 336 scores 2 marks. This is supported by the candidate correctly calculating that 10% of 420 = 42 and therefore 20% = 84. They have also shown the subtraction of 420 – 84, identified by the carry figures, leading to the correct answer.

M1 was earned if a method to find 420 × 0.8 or equivalent, or 420 – 84 was seen but errors were then made in calculations. Another alternative method was to multipliy the hourly rate by 28 usually seen in 2 steps, × 7 then × 4. This method could follow through from their part (a) answer.

Question 10(b)

A square is divided into three rectangles, **A**, **B** and **C**.



Not to scale

Rectangle **A** has length n cm and a width of 2 cm.
Rectangle **C** has length 4 cm.

(b) The three rectangles all have the **same** area.

Work out the value of n.

(b) $n =$ ..... **[3]**

Exemplar 1 – Mark(s): 2

$2n = 4(4-n)$
$2n = 16-4n$
$6n = 16$
$n = 2.5$

(b) $n =$ 2.5 **[3]**

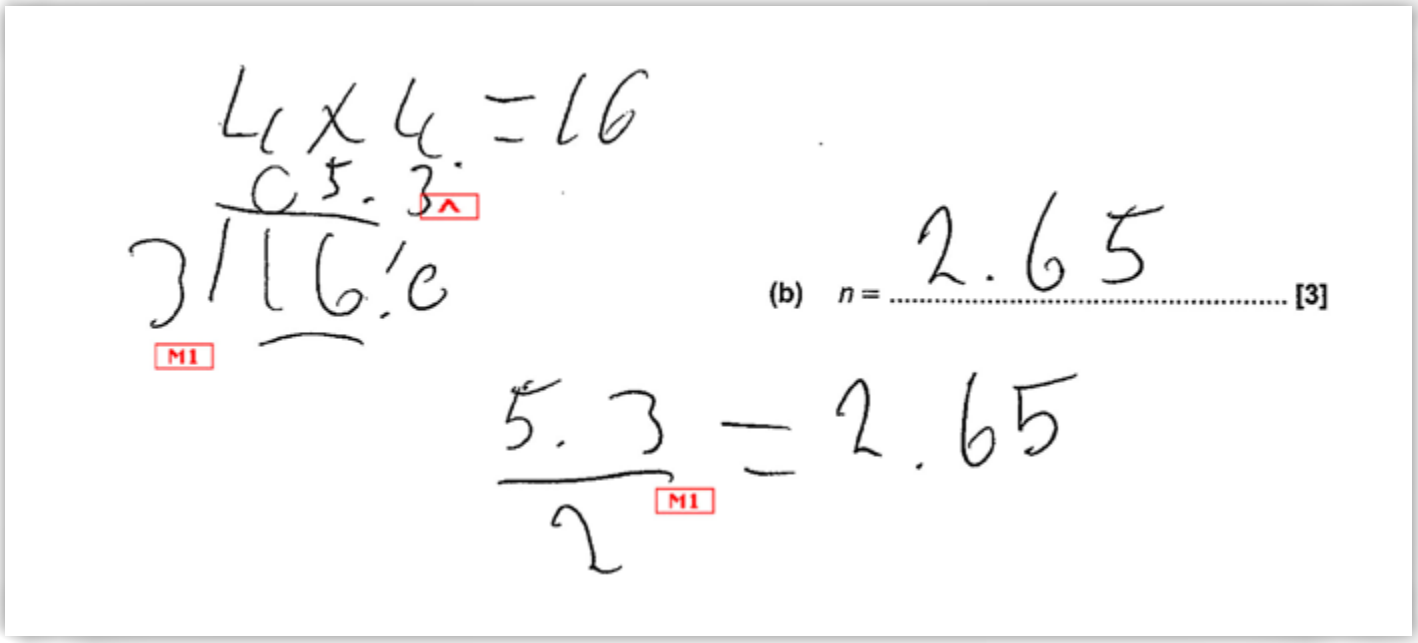
Examiner commentary

M1 is awarded for identifying that the area of rectangle C is represented by $4(4 – n)$.

A second M1 is awarded for equating this to the area of rectangle B, or A, forming the equation $2n = 4(4 – n)$. The candidate has begun to simplify this to $6n = 16$. However, a division calculation is not seen and an incorrect answer of 2.5 is given so the last mark is not awarded.

Simplifying further to $n = \frac{16}{6}$ or $\frac{8}{3}$ would have also scored the final mark.

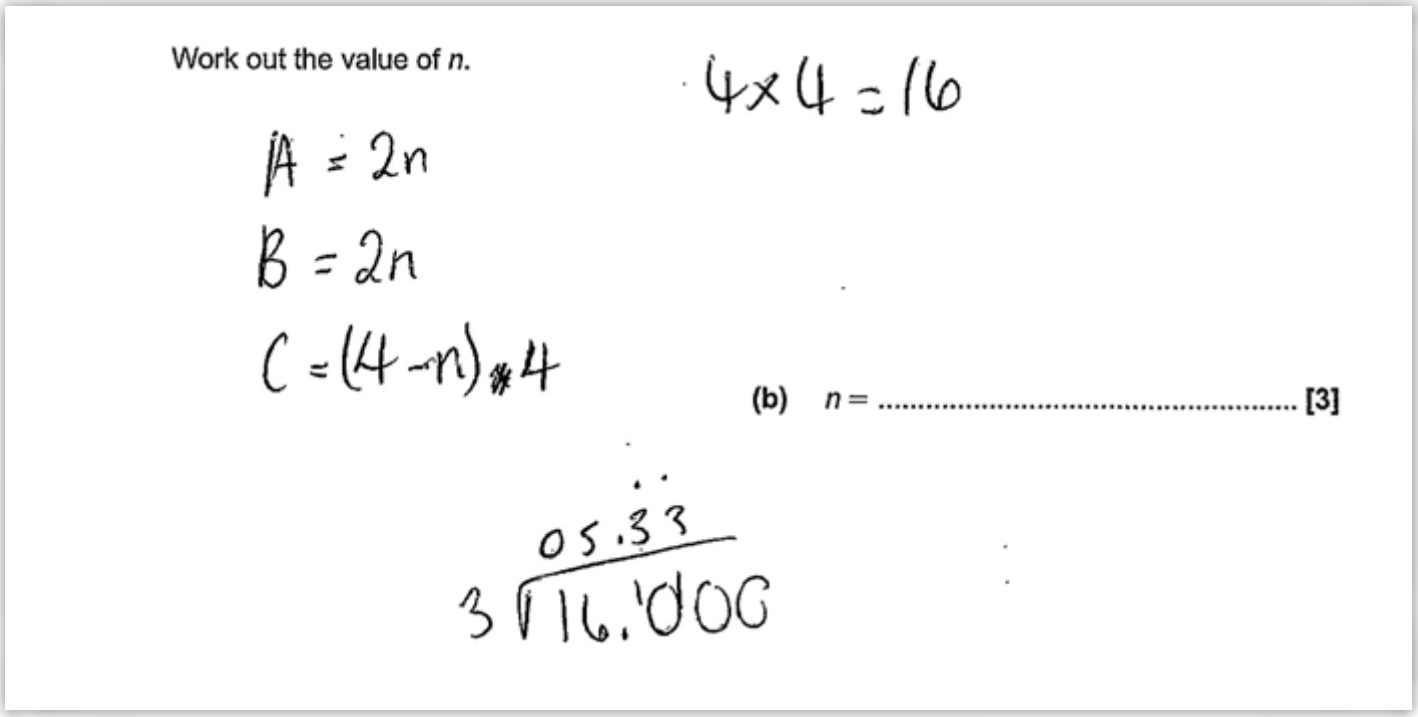
Exemplar 2 – Mark(s): 2



Examiner commentary

Here the question has been attempted without any algebraic expressions being formed. The candidate has shown the square has an area of 4×4. They have also identified that the result of this multiplication needs to be divided by 3 to give the area of one rectangle, at this point M1 is earned. They have not gone far enough with their division and have truncated the answer at 5.3 instead of continuing to at least 3 significant figures. The expression $2n = \frac{16}{3}$ is implied by $\frac{5.3}{2}$ as we can clearly see that 5.3 has come from $16 \div 3$. The second M1 is earned at this stage. The answer of 2.65 is outside of accuracy so the final mark is lost.

Exemplar 3 – Mark(s): 1



Examiner commentary

The candidate has identified the correct algebraic expressions for the areas of rectangles A, B and C. M1 is awarded for C = (4 – *n*)4. Alternatively M1 could have been earned for 16 ÷ 3, identifying that the area of one of the 3 rectangles would be the result of this division.

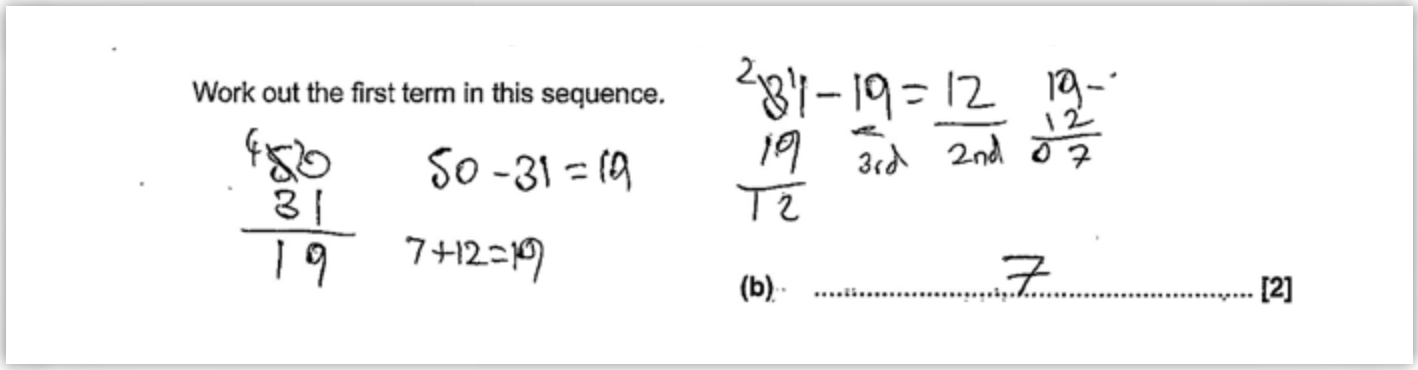
Question 11(b)

(b) In a different Fibonacci sequence the fourth term is 31 and the fifth term is 50.

Work out the first term in this sequence.

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

Mark(s): 2



Examiner commentary

A correct answer of 7 is awarded 2 marks, supported in the working by 19 labelled as the 3rd term and 12 labelled as the 2nd term.

Those not achieving an answer of 7 could attain M1 if the term before 31 was clearly identified as 19. A common error was to just find the difference between 31 and 50 and then repeatedly subtract this difference of 19. In these cases M1 was not awarded as the sequence generated was not a Fibonacci sequence.

Question 11(c)

(c) The second and third terms in the following Fibonacci sequence are x and y.

Write down algebraic expressions for the first, fourth and fifth terms.

..... x y .... [3]

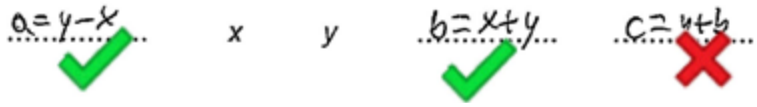
Exemplar 1 – Mark(s): 3

[3]

Examiner commentary

All 3 marks are awarded as all 3 terms are correctly stated. The final term $(x + y) + y$ is a correct equivalent expression to $y + x + y$ or $2y + x$ stated in the mark scheme.

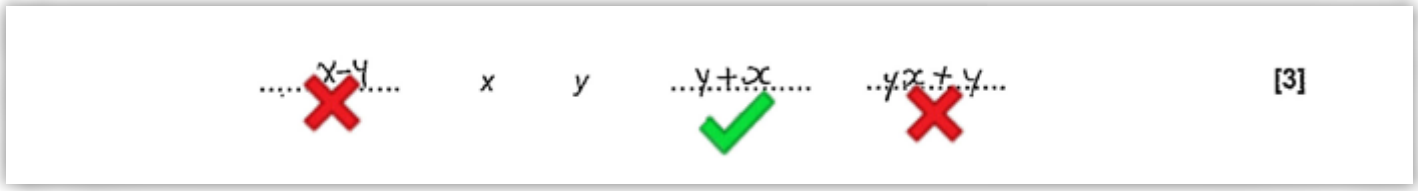
Exemplar 2 – Mark(s): 2



Examiner commentary

Equating their correct expression to a different variable is condoned so $a = y - x$ and $b = x + y$ both score a mark. In the final expression, although $c = y + b$ is a correct statement from their previous 2 terms, this expression is not in terms of x and y so a third mark is not awarded. The candidate should have gone on to substitute $b = x + y$ into the expression $y + b$ to gain the third mark.

