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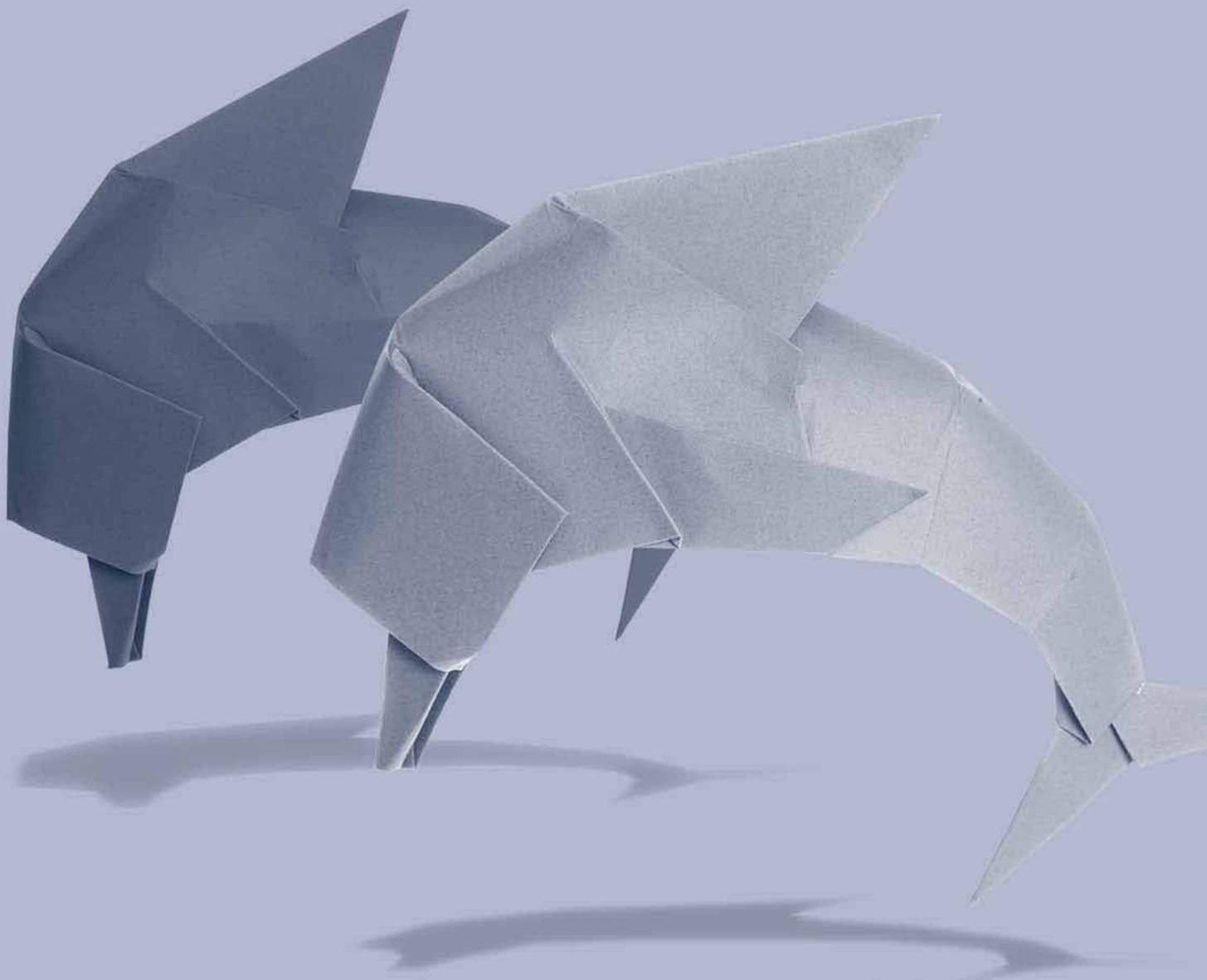
GCSE (9–1) Mathematics



Exemplar student answers with examiner comments

Pearson Edexcel Level 1/Level 2 GCSE (9–1) in Mathematics (1MA1)

First teaching from September 2015

First certification from June 2017

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Contents

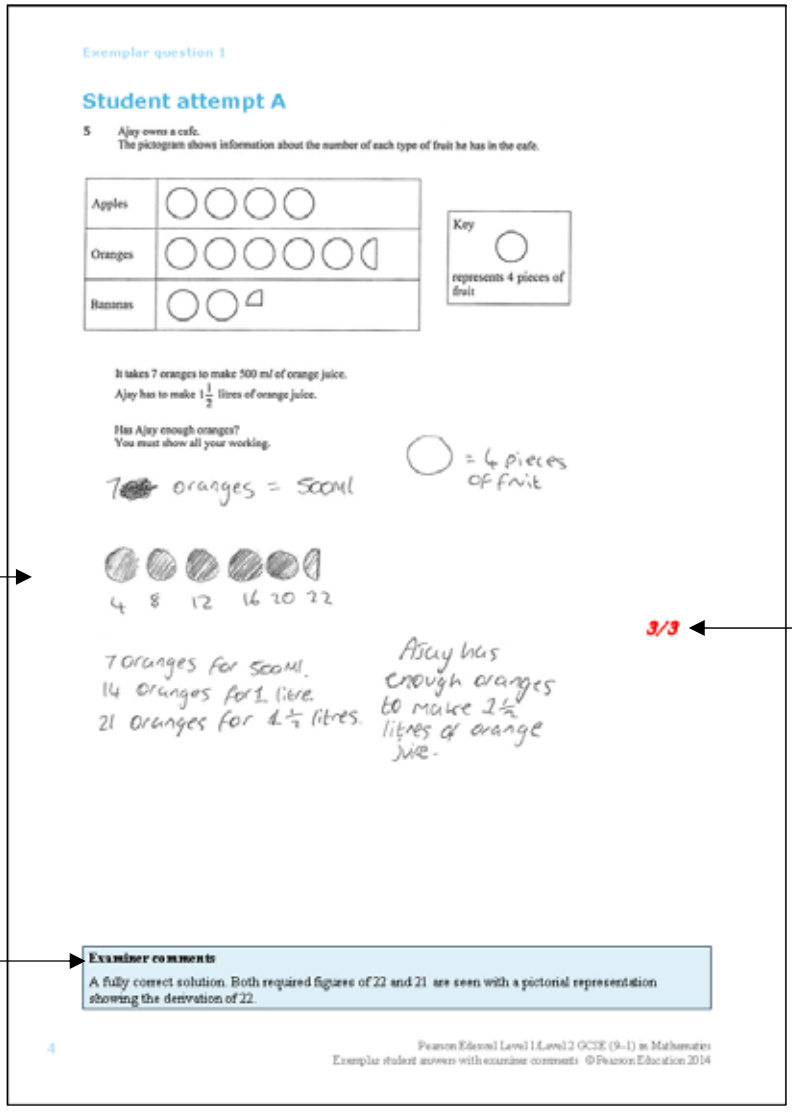
About this booklet

This booklet has been produced to support mathematics teachers delivering the new GCSE Mathematics specification (first assessment summer 2017).

The booklet looks at questions from the Sample Assessment Materials. It shows real student responses to these questions, and how the examining team follow the mark schemes to demonstrate how the students would be awarded marks on these questions.

How to use this booklet

Our examining team have selected student responses to 21 questions from the trialling of the Sample Assessment Materials. Following each question you will find the mark scheme for that question and then a range of student responses with accompanying examiner comments on how the mark scheme has been applied and the marks awarded, and on common errors for this sort of question.



Student response

Examiner commentary on the student response

Marks awarded for the question or question parts

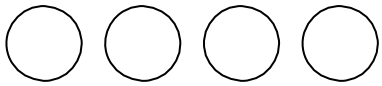
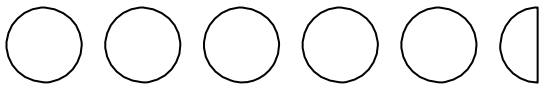
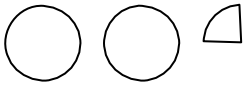
GCSE Mathematics Paper 1F (non-calculator)

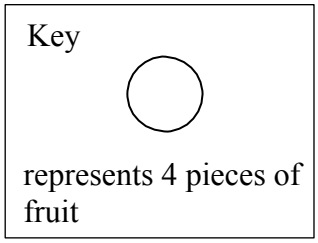
Exemplar question 1

Foundation tier Paper 1 (non-calculator)

5 Ajay owns a cafe.

The pictogram shows information about the number of each type of fruit he has in the cafe.

Apples	
Oranges	
Bananas	



It takes 7 oranges to make 500 m*l* of orange juice

Ajay has to make $1\frac{1}{2}$ litres of orange juice.

Has Ajay enough oranges?

You must show all your working.

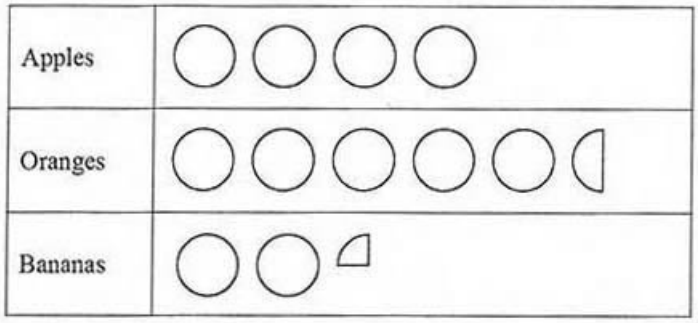
(Total for Question 5 is 3 marks)

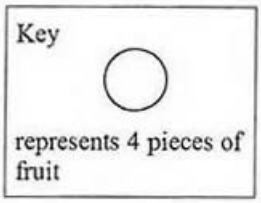
Mark scheme

Question	Working	Answer	Mark	AO	Notes
5	5 × 4 + 2 (= 22) oranges	Yes with supporting evidence	P	2.3a	P1 for interpreting the key, e.g. 5 × 4 + 2 **or** 22 (oranges)
	1.5 × 1000 ÷ 500 (=3) '3' × 7 (=21)		P	3.1b	P1 for complete process to find number of oranges needed
			C	2.3b	C1 for 'yes' with 21 and 22

Student attempt A

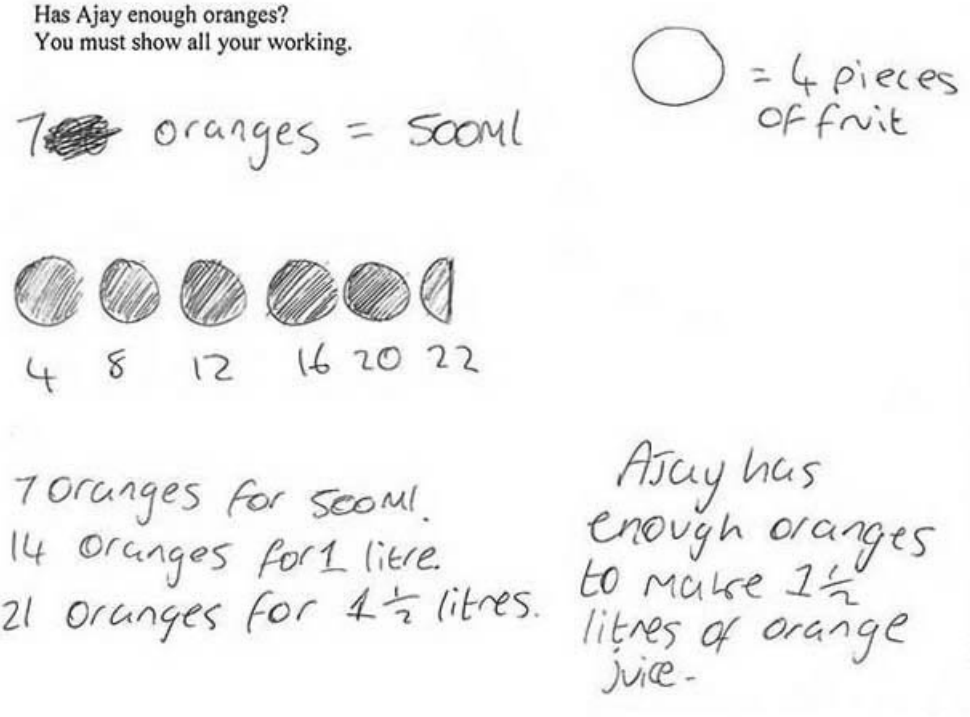
5 Ajay owns a cafe.
The pictogram shows information about the number of each type of fruit he has in the cafe.





It takes 7 oranges to make 500 m*l* of orange juice.
Ajay has to make $1\frac{1}{2}$ litres of orange juice.

Has Ajay enough oranges?
You must show all your working.



3/3

Examiner comments

A fully correct solution. Both required figures of 22 and 21 are seen with a pictorial representation showing the derivation of 22.

Student attempt B

5 Ajay owns a cafe.
The pictogram shows information about the number of each type of fruit he has in the cafe.

Apples	○ ○ ○ ○ 1½
Oranges	○ ○ ○ ○ ○ ◗ 22
Bananas	○ ○ ◪ 9

Key
○ represents 4 pieces of fruit

It takes 7 oranges to make 500 m*l* of orange juice.
Ajay has to make $1\frac{1}{2}$ litres of orange juice.

Has Ajay enough oranges?
You must show all your working.

Total of 22 oranges and he wants $1\frac{1}{2}$ litres of orange juice. 7 oranges make 500ml so 21 will make 1500ml will be $1\frac{1}{2}$ litres.

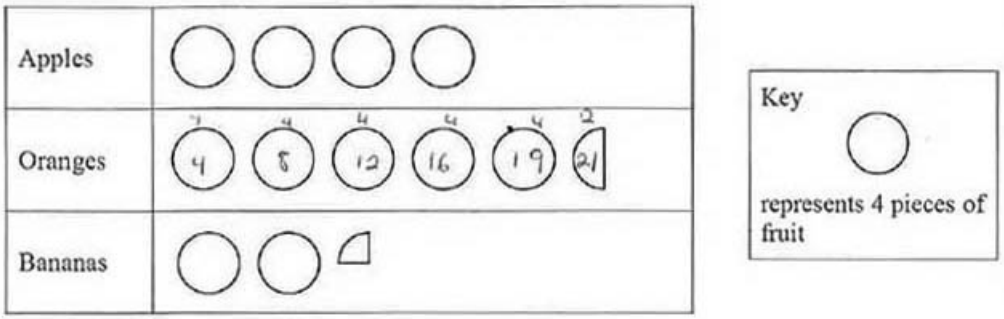
2/3

Examiner comments

Both required figures of 22 and 21 are seen. However, the student has not made a final conclusion so the final mark cannot be awarded.

Student attempt C

5 Ajay owns a cafe.
The pictogram shows information about the number of each type of fruit he has in the cafe.



It takes 7 oranges to make 500 ml of orange juice.
Ajay has to make $1\frac{1}{2}$ litres of orange juice.

Has Ajay enough oranges?
You must show all your working.

Yes

1000 ml → 1 litre
500ml → $\frac{1}{2}$ litre
= $1\frac{1}{2}$ litres → 1500ml → 21 oranges

21 oranges. NA
7 × 3 = 21

Ajay has enough oranges because all the ~~circles~~ oranges added together makes 21 oranges and that is the exact amount of oranges needed to make $1\frac{1}{2}$ litres because 7 × 3 = 21.

2/3

Examiner comments

The student has clearly interpreted the key correctly, as can be seen by the working in the pictogram. Despite the arithmetic error, the first process mark can still be awarded (this error is penalised by withholding the final mark). The second process mark is awarded for the correct process to find the number of oranges needed for 1.5 litres.

Student attempt D

5 Ajay owns a cafe.
The pictogram shows information about the number of each type of fruit he has in the cafe.

Apples	○ ○ ○ ○
Oranges	○ ○ ○ ○ ○ ◗
Bananas	○ ○ ◪

Key: ○ represents 4 pieces of fruit

It takes 7 oranges to make 500 ml of orange juice.
Ajay has to make $1\frac{1}{2}$ litres of orange juice.

Has Ajay enough oranges?
You must show all your working.

He has

4
4
4
4
4
2
26 oranges

1000ml in litre

7 oranges = 500

7 oranges = 500

7 oranges = 500

1500 ml

26 - 21 = 5

5 oranges left from 3 500ml.

* Ajay doesn't have enough oranges he can only make at the most 1500ml of oranges and he needs 1000ml to make a litre and a half

2/3

Examiner comments

All the processes shown are correct. There is an error in the arithmetic when working out 4 + 4 + 4 + 4 + 4 + 2, so the final mark which encompasses the accuracy mark cannot be awarded.

Exemplar question 2

Foundation tier Paper 1 (non-calculator)

4 (a) Write down the 20th odd number.

(1)

The sum of two consecutive odd numbers is 48

(b) Find the smaller of these two odd numbers

(2)

Here are the first five terms of an arithmetic sequence.

5 8 11 14 17

(c) Is 42 a term of this sequence?
Show how you get your answer.

(2)

(Total for Question 4 is 5 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
4 (a)		39	B	1.3a	B1 cao
4 (b)		23	P	3.1a	P1 for a correct process to start to solve the problem, e.g. 48 ÷ 2 or 23 + 25
			A	1.3a	A1
4 (c)		No with justification	P	2.2	P1 for a start to the process, e.g. sight of $3n + 2$ or a correct continuation of sequence with an extra 3 terms
			C	2.4a	C1 for 'No' with full justification, e.g. if $3n + 2 = 42$ then $n = \frac{40}{3}$ which is not an integer value **or** complete sequence up to 41, 44 with statement that 42 is not in the sequence

Student attempt A

4 (a) Write down the 20th odd number. 39

1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39

1/1

(1)

The sum of two consecutive odd numbers is 48

(b) Find the smaller of these two odd numbers.

23 and 25

1/2

(2)

Here are the first five terms of an arithmetic sequence.

5 8 11 14 17

(c) Is 42 a term of this sequence?
Show how you get your answer.

5 8 11 14 17 20 23 26 29 32 35 38 41 44
1 4 7 10 13 47 50 53 57

3n+2 3n+2

3×42 = 126+2
= 128

1/2

(2)

(Total for Question 4 is 5 marks)

Examiner comments

In part (b) the smaller number is never identified. In part (c) the student does continue the sequence correctly and goes as far as 44. However, there is no concluding statement to explain their findings.

Student attempt B

4 (a) Write down the 20th odd number.

39

1/1

1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 (1)39

The sum of two consecutive odd numbers is 48

(b) Find the smaller of these two odd numbers. 23

23 + 25 = 48

2/2

(2)

Here are the first five terms of an arithmetic sequence.

5 8 11 14 17

(c) Is 42 a term of this sequence?
Show how you get your answer. NO

5 13 = 8 8+3 = 11

1/2

3n + 2

42 - 2 = 40 ÷3 = 13.33

(2)

(Total for Question 4 is 5 marks)

Examiner comments

In part (c) the correct equation $3n + 2 = 42$ has in effect been solved to give 13.33…, but the student does not explain why this shows that 42 is not in the sequence. As a minimum, a statement along the lines of "13.3… is not a whole number" is needed with this method.

Student attempt C

4 (a) Write down the 20th odd number.

1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39

39

1/1

(1)

The sum of two consecutive odd numbers is 48

(b) Find the smaller of these two odd numbers.

23 + 25.

1/2

(2)

Here are the first five terms of an arithmetic sequence.

5 , 8 , 11 , 14 , 17

(c) Is 42 a term of this sequence?
Show how you get your answer.

17 20 23 26 29 32 35 38 41 44 47

48

42 is not in the sequence because the sequence goes up in three's.

2/2

(2)

(Total for Question 4 is 5 marks)

Examiner comments

In part (b) the student lists the two odd numbers with a sum of 48, but the fails to identify the smaller of these as required by the question. In part (c) the student clearly shows that 42 is missing from the sequence by continuing the sequence and showing the numbers either side of 42 (41 and 44).

Student attempt D

4 (a) Write down the 20th odd number.

39

1/1

(1)

The sum of two consecutive odd numbers is 48

(b) Find the smaller of these two odd numbers.

23 + 25 = 48

1/2

(2)

Here are the first five terms of an arithmetic sequence.