Exemplar 3 – Mark(s): 1

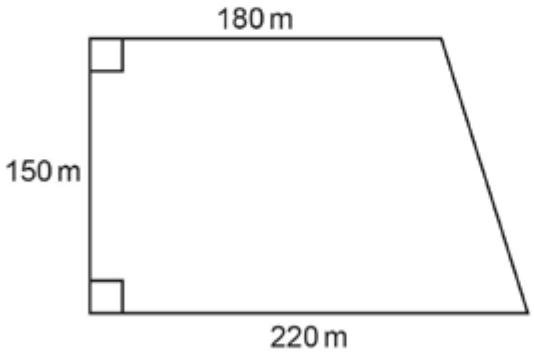


Examiner commentary

The first mark is lost as the subtraction has been performed the wrong way around. The second mark is awarded for a correct fourth term equivalent to $x + y$ and the third mark is lost as $yx + y$ is not equivalent to $y + x + y$.

Question 12(b)

A farmer has a field that is in the shape of a trapezium.
He measures the field so that he can work out the area.
He puts his measurements on this diagram of the field.



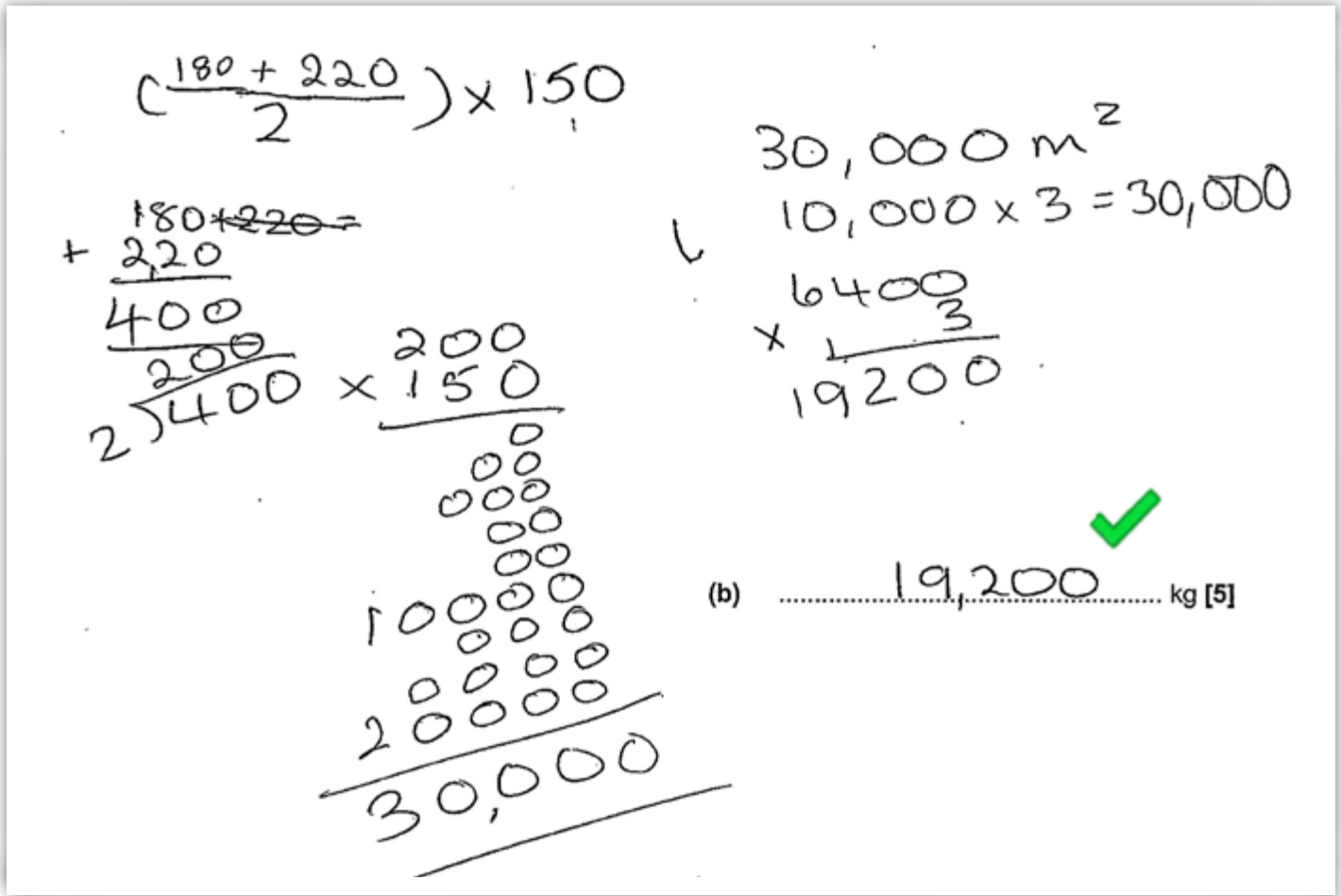
Not to scale

(b) The field produces 6400 kilograms of wheat per hectare.
One hectare is 10000 m^2.

Work out how many kilograms of wheat the field produces.

(b) ..... kg **[5]**

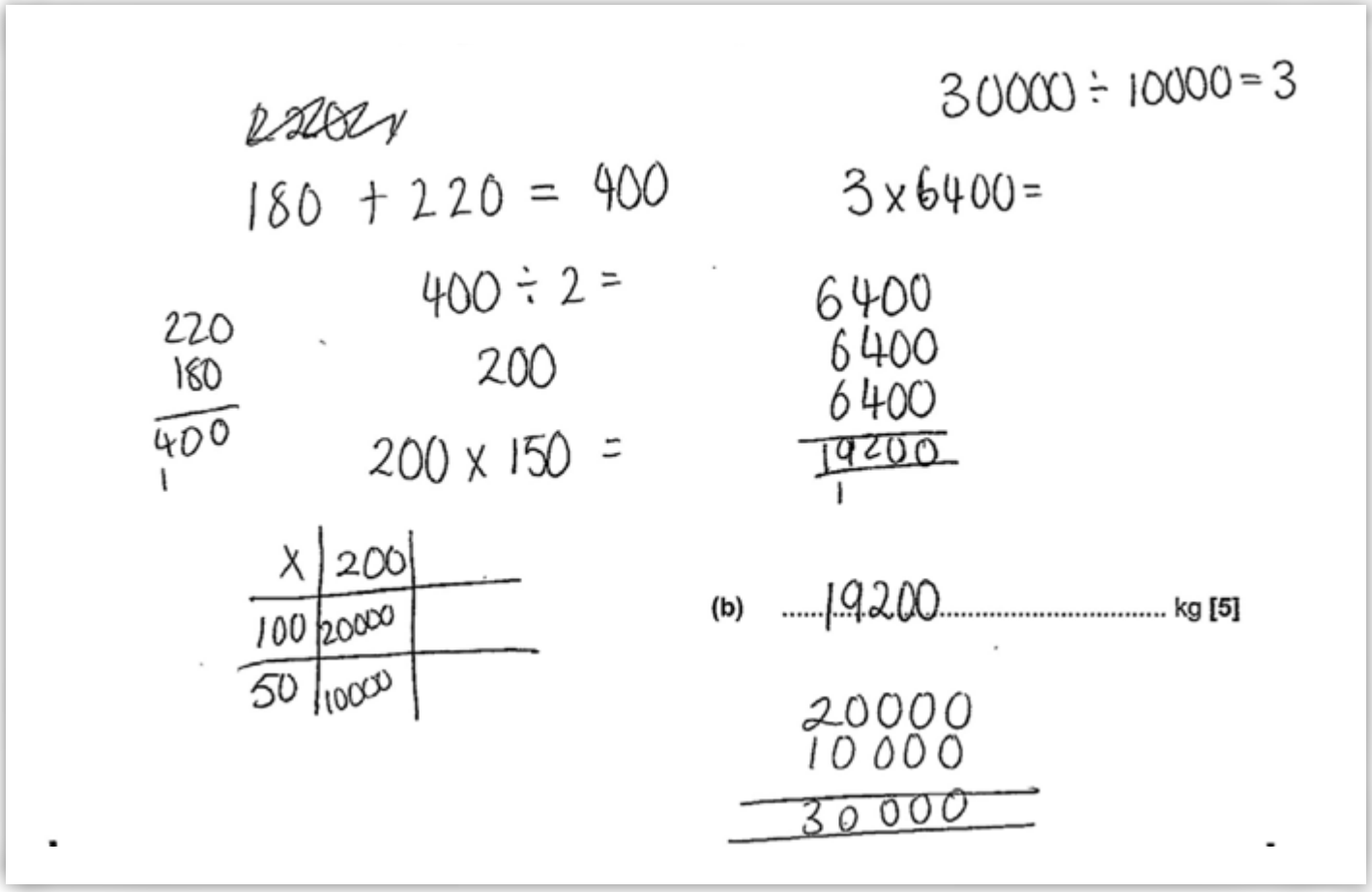
Exemplar 1 – Mark(s): 5



Examiner commentary

The correct answer of 19 200 is awarded the full 5 marks. All steps of working leading to this correct answer are shown. Substitution of values from the diagram into the formula for a trapezium is seen followed by all calculations required to get to the answer of the trapezium area of 30 000m^2. Although seeing their area ÷ 10 000 is preferable, the associated working of 10 000 × 3 = 30 000 is seen. The final step of 6400 × their area in hectares is also written down.

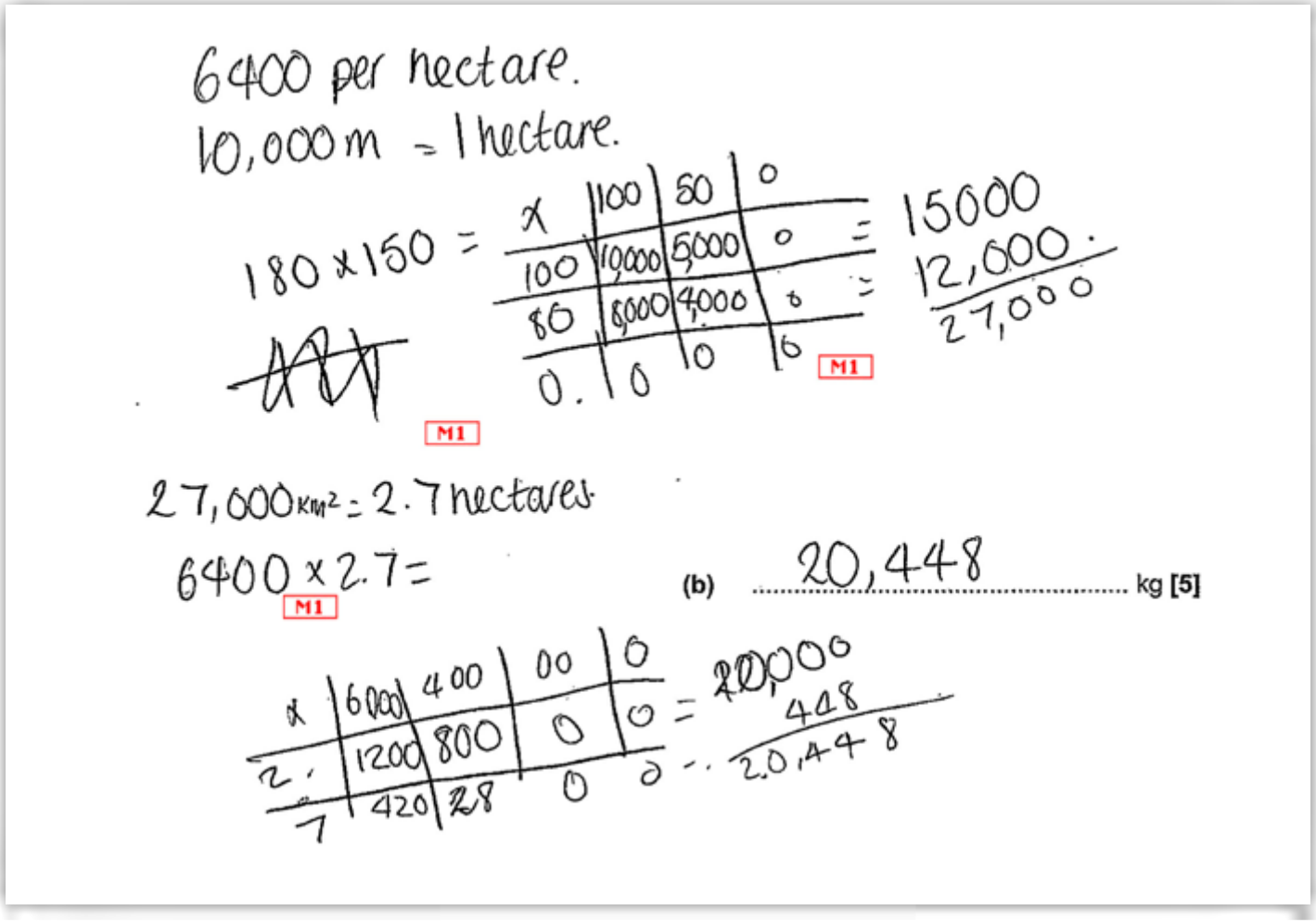
Exemplar 2 – Mark(s): 5



Examiner commentary

This differs to the previous example in that the candidate does not state the numerical form of the formula but all the steps to get to the area of the trapezium are clearly shown. Here the division 30 000 ÷ 10 000 = 3 is seen. Clear calculations lead to the correct answer of 19 200 so again the full 5 marks are gained.