5 8 11 14 17

(c) Is 42 a term of this sequence?
Show how you get your answer. NO

17 20 23 26 29 32 35 38 41

NO it only goes up to 41

1/2

(2)

(Total for Question 4 is 5 marks)

Examiner comments

In part (b) the smaller number is never identified. In part (c) the student doesn't go quite far enough, as they stopped at 41 rather than continuing to fully demonstrate that 42 is missing from the sequence.

Exemplar question 3

Foundation tier Paper 1 (non-calculator)

8 Carpet tiles are going to be used to cover a floor.

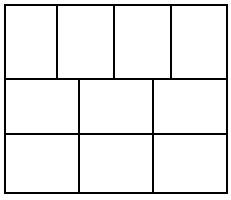
The floor is a 1200 mm by 1000 mm rectangle.
Each carpet tile is a 40 cm by 30 cm rectangle.

Exactly 10 carpet tiles can be used to cover the floor completely.

Show in a labelled sketch how this can be done.

(Total for Question 8 is 3 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
8	1200 ÷ 300 = 4 1200 ÷ 400 = 3 1000 = 400 + 300 + 300	Correct diagram with correct layout 	M P C	1.1 2.3a 2.3b	M1 for changing to consistent units, e.g. 1000 ÷ 10 or 40 × 10 P1 for interpreting information and a process to fit tiles in floor area, e.g. may be seen on a sketch or may see a calculation C1 for diagram to communicate a correct layout with lengths clearly identified

Student attempt A

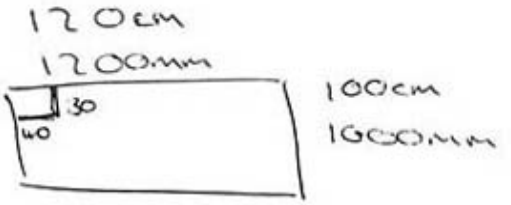
8 Carpet tiles are going to be used to cover a floor.

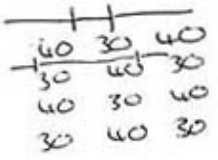
The floor is a 1200 mm by 1000 mm rectangle.
Each carpet tile is a 40 cm by 30 cm rectangle.

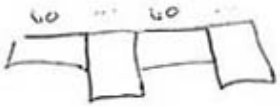
Exactly 10 carpet tiles can be used to cover the floor completely.

Show in a labelled sketch how this can be done.

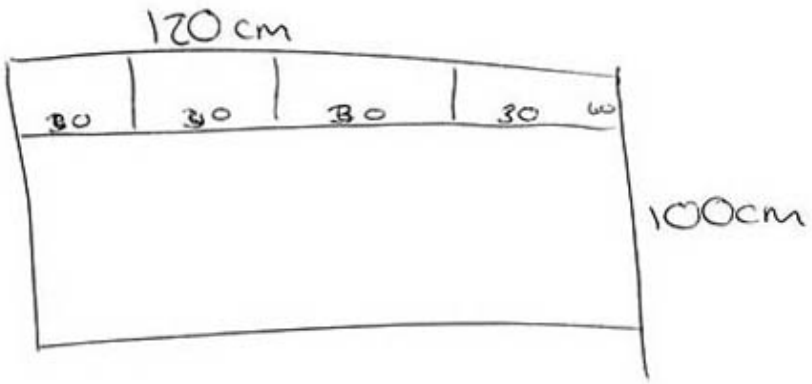
10 mm = 1 cm



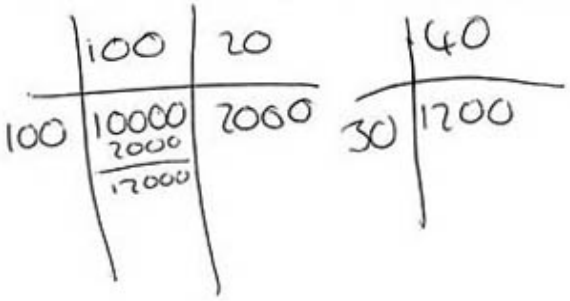




2/3



(Total for Question 8 is 3 marks)



12,000 ÷ 1200
=
10

Examiner comments

The student is working with consistent units so gains the first mark. There is evidence to show four carpet tiles correctly fitting along one side of the room, so the second mark can be awarded, but no further progress is made.

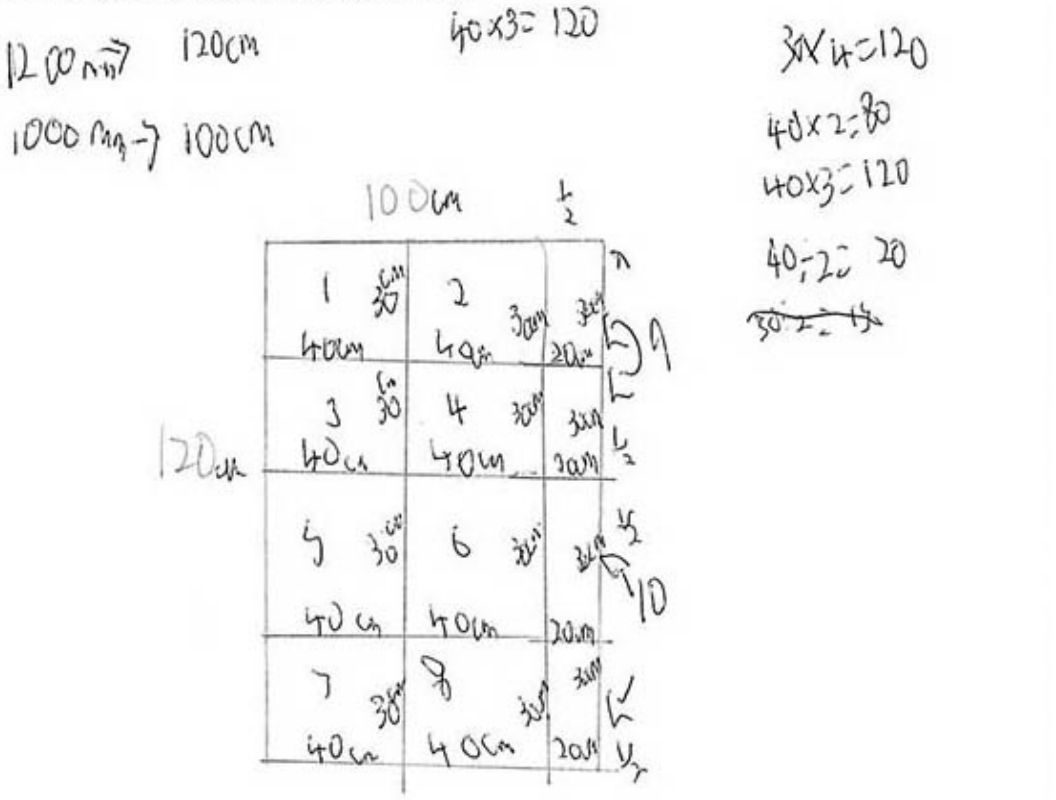
Student attempt B

8 Carpet tiles are going to be used to cover a floor.

The floor is a 1200 mm by 1000 mm rectangle.
Each carpet tile is a 40 cm by 30 cm rectangle.

Exactly 10 carpet tiles can be used to cover the floor completely.

Show in a labelled sketch how this can be done.



3/3

(Total for Question 8 is 3 marks)

Examiner comments

A fully correct solution. There was nothing in the question to prevent tiles being cut, so this solution is allowable. The diagram is correct with all necessary dimensions shown.

Student attempt C

8 Carpet tiles are going to be used to cover a floor.

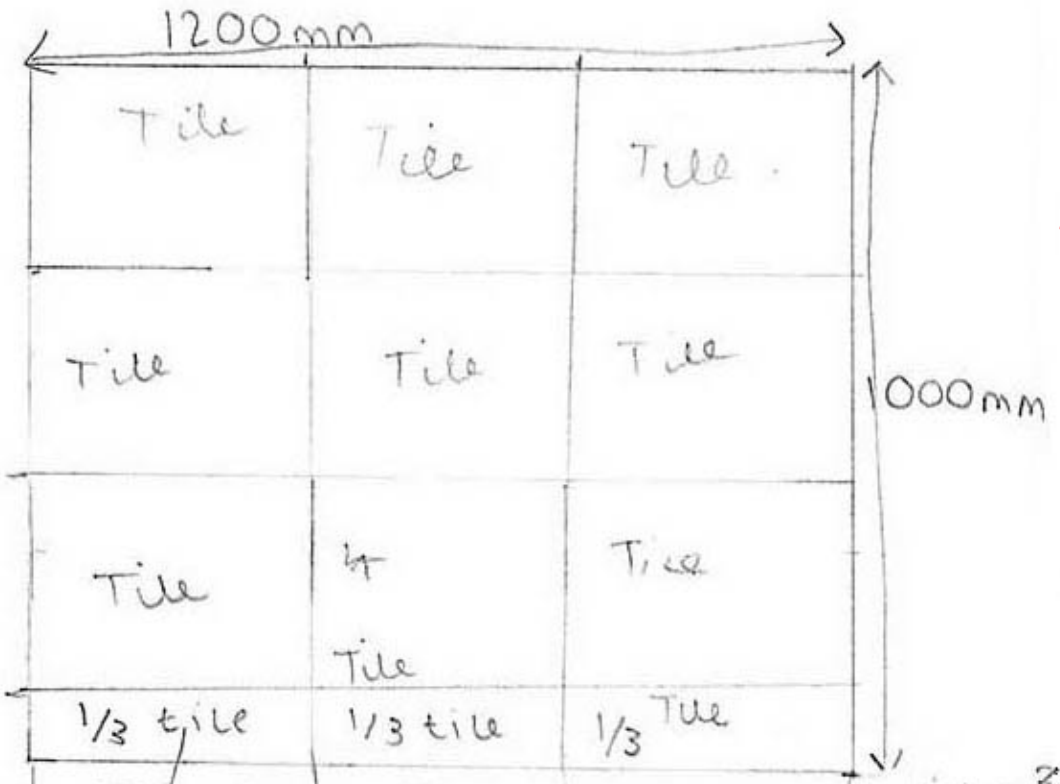
The floor is a 1200 mm by 1000 mm rectangle.
Each carpet tile is a 40 cm by 30 cm rectangle.

12cm and 10cm
4cm and 3 cm

Exactly 10 carpet tiles can be used to cover the floor completely.

Show in a labelled sketch how this can be done.

1cm = 100mm



2/3

The tenth piece can be cut into 3 equal pieces to fit they will be cut into 10cm x 10cm

(Total for Question 8 is 3 marks)

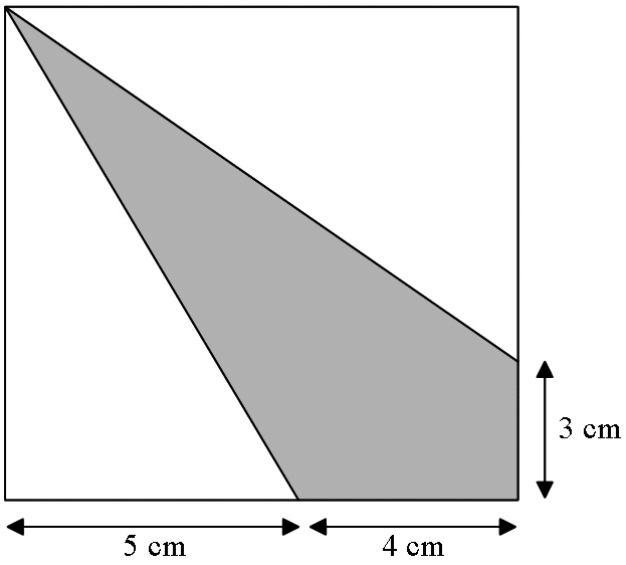
Examiner comments

At first glance it appears that the student is using 1 cm as 100 mm but on closer inspection, looking at the figures in the top right-hand corner shows that the scale of 1 cm to 10 mm has been used to draw the diagram. Not all dimensions on the diagram are shown (missing on the tiles), so the final mark cannot be awarded.

Exemplar question 4

Foundation tier Paper 1 (non-calculator)

9 The diagram shows a shaded quadrilateral inside a square.



Work out the area of the shaded quadrilateral.

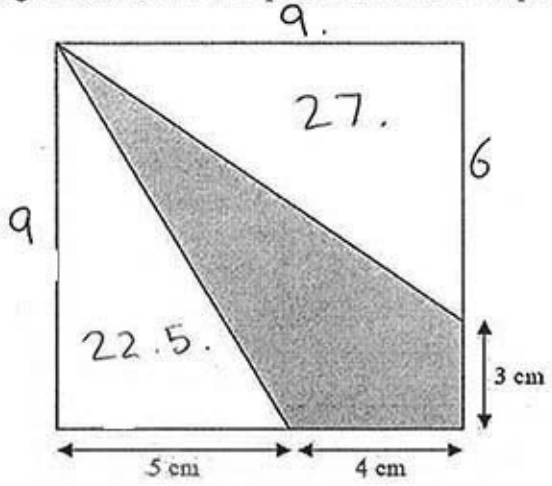
(Total for Question 9 is 4 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
9	Square $9 \times 9 = 81$ Bottom triangle $\frac{5 \times 9}{2} = \frac{45}{2}$	31.5 cm^2	P	3.1b	P1 for a process to establish the missing lengths on the perimeter of the shape
	Top triangle $\frac{6 \times 9}{2} = \frac{54}{2}$		P	3.1b	P1 for a process to begin the problem by finding the area of one relevant shape
	Shaded area $81 - 22.5 - 27$		P	3.1b	P1 for complete process to find the shaded area, e.g. $9 \times 9 - ('22.5' + '27')$
	Or $\frac{1}{2} \times 4 \times (4+5) + \frac{1}{2} \times 3 \times (4+5)$		A	1.3b	A1 cao

Student attempt A

9 The diagram shows a shaded quadrilateral inside a square.



3/4

Work out the area of the shaded quadrilateral.

length = 9 cm.
5 x 9 ÷ 2 = 22.5.

area = 9x9. = 81 cm².
9-3=6.
6x9=54÷2=27.

22.5 +27 = 49.5.
81 - 49.5 = 32.5 cm².

7811
49.5
32.5

Shaded quadrilateral
32.5 cm².

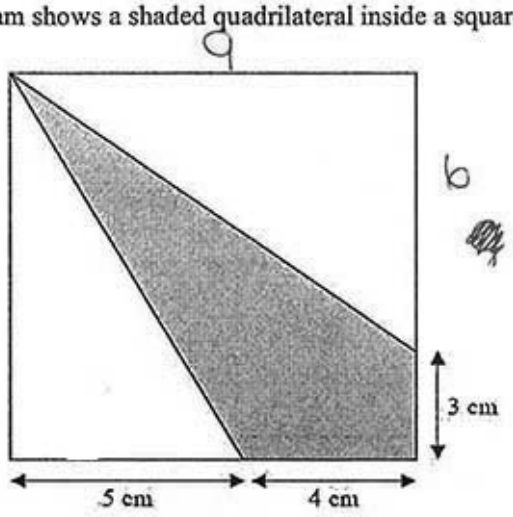
(Total for Question 9 is 4 marks)

Examiner comments

A fully correct solution, but an arithmetic error in the final calculation means that only the three process marks can be awarded.

Student attempt B

9 The diagram shows a shaded quadrilateral inside a square.



Work out the area of the shaded quadrilateral.

$9 \times 6 = 63 \div 2 = 31.5$

$5 \times 9 = 45 \div 22.5$

$9^2 = 81$

$4 \times 3 = 12$

$9 \times 3 = 27$

39

$108 + 39 = 147$

$31.5 + 22.5 = 54$

$81 - 54 = 27$ - area of shaded quadrilateral

3/4

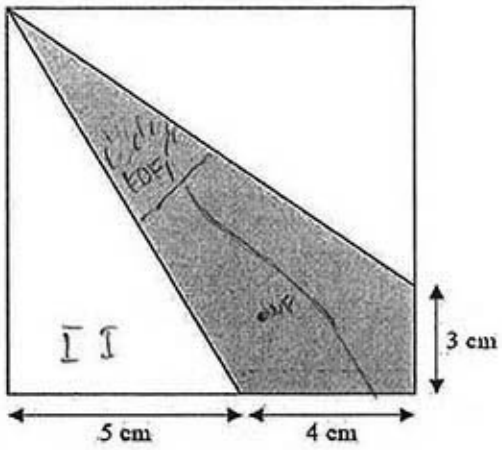
(Total for Question 9 is 4 marks)

Examiner comments

This student has the wrong final answer due to an early arithmetic error. All the correct processes needed to find the area of the shaded quadrilateral are shown, so all three process marks can be awarded.

Student attempt C

9 The diagram shows a shaded quadrilateral inside a square.



Work out the area of the shaded quadrilateral.

9cm × 9 cm = 81cm

3cm × 4cm = 12 cm

93cm

93cm ÷ 2cm = 46·5cm

1/4

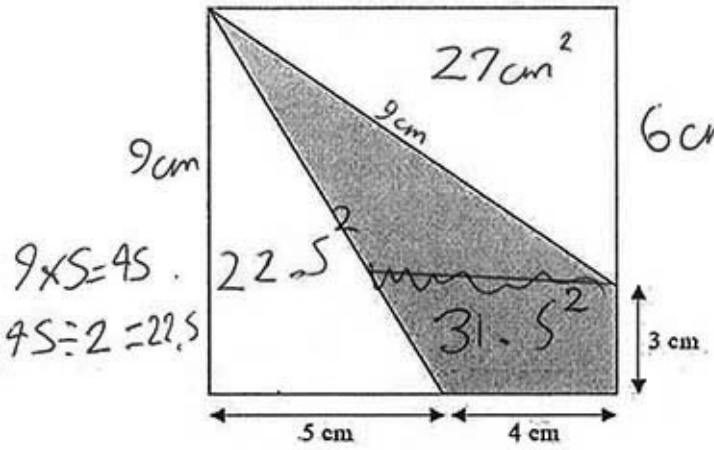
(Total for Question 9 is 4 marks)

Examiner comments

The student has made a start to solving the problem by calculating the area of the square. Further calculations are incorrect, so only the first process mark can be awarded.

Student attempt D

9 The diagram shows a shaded quadrilateral inside a square.



Work out the area of the shaded quadrilateral.

9×6 = 54 ÷2 =27

27 + 22.5 = 49.5

9×5=45.

45÷2 =22.5

9×9 = 81

81 − 49.5 = 31.5

38.5

8.0

50 + 30 = 80 − 5 = 79.5

+ was 0.5

80

+ 1 = 81

Area of shaded quadrilateral

= 31.5²

3/4

(Total for Question 9 is 4 marks)

Examiner comments

This student shows all the correct processes. However, the final answer is written incorrectly as 31.5^2 rather than $31.5cm^2$, so the final mark accuracy mark cannot be awarded

Exemplar question 5

Foundation tier Paper 1 (non-calculator) (also Higher tier question 6)

18 Modelling the planet Mercury as a sphere, it has a radius of 2440 km.

(a) (i) Work out an estimate in square kilometres for the surface area of Mercury.

(ii) Without carrying out a further calculation, give evidence to show whether your method gives you an underestimate or an overestimate for the surface area of Mercury.

(3)

In July 2013, the spacecraft Messenger was near Mercury at a distance of 9.75×10^7 km from Earth.

Taking the speed of light to be 3×10^8 m/s,

(b) work out how long it takes light to travel a distance of 9.75×10^7 km.

(3)

(Total for Question 18 is 6 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
18 (a) (i)	$4 \times 3 \times 2000^2$	48 000 000 km^2	M	1.3a	M1 for use of $4\pi r^2$ with either π or r rounded to 1 significant figure
			A	1.3a	A1 accept 50 000 000 km^2
(ii)			C	3.4a	C1 for appropriate evaluation of method, e.g. 3 and 2000 both less than true values
18 (b)	$9.75 \times 10^7 \times 1000 \div (3 \times 10^8)$	325 s	M	1.3b	M1 for use of distance ÷ time
			M	1.3b	M1 for consistent units
			A	1.3b	A1 cao

Student attempt A

18 Modelling the planet Mercury as a sphere, it has a radius of 2440 km.

(a) (i) Work out an estimate in square kilometres for the surface area of Mercury.