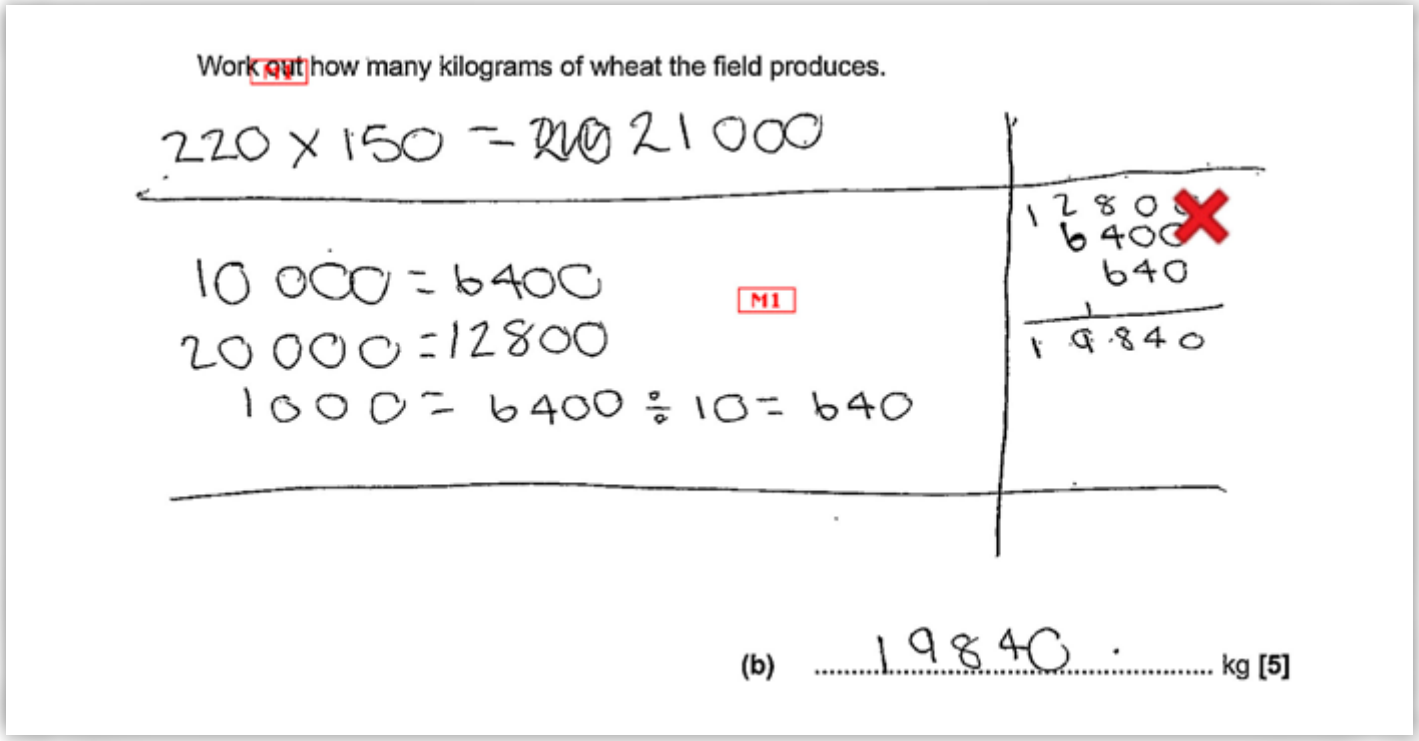
Exemplar 3 – Mark(s): 3



Examiner commentary

The error here is that the formula for area of a trapezium has not been used and just the area of a 180 by 150 rectangle has been found. Therefore just M1 is awarded for attempt at an area rather than M2. Although showing the division step would be clearer, the calculation 6400 × 2.7 following the numerical values in the line above earns the M1 mark for converting area to hectares. Another M mark is awarded for 6400 × their area.

Exemplar 4 – Mark(s): 2

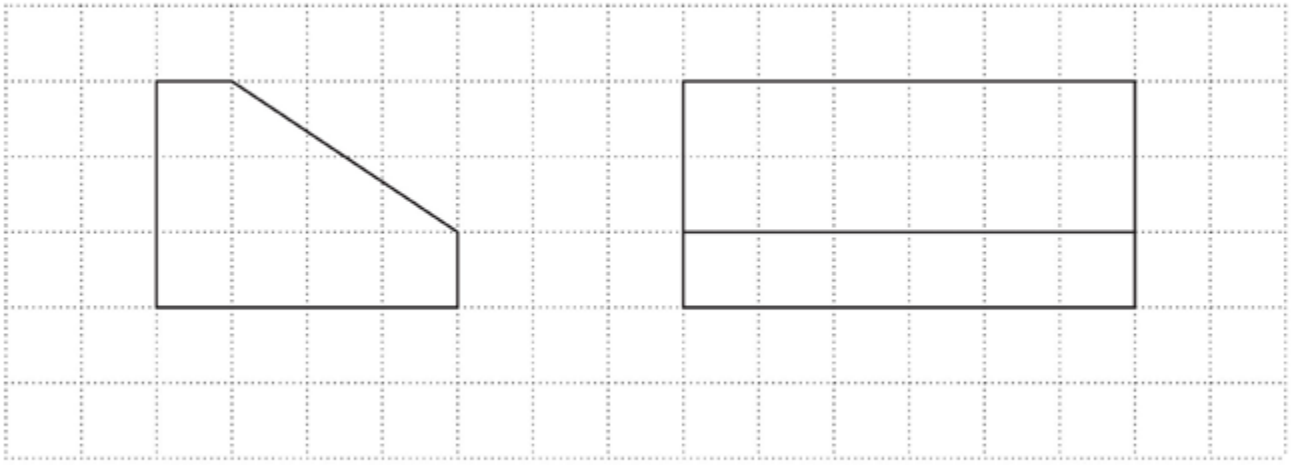


Examiner commentary

Similar to the previous exemplar just the area of a rectangle is found, this time the larger one of 220 by 150. M1 is awarded at this stage for attempt at an area even though it is incorrectly calculated. The candidate earns another M1 for attempting to convert their area to hectares by equating 10 000 to 6 400 then using this to find the number of kilograms needed for 20 000 hectares and 1000 hectares. The final M mark for 6400 × their area cannot be awarded as in their final calculation an extra 6400 has been added. Stating 21 000 ÷ 10 000 then 6400 × 2.1 would have been a clearer and more refined method.

Question 13(a)

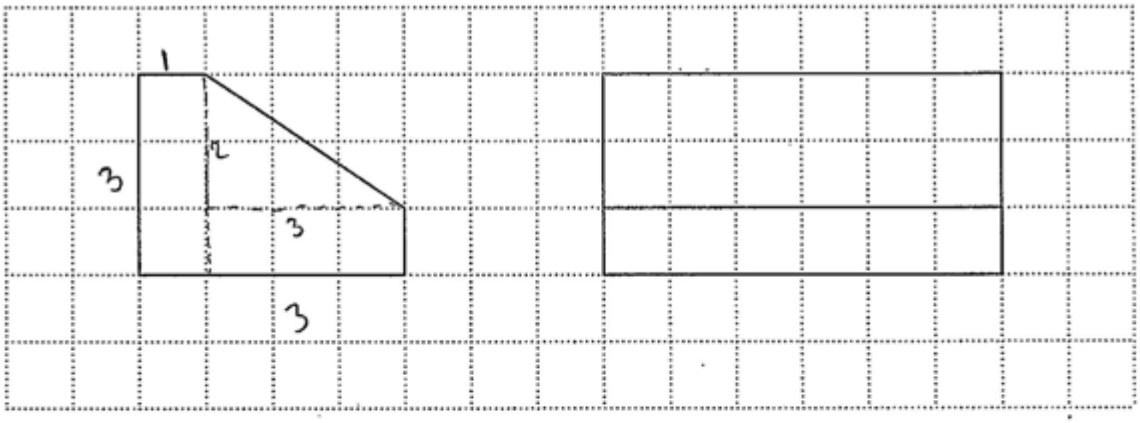
The front and side elevations of a prism, with a pentagon as its cross section, are drawn on this one-centimetre square grid.



(a) Draw accurately the plan of the prism on the grid below.

[2]

Mark(s): 2



(a) Draw accurately the plan of the prism on the grid below.

[2]

Examiner commentary

A 6 cm by 4 cm ruled rectangle with a ruled internal line drawn in the correct place earns this candidate full marks. Use of a ruler shows very clear intention of the dimensions to be marked.

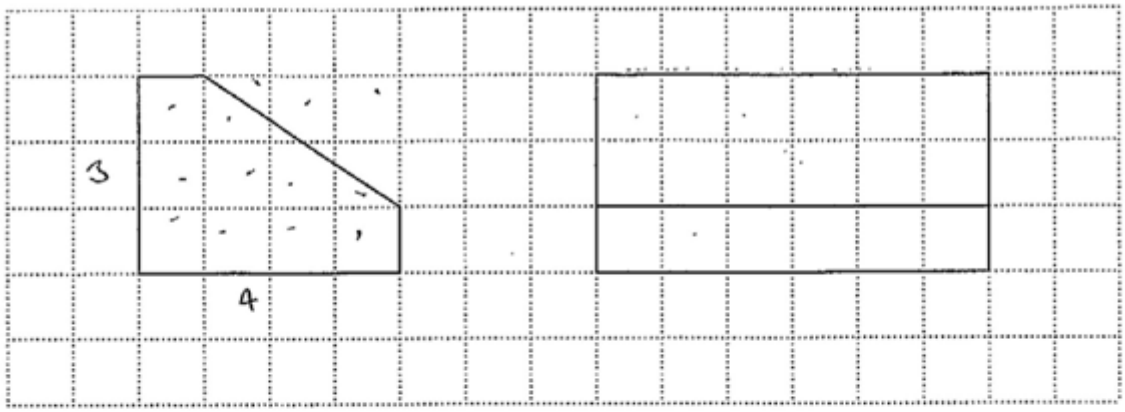
B1 could be scored for a 6 cm by 4 cm rectangle with no internal lines or incorrect internal lines.

Question 13(b)

(b) Calculate the volume of the prism.

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

Exemplar 1 – Mark(s): 3



(b) Calculate the volume of the prism.

9 x 6

area of x-section = 9 cm^2
length/height = 6 cm^2

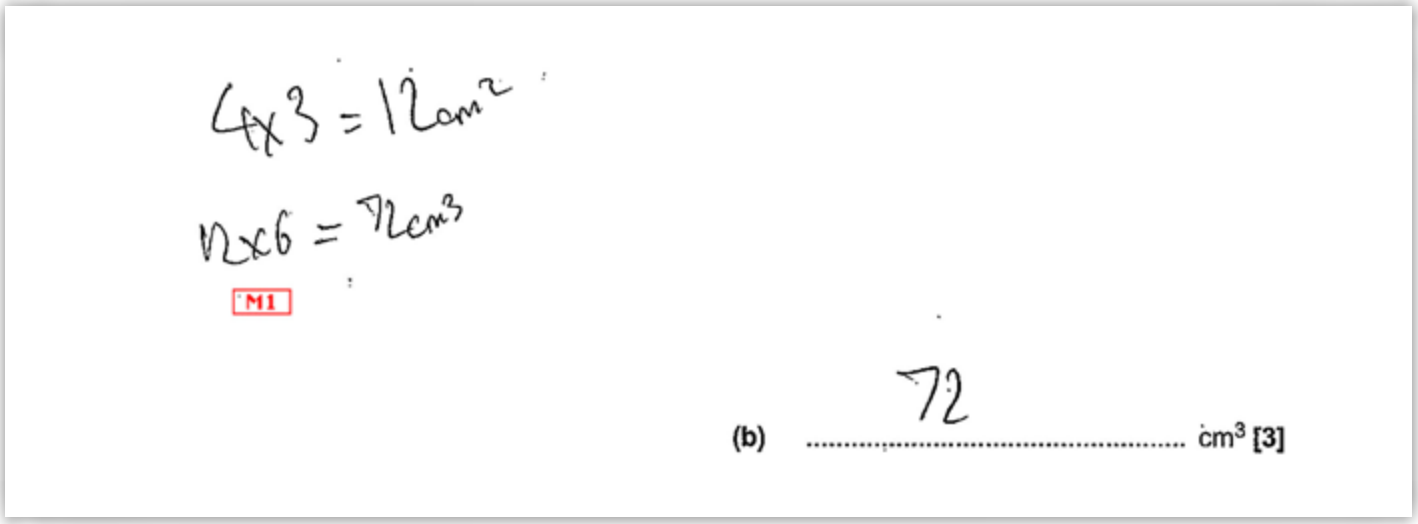
½ x 6 x 9 = 54 x ½

(b) 54 cm^3 **[3]**

Examiner commentary

The correct answer of 54 scores 3 marks, supported by two steps of working. First the candidate finds the area of the cross section to be 9 cm^2. They then multiply 9 by 6, the length of the prism.

Exemplar 2 – Mark(s): 1



Examiner commentary

Here the shape of the cross section has not been considered correctly. Its area has been calculated as though it is a 4 cm by 3 cm rectangle so B1 for an area of 9 cm^2 is not earned. M1 is awarded for this incorrect area multiplied by 6, the length of the prism.

Question 14

Work out $\frac{2}{15} \times \frac{15}{22}$.

Give your answer in its lowest terms.

..... [2]

Mark(s): 2

$\frac{2}{15} \times \frac{15}{22} = \frac{30}{330}$ $\frac{1}{11}$

220 * 110 = 330

~~1~~ $\frac{1}{11}$ ..... [2]

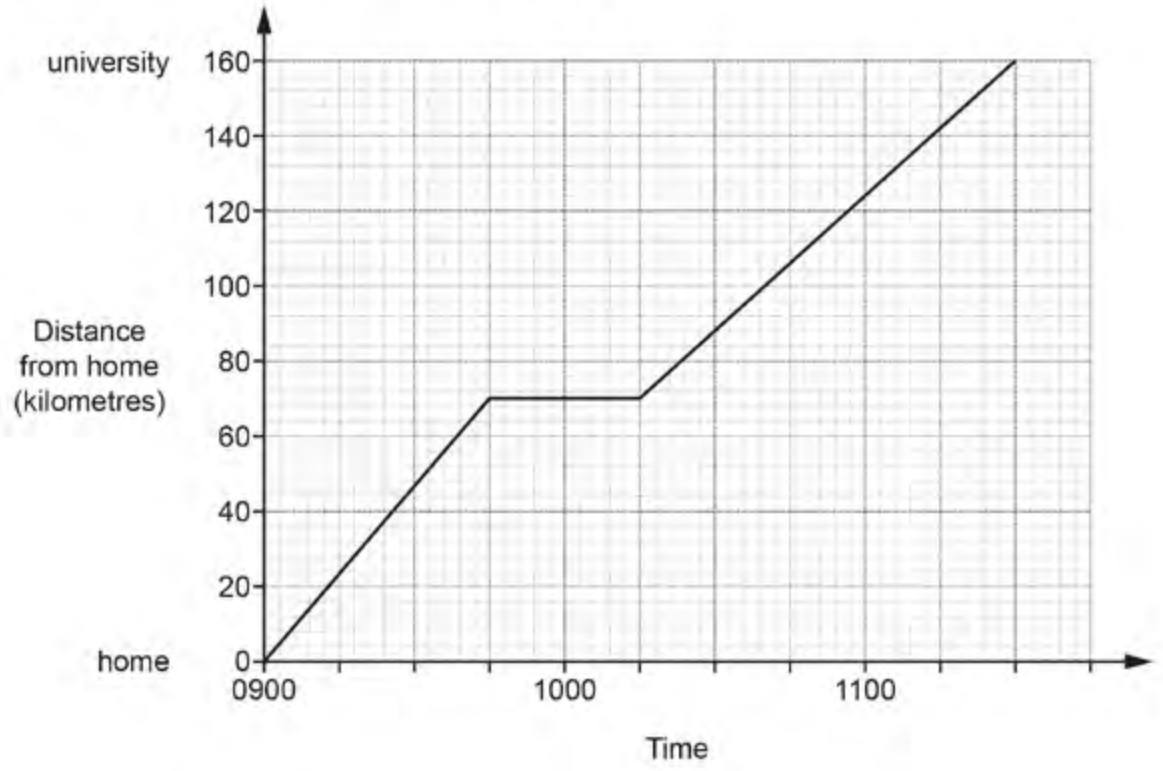
Examiner commentary

The correct final answer of $\frac{1}{11}$ scores 2 marks. The unsimplified fraction $\frac{30}{330}$ is stated in the working.

Few candidates cancelled the fractions before multiplication which would have simplified the arithmetic. Candidates using the correct rule for multiplying fractions usually attained M1 for $\frac{30}{330}$, the final mark being lost if not simplifying this fully or making errors in cancelling.

Question 15

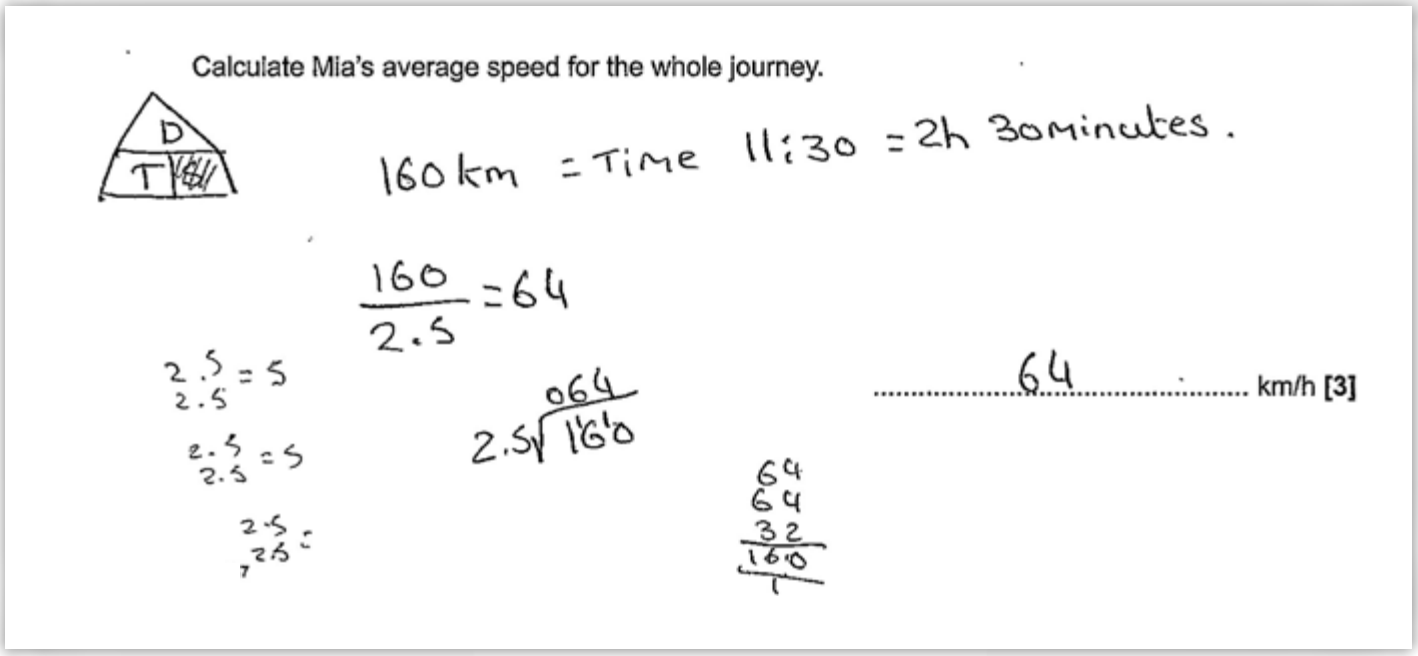
The graph shows Mia's journey from her home to university.



Calculate Mia's average speed for the whole journey.

..... km/h **[3]**

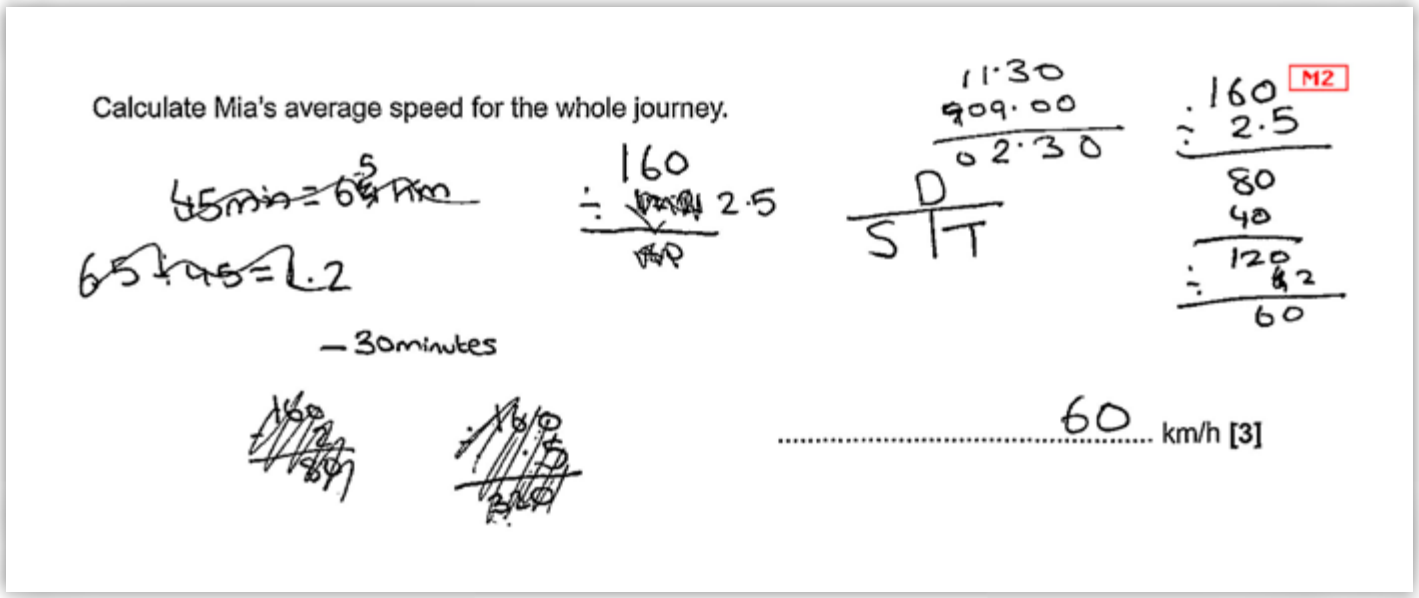
Exemplar 1 –Mark(s): 3



Examiner commentary

Full marks are earned for 64 seen on the answer line. The distance of 160 km and the time of 11:30 are taken from the graph and the time gap of 2 hours 30 minutes is identified. This length of time is changed to 2.5 to enable the calculation of distance divided by time. This is shown in the working as $\frac{160}{2.5}$ and the bus stop method is used to find the correct answer of 64.

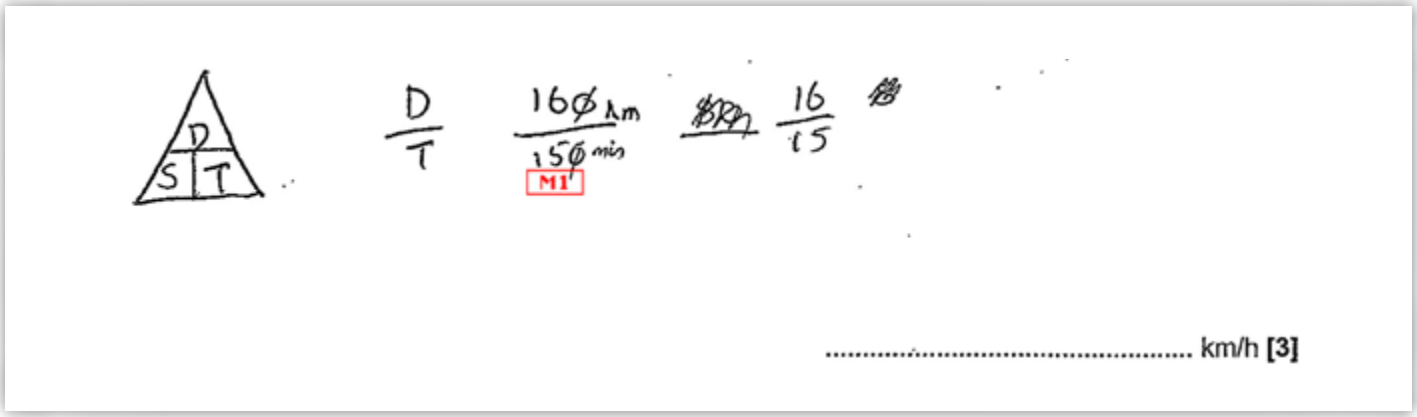
Exemplar 2 –Mark(s): 2



Examiner commentary

In this method the candidate shows how they have got to a time gap of 2.5. 02.30 is not correct notation for a time interval as this would imply a time of 2.30am. However the candidate has gone on to state 160 ÷ 2.5 so M2 is awarded. Their method for division has been unsuccessful so the final mark is lost.

Exemplar 3 –Mark(s): 1



Examiner commentary

In all 3 exemplars the speed/distance/time triangle is in evidence which has enabled candidates to set up a correct division.

In this response the candidate has attempted to find the speed in km/min but the answer space requires the answer in km/h. Therefore M1 is the maximum scored for an attempt at 160 divided by their time interval.