$4\pi r^2$.

2440^2

$12 \times 2500^2 = 30,000^2 = 900,000,000\ km^2$

$4 \times 3 = 12$

$12(2440^2)$

(ii) Without carrying out a further calculation, give evidence to show whether your method gives you an underestimate or an overestimate for the surface area of Mercury.

$2500 - 2440 = 60$.

$\pi - 3 = 0.14...$

60 more significant than 0.14....

1/3

(3)

In July 2013, the spacecraft Messenger was near Mercury at a distance of 9.75×10^7 km from Earth.

Taking the speed of light to be 3×10^8 m/s,

(b) work out how long it takes light to travel a distance of 9.75×10^7 km.

$3 \times 10^8 = 300,000,000$

$97,500,000$

$300,000,000 \div 97,500,000$

1/3

$300 \div 975$

$975 \div 300 = 3.25$

(3)

(Total for Question 18 is 6 marks)

Examiner comments

(a) There is evidence of the correct formula being used with approximation, but the answer coming from this is incorrect. There is no indication in part (ii) as to whether the answer in (i) is an overestimate or underestimate.

(b) A method mark is awarded for the correct use of speed divided by distance. However, the units are not consistent, which means the final answer is incorrect.

Student attempt B

18 Modelling the planet Mercury as a sphere, it has a radius of 2440 km.

(a) (i) Work out an estimate in square kilometres for the surface area of Mercury.

4 × 3.14 = 12.56 2500^2 =

12500000 ~~km~~
2500000
4 × 6250000
~~m~~ 2500000

25 × 25 = 625
2500 × 2500 = 6250000

25000000 km²

(ii) Without carrying out a further calculation, give evidence to show whether your method gives you an underestimate or an overestimate for the surface area of Mercury.

Overestimate

0/3

(3)

In July 2013, the spacecraft Messenger was near Mercury at a distance of 9.75×10^7 km from Earth.

Taking the speed of light to be 3×10^8 m/s,

(b) work out how long it takes light to travel a distance of 9.75×10^7 km.

9.75 × ~~10~~0000000 km = 975000000 km

= 975000000000 m

3×10^8 = 300000000 m/s

takes light 3250000000000 seconds

3250
3) 9750

~~3000000000) 975000000000~~

8 0's

2/3

(3)

(Total for Question 18 is 6 marks)

Examiner comments

(a) At no point in this part does the candidate either state or use the formula for the surface area of a sphere. The comment in (ii) is not sufficient to gain a mark, as no evidence is provided for the statement.

(b) The method in this part is fully correct. The error comes in the first stage when writing 9.75×10^7 as an ordinary number. This is penalised by the loss of the final accuracy mark.

Student attempt C

18 Modelling the planet Mercury as a sphere, it has a radius of 2440 km.

(a) (i) Work out an estimate in square kilometres for the surface area of Mercury.

$SA = 4\pi r^2$ ~~$\pi = 3$~~ $\pi \to 3$

$= 4 \times 3 \times 2000^2$ $2440 \to 2000$ $2000^2 = 4000000$

$SA = 48,000,000$ km

$= 12 \times 2000^2$ $12 \times 4,000,000 = 48,000,000$

(ii) Without carrying out a further calculation, give evidence to show whether your method gives you an underestimate or an overestimate for the surface area of Mercury.

underestimate because

2440 km was ~~changed~~ rounded down to 2000km

and π was ~~changed~~ rounded down to 3.

3/3

(3)

In July 2013, the spacecraft Messenger was near Mercury at a distance of 9.75×10^7 km from Earth.

Taking the speed of light to be 3×10^8 m/s,

(b) work out how long it takes light to travel a distance of 9.75×10^7 km.

$\frac{9.75 \times 10^7}{3 \times 10^8}$ 975000000 / 300000000

1/3

97500000 / 30000000 $\frac{975}{30}$ 30 | 975.000 = 32.5

32.5 seconds

(3)

(Total for Question 18 is 6 marks)

Examiner comments

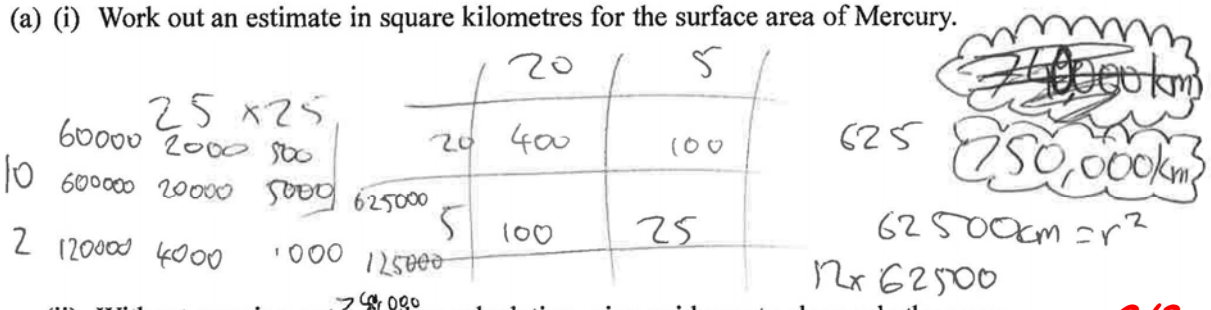
(a) A correct estimation in (i) with a correct statement with evidence in (ii). The units are incorrect: this is not penalised as the mark scheme does not require these to be stated as they are contained within the demand.

(b) A method mark is awarded for the correct use of speed divided by distance. However, the units are not consistent which means the final answer is incorrect.

Student attempt D

18 Modelling the planet Mercury as a sphere, it has a radius of 2440 km.

(a) (i) Work out an estimate in square kilometres for the surface area of Mercury.



(ii) Without carrying out a further calculation, give evidence to show whether your method gives you an underestimate or an overestimate for the surface area of Mercury.

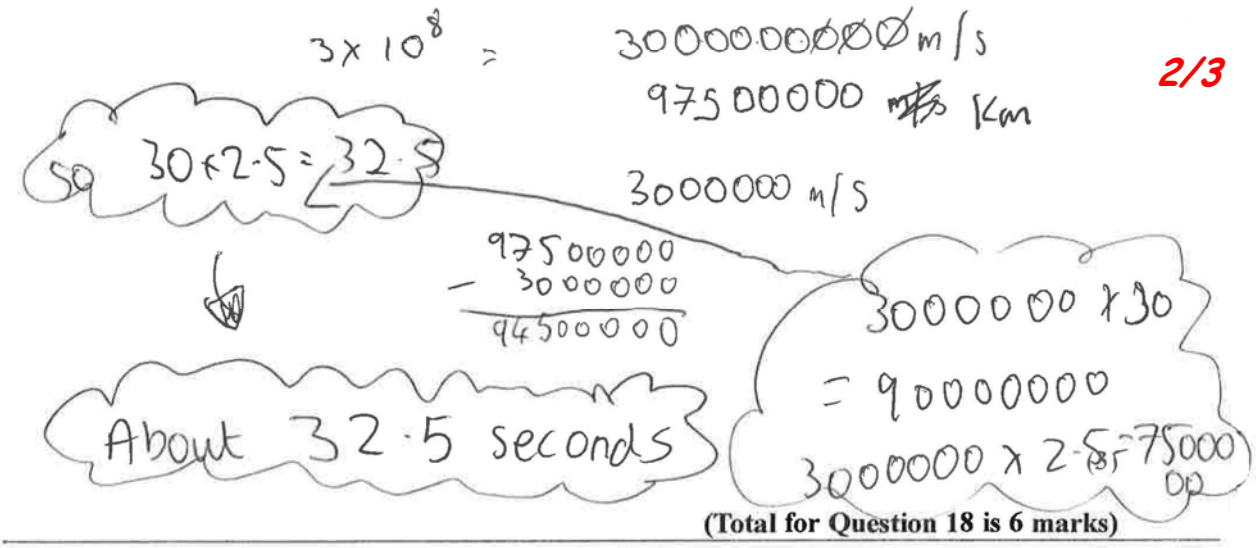
2/3

I think its an overestimate as i made 2440 km radius 2500 km, and π = 3 instead of 3.14. but the range from 2440 km → 2500 km is larger so I think its an over estimate (3)

In July 2013, the spacecraft Messenger was near Mercury at a distance of 9.75×10^7 km from Earth.

Taking the speed of light to be 3×10^8 m/s,

(b) work out how long it takes light to travel a distance of 9.75×10^7 km.



2/3

(Total for Question 18 is 6 marks)

Examiner comments

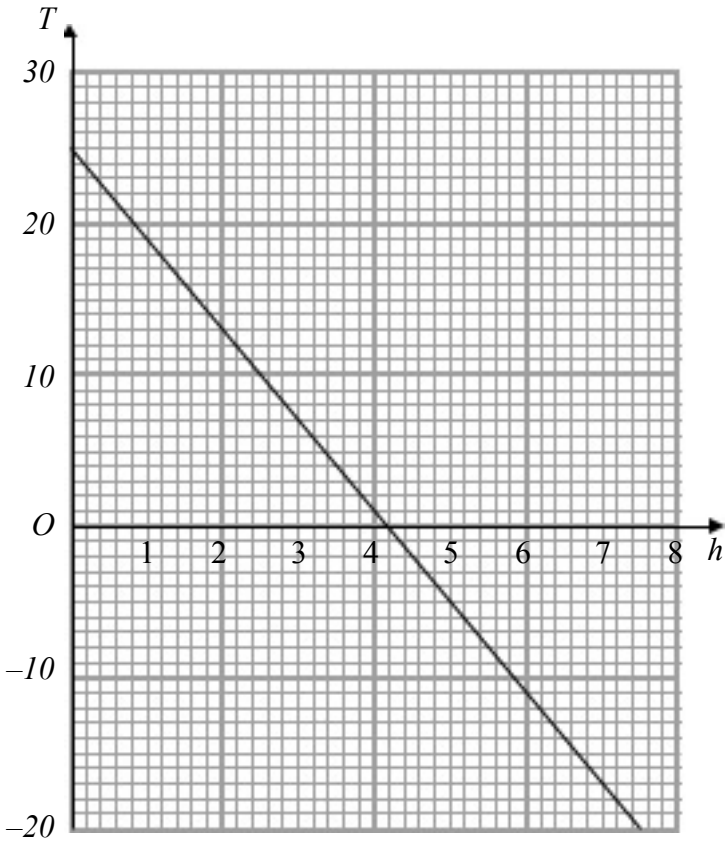
(a) The correct formula is used with 3 and 2500. However, an arithmetic error occurs when squaring 2500, so only the method mark can be awarded. There is an appropriate statement in (ii) which is sufficient to gain the available mark.

(b) The overall method is correct. The cancelling of three zeros shows the use of consistent units. The error has occurred when writing the standard form number as an ordinary number. This is penalised by the loss of the final accuracy mark.

Exemplar question 6

Foundation tier Paper 1 (non-calculator)

19 The graph gives information about how the temperature, T °C, of the atmosphere decreases as the height above ground level, h km, increases.



(a) Use the graph to estimate the temperature at a point 2.5 km above ground level.

(1)

A balloon rises up from ground level to a height of 5.5 km.

(b) Use the graph to estimate the decrease in temperature.

(2)

Jean says:

"The temperature falls 6 °C for every kilometre the balloon rises."

(c) What evidence is available from the graph to support this?

(4)

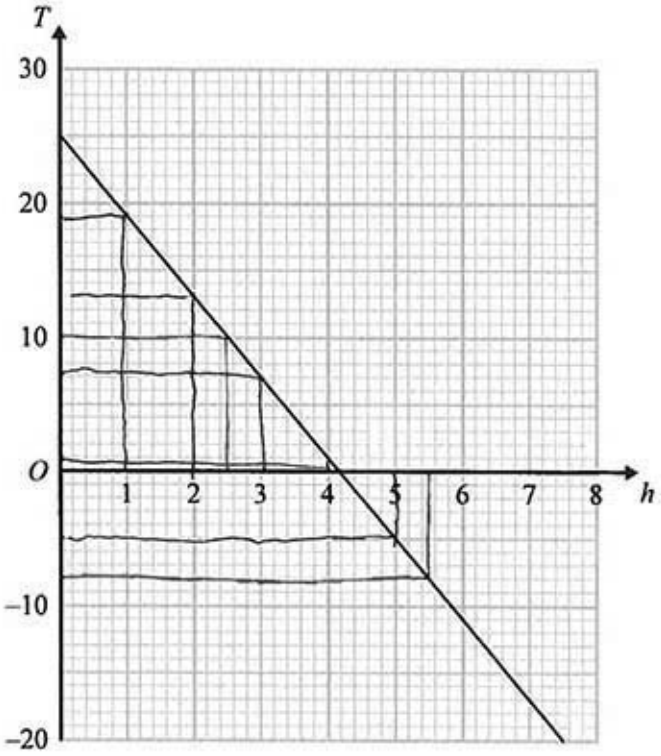
(Total for Question 19 is 7 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
19 (a)		10^oC	B	1.3a	B1 for answer in range 9 – 11
19 (b)	25 – – 8	33^oC	P	2.3a	P1 for a process to identify 25 as the temperature when $h = 0$ and when h is 5.5 and show an intention to subtract, e.g. 25 – – 8
			A	1.3a	A1 for 33ºC cao
19 (c)		Explanation with −6	C	2.3a	C1 the graph is a straight line, e.g. the gradient is constant oe
			C	2.1b	C1 falling as the graph has a negative gradient (or gradient is −6)
			M	1.3a	M1 for method to find gradient
			A	1.3a	A1 for −6

Student attempt A

19 The graph gives information about how the temperature, T °C, of the atmosphere decreases as the height above ground level, h km, increases.



(a) Use the graph to estimate the temperature at a point 2.5 km above ground level.

1/1

10°C

(1)

A balloon rises up from ground level to a height of 5.5 km.

(b) Use the graph to estimate the decrease in temperature.

~~25~~ ~~28~~ 25+8

2/2

33

33°C

(2)

Student attempt A continued

Jean says:

"The temperature falls 6 °C for every kilometre the balloon rises."

(c) What evidence is available from the graph to support this?

This is a straight line, which shows that the temperature falls at a constant rate, and when looking at the temperature at each kilometer, we can see that it does drop by 6°C each kilometer (0, 25), (1, 19), (2, 13), (3, 7) which means that Jean is correct.

4/4

(4)

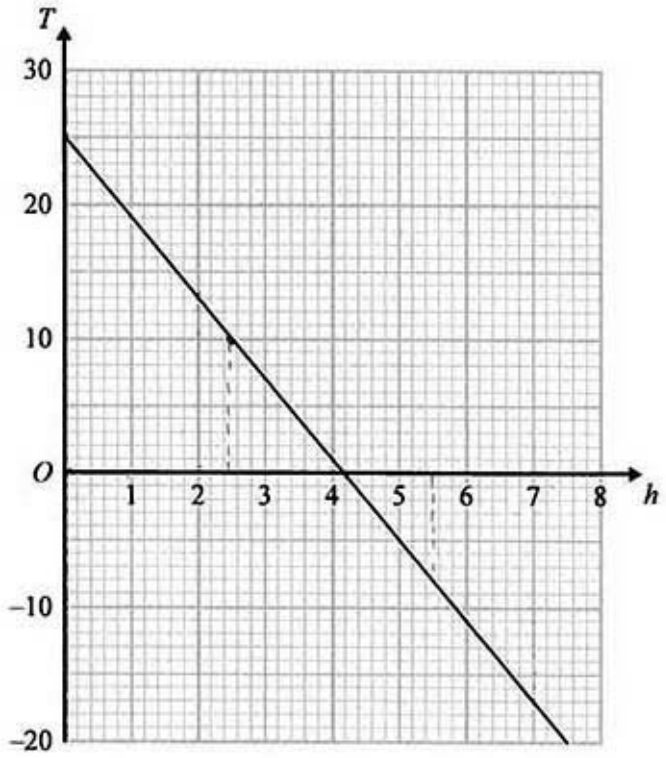
(Total for Question 19 is 7 marks)

Examiner comments

In part (c) there is a good explanation with enough detail to be able to award full marks. As the student has made the link between the straight line and the temperature falling at a constant rate, the illustration given by a set of coordinates is sufficient to show that the gradient is –6, although this is never explicitly stated.

Student attempt B

19 The graph gives information about how the temperature, T °C, of the atmosphere decreases as the height above ground level, h km, increases.



(a) Use the graph to estimate the temperature at a point 2.5 km above ground level.

10°C

1/1

(1)

A balloon rises up from ground level to a height of 5.5 km.

(b) Use the graph to estimate the decrease in temperature.

25° → −8°

−33°

1/2

(2)

Student attempt B continued

Jean says:

"The temperature falls 6 °C for every kilometre the balloon rises."

(c) What evidence is available from the graph to support this?

from 0 → 7 km the temperature change is 42°C $\frac{42^\circ}{7} = 6^\circ$ meaning that Jean's statement is correct

1/4

(4)

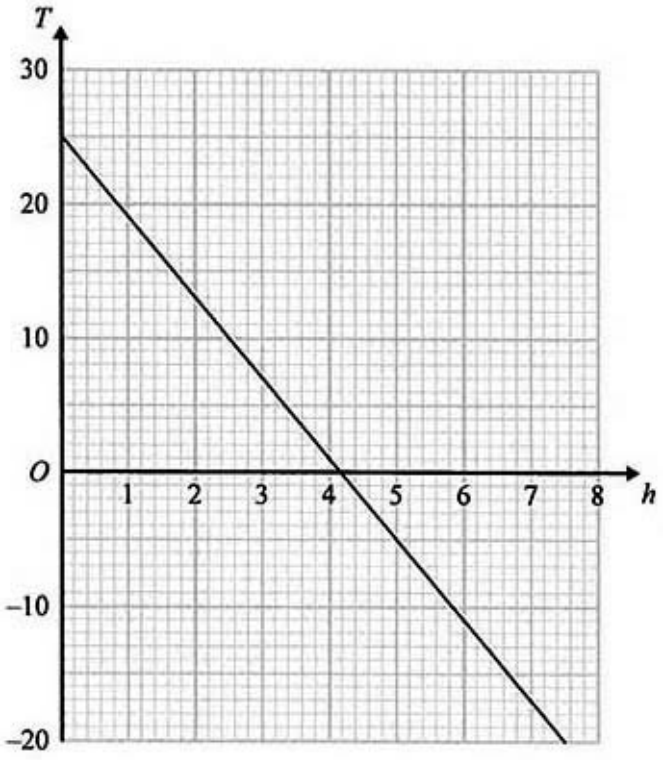
(Total for Question 19 is 7 marks)

Examiner comments

The student has found the two relevant temperatures in part (b) and shown an intention to subtract, albeit the wrong way round. Just about the full extent of the line has been used to find the gradient, so the method mark can be awarded, but not the accuracy mark as there is no indication that the gradient is negative.

Student attempt C

19 The graph gives information about how the temperature, T °C, of the atmosphere decreases as the height above ground level, h km, increases.



(a) Use the graph to estimate the temperature at a point 2.5 km above ground level.

1/1

10°C (1)

A balloon rises up from ground level to a height of 5.5 km.

(b) Use the graph to estimate the decrease in temperature.

0/2

–8°C (2)

Student attempt C continued

Jean says:

"The temperature falls 6 °C for every kilometre the balloon rises."

(c) What evidence is available from the graph to support this?

There is a negative gradient showing the decrease in temperature.

At 6km the temperature is −11 and when the balloon gets to 7km the temperature is −17.

the difference between −11 and −17 is 6.

Showing that the temperature fell 6°C from −11 to −17 in 1km.

At 1km the temperature = 19°C when the balloon goes up another km to 2km the temperature falls 6°C to 13°C.

3/4

(4)

(Total for Question 19 is 7 marks)

Examiner comments

In part (b) the student has made what was a common error and neglected to find and then use the temperature at ground level. There is no mention in part (c) of the link between a straight line and constant rate.

Exemplar question 7

Foundation tier Paper 1 (non-calculator)

20 Michael carried out a survey of the time, in minutes, it takes the 20 people in his office to get to work. This table gives some information about his results.

Time (t minutes)	Frequency
$0 < t \leq 10$	8
$10 < t \leq 20$	6
$20 < t \leq 30$	1
$30 < t \leq 40$	4
$40 < t \leq 50$	1

Michael used this information to work out the mean of the times taken. He got an answer of 68 minutes.

(a) Explain why it is impossible for the mean time to be 68 minutes.

(1)

The 20 people in the survey had:
a mean age of 45 years
a median age of 41 years

Michael decides to include his age so that he works out the mean age and median age of 21 people.
Michael is 42 years old.

Here are two statements about the ages of the 21 people.

Statement 1: The mean age of the 21 people is less than 45 years.

Statement 2: The median age of the 21 people is more than 41 years.

(b) (i) Is statement 1 correct?
You must give a reason to support your answer.

(ii) Is statement 2 correct?
You must give a reason to support your answer.

(2)

(Total for Question 20 is 3 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
20 (a)		Explanation	C	2.5a	C1 for explanation, e.g. 68 is outside the range of the data
20 (b) (i)		Yes and reason	C	2.4a	C1 for Yes and reason, e.g. mean will go down as Michael's age is below the mean of the 20 people
(ii)		Don't know and reason	C	2.4a	C1 for 'don't know' and reason, e.g. cannot tell as do not know other ages

Student attempt A

20 Michael carried out a survey of the time, in minutes, it takes the 20 people in his office to get to work. This table gives some information about his results.

Time (t minutes)	Frequency
$0 < t \leqslant 10$	8
$10 < t \leqslant 20$	6
$20 < t \leqslant 30$	1
$30 < t \leqslant 40$	4
$40 < t \leqslant 50$	1

1/1

Michael used this information to work out the mean of the times taken.
He got an answer of 68 minutes.

(a) Explain why it is impossible for the mean time to be 68 minutes.

His survey only goes up to 50 minutes.

(1)

The 20 people in the survey had:
a mean age of 45 years
a median age of 41 years

Michael decides to include his age so that he works out the mean age and median age of 21 people.
Michael is 42 years old.

Here are two statements about the ages of the 21 people.

Statement 1: The mean age of the 21 people is less than 45 years.

Statement 2: The median age of the 21 people is more than 41 years.

(b) (i) Is statement 1 correct?
You must give a reason to support your answer.

Yes see working bellon

$20 \times 45 = 900$

$900 + 42 = 942$

$\frac{942}{21} = 21\overline{)942.0}$ (44)

1/2

(ii) Is statement 2 correct?
You must give a reason to support your answer.

No 42+41 are close numbers and so would not that have a great effect on the median

(2)

(Total for Question 20 is 3 marks)

Examiner comments

(a) A clear indication that the mean cannot be greater than 50.

(b) In part (i) the student has calculated the mean: although not necessary, this is an acceptable way of answering the question.

Student attempt B

20 Michael carried out a survey of the time, in minutes, it takes the 20 people in his office to get to work. This table gives some information about his results.

Time (t minutes)	Frequency
$0 < t \leqslant 10$	8
$10 < t \leqslant 20$	6
$20 < t \leqslant 30$	1
$30 < t \leqslant 40$	4
$40 < t \leqslant 50$	1

1/1

Michael used this information to work out the mean of the times taken.
He got an answer of 68 minutes.

(a) Explain why it is impossible for the mean time to be 68 minutes.

Because no-one took any longer than 50 minutes

(1)

The 20 people in the survey had:
a mean age of 45 years
a median age of 41 years

Michael decides to include his age so that he works out the mean age and median age of 21 people.
Michael is 42 years old.

Here are two statements about the ages of the 21 people.

Statement 1: The mean age of the 21 people is less than 45 years.

Statement 2: The median age of the 21 people is more than 41 years.

0/2

(b) (i) Is statement 1 correct?
You must give a reason to support your answer.

Yes, because the mean is an average and Michaels age of 42 would decrease the average lower than 45

(ii) Is statement 2 correct?
You must give a reason to support your answer.

Yes, because Michael, at the age of 42, is of higher age than the median meaning the median should increase

(2)

(Total for Question 20 is 3 marks)

Examiner comments

(a) A clear indication that the mean cannot be greater than 50.

(b) The reason given in part (i) is not sufficient, as it doesn't explicitly state that Michael's age is lower than the mean.

Student attempt C

20 Michael carried out a survey of the time, in minutes, it takes the 20 people in his office to get to work. This table gives some information about his results.

Time (t minutes)	Frequency	FX
$0 < t \leqslant 10$	8	40
$10 < t \leqslant 20$	6	90
$20 < t \leqslant 30$	1	25
$30 < t \leqslant 40$	4	140
$40 < t \leqslant 50$	1	45
	20	340

340 / 5 =

Michael used this information to work out the mean of the times taken.
He got an answer of 68 minutes.

(a) Explain why it is impossible for the mean time to be 68 minutes.

the total of the FX column is 340, there are 5 frequencies. $\frac{340}{5} = 68$

0/1

(1)

The 20 people in the survey had:
a mean age of 45 years
a median age of 41 years

Michael decides to include his age so that he works out the mean age and median age of 21 people.
Michael is 42 years old.

Here are two statements about the ages of the 21 people.

Statement 1: The mean age of the 21 people is less than 45 years.

Statement 2: The median age of the 21 people is more than 41 years.

(b) (i) Is statement 1 correct?
You must give a reason to support your answer.
Yes because Michael is younger than the mean age of 45

1/2

(ii) Is statement 2 correct?
You must give a reason to support your answer.
Yes because another age is added so the middle age will no longer be 41

(2)

(Total for Question 20 is 3 marks)

Examiner comments

(a) The student makes the common error of dividing by 5 rather than 20 when trying to calculate the mean.

(b) The correct answer of 'yes' is given along with a correct reason.

GCSE Mathematics Paper 2F (calculator)

Exemplar question 8

Foundation tier Paper 2 (calculator)

8 Delia uses this rule to cook some beef.

Cooking time in minutes = 20 × weight in pounds + 30

The weight of the beef is 1.5 kg.
1 kg = 2.2 pounds.

(a) How long will the beef take to cook?

(4)

Kevin has a different piece of beef.
The weight of his beef is 3 kg.

Kevin says

'Because the weight of my piece of beef is twice the weight of Delia's piece of beef it will take twice as long to cook as Delia's piece took.'

(b) Is Kevin correct?

Explain your answer.

(1)

(Total for Question 8 is 5 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
8 (a)		96 minutes	M P P A	1.3a 3.1d 3.1d 1.3b	M1 for 1.5 × 2.2 (= 3.3) P1 for process to start to find cooking time P1 for full process to find cooking time A1 for 96 minutes or 1 hour 36 minutes
8 (b)		No and comment	C	3.4a	C1 for no with valid comment eg his takes 3 × 2.2 × 20 + 30 = 162 which is not double 96 (need both the decision and a comment to gain the mark)

Student attempt A

8 Delia uses this rule to cook some beef.

Cooking time in minutes = 20 × weight in pounds + 30

The weight of the beef is 1.5 kg.
1 kg = 2.2 pounds.

(a) How long will the beef take to cook?

4/4

1kg = 2.2 pounds
0.5 kg = 1.1 pounds

1.5 kg = 2.2 pounds + 1.1 pounds
= 3.3 pounds

cooking time in minutes = 20 × 3.3 + 30
= 96

The beef will take 96 minutes to cook

(4)

Kevin has a different piece of beef.
The weight of his beef is 3 kg.

Kevin says

'Because the weight of my piece of beef is twice the weight of Delia's piece of beef it will take twice as long to cook as Delia's piece took.'

(b) Is Kevin correct?
Explain your answer.

3kg = 2.2 pounds × 3
= 6.6 pounds

cooking time in minutes = 20 × 6.6 + 30
= 162

The beef will take 162 minutes to cook

162 ÷ 96 = 1.6875

1/1

No Kevin is not correct because 162 minutes does not divide by 96 to make two. But if we were to round 1.6875 to the nearest integer, then he would be correct; since the question does not ask for rounding – Kevin is not correct.

(1)

(Total for Question 8 is 5 marks)

Examiner comments

(a) A fully correct answer with the units correctly stated.

(b) A nice alternative approach taken here that would gain the mark.

Student attempt B

8 Delia uses this rule to cook some beef.

Cooking time in minutes = 20 × weight in pounds + 30

The weight of the beef is 1.5 kg.
1 kg = 2.2 pounds.

(a) How long will the beef take to cook?

1 kg = 2.2 lb
0·5kg = 1·1 lb
3·3lb

3·3 x 20 = 66

66 + 30 = 96

= 96 minutes

4/4

(4)

Kevin has a different piece of beef.
The weight of his beef is 3 kg.

Kevin says

'Because the weight of my piece of beef is twice the weight of Delia's piece of beef it will take twice as long to cook as Delia's piece took.'

(b) Is Kevin correct?
Explain your answer.

~~He won't be~~

96 x 2 = 192

3kg = (2.2x3) = 6.6lb

6·6 x 20 = 132

132 + 30 = 162 minutes

no, it wait be double the cook time because it would mean you would add 60 at the end, not 30, so would add another 30 minutes cooking time.

1/1

(Total for Question 8 is 5 marks)

Examiner comments

(a) A fully correct answer with the units correctly stated.

(b) The student has realised that you would need to add 60 at the end rather than 30 if the statement is correct. (The figures alone with the answer of 'no' would have been sufficient.)

Student attempt C

8 Delia uses this rule to cook some beef.

Cooking time in minutes = 20 × weight in pounds + 30

The weight of the beef is 1.5 kg.
1 kg = 2.2 pounds.

(a) How long will the beef take to cook?

1.5kg = 3.05 pounds - ~~30.5~~ 61
20 × 3.05 pounds = ~~3 pounds~~. + 30 = ~~37~~ minutes

91 minutes.

2/4

(4)

Kevin has a different piece of beef.
The weight of his beef is 3 kg.

Kevin says

'Because the weight of my piece of beef is twice the weight of Delia's piece of beef it will take twice as long to cook as Delia's piece took.'

(b) Is Kevin correct?
Explain your answer.

~~No~~ NO. because it is not directly proportional.

1/1

(1)

(Total for Question 8 is 5 marks)

Examiner comments

(a) The conversion to pounds is incorrect and no method is shown. There is then evidence of the formula being applied correctly so both process marks can be awarded.

(b) The statement is sufficient even though it isn't clear what 'it' the student is referring to.

Student attempt D

8 Delia uses this rule to cook some beef.

Cooking time in minutes = 20 × weight in pounds + 30

The weight of the beef is 1.5 kg.
1 kg = 2.2 pounds.

(a) How long will the beef take to cook?

Cooking time in minutes ~~20 x (2.2 + 30)~~

1kg = 2.2 pounds
0.5kg = 1.1 pounds
1.5kg = 3.3 pounds

20 x 3.3 = 66 minutes + 30 = 96 minutes

4/4

~~96~~ mins

(4)

Kevin has a different piece of beef.
The weight of his beef is 3 kg.

Kevin says

'Because the weight of my piece of beef is twice the weight of Delia's piece of beef it will take twice as long to cook as Delia's piece took.'

(b) Is Kevin correct?
Explain your answer.

1.5kg = 3.3 pounds
3kg = 6.6 pounds

0/1

20 x 6.6 = 132 minutes + 30 = 152 minutes

96 x 2 = 192 mintes

192 mins > 152 mins
So No Kevin is wrong

(1)

(Total for Question 8 is 5 marks)

Examiner comments

(a) A fully correct answer with the units correctly stated.

(b) The conclusion might be correct, but it is supported by incorrect figures so the mark cannot be awarded.

Student attempt E

8 Delia uses this rule to cook some beef.

Cooking time in minutes = 20 × weight in pounds + 30

The weight of the beef is 1.5 kg.
1 kg = 2.2 pounds.

(a) How long will the beef take to cook?

1kg = £2.2 + = 3.3
500g = £1.1

20 × 3.3 +30 = 96

3/4

(4)

Kevin has a different piece of beef.
The weight of his beef is 3 kg.

Kevin says

'Because the weight of my piece of beef is twice the weight of Delia's piece of beef it will take twice as long to cook as Delia's piece took.'

(b) Is Kevin correct?
Explain your answer.

3kg x 2.2 = 6.6 pounds

20 x 6.6 +30 = 162 min

1/1

96 x 2 = 192 min
= WRONG

(1)

(Total for Question 8 is 5 marks)

Examiner comments

(a) A fully correct method leading to a correct answer. However, an answer of 96 alone is insufficient: there must be units given with the answer in order to gain the final mark.

(b) The student has worked out both necessary times correctly and shown that they are not equal.

Student attempt F

8 Delia uses this rule to cook some beef.

Cooking time in minutes = 20 × weight in pounds + 30

The weight of the beef is 1.5 kg.
1 kg = 2.2 pounds.

(a) How long will the beef take to cook?

1.5 kg = 3.3 pounds
20 × 3.3 = 66
+ 30 = 96
96 minutes

4/4

(4)

Kevin has a different piece of beef.
The weight of his beef is 3 kg.

Kevin says

'Because the weight of my piece of beef is twice the weight of Delia's piece of beef it will take twice as long to cook as Delia's piece took.'

(b) Is Kevin correct?
Explain your answer.

3 kg = 6.6 pounds × 20 = 132 + 30 = 162
No, Kevin's piece of beef will take 162 minutes to cook

0/1

(1)

(Total for Question 8 is 5 marks)

Examiner comments

(a) A fully correct answer with the units correctly stated.

(b) The time to cook Kevin's beef has been correctly calculated, but the figure to compare this with has not been stated.

Student attempt G

8 Delia uses this rule to cook some beef.

Cooking time in minutes = 20 × weight in pounds + 30

The weight of the beef is 1.5 kg.
1 kg = 2.2 pounds.

(a) How long will the beef take to cook?

1.5 kg = 3.3 lbs

1 kg = 2.2

0.5 kg = 1.1

x10 200
30 6000
9 600

20 × 3.3 + 30

20 × 3.3 = 66 mins + 30 = 96 mins

= 1h 36 mins

20 × 03:

4/4

(4)

Kevin has a different piece of beef.
The weight of his beef is 3 kg.

Kevin says

> 'Because the weight of my piece of beef is twice the weight of Delia's piece of beef it will take twice as long to cook as Delia's piece took.'

(b) Is Kevin correct?
Explain your answer.

No because you will still add 30, so it wont be doubled.

1/1

(1)

(Total for Question 8 is 5 marks)

Examiner comments

(a) A fully correct answer with the units correctly stated.

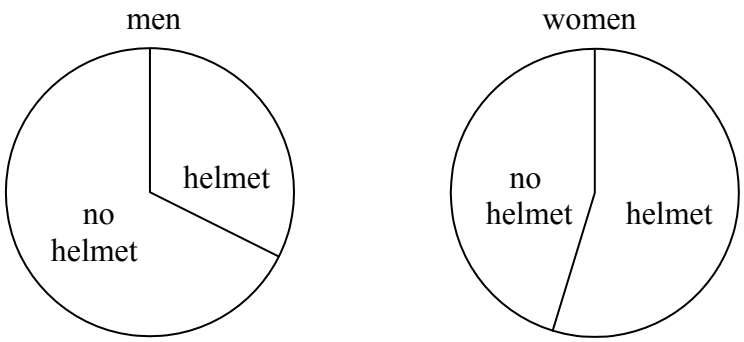
(b) The statement is sufficient, as there is a realisation that the 30 still needs to be added to the time.

Exemplar question 9

Foundation tier Paper 2 (calculator)

11 Imran carried out a survey on the wearing of cycle helmets by the men and the women living in his village.

He used the information he collected to draw two pie charts.



Mary looks at the two pie charts.

She says:

"The pie charts show that more women wear helmets than men."

(a) Is Mary right?
You must explain your answer

(1)

Imran chose to draw pie charts to display the results of his survey.

(b) Are pie charts the best way to show this information?
You must explain your answer.

(1)

(Total for Question 11 is 2 marks)

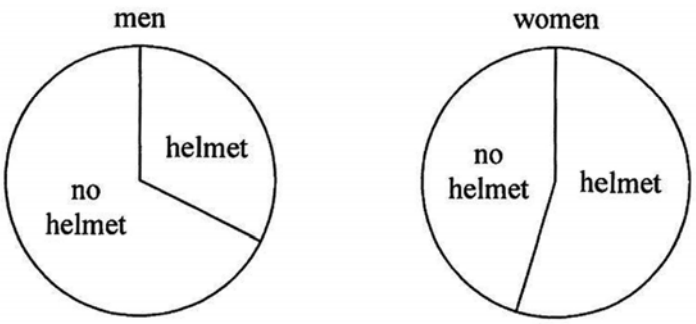
Mark scheme

Question	Working	Answer	Mark	AO	Notes
11 (a)		Explanation	C	2.3b	C1, e.g. No because pie charts show proportions not actual numbers **or** could be that there were more men in the survey than women
11 (b)		Explanation	C	2.5b	C1, e.g. Yes pie charts are useful if you want to show proportion in each category **or** No – if you want to show that more women than men wear helmets, then bar chart or vertical line graph would be more appropriate

Student attempt A

11 Imran carried out a survey on the wearing of cycle helmets by the men and the women living in his village.

He used the information he collected to draw two pie charts.



1/1

Mary looks at the two pie charts.

She says:

"The pie charts show that more women wear helmets than men."

(a) Is Mary right?
You must explain your answer.

No, because it doesn't State how many women and men took part in tle survey. For example tlere could be 10 women and 100 men.

(1)

Imran chose to draw pie charts to display the results of his survey.

(b) Are pie charts the best way to show this information?
You must explain your answer.

No, because you can't tell tle exact percentage of people. The best way is to use a bar graph with axis.

0/1

(1)

(Total for Question 11 is 2 marks)

Examiner comments

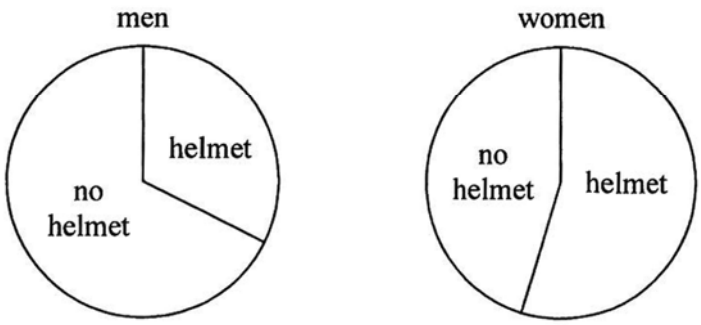
(a) A good explanation with example figures given.

(b) The explanation refers to percentages, with the implication that a pie chart doesn't show these but a bar chart does: this is an incorrect statement so the mark cannot be awarded.

Student attempt B

11 Imran carried out a survey on the wearing of cycle helmets by the men and the women living in his village.

He used the information he collected to draw two pie charts.



1/1

Mary looks at the two pie charts.

She says:

"The pie charts show that more women wear helmets than men."

(a) Is Mary right?
You must explain your answer.

NO, becase it doesnt state how many women and men took part in the survey.

(1)

Imran chose to draw pie charts to display the results of his survey.

1/1

(b) Are pie charts the best way to show this information?
You must explain your answer.

NO, because you cannot tell how many people at of the people who had been surveyed wore a helmet, could use a bar graph for clearer results.

(1)

(Total for Question 11 is 2 marks)

Examiner comments

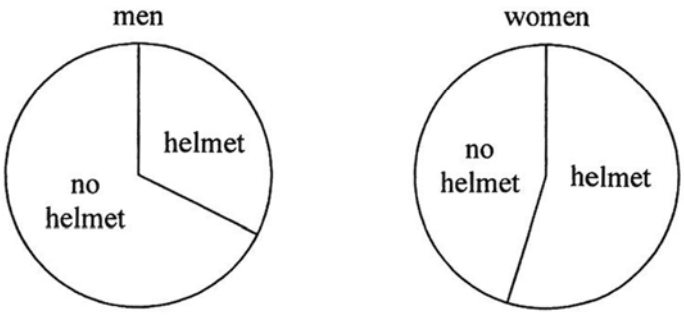
(a) A correct explanation.