Question 16

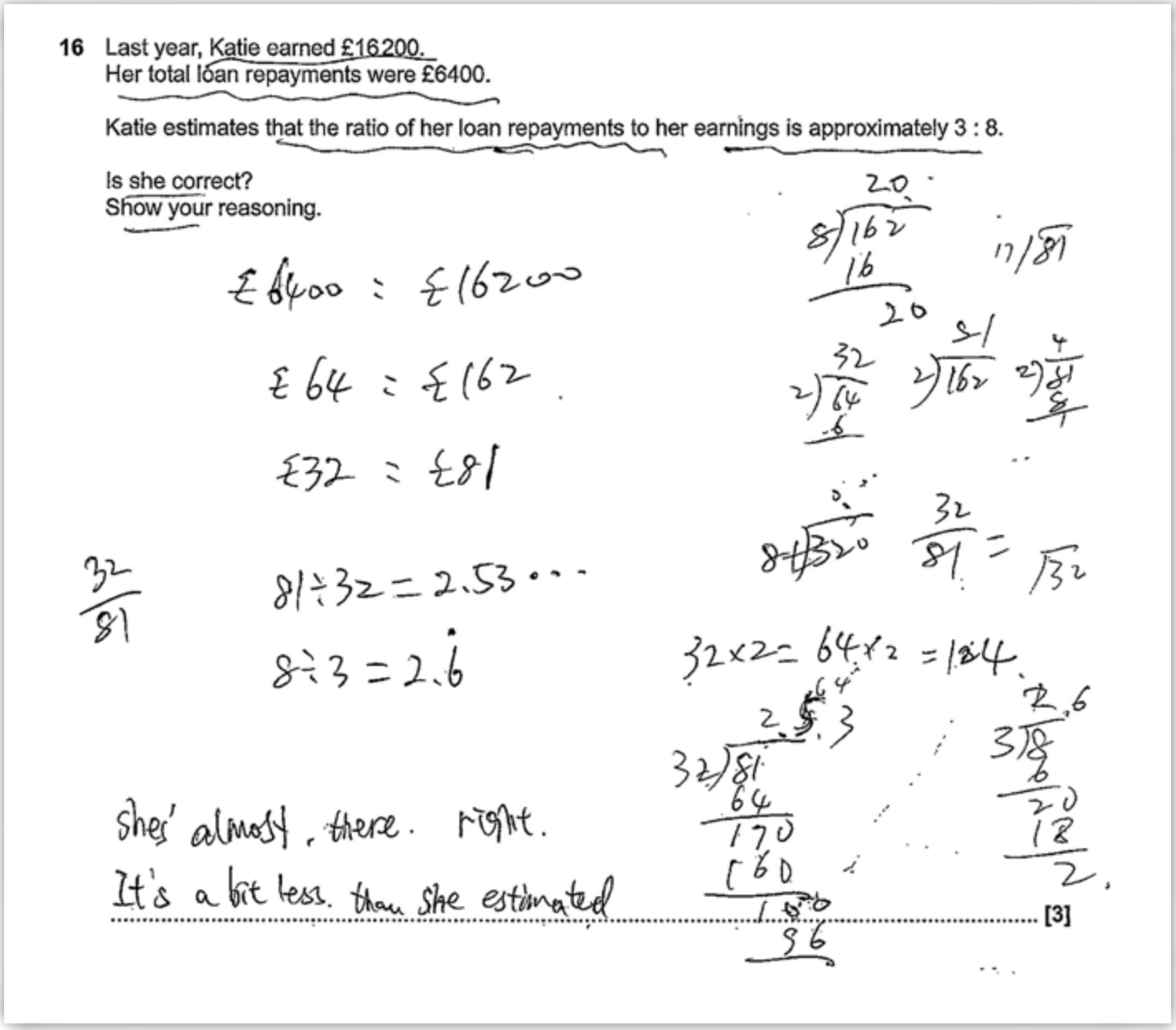
Last year, Katie earned £16 200.
Her total loan repayments were £6400.

Katie estimates that the ratio of her loan repayments to her earnings is approximately 3 : 8.

Is she correct?
Show your reasoning.

..... [3]

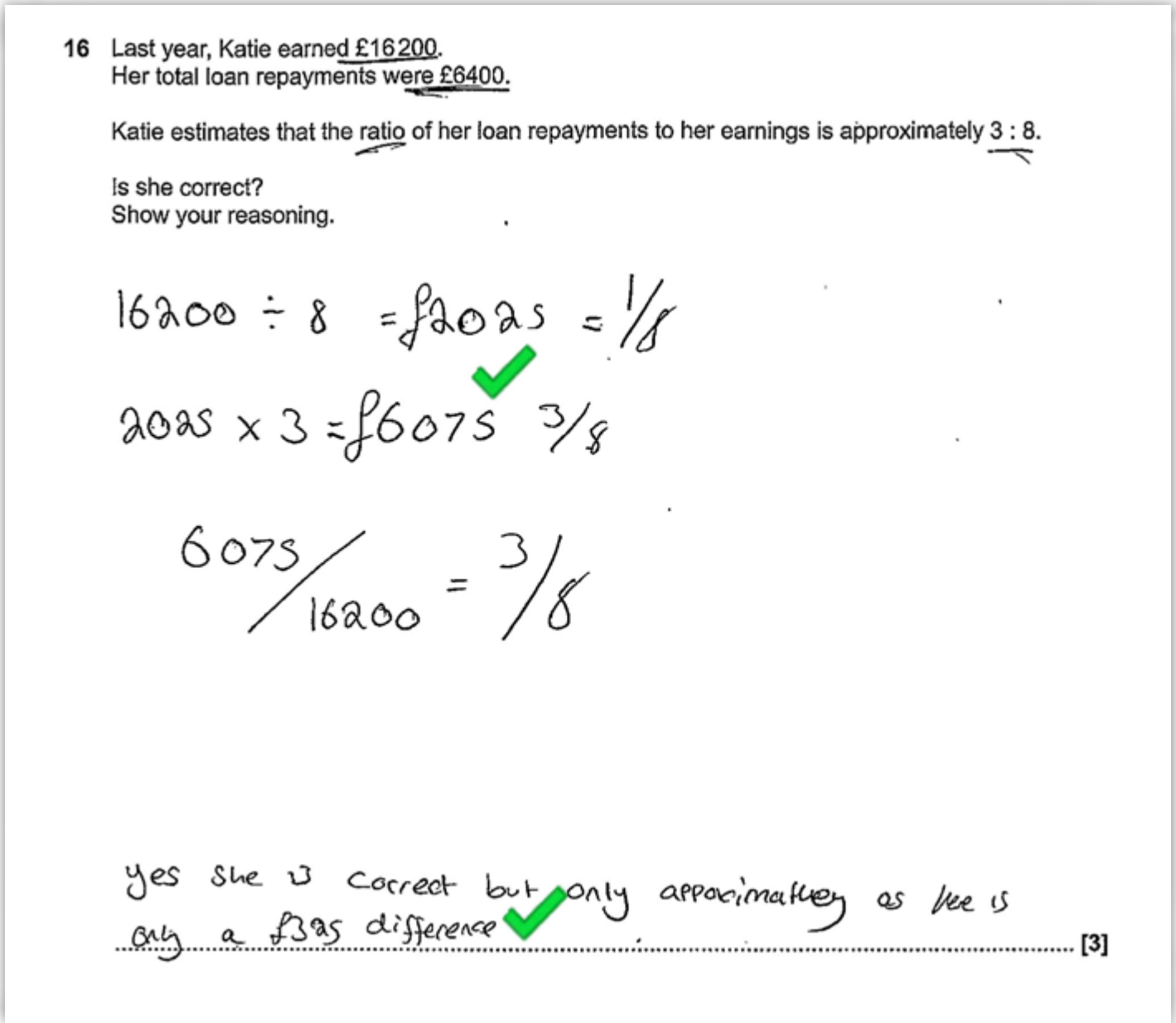
Exemplar 1 –Mark(s): 3



Examiner commentary

3 marks are earned by method B of the mark scheme. 6400 : 16 200 is successfully simplified to 32 : 81. The candidate shows some comparison between 31 : 81 and 3 : 8 by considering the answers to 81 ÷ 31 and 8 ÷ 3. The final statement indicates an idea of approximation and the word 'right' implies Katie is correct. Again with this method, appreciation of the need to estimate would lead this candidate to round to 6000 : 16 000 which would cancel more easily to 3 : 8.

Exemplar 2 –Mark(s): 3



16 Last year, Katie earned £16200.
Her total loan repayments were £6400.

Katie estimates that the ratio of her loan repayments to her earnings is approximately 3 : 8.

Is she correct?
Show your reasoning.

16200 ÷ 8 = £2025 = 1/8

2025 x 3 = £6075 3/8

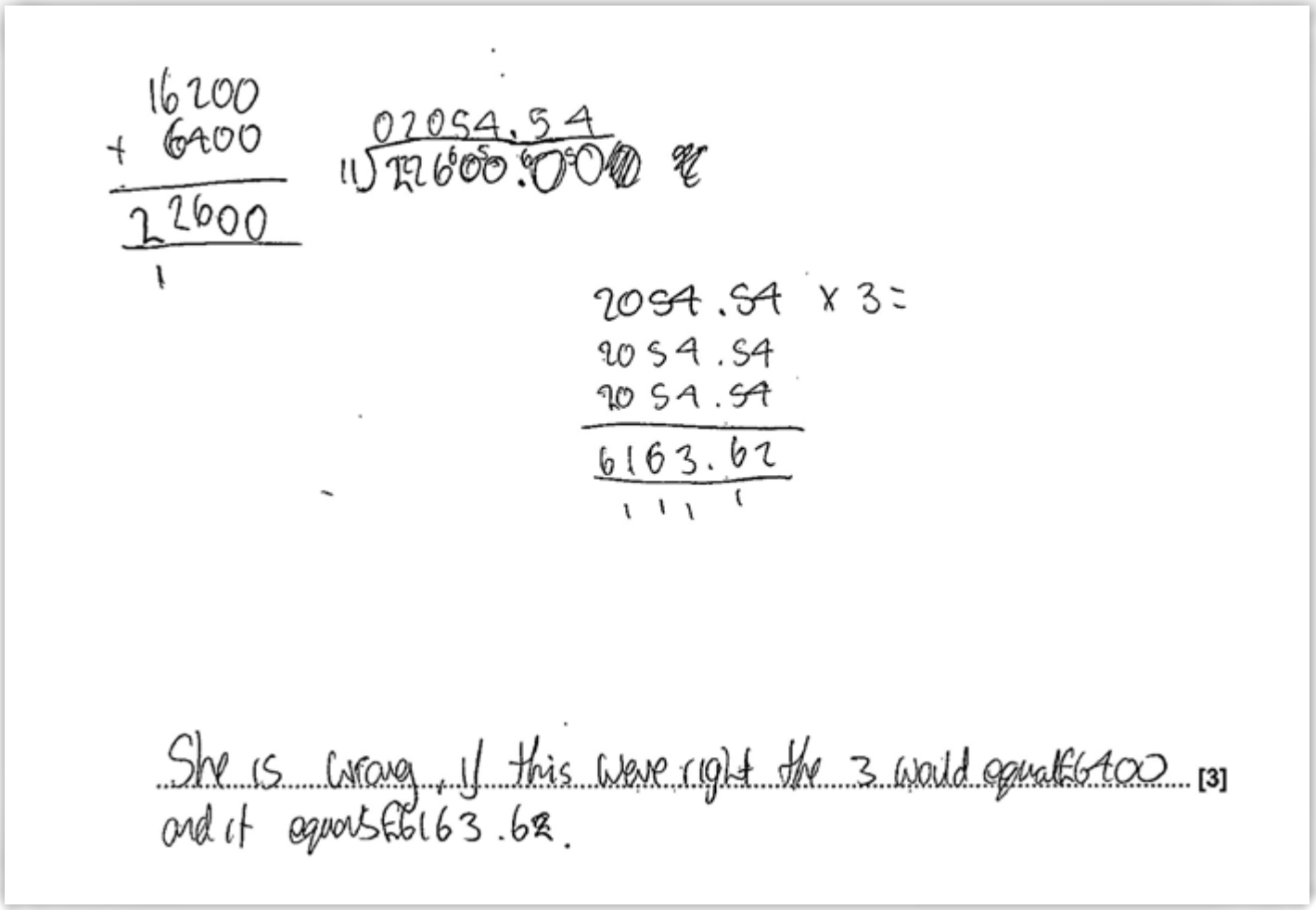
6075/16200 = 3/8

yes she is correct but only approximately as there is only a £325 difference [3]

Examiner commentary

By method C of the markscheme all 3 marks are scored. $\frac{3}{8}$ of 16 200 is correctly evaluated to a value of 6075. Again, the candidate has not considered estimating and so misses the opportunity to use the more straightforward value of 16 000. The final statement has 'yes' stated, a comparison between £6400 and £6075 and reference that approximation is relevant.

Exemplar 3 –Mark(s): 2



Examiner commentary

By method C of the markscheme $\frac{3}{11}$ of (16 200 + 6400) is correctly evaluated to a value between 6163 to 6165 so M2 is awarded. The candidate has not made reference to the part of the question that states 'Katie estimates…' so the numbers in their calculations are too accurate.

$\frac{3}{11}$ of (16 000 + 6000) would come to 6000 and so would lead to a correct conclusion of 'Yes' allowing the third mark to be earned. An added problem with using the numbers given rather than estimated values is that divisions are made more complicated, taking more time to complete.