(b) In this response the bar chart would, as the student has said, show how many people wore a helmet.

Student attempt C

11 Imran carried out a survey on the wearing of cycle helmets by the men and the women living in his village.

He used the information he collected to draw two pie charts.



Mary looks at the two pie charts.

She says:

"The pie charts show that more women wear helmets than men."

0/1

(a) Is Mary right?
You must explain your answer.

Yes, because on the women pie chart, most of the chart is showing a bigger percentage of women were a helmet than men. The charts shows just over 50% wear helmets and over 25% of men wear helmets

(1)

Imran chose to draw pie charts to display the results of his survey.

(b) Are pie charts the best way to show this information?
You must explain your answer.

1/1

No, because they do not accurately show how many people do or do not wear helmets.

(1)

(Total for Question 11 is 2 marks)

Examiner comments

(a) An incorrect statement which just refers to the percentage shown on the pie charts and doesn't make a comment about the actual number of men/women.

(b) The explanation here is sufficient, as the student realises that you cannot tell how many people do or do not wear a helmet from the pie charts.

GCSE Mathematics Paper 3F (calculator)

Exemplar question 10

Foundation tier Paper 3 (calculator)

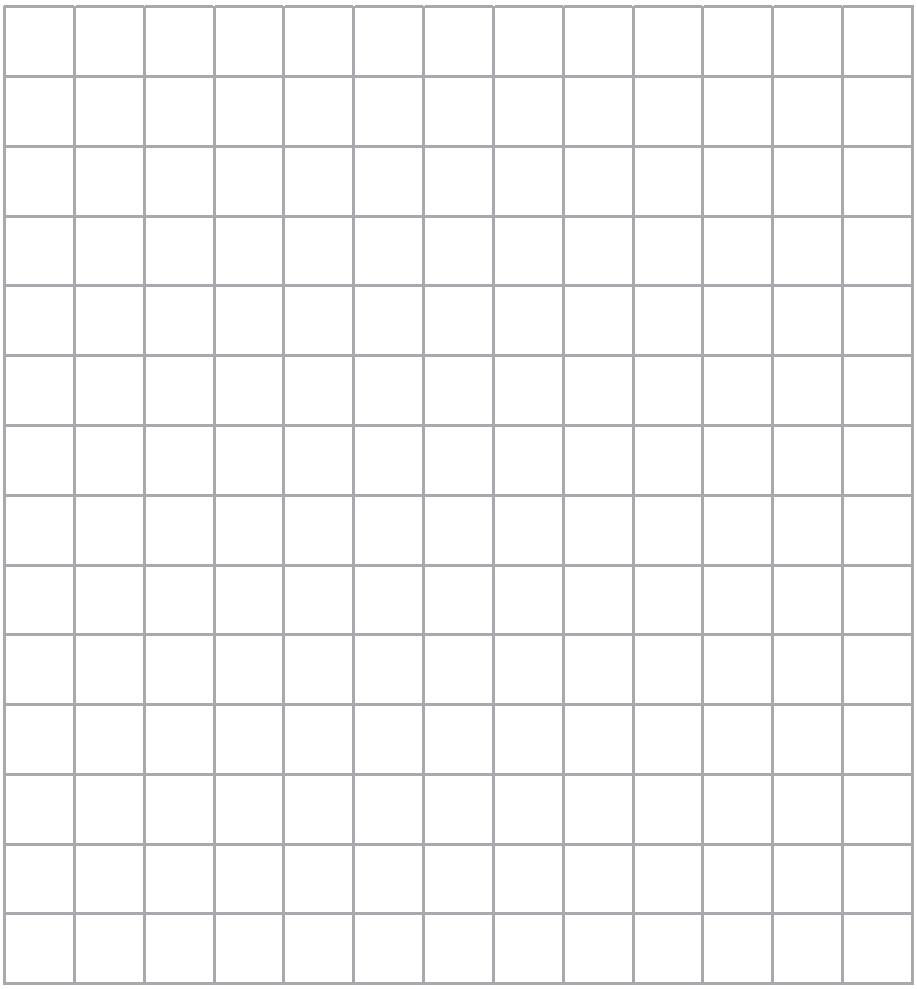
11 A has coordinates (40, 60)
B has coordinates (0, 20)

A straight line passes through the points A and B.

The point P lies on this straight line.

The x-coordinate of P is 0.5.

(a) Find the y-coordinate of P.



(3)

(b) Is your answer to part (a) reliable?
Explain your answer.

(1)

(Total for Question 11 is 4 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
11 (a)		20.5	P	3.1b	P1 for a correct start to a correct process to identify the required straight line, e.g. a sketch showing points (40, 60) and (0, 20) joined with a line segment or a correct process to find the gradient of a line between the two points, e.g. $\frac{60-20}{40-0}$ (=1)
			P	3.1b	P1 for a correct process using scale factors, e.g. showing two similar triangles with the line crossing the x-axis or for a correct process using $y = mx + c$ to find the value of c (= 20) or $y = x + 20$
			A	1.3b	A1 for 20.5
11 (b)		decision and explanation	C	3.4b	C1 for a decision on the reliability of their answer to part (a) with valid explanation eg no I have drawn a line on he grid and my line may not be accurate(need both the decision and an explanation to gain the mark)

Student attempt A

11 A has coordinates (40, 60)
B has coordinates (0, 20)

A straight line passes through the points A and B.

The point P lies on this straight line.

The x-coordinate of P is 0.5.

(a) Find the y-coordinate of P.

$x = 40$ when $y = 60$
$x = 0$ when $y = 20$

$x = y - 20$

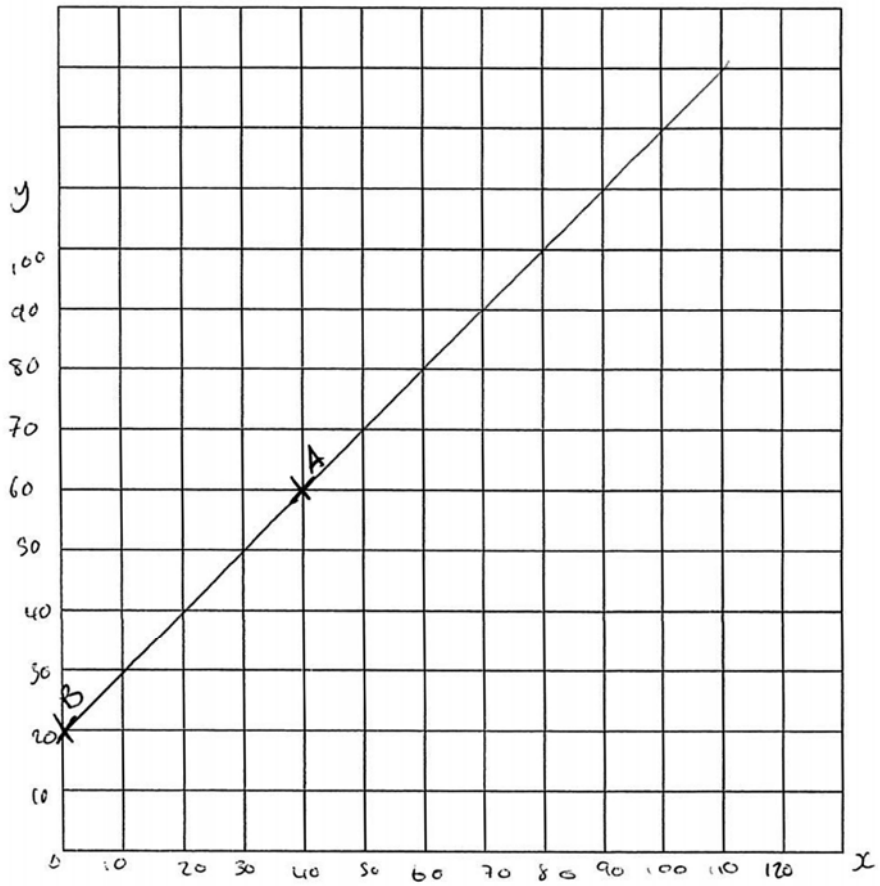
$y = x + 20$

$y = 20.5$

(0.5, 20.5)

what is y when
$x = 0.5$

Student attempt A continued



3/3

(3)

(b) Is your answer to part (a) reliable?
Explain your answer.

There is only two points so there is no certainty that they are both correct, there should be at least 3.

0/1

NO

(1)

(Total for Question 11 is 4 marks)

Examiner comments

(a) An algebraic approach is taken, with the equation of the line correctly given along with the correct value for the y coordinate.

(b) The explanation is not correct.

Student attempt B

11 A has coordinates (40, 60)
B has coordinates (0, 20)

A straight line passes through the points A and B.

The point P lies on this straight line.

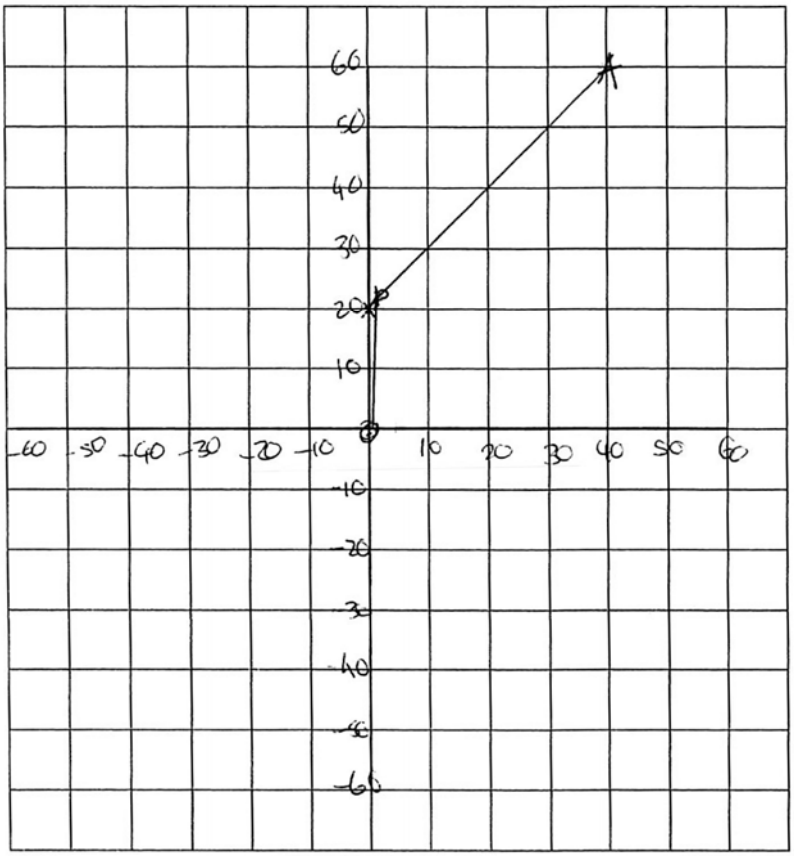
The x-coordinate of P is 0.5.

(a) Find the y-coordinate of P.

21

(0.5, 21)

Student attempt B continued



2/3

(3)

(b) Is your answer to part (a) reliable?
Explain your answer.

no, I can not see the exact point on my graph

1/1

(1)

(Total for Question 11 is 4 marks)

Examiner comments

(a) The student has plotted the points and attempted to draw a graph, but the value given for the y coordinate is incorrect.

(b) The student realises why their method is not reliable.

Student attempt C

11 A has coordinates (40, 60)
B has coordinates (0, 20)

A straight line passes through the points A and B.

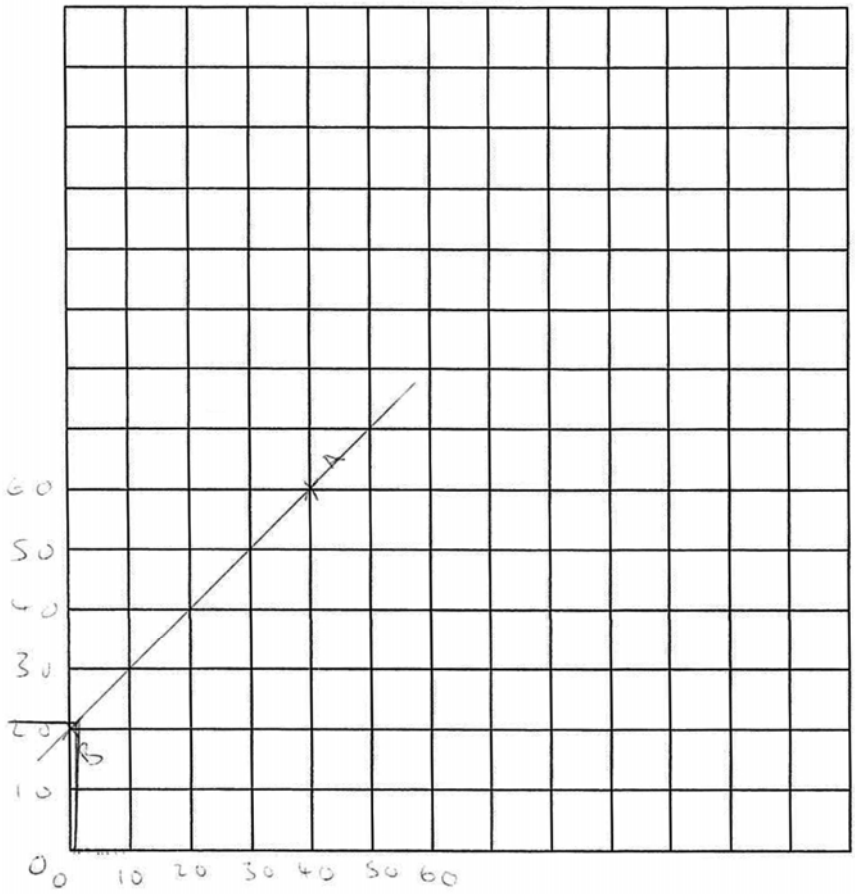
The point P lies on this straight line.

The x-coordinate of P is 0.5.

(a) Find the y-coordinate of P.

$y = 2.5$.

Student attempt C continued



2/3

(3)

(b) Is your answer to part (a) reliable?
Explain your answer.

No not at all because, my scale was too big to get an accurate measurement of where 0.5 was on my x ~~axis~~ coordinate so this meant the accuract of my y coordinate isnt reliable.

1/1

(1)

(Total for Question 11 is 4 marks)

Examiner comments

(a) The process is correct, but the value of the *y* coordinate is incorrect.

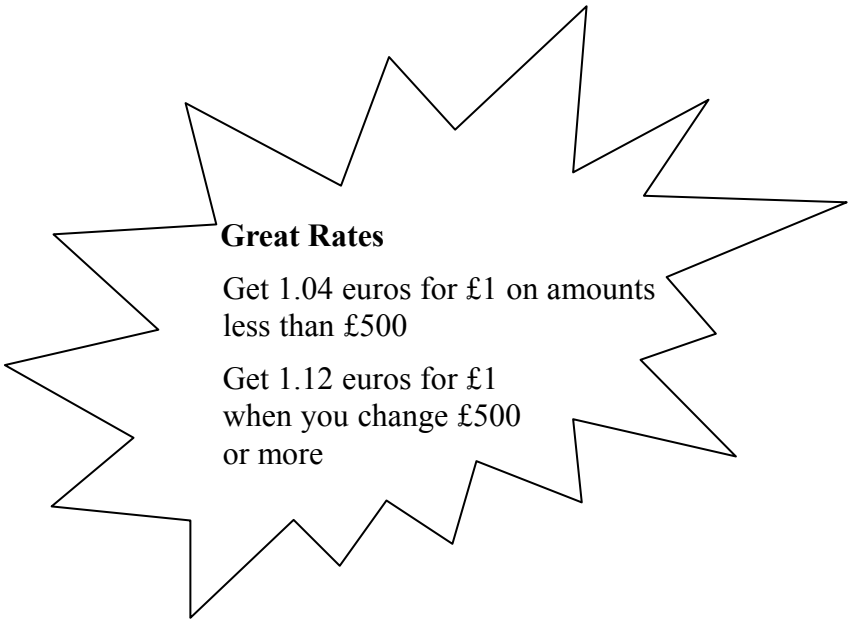
(b) The explanation given here is sufficient, as the student realises that their method is unreliable due to the scale used.

Exemplar question 11

Foundation tier Paper 3 (calculator) (also Higher tier question 1)

12 Mr and Mrs Sharma are going to France.

They each have £300 which they want to change into euros.
They see this deal in a bank.



Mr and Mrs Sharma want the best deal.

They put their money together before changing it into euros.

How much extra money do they get by putting their money together before they change it?

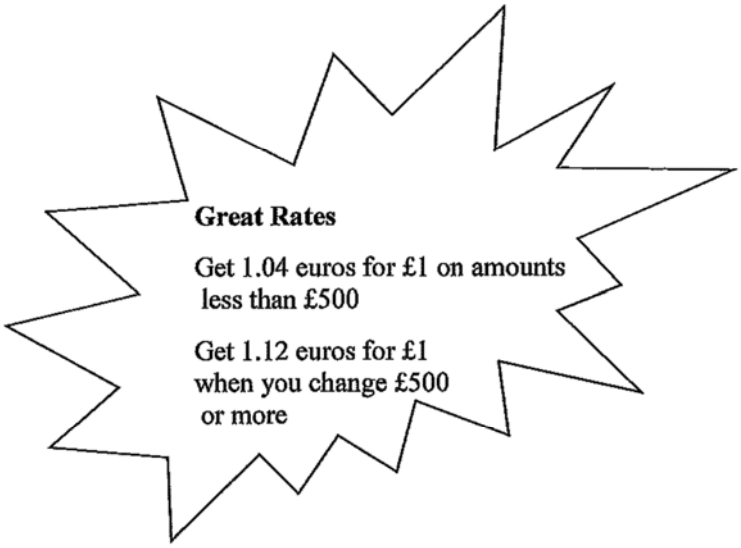
(Total for Question 12 is 3 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
12		€48 or £42.86	P	3.1c	P1 for a correct process, using the lower rate, to find the amount by changing their money separately, e.g. 300 × 1.04 × 2 (= 624)
			P	3.1c	P1 for a correct process, using the higher rate, to find the amount by changing their money together, e.g. 300 × 2 × 1.12 (= 672) resulting in two values to compare
			A	1.3a	A1 for 48 euros or £42.85 or £42.86 if converted to sterling, units must be clear

Student attempt A

11 Mr and Mrs Sharma are going to France.
They each have £300 which they want to change into euros.
They see this deal in a bank.



2/3

Mr and Mrs Sharma want the best deal.

They put their money together before changing it into euros.

How much extra money do they get by putting their money together before they change it?

£300 + £300 = £600

600 x 1.12 = 672 euros

1x10 1÷10

600 x 112 = 67200

600	
100	60000
10	6000
2	1200

300 x 1.04 = 312 x2 = 624

672 - 312 = 360

~~they get £~~ extra

£48 extra

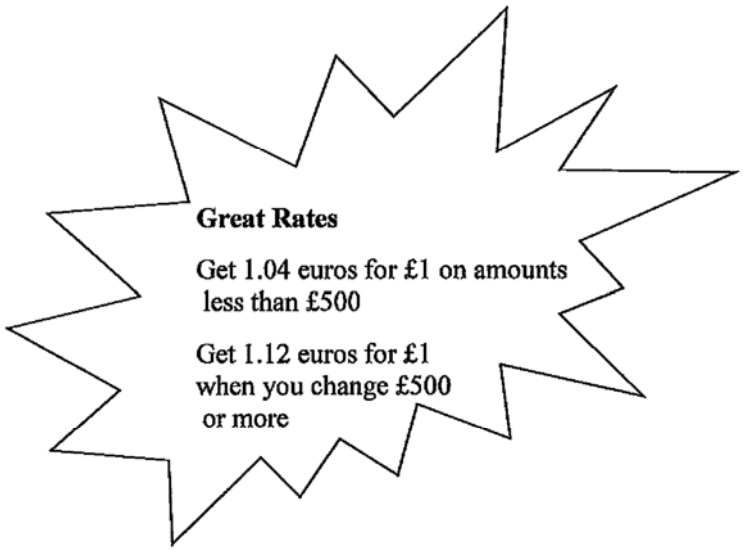
(Total for Question 11 is 3 marks)

Examiner comments

A fully correct method, but the wrong units are given with the final answer so the final mark cannot be awarded.

Student attempt B

11 Mr and Mrs Sharma are going to France.
They each have £300 which they want to change into euros.
They see this deal in a bank.

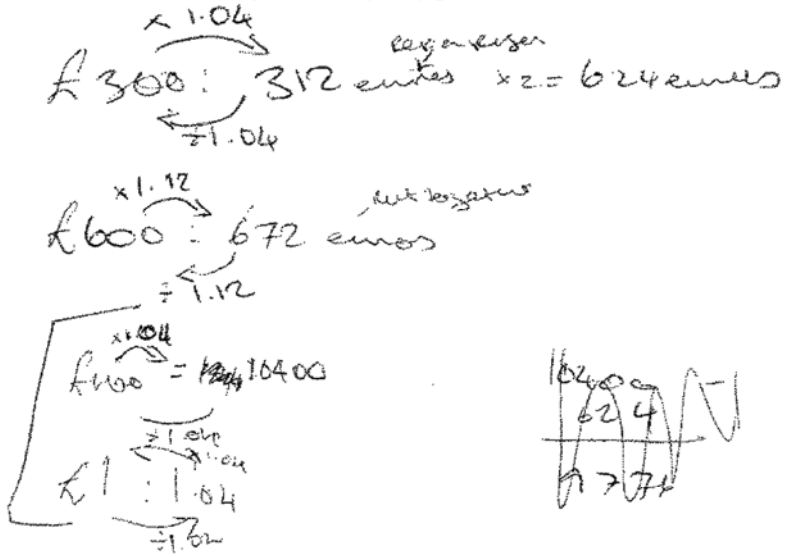


2/3

Mr and Mrs Sharma want the best deal.

They put their money together before changing it into euros.

How much extra money do they get by putting their money together before they change it?



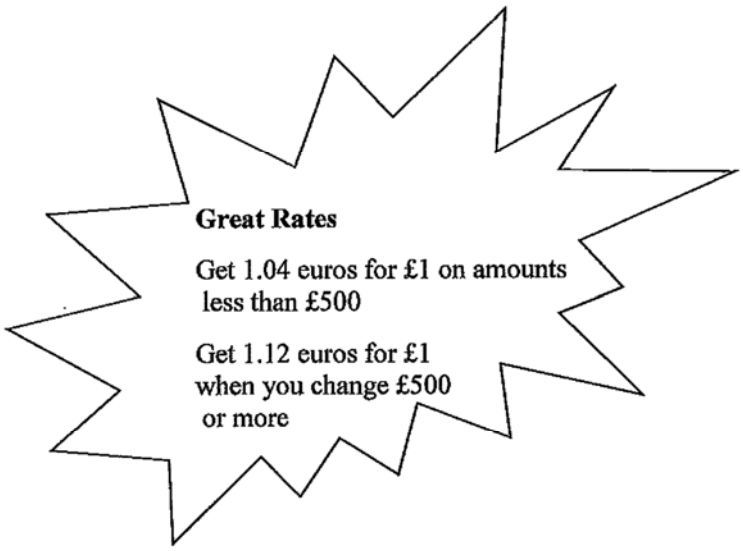
(Total for Question 11 is 3 marks)

Examiner comments

The student has got as far as 624 euros and 672 euros, which is sufficient to gain the first two process marks, but then fails to find the difference.

Student attempt C

11 Mr and Mrs Sharma are going to France.
They each have £300 which they want to change into euros.
They see this deal in a bank.



2/3

Mr and Mrs Sharma want the best deal.

They put their money together before changing it into euros.

How much extra money do they get by putting their money together before they change it?

÷1.04
1·04 : £1
× 1·04
÷ 500

300 × 1·04 =
312
× 2
624

÷1·04
1·12 : £1
× 1·12
× 500

300 × 1·12 =
336
× 2
672

Difference = 48

(Total for Question 11 is 3 marks)

Examiner comments

A fully correct method, but no units are given with the final answer so the final mark cannot be awarded.

Exemplar question 12

Foundation tier Paper 3 (calculator) (also Higher tier question 4)

15 Linda keeps chickens.
She sells the eggs that her chickens lay.

She has 140 chickens.
Each chicken lays 6 eggs a week.

Linda gives each chicken 100 g of chicken feed each day.
The chicken feed costs £6.75 for a 25 kg bag.

Work out the cost of the chicken feed for every 12 eggs.

(Total for Question 15 is 5 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
15		38p	P	3.1d	P1for a correct first step, e.g. 140 × 6 (= 840 eggs per week)
			P	3.1d	P1 for a correct process to find the weight of feed per week, e.g. 100 × 140 × 7 (= 98000g or 98 kg)
			P	3.1d	P1 for a correct method to find the weekly cost, e.g. 6.75 ÷ 25 × "98" (= £26.46)
			P	3.1d	P1 for completing the process to find the cost of feed required for 12 eggs, e.g. (2646 ÷ 840) × 12 = 37.8p
			A	1.3b	A1 for 37.8p or 38p oe

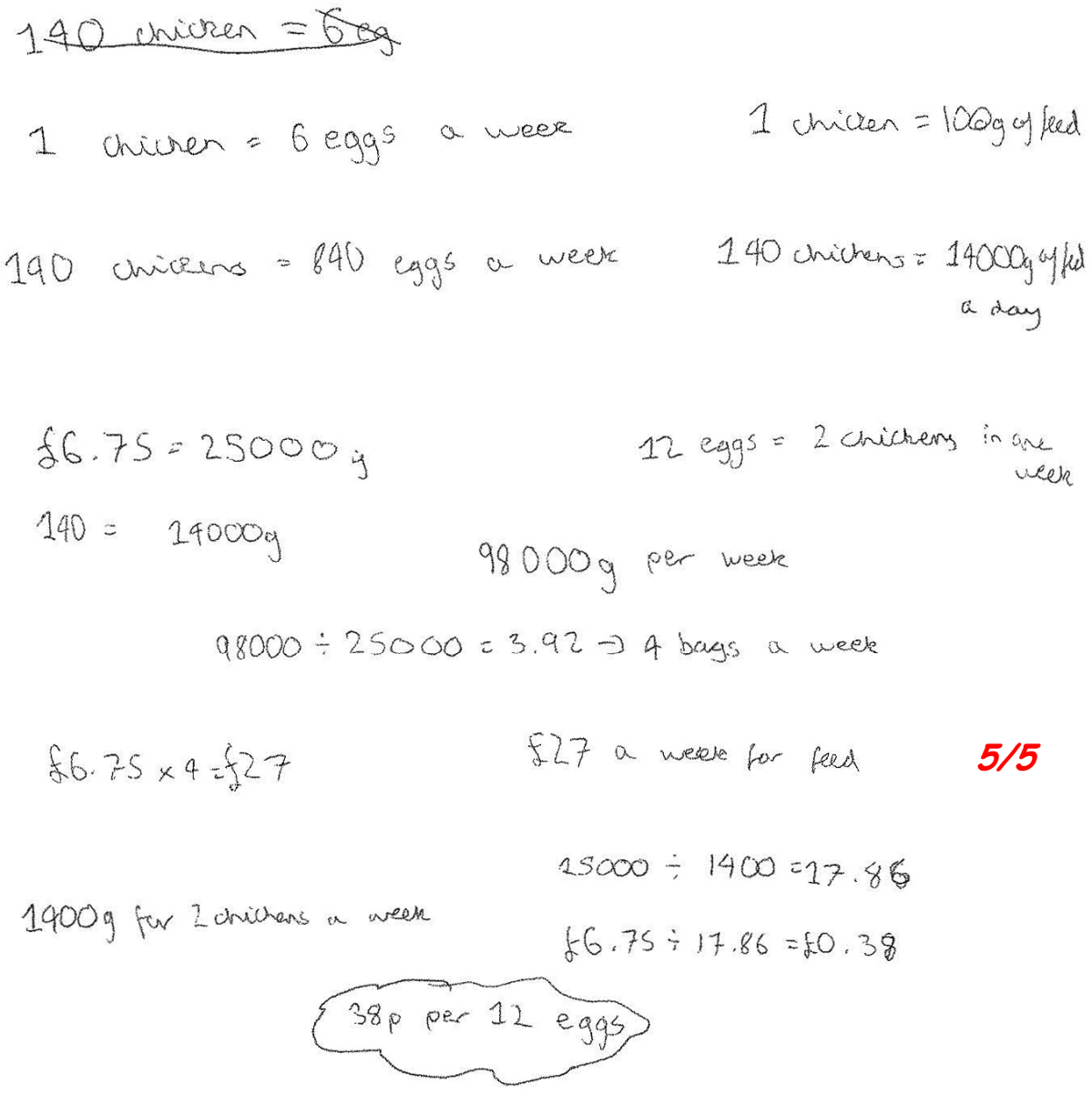
Student attempt A

15 Linda keeps chickens.
She sells the eggs that her chickens lay.

She has 140 chickens.
Each chicken lays 6 eggs a week.

Linda gives each chicken 100 g of chicken feed each day.
The chicken feed costs £6.75 for a 25 kg bag.

Work out the cost of the chicken feed for every 12 eggs.



(Total for Question 15 is 5 marks)

Examiner comments

A fully correct solution, with the correct units given with the answer.

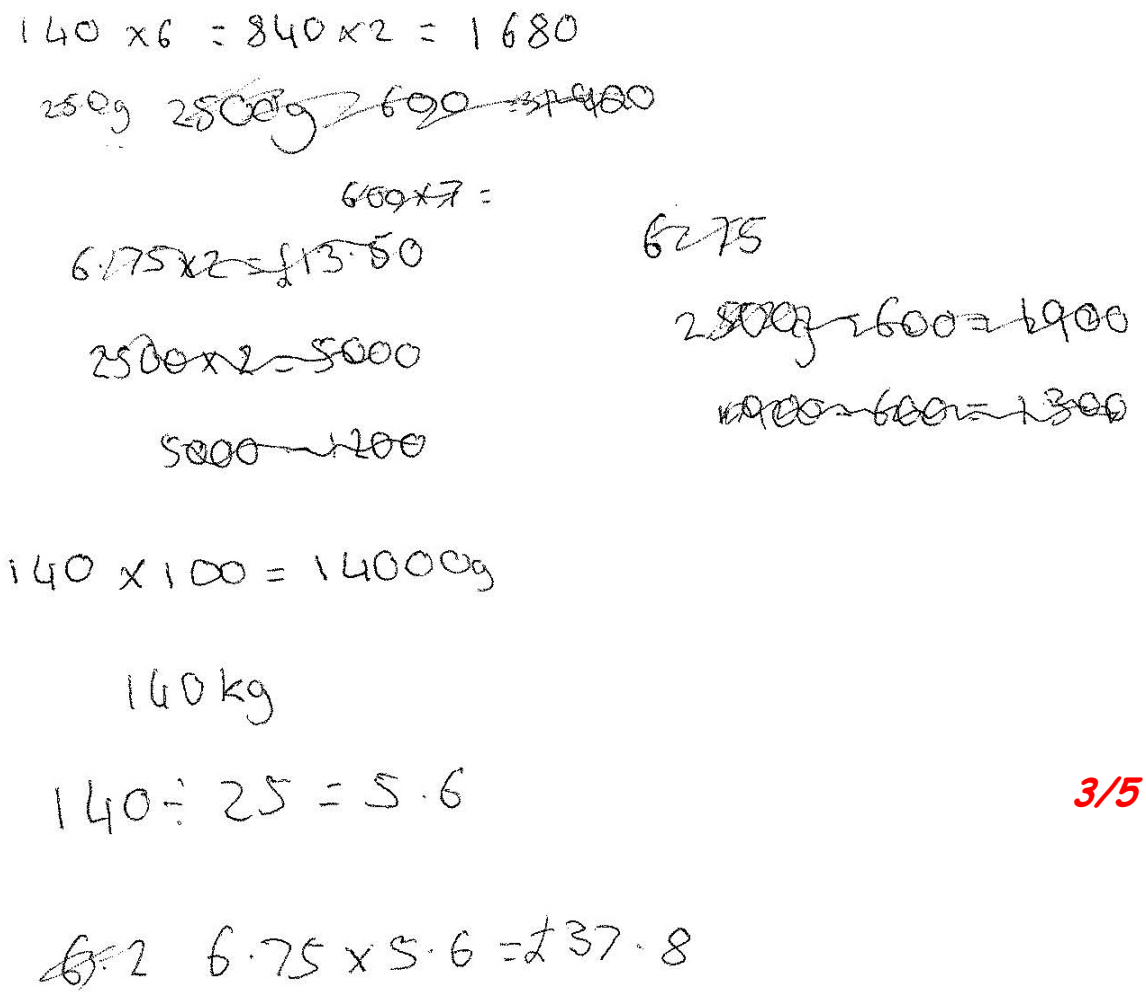
Student attempt B

15 Linda keeps chickens.
She sells the eggs that her chickens lay.

She has 140 chickens.
Each chicken lays 6 eggs a week.

Linda gives each chicken 100 g of chicken feed each day.
The chicken feed costs £6.75 for a 25 kg bag.

Work out the cost of the chicken feed for every 12 eggs.



3/5

(Total for Question 15 is 5 marks)

Examiner comments

The student starts by finding the weekly number of eggs produced; however, this isn't used for the final answer. The working for the final answer starts below the crossed-out working. Here the error is in the conversion of grams to kg. This then leads to the wrong answer.

Student attempt C

15 Linda keeps chickens.
She sells the eggs that her chickens lay.

She has 140 chickens.
Each chicken lays 6 eggs a week.

Linda gives each chicken 100 g of chicken feed each day.
The chicken feed costs £6.75 for a 25 kg bag.

Work out the cost of the chicken feed for every 12 eggs.

£6.75 x 4 = £27 per day

£27 x 7 = £189

£189 ÷ 140 = £1.35 per chicken

£1.35 = 6 eggs

(£1.35 x 2) = 12 eggs

£2.70 = 12 eggs

£2.70 of chicken feed for every 12 eggs

2/5

(Total for Question 15 is 5 marks)

Examiner comments

This student starts by multiplying £6.75 by 4; it isn't clear where the '4' has come from. (It is possible that this is from 100(g) ÷ 25(kg).) Having found what they think is the cost of food per week, the student divides this by the number of chickens (140) to find the cost for 6 eggs, and then doubles this to find the cost for 12 eggs, so the 3rd and 4th process marks can be awarded.

Student attempt D

15 Linda keeps chickens.
She sells the eggs that her chickens lay.

She has 140 chickens.
Each chicken lays 6 eggs a week.

Linda gives each chicken 100 g of chicken feed each day.
The chicken feed costs £6.75 for a 25 kg bag.

Work out the cost of the chicken feed for every 12 eggs.

100 X 7 = 700 X 140 = 98000 X 2 = 196000g ÷ 140

~~196kg~~ = 1400g of feed Per chicken

1400 ÷ 1000 = 1.4kg ~~196kg ÷ 25 = 7.84~~

1.4kg = One bag

~~= 8 bags~~

6.75 ÷ 25 = 0.27 X ~~6.75 X 8 = £54~~

1.4

= £0.378

= £0.38 (2DP)

5/5

(Total for Question 15 is 5 marks)

Examiner comments

A fully correct solution, with the correct units given with the answer.

Student attempt E

15 Linda keeps chickens.
She sells the eggs that her chickens lay.

1000g = 1kg

She has 140 chickens.
Each chicken lays 6 eggs a week.

Linda gives each chicken 100 g of chicken feed each day.
The chicken feed costs £6.75 for a 25 kg bag.

Work out the cost of the chicken feed for every 12 eggs.

eggs per week = 140 x 6 = 840

Chicken feed per chicken per week = 700g

12 eggs per week = 1400kg

1400g → 1.4kg

25 x 0.056 = 1.4

5.6%

4/5

6.75 x ~~5.6~~ 0.056 = 0.378

= 0.38p

Ans = 0.38p

(Total for Question 15 is 5 marks)

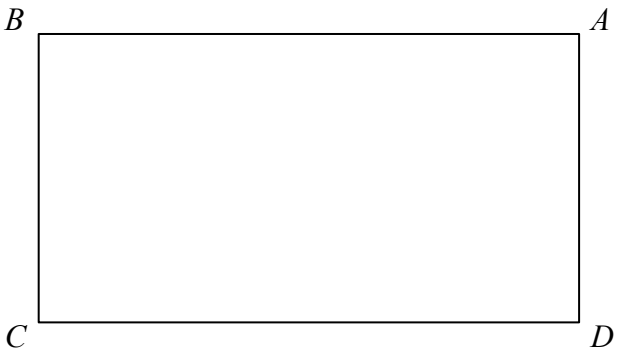
Examiner comments

This student has taken the approach of realising that one chicken will lay 12 eggs in two weeks. The amount of food needed by one chicken in two weeks is 1.4 kg, which is 0.056 of a 25 kg bag. The complete process is correct; the only error is the units in the final answer, with 0.38p rather than £0.38 or 38p given.

Exemplar question 13

Foundation tier Paper 3 (calculator) (also Higher tier question 6)

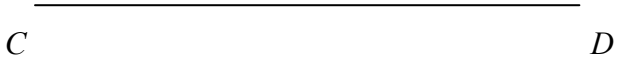
17 The diagram shows a rectangle *ABCD*.



In the space below, use a ruler and a pair of compasses to construct a right-angled triangle equal in area to the area of the rectangle *ABCD*.

You must show all your construction lines.

The base of the triangle, which is equal in length to the side *CD*, has been drawn for you.



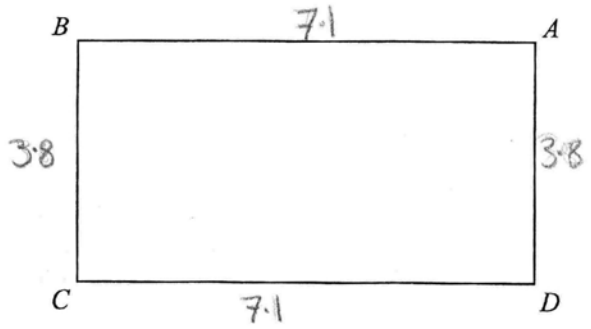
(Total for Question 17 is 3 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
17		A correct right-angled triangle constructed	P	2.3a	P1 for a construction of a right angle at C or D (construction arcs must be seen)
			P	2.3b	P1 (indep) for the correct height of the triangle drawn or shown
			P	2.3b	P1 for a fully correct constructed triangle

Student attempt A

17 The diagram shows a rectangle *ABCD*.



In the space below, use a ruler and a pair of compasses to construct a right-angled triangle equal in area to the area of the rectangle *ABCD*.

You must show all your construction lines.

The base of the triangle, which is equal in length to the side *CD*, has been drawn for you.