Question 17(a)

(a) Rearrange the equation to make x the subject.

$$y = 7x - 3$$

(a) $x =$ ..... **[2]**

Mark(s): 2

$y + 3 = 7x$

$\frac{y+3}{7} = x$

(a) $x = \frac{y+3}{7} = x$ **[2]**

Examiner commentary

The correct answer of $\frac{y+3}{7} = x$ scores 2 marks. Supporting working shows a first correct step of $y + 3 = 7x$. As '$x =$' is already printed on the answer line, just stating $\frac{y+3}{7}$ also scores 2.

Candidates not scoring full marks could attain M1 for a 1st correct step. This could be either $y + 3 = 7x$ or $\frac{y}{7} = x - \frac{3}{7}$.
Or, after an error made in their first step, M1 may come from a correct follow through completion to answer, i.e. $\frac{y-3}{7}$ written on the answer line following $y - 3 = 7x$.

Question 17(b)(ii)

(b) Factorise.

(ii) $x^2 + 8x + 12$

(ii) ..... [2]

Mark(s): 2

(ii) $x^2 + 8x + 12$

$(x+6)(x+2)$

Times
End
Add
middle

$6 \times 2 = 12$
$6 + 2 = 8$

(ii) $(x+6)(x+2)$ [2]

Examiner commentary

Correct factorisation of the given quadratic to $(x + 6)(x + 2)$ earns 2 marks. From the general form of $(x + a)(x + b)$ this candidate has shown that they need to multiply, $a \times b$, to achieve the numeric term and add, $a + b$, to achieve the x term.

A partially successful attempt to factorise scored M1 if in $(x + a)(x + b)$, $ab = \pm 12$ or $a + b = \pm 8$, or a preliminary factorisation of $x(x + 6) + 2(x + 6)$ or $x(x + 2) + 6(x + 2)$ was seen.

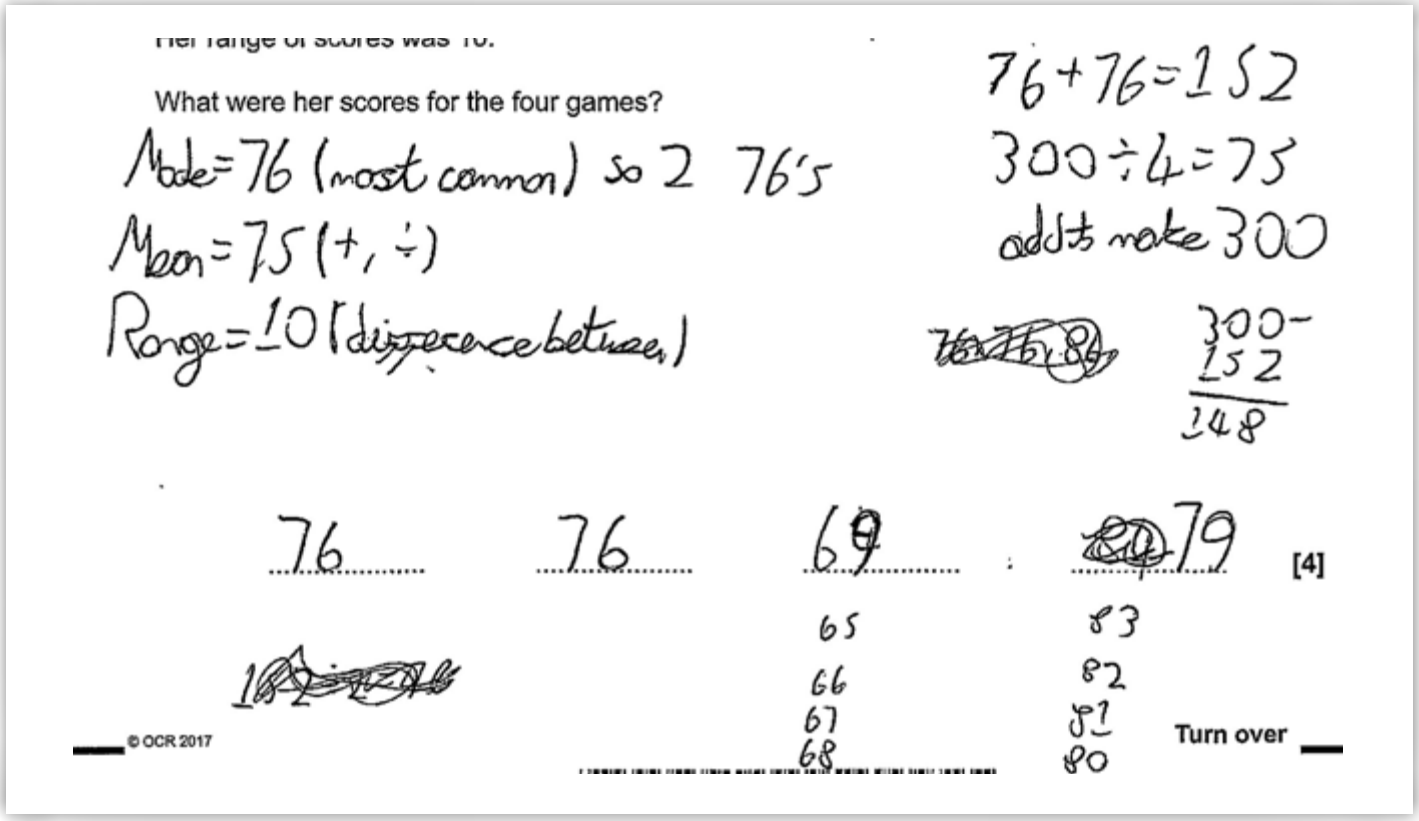
Question 18

Jenny played four games of golf.
For these games her modal score was 76 and her mean score was 75.
Her range of scores was 10.

What were her scores for the four games?

.... [4]

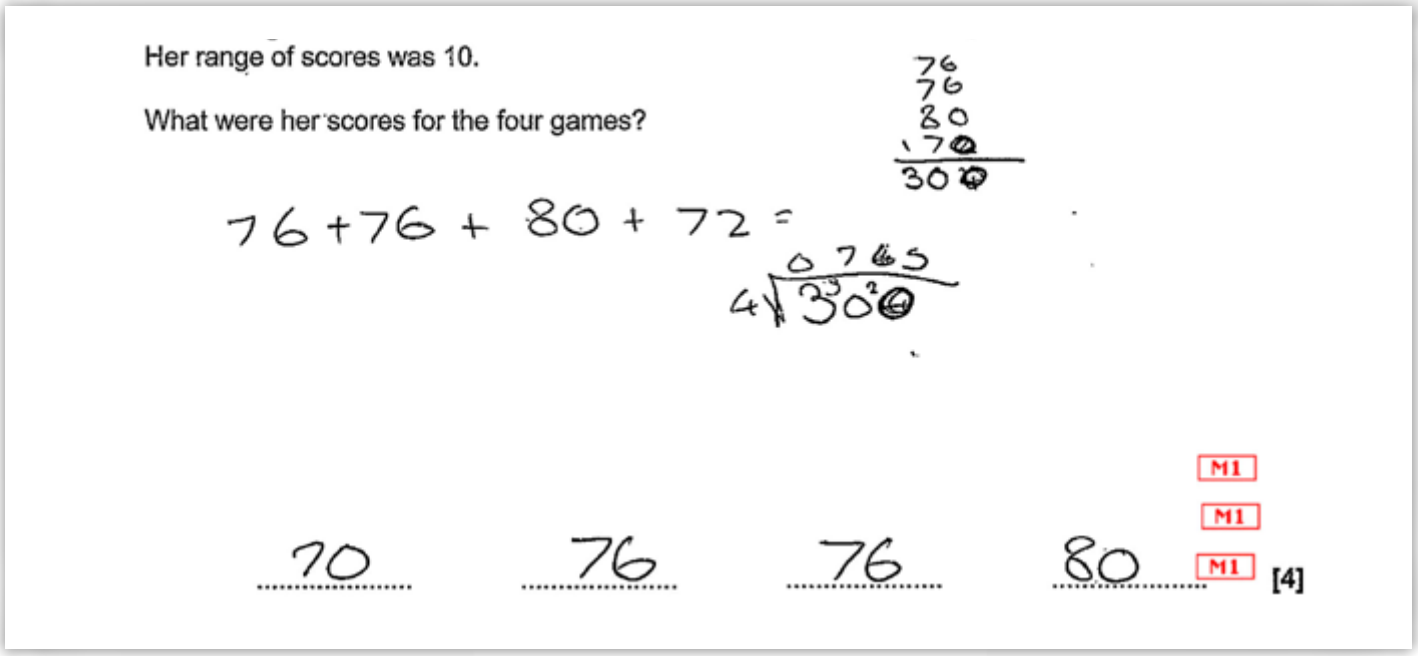
Exemplar 1 – Mark(s): 4



Examiner commentary

4 marks are awarded for the 4 correct scores of 69, 76, 76, 79 stated in any order. Supporting work shows the candidate has recognised that the 4 scores should add to make 300 and at least 2 numbers must be 76 for this to be the mode. Subtracting 76 × 2 from 300 gives them a total of 148 and they have used trials to find the other 2 values so that all 4 values have a range of 10.

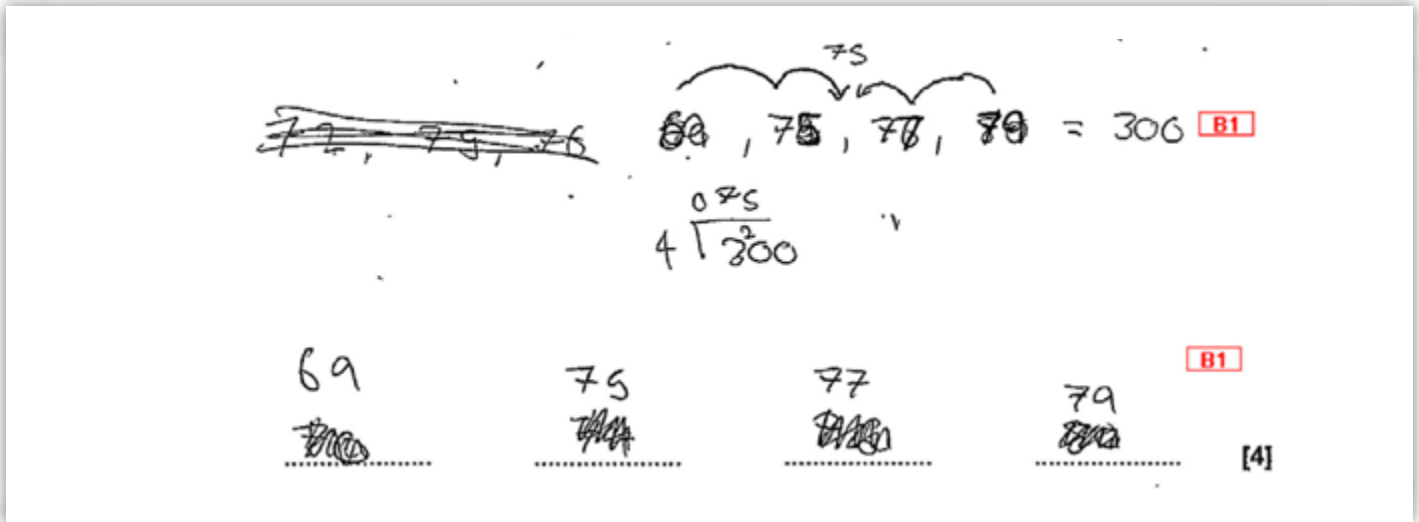
Exemplar 2 – Mark(s): 3



Examiner commentary

This candidate scores B3 for 4 values with a mode of 76 and a range of 10. Although they have correctly implied in the workspace that the 4 values should sum to 300, they have not been able to achieve this total from their final 4 values so the fourth mark is lost. Trialling more pairs of numbers that add to 300 – (76 × 2) would enable them to work towards the correct solution.