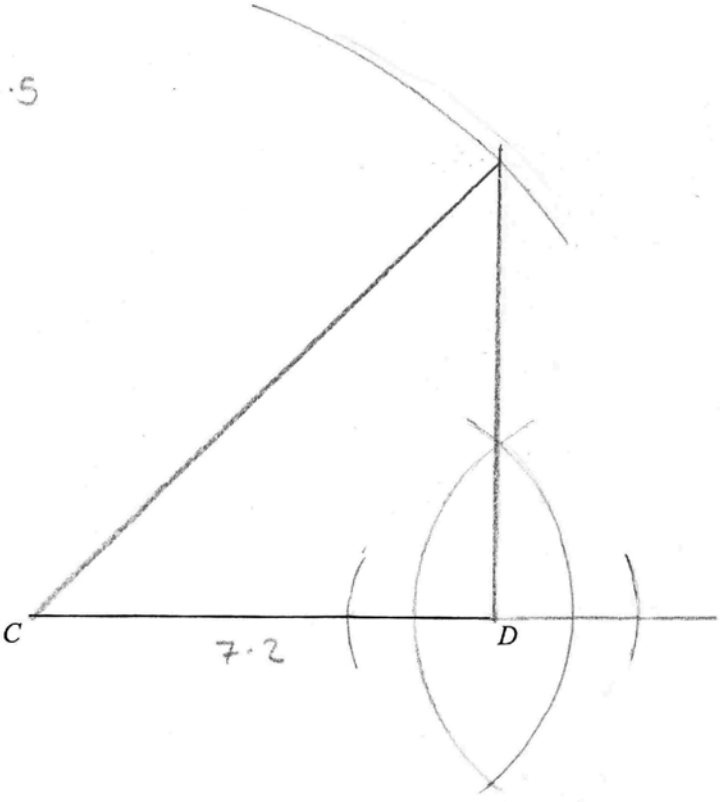
ABCD = 7·1 × 3·8
= 26·98
= 27 to 2 sf

Triangle = $\frac{b \times h}{2}$

= 27
= 54 ÷ 2

∴ 54 = 7·2 × 7·5

$h^2 = a^2 + b^2$
$h^2 = 7.2^2 + 7.5^2$
$h = \sqrt{7.2^2 + 7.5^2}$
$h = 10.4$



1/3

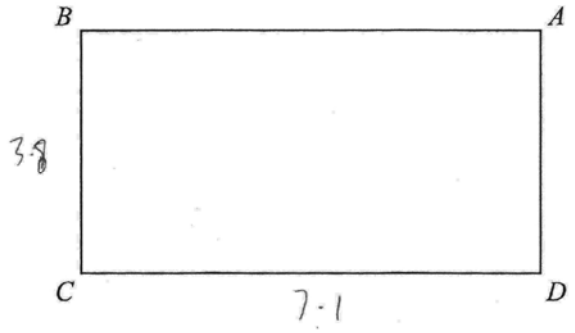
(Total for Question 17 is 3 marks)

Examiner comments

The student has constructed a right angle; construction arcs are seen so the first process mark can be awarded. There is an attempt to calculate the height, but rounding occurs so the value of 7.6, which would come from the student's measurement of the rectangle, is never seen.

Student attempt B

17 The diagram shows a rectangle *ABCD*.

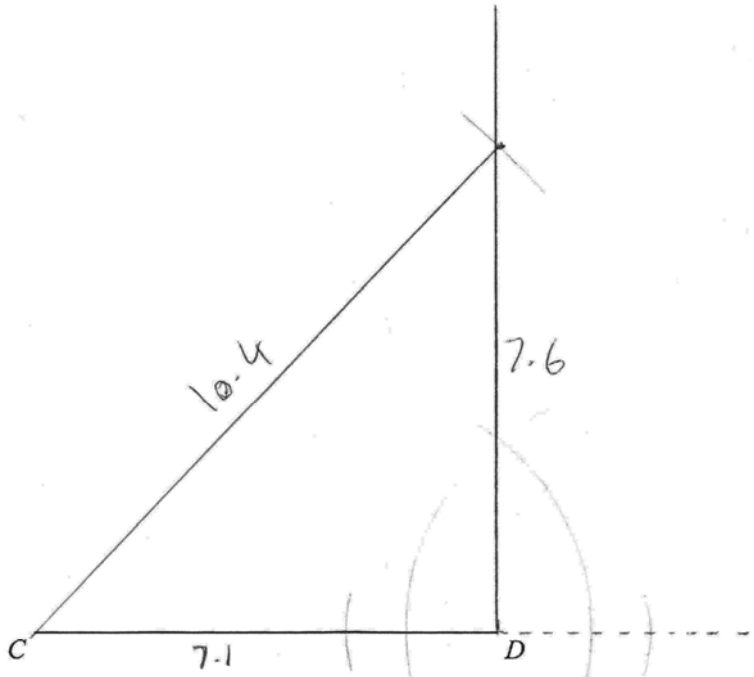


In the space below, use a ruler and a pair of compasses to construct a right-angled triangle equal in area to the area of the rectangle *ABCD*.

You must show all your construction lines.

The base of the triangle, which is equal in length to the side *CD*, has been drawn for you.

10.4



1/3

$\frac{7.1 \times x}{2} = 26.98$ $x = \frac{53.96}{7.1}$ $x = 7.6$

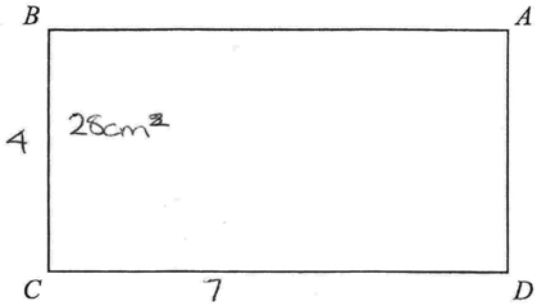
(Total for Question 17 is 3 marks)

Examiner comments

No construction arcs are seen, so the first process mark cannot be awarded. The correct height of the triangle is seen, so the second mark can be awarded.

Student attempt C

17 The diagram shows a rectangle *ABCD*.



In the space below, use a ruler and a pair of compasses to construct a right-angled triangle equal in area to the area of the rectangle *ABCD*.

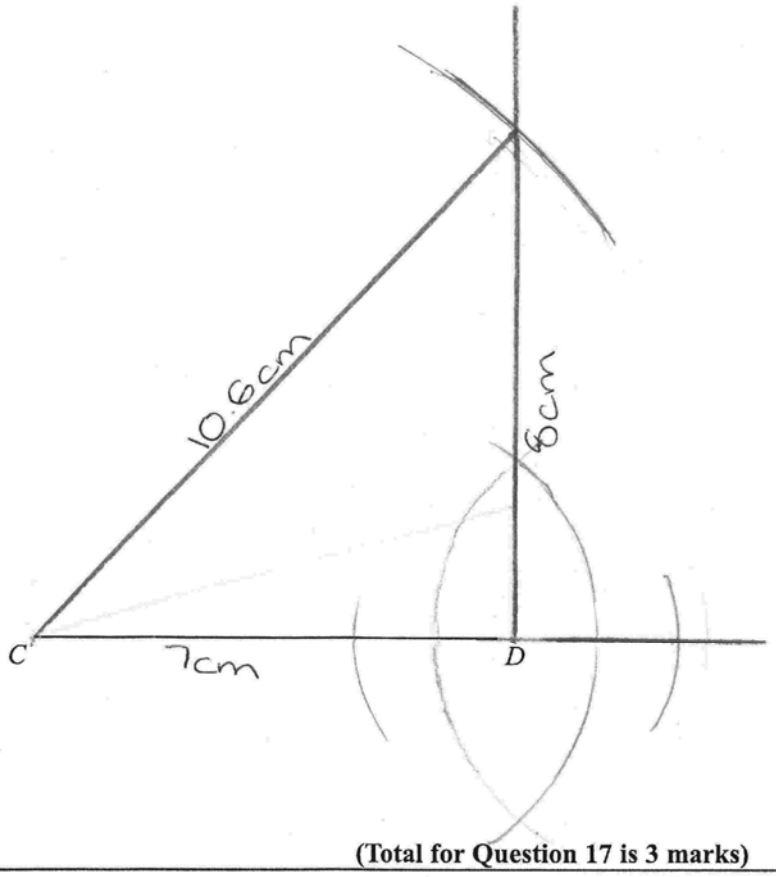
You must show all your construction lines.

The base of the triangle, which is equal in length to the side *CD*, has been drawn for you.

ABCD = 7×4
= 28

$h^2 = a^2 + b^2$
$= 7^2 + 8^2$
$h = \sqrt{7^2 + 8^2}$
$h = 10.6$

Triangle = $\frac{b \times h}{2}$
$= \frac{7 \times 8}{2}$
$= 23$



2/3

(Total for Question 17 is 3 marks)

Examiner comments

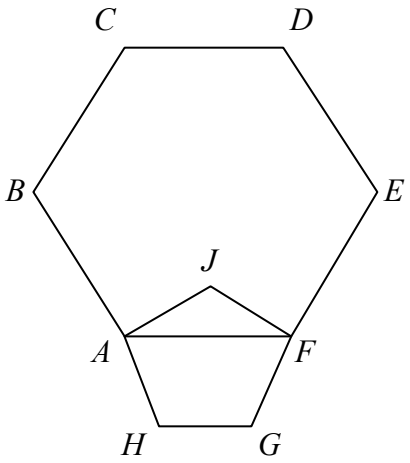
The student has constructed a right angle; construction arcs are seen, so the first process mark can be awarded. The student has measured the height of the rectangle as 4 cm, so the given height of 8 cm for the triangle is correct, but this leads, overall, to an incorrect triangle and the loss of the final mark.

GCSE Mathematics Paper 1H (non-calculator)

Exemplar question 14

Higher tier Paper 1 (non-calculator)

9 *ABCDEF* is a regular hexagon.
AJFGH is a regular pentagon.



Work out the size of angle *BAJ*.

(Total for Question 9 is 4 marks)

Mark scheme

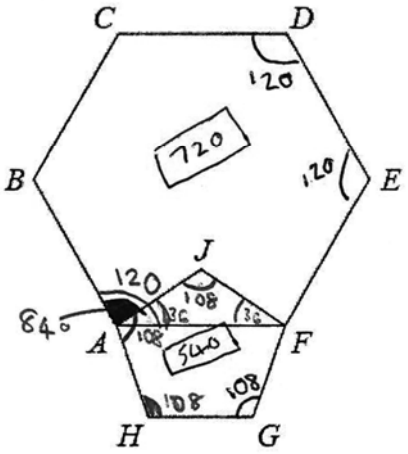
Question	Working	Answer	Mark	AO	Notes
9		84°	P	3.1b	P1 for process to find size of interior angle of hexagon or pentagon
			P	3.1b	P1 for establishing a correct process to find angle *JAF*, e.g. *JAF* = (180 − 108) ÷ 2
			P	3.1b	P1 for a complete process to find angle *BAJ*
			A	1.3b	A1 cao

Student attempt A

9 *ABCDEF* is a regular hexagon.

AJFGH is a regular pentagon.

↳ Same angles + same length sides.



Work out the size of angle *BAJ*.

- Each angle in hexagon = 120 because 720 ÷ 6 = 120
- Each angle in pentagon = 108 because 540 ÷ 5 = 108
- Angle $A\hat{J}F$ = 108 so angle $J\hat{A}F$ and angle $J\hat{F}A$ are both 36 (180 − 108 ÷ 2) - isosceles
- 120 − ($B\hat{A}F$) − 36 ($J\hat{A}F$) = 84° so $B\hat{A}J$ = 84°

4/4

(Total for Question 9 is 4 marks)

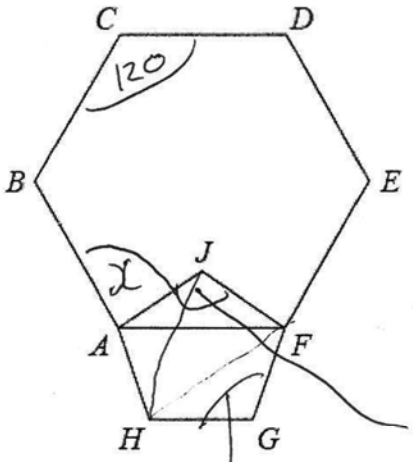
Examiner comments

A fully correct answer, with angle *BAJ* given as 84°.

Student attempt B

9 *ABCDEF* is a regular hexagon.

AJFGH is a regular pentagon.



Work out the size of angle *BAJ*.

180 − 108 = 72 ÷ 2 =

36

120 − 36 = 84

3/4

(Total for Question 9 is 4 marks)

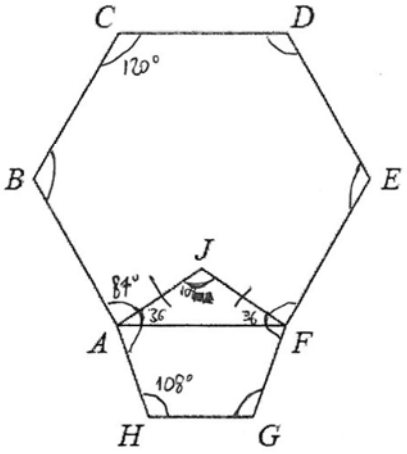
Examiner comments

An interior angle of the hexagon is correctly shown as 120°. The correct processes to calculate angle *BAJ* are seen in the working space. The number 84 is seen in the working space but the lack of a degrees sign means that the final accuracy mark cannot be awarded.

Student attempt C

9 *ABCDEF* is a regular hexagon.

AJFGH is a regular pentagon.



180 - 108 = 72 ÷ 2 = 36

120 - 36 = 84

Work out the size of angle *BAJ*.

4/4

(Total for Question 9 is 4 marks)

Examiner comments

The answer is correct and shown on the diagram as well as in the circled answer.

Exemplar question 15

Higher tier Paper 1 (non-calculator)

10 Ishmael is a salesperson for a company.

His monthly wage is made up of his fixed basic wage plus commission.

His commission for a month is a fixed percentage of the sales he makes that month.
The table gives some information about his monthly wages.

Month	Monthly wage (£)	Sales (£)
June	1700	20 000
July	2200	30 000
August	2050	27 000

In September, Ishmael's monthly wage was £1850 Work out his sales, in £, for September.

(Total for Question 10 is 4 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
10		Method 1 $2200 - 1700 = 500$ $30000 - 0000 = 10000$ For every £100 increase in wage the increase in sales = £2000 $1850 - 1700 = 150$ Difference in sales $= 1.5 \times 2000 = 3000$ $20000 + 3000$ Method 2 Use $y = mx + c$ $1700 = 20000m + c$ $2200 = 30000m + c$ $m = \frac{2200 - 1700}{30000 - 20000}$ $= 0.05$ $c = 2200 - 30000 \times 0.05 = 700$ When $y = 1850$, $x = \frac{1850 - 700}{0.05}$ Method 3 Draw a graph	P P P A	2.3a 3.1d 3.1d 1.3b	P1 for process to interpret information, e.g. $2200 - 1700 = 500$ oe or use $y = mx + c$ or start to draw graph P1 for process to build on initial strategy, e.g. $2200 - 1700 = 500$ and $30000 - 20000 = 10000$ oe use proportional increase or process to find m and c P1 for strategy to use found information, e.g. $1000 \div 5$ or use values of m and c or use straight line graph A1 cao

Student attempt A

10 Ishmael is a salesperson for a company.

His monthly wage is made up of his fixed basic wage plus commission.
His commission for a month is a fixed percentage of the sales he makes that month.

The table gives some information about his monthly wages.

Month	Monthly wage (£)	Sales (£)
June	1700	20 000
July	2200	30 000
August	2050	27 000

In September, Ishmael's monthly wage was £1850

Work out his sales, in £, for September.

1850

£150 loss = £3000 loss in Sales
£50 loss = £1000 loss in Sales
£200 loss = £4000 loss in Sales

£27 1000 − £4000 = £23,000

4/4

(Total for Question 10 is 4 marks)

Examiner comments

The correct processes are shown along with the correct answer.

Student attempt B

10 Ishmael is a salesperson for a company.

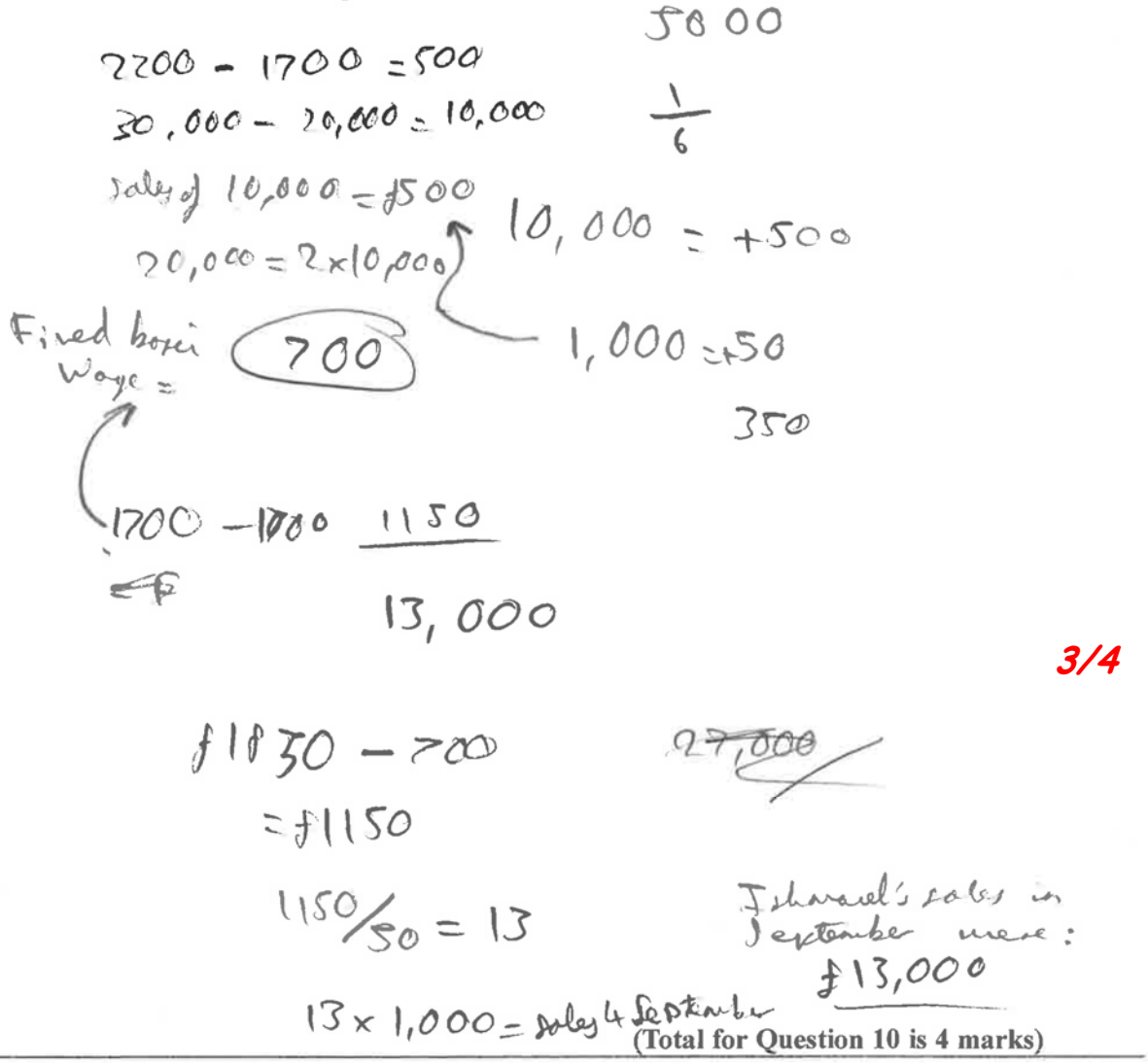
His monthly wage is made up of his fixed basic wage plus commission.
His commission for a month is a fixed percentage of the sales he makes that month.

The table gives some information about his monthly wages.

Month	Monthly wage (£)	Sales (£)
June	1700	20 000
July	2200	30 000
August	2050	27 000

In September, Ishmael's monthly wage was £1850

Work out his sales, in £, for September.



(Total for Question 10 is 4 marks)

Examiner comments

The processes shown in the working are fully correct. There is an arithmetic error towards the bottom of the page, where 1150/50 is evaluated as 13 rather than 23. This leads to an incorrect answer, so the final mark cannot be awarded.

Student attempt C

10 Ishmael is a salesperson for a company.

His monthly wage is made up of his fixed basic wage plus commission.
His commission for a month is a fixed percentage of the sales he makes that month.

The table gives some information about his monthly wages.

Month	Monthly wage (£)	Sales (£)
June	1700	20 000
July	2200	30 000
August	2050	27 000

+500 −150 +10000 −3000

1850

In September, Ishmael's monthly wage was £1850

Work out his sales, in £, for September.

2/4

(Total for Question 10 is 4 marks)

Examiner comments

The working in the table shows a correct start has been made to solve the problem. The sight of the correct differences in the two columns means that two process marks can be awarded.

Exemplar question 16

Higher tier Paper 1 –Non-calculator

11 (b) The force of attraction, F newtons, between two magnets varies inversely as the square of the distance, d cm, between the two magnets.