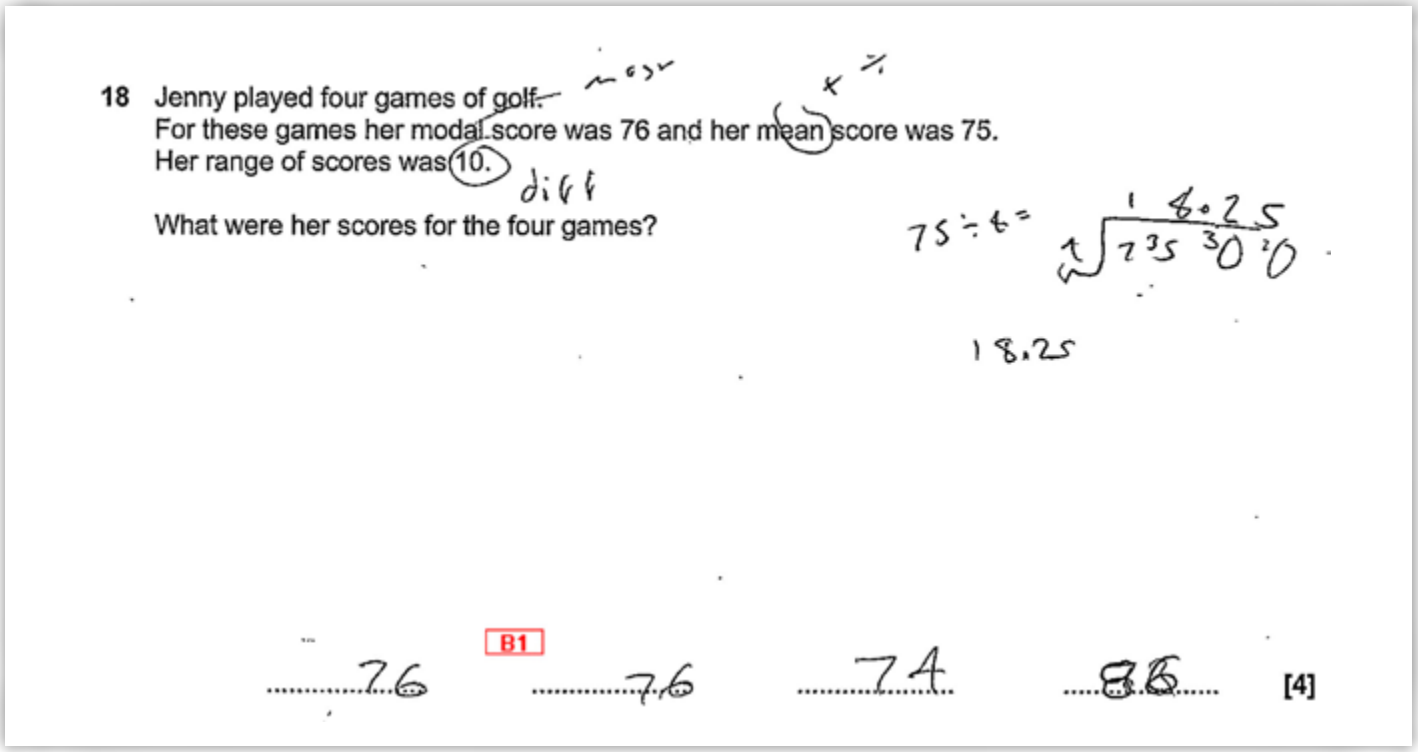
Exemplar 3 – Mark(s): 2



Examiner commentary

This candidate scores B1 for the sum of the 4 values is 300, implied in the workspace by either seeing 4 values = 300 or by the division 300 ÷ 4 seen. Another B1 is scored for a range of 10 for their given values on the answer line. However no more marks are awarded as there is no mode for their 4 values. Identifying 76 as the mode would be a better starting point to build up to 4 values adding to 300.

Exemplar 4 – Mark(s): 1



18 Jenny played four games of golf.
For these games her modal score was 76 and her mean score was 75.
Her range of scores was 10.
What were her scores for the four games?

75 ÷ 4 = 18.25

B1

76 76 74 86 [4]

Examiner commentary

Here 75 has been divided by 4 rather than multiplied so the total of 300 required for the 4 values has not been achieved. B1 is scored for a mode of 76 for their final 4 values. There is evidence that the range of 10 may have been considered as 76 and 86 are part of the final answer, however the value of 74 changes this aspect and so no further marks are awarded.

Question 19(a)

The population of a village is in the following ratios.

- men : children = 11 : 3
- women : children = 5 : 2

(a) Find the ratio men : women.
Give your answer in its simplest form.

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

Mark(s): 2

- men : children = 11 : 3
- women : children = 5 : 2

Men : Women = 22 : 15

(a) Find the ratio men : women.
Give your answer in its simplest form.

×2 (11 men : 3 children) ×2
22 men : 6 children

×3 (5 women : 2 children) ×3
15 women : 6 children

(a) 22 : 15 **[2]**

Examiner commentary

22 : 15 scores 2 marks, supported by the working of 2 correct ratios with a common number of children seen, 22 : 6 for the ratio of men to children and 15 : 6 for the ratio of women to children.

If these 2 ratios were not combined to give a correct final answer then M1 would be awarded for seeing both of them. M1 could also be gained for an unsimplified answer of a ratio equivalent to 22 : 15, such as 11 : 7.5.

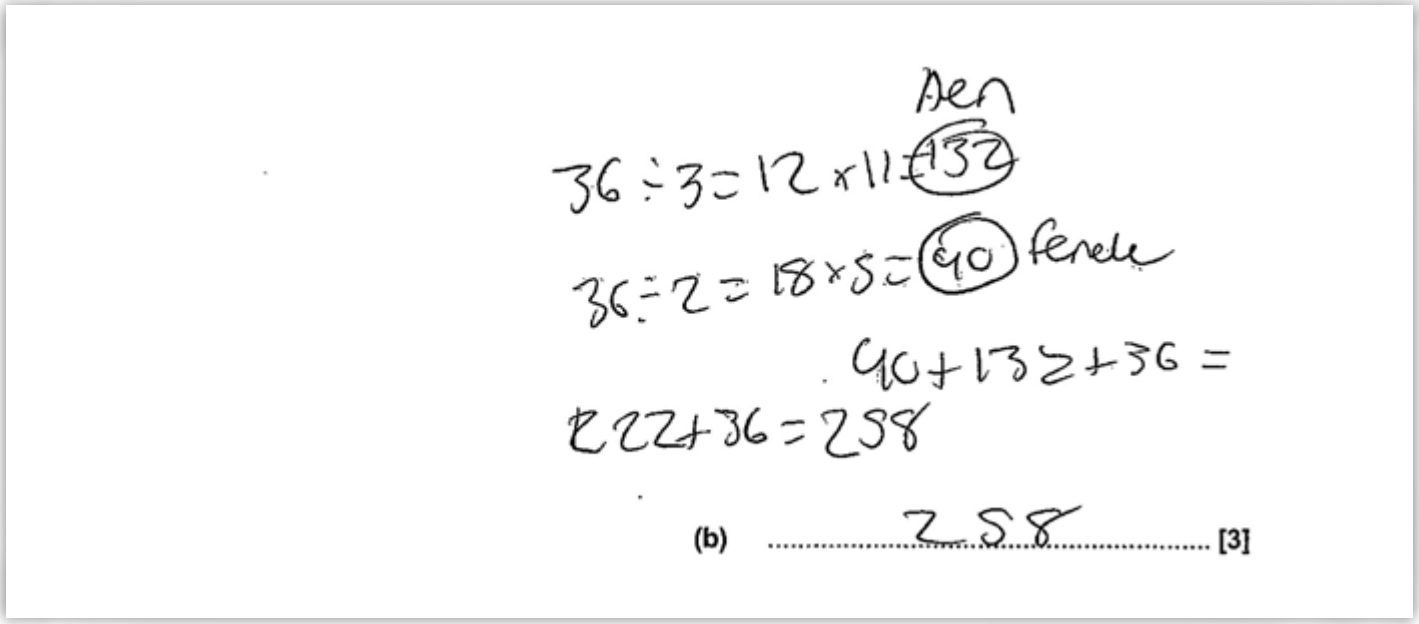
Question 19(b)

(b) There are 36 children in the village.

Find the total population of the village.

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

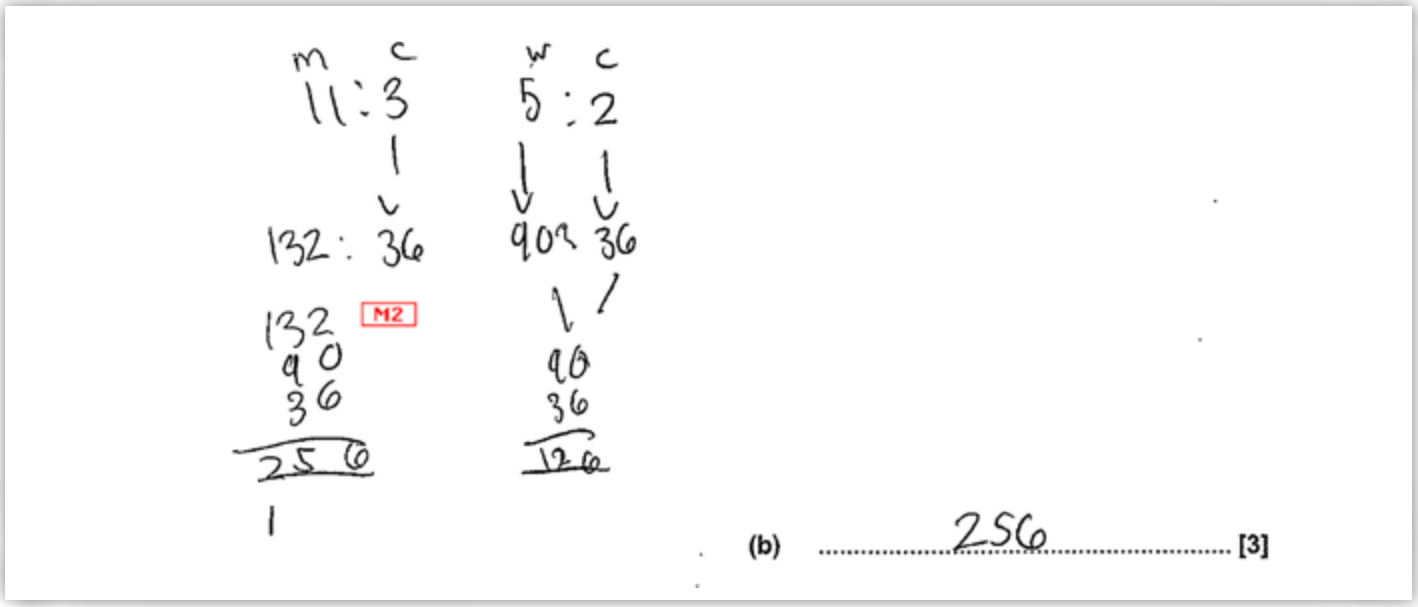
Exemplar 1 – Mark(s): 3



Examiner commentary

An answer of 258 scores 3 marks, supported by the method of $\frac{36}{3} \times 11$ to find the number of men and $\frac{36}{2} \times 5$ to find the number of women. The total of men, women and children are then added together, 132 + 90 + 36.

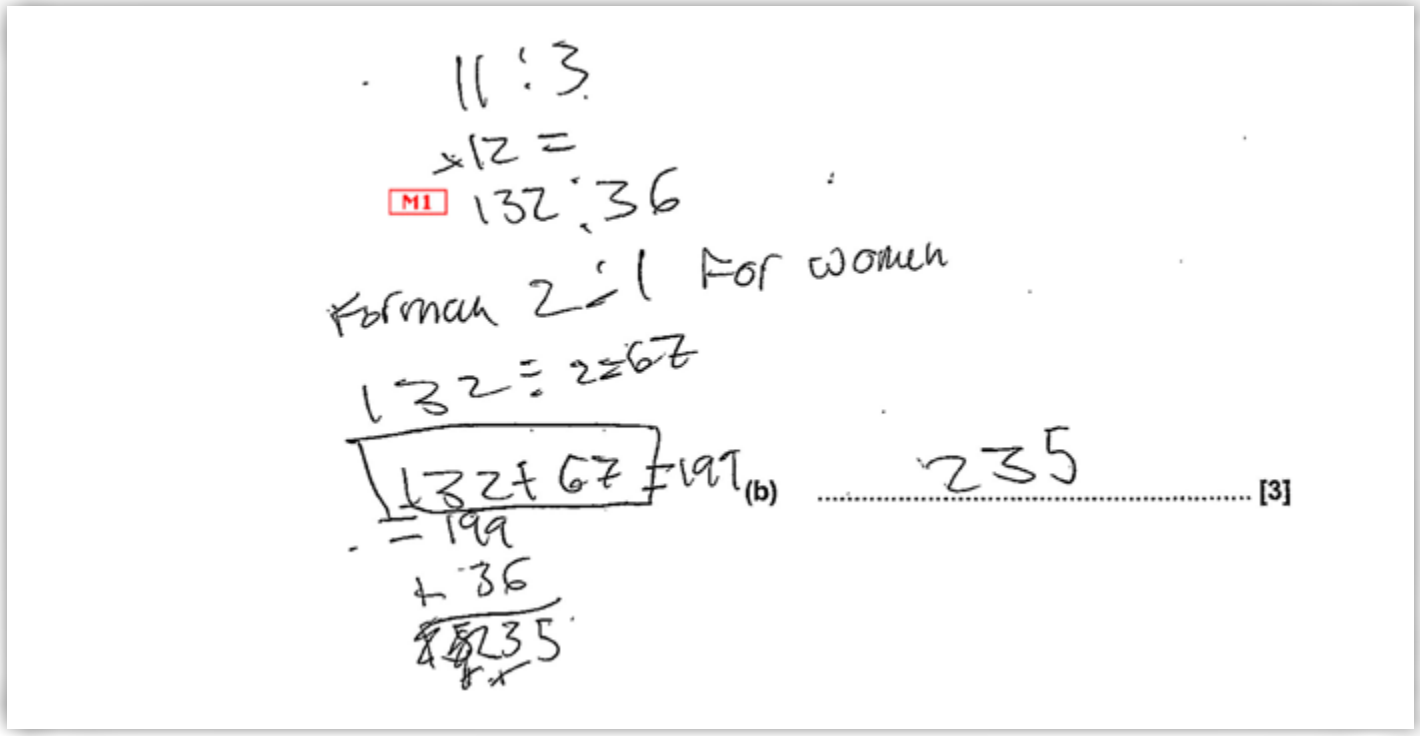
Exemplar 2 – Mark(s): 2



Examiner commentary

This candidate uses equivalent ratios to find the number of men and women when there are 36 children. They correctly find the values of 132 for men and 90 for women, and go on to add these 2 values (as well as 36) which scores M2. There is an error in their addition leading to an incorrect answer of 256 and so the final mark is withheld.

Exemplar 3 – Mark(s): 1



Examiner commentary

M1 is scored for the method to find 132 for the number of men from the equivalent ratio to 11 : 3 of 132 : 36. The ratio for women to children has not been considered. The method leading to the value of 67 for the number of women is incorrect and so no further marks are earned. Using a similar technique with the women to children ratio of 5 : 2 as they had used for men to children would have lead to a correct value of number of women.

Question 20

George is the manager of a shoe shop.
He samples 50 of his customers and asks them about the **one** style of shoe they would buy next.
The table shows his results.

Style of shoe	Number of customers
Laced shoes	18
Boots	15
Sandals	8
Trainers	5
Other	4

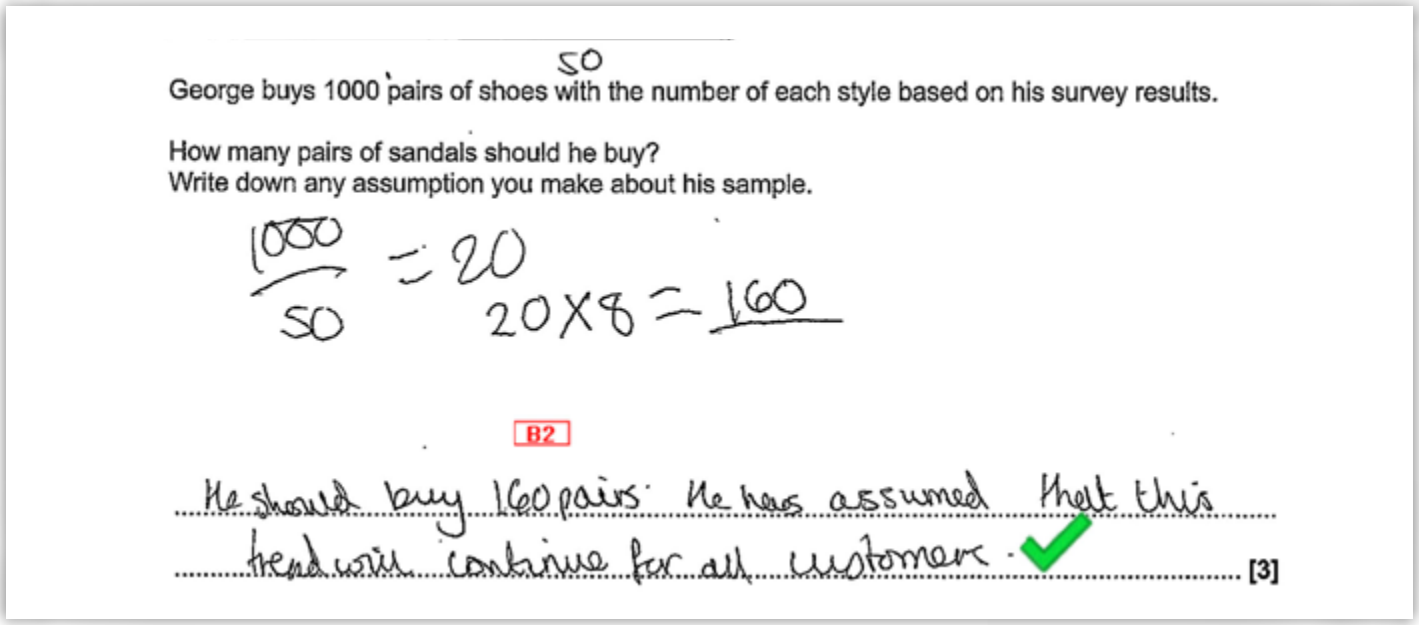
George buys 1000 pairs of shoes with the number of each style based on his survey results.

How many pairs of sandals should he buy?
Write down any assumption you make about his sample.

.....

..... [3]

Exemplar 1 – Mark(s): 3



Examiner commentary

3 marks are awarded for this response. 160 is correct, supported by a method equivalent to $\frac{8}{50} \times 1000$. This method to find 160 is seen in 2 steps, $\frac{1000}{50} = 20$ then $20 \times 8 = 160$.

The words 'assumed that this trend will continue for all customers' implies that the 1000 results are a representative sample so this is a scoring statement.

Exemplar 2 – Mark(s): 2

George buys 1000 pairs of shoes with the number of each style based on his survey results.

How many pairs of sandals should he buy?
Write down any assumption you make about his sample.

18 : 15 : 8 : 5 : 2C

8 × 2C = 16C

5C = 1000

1C = 200

16C = 3200

B2

He buys 160 pairs

I assumed his survey was not estimated [3]

Examiner commentary

160 scores B2 supported by a 2 step method equivalent to $\frac{8}{50} \times 1000$. The statement 'assumed his survey was not estimated' does not refer to the sample or that it is representative so this does not score a mark.

Exemplar 3 – Mark(s): 1

How many pairs of sandals should he buy?
Write down any assumption you make about his sample.

1000 ÷ 8 =

1000 × 4 = 4000

$\frac{8}{50} \times 1000$

M1

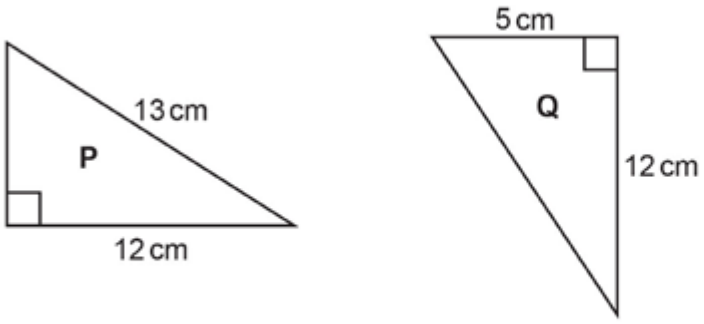
..... [3]

Examiner commentary

This candidate has only shown the correct method of $\frac{8}{50} \times 1000$ required to find the number of pairs of sandals, so just M1 is awarded. To score further marks they should calculate the value of 160 and provide a statement giving evidence of what assumptions they have made about the sample.

Question 21(a)

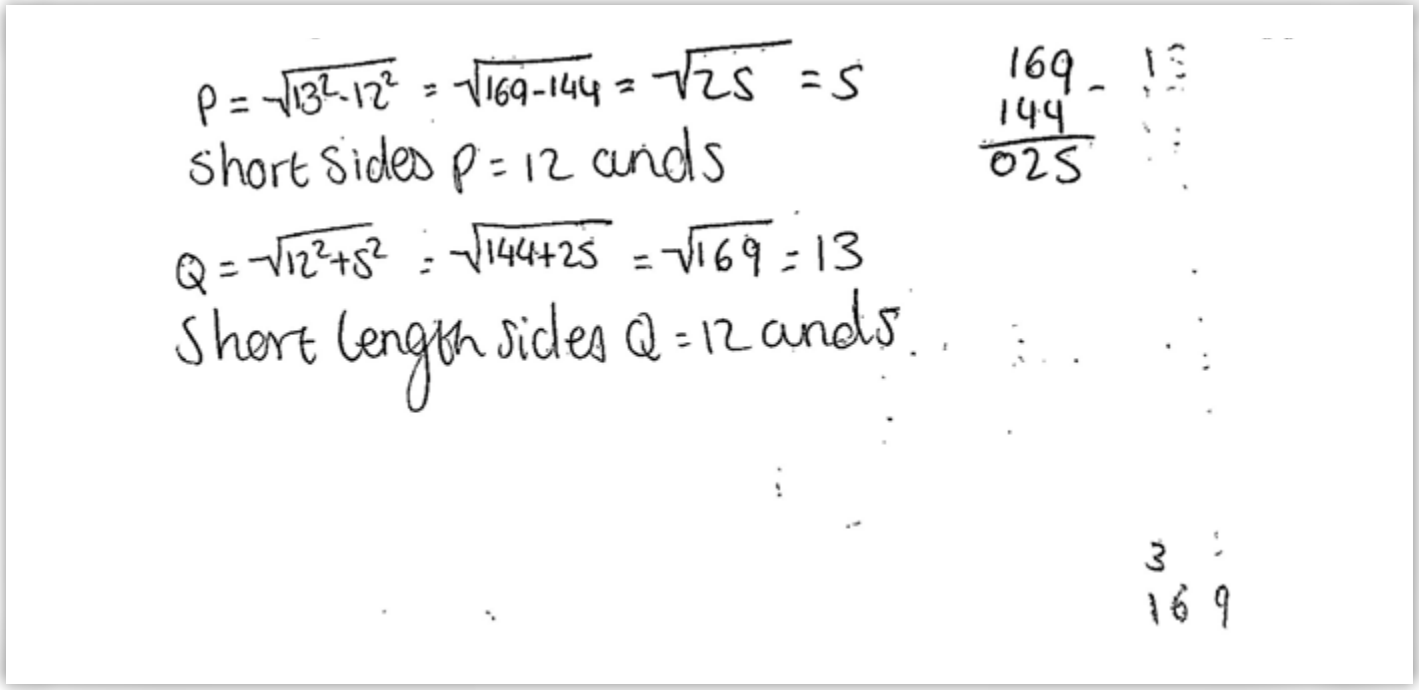
Triangles **P** and **Q** are right-angled.



Not to scale

(a) Show that the two shorter sides in triangle **P** have the same lengths as the two shorter sides in triangle **Q**. **[3]**

Exemplar 1 – Mark(s): 3

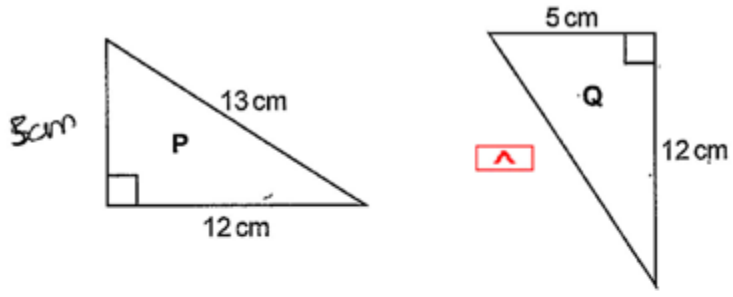


Examiner commentary

M1 is scored for $13^2 - 12^2$ and a further M1 for seeing this expression within the square root, $\sqrt{13^2 - 12^2}$. A1 is also awarded for showing that the two shortest sides in both triangles are 5 [cm] and 12 [cm]. This is seen in the statements 'short sides P = 12 and 5' and 'short length sides Q = 12 and 5'.

Alternatively the 2 method marks could have been awarded for $\sqrt{5^2 + 12^2}$.

Exemplar 2 – Mark(s): 2



(a) Show that the two shorter sides in triangle **P** have the same lengths as the two shorter sides in triangle **Q**. **[3]**

169 144

M1 $13^2 - 12^2 = 25$

$\sqrt{25} = 5$ cm

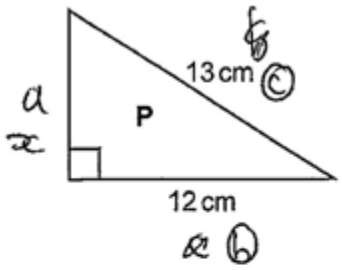
M1

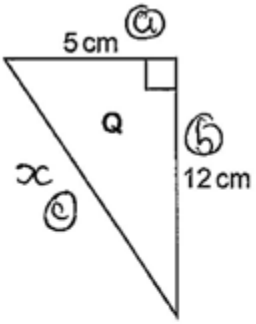
169
144
025

Examiner commentary

M1 is scored for $13^2 - 12^2$ and a further M1 is given for $\sqrt{13^2 - 12^2}$ implied by $\sqrt{25}$. Here the A1 is not awarded as although the 5 cm side is clearly labelled on triangle P, 13 [cm] has not been labelled on triangle Q.

Exemplar 3 – Mark(s): 1





Not to scale

(a) Show that the two shorter sides in triangle **P** have the same lengths as the two shorter sides in triangle **Q**. **[3]**

P = $a^2 + b^2 = c^2$
$x^2 + 12^2 = 13^2$
$x^2 + \ldots 144 +$

Q = $a^2 + b^2 = c^2$
M1 $5^2 + 12^2 = x^2$
$25 + 144 = x^2$
$x^2 = 169$

025
144
169

Examiner commentary

This candidate began with triangle P but got stuck at the stage of rearranging $x^2 + 12^2 = 13^2$. However, M1 is scored for $5^2 + 12^2$ and the candidate has simplified this to $x^2 = 169$ but has gone no further. As no square root symbol is seen the second M1 is not awarded and therefore the A mark cannot be earned either.

Completing the working to show $x = \sqrt{169}$ would have gained the second M mark and stating the 'two shortest sides in both triangles are 5 [cm] and 12 [cm]' would gain the A mark.

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