(i) What happens to the force of attraction between the magnets when the distance between the magnets is doubled?

When the magnets are 3 cm apart the force of attraction between them is 40 newtons.

(ii) What is the force of attraction between the magnets when they are 10 cm apart?

(5)

(Total for Question 11b is 5 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
11 (b) (i)		$\frac{1}{4}$ of original force	P	3.1c	P1 for $F = \frac{k}{d^2}$ and $F = \frac{k}{(2d)^2}$ (d may be numerical) or 'Force gets smaller'
			P	3.3	P1 for full interpretation of results rather than a specific distance, e.g. $\frac{1}{4}$ of original force
11 (b) (ii)	$40 = \frac{k}{3^2}$ $(k = 360)$	3.6 N	M	1.3b	M1 for $40 = \frac{k}{3^2}$
	$360 \div 10^2$		M	1.3b	M1 for complete method, e.g. $360 \div 10^2$
			A	1.3b	A1 cao

Student attempt A

(b) The force of attraction, F newtons, between two magnets varies inversely as the square of the distance, d cm, between the two magnets.

(i) What happens to the force of attraction between the magnets when the distance between the magnets is doubled?

It decreases

1/2

When the magnets are 3 cm apart the force of attraction between them is 40 newtons.

(ii) What is the force of attraction between the magnets when they are 10 cm apart?

$y = k \frac{1}{40}$

$k = 360$

$100 = 360 \times \frac{1}{x}$

$\downarrow \times x$

$100x = 360$

$\downarrow \div 100$

$x = 3.6N$

3/3

(5)

(Total for Question 11 is 6 marks)

Examiner comments

(i) The student has recognised that the inverse relationship means that the force will decrease, but hasn't identified by how much, so only one mark can be awarded.

(ii) A fully correct solution.

Student attempt B

(b) The force of attraction, F newtons, between two magnets varies inversely as the square of the distance, d cm, between the two magnets.

(i) What happens to the force of attraction between the magnets when the distance between the magnets is doubled?

2/2

the force [illegible] quaters.

When the magnets are 3 cm apart the force of attraction between them is 40 newtons.

(ii) What is the force of attraction between the magnets when they are 10 cm apart?

$F=k/d^2$

$40=k/3^2$

$40=k/9$

$360=k$

$F=360/d^2$

$F=360/10^2$

$F=360/100$

$F=3.6$

When they are 10cm apart the force is 3.6N.

3/3

(5)

(Total for Question 11 is 6 marks)

Examiner comments

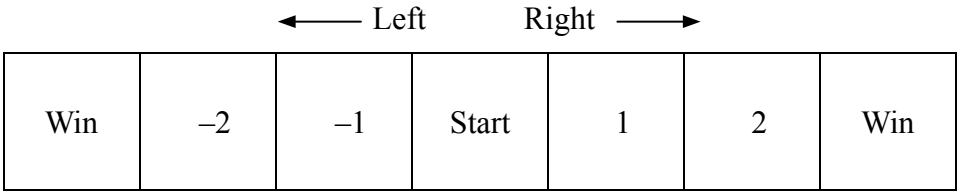
(i) A correct answer; sufficient for full marks.

(ii) A fully correct solution.

Exemplar question 17

Higher tier Paper 1 (non-calculator)

14 Here is a board for a game.



Jim begins with a counter on **Start**. He rolls a fair dice.

He moves his counter one square to the right when the dice lands on 1 or on 2 or on 3 or on 4

Otherwise he moves his counter one square to the left.

Jim rolls the dice twice and moves his counter twice.

(a) Work out the probability that his counter will then be on the square with 2 on it.

(2)

Jim puts the counter back on the **Start** square.

He rolls the dice 3 times and moves his counter three times.

(b) Work out the probability that his counter will then be on the square with –1 on it.

(3)

Jim wins the game when his counter lands on a square with **Win** on it.

Jim says:

"I cannot win in an even number of throws of the dice."

(c) Explain whether or not Jim is correct.

(1)

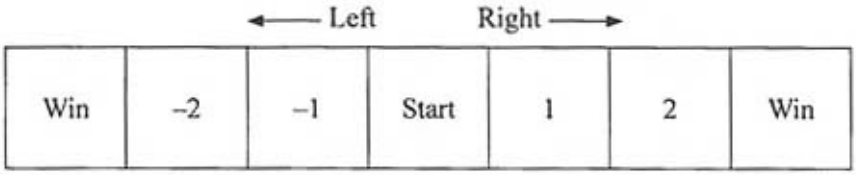
(Total for Question 14 is 6 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
14 (a)	$\frac{4}{6}\times\frac{4}{6}$	$\frac{16}{36}$	P	3.1c	P1 for process to calculate probability of RR, e.g. $\frac{4}{6}\times\frac{4}{6}$ or sample space with all elements correctly identified
			A	1.3a	A1 oe
14 (b)	$3\times\frac{2}{6}\times\frac{2}{6}\times\frac{4}{6}$	$\frac{48}{216}$	P	3.1d	P1 for process to calculate probability of RRL in any one order, e.g. $\frac{2}{6}\times\frac{2}{6}\times\frac{4}{6}$
			P	3.1d	P1 for process to calculate correct probability, e.g. $3\times\frac{2}{6}\times\frac{2}{6}\times\frac{4}{6}$
			A	1.3b	A1 oe
14 (c)		Yes + reason	C	1.3b	C1 Yes because an even number of +1s and –1s cannot give the answers +3 or – 3

Student attempt A

14 Here is a board for a game.



Jim begins with a counter on **Start**.
He rolls a fair dice.

He moves his counter one square to the right when the dice lands on 1 or on 2 or on 3 or on 4

Otherwise he moves his counter one square to the left.

Jim rolls the dice twice and moves his counter twice.

(a) Work out the probability that his counter will then be on the square with 2 on it.

4/6 = 2/3 - right

2/6 = 1/3 - left

4/6 + 4/6 = 8/12 = 4/6 = 2/3

2/3 (2)

0/2

Jim puts the counter back on the **Start** square.

He rolls the dice 3 times and moves his counter three times.

(b) Work out the probability that his counter will then be on the square with –1 on it.

1/3 + 2/3 + 1/3 = 4/9

2/6 + 4/6 + 2/6 = 8/18 = 4/9 (3)

0/3

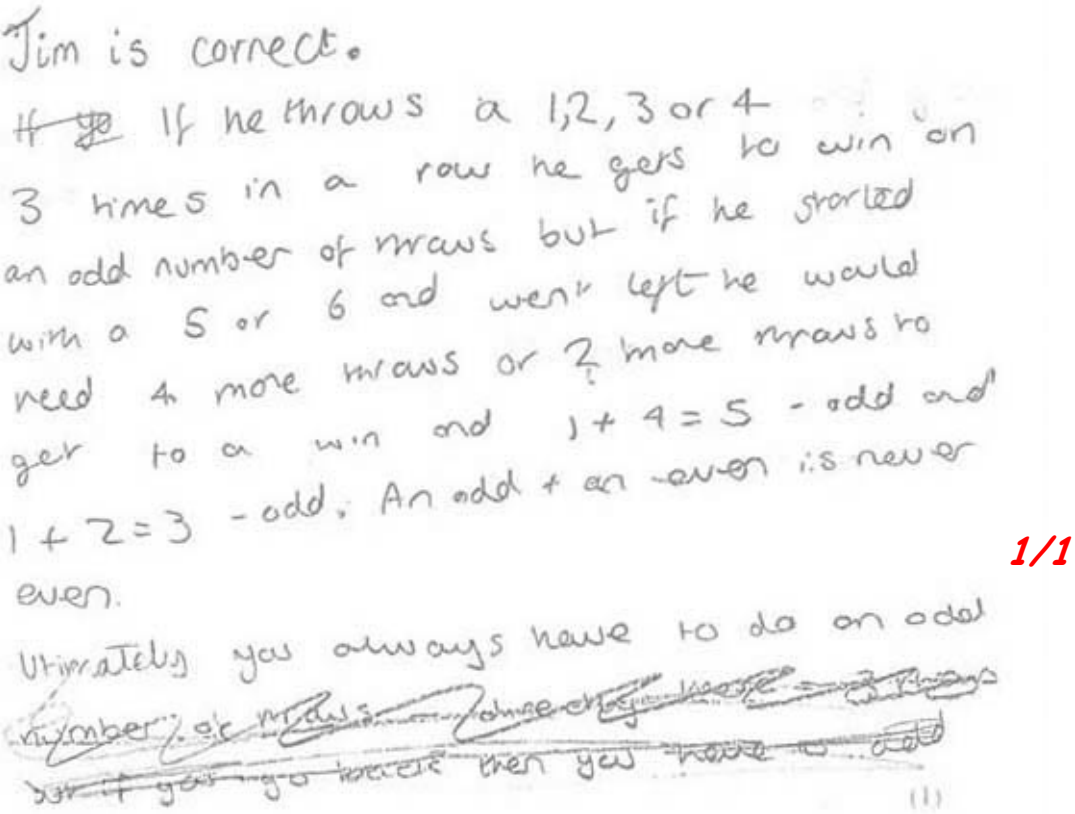
Student attempt A continued

Jim wins the game when his counter lands on a square with **Win** on it.

Jim says:

"I cannot win in an even number of throws of the dice."

(c) Explain whether or not Jim is correct.



1/1

(Total for Question 14 is 6 marks)

Examiner comments

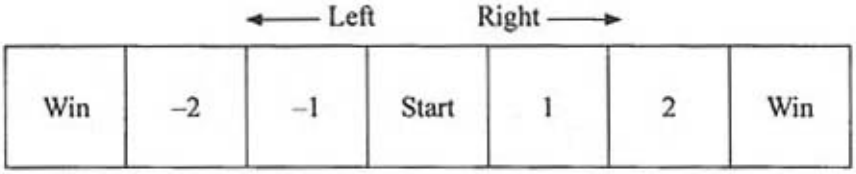
(a) The student has made the error of adding the two probabilities. At this level, students need to show the correct operation as well as the correct probabilities.

(b) The probabilities have again been added rather than multiplied.

(c) A full explanation.

Student attempt B

14 Here is a board for a game.



Jim begins with a counter on **Start**.
He rolls a fair dice.

He moves his counter one square to the right when the dice lands on 1 or on 2 or on 3 or on 4

Otherwise he moves his counter one square to the left.

2/2

Jim rolls the dice twice and moves his counter twice.

(a) Work out the probability that his counter will then be on the square with 2 on it.

$\frac{4}{6} \times \frac{4}{6} - \frac{16}{36} = \frac{4}{9}$

(2)

Jim puts the counter back on the **Start** square.

He rolls the dice 3 times and moves his counter three times.

(b) Work out the probability that his counter will then be on the square with –1 on it.

1/3

$\frac{4}{6} \times \frac{2}{6} \times \frac{2}{6} = \frac{16}{216}$ + $\frac{32}{216} = \frac{16}{108} =$

$\frac{2}{6} \times \frac{2}{6} \times \frac{4}{6} = \frac{16}{216}$

(3)

$\frac{8}{54} = \frac{4}{27}$

Student attempt B continued

Jim wins the game when his counter lands on a square with **Win** on it.

Jim says:

"I cannot win in an even number of throws of the dice."

(c) Explain whether or not Jim is correct.

Jim is correct because if ya roll evenly you would always be one roll away from winning, either on -2 or 2.

0/1

(1)

(Total for Question 14 is 6 marks)

Examiner comments

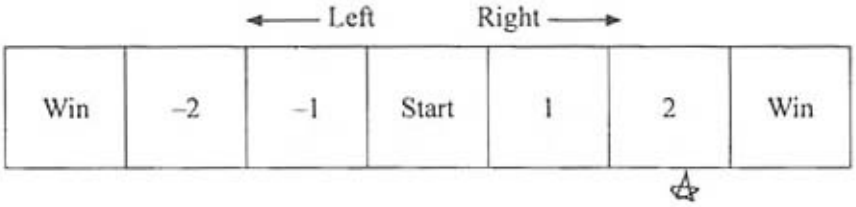
(a) A correct answer.

(b) The first process mark can be awarded for the correct three probabilities multiplied together. This is then multiplied by 2 rather than by 3, so no further marks can be awarded.

(c) An incorrect answer.

Student attempt C

14 Here is a board for a game.



Jim begins with a counter on **Start**.
He rolls a fair dice.

He moves his counter one square to the right when the dice lands on 1 or on 2 or on 3 or on 4

Otherwise he moves his counter one square to the left.

2/2

Jim rolls the dice twice and moves his counter twice.

(a) Work out the probability that his counter will then be on the square with 2 on it.

1 2 3 4

4/6 ×

$\frac{4}{6} \times \frac{4}{6} = \frac{16}{36} = \frac{4}{9}$

$\frac{4}{9}$

Jim puts the counter back on the **Start** square.

He rolls the dice 3 times and moves his counter three times.

(b) Work out the probability that his counter will then be on the square with –1 on it.

right

1 2 3 4 4/6

2/6

5 6

left

$3 \times 2/6 \times 2/6 \times \frac{4}{6} = \frac{16}{216}$

2/3

$\frac{32}{216}$

48

32

216

$\frac{48}{216}$

36×6 216

180

36

Student attempt C continued

Jim wins the game when his counter lands on a square with **Win** on it.

Jim says:

"I cannot win in an even number of throws of the dice."

(c) Explain whether or not Jim is correct.

Jim is correct as the square Win is 3 jumps away from start which is odd.

As an odd add an even is odd, then that is also an odd number of rolls away.

1/1

(1)

(Total for Question 14 is 6 marks)

Examiner comments

(a) A correct answer.

(b) The correct working is seen. It is then not completely clear which fraction is the final answer. There are several to choose from; it is incumbent on the student to make their final answer clear.

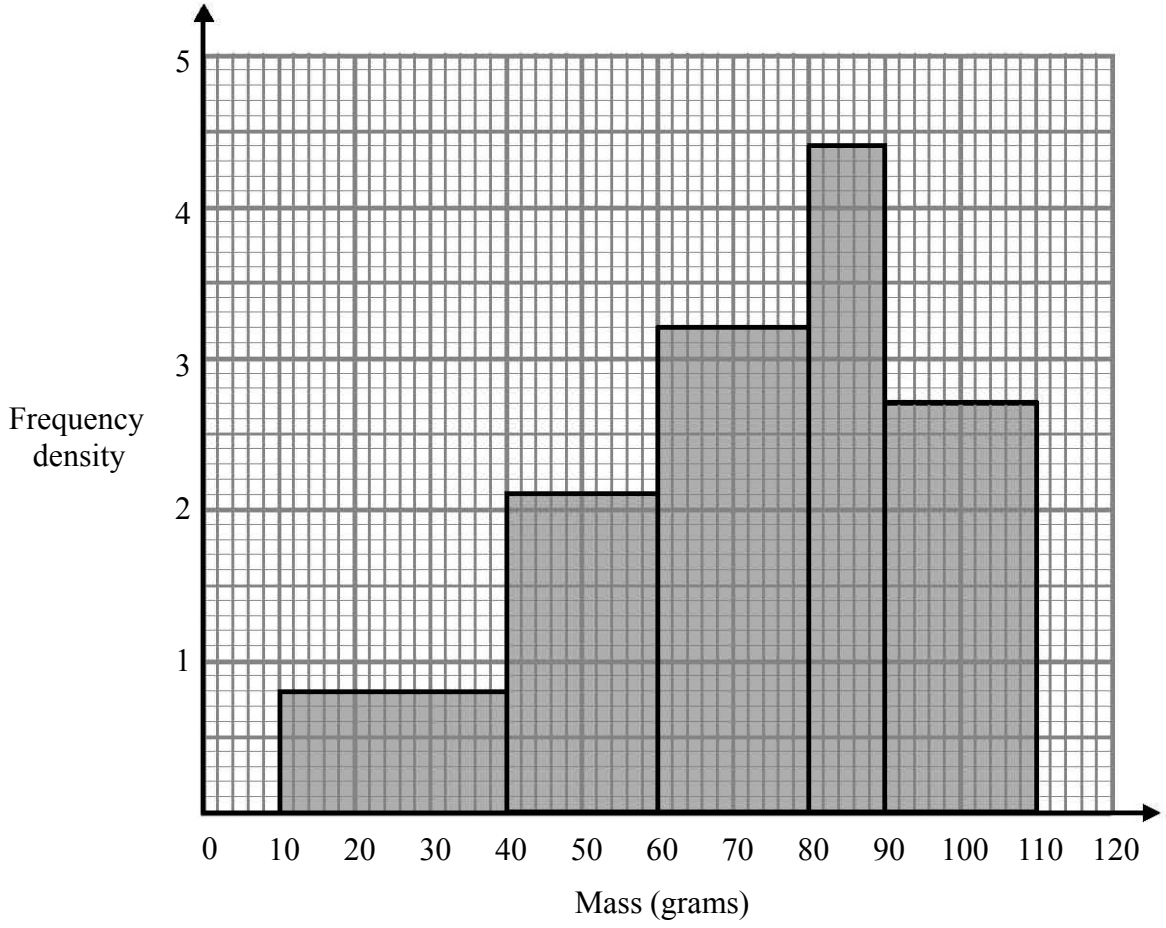
(c) Just about enough here to award the mark.

GCSE Mathematics Paper 2H (calculator)

Exemplar question 18

Higher tier Paper 2 (calculator)

14 A biologist is studying the effects of global warming on animal size.
The histogram gives information about the masses of a species of snail in a sample he took in 2013 from a large lake.



The mean mass of the same species of snail taken from the lake in 2003 was 75 grams.

(a) Is there any evidence to support the hypothesis that the mass of this species of snail has decreased?

(5)

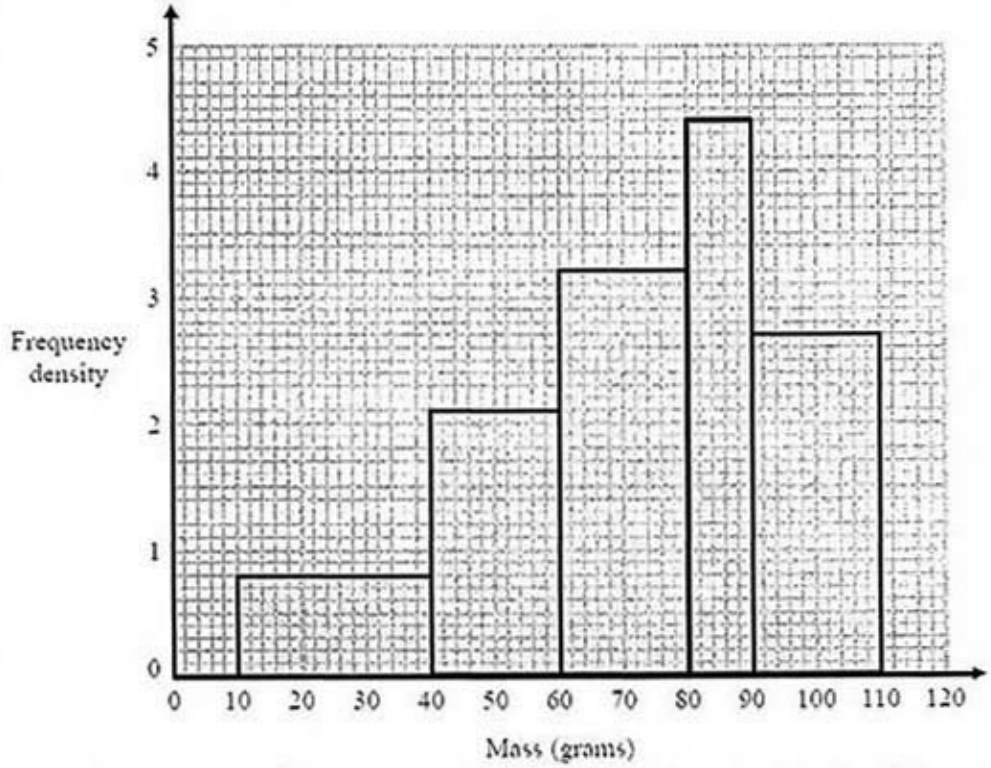
(Total for Question 14a is 5 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
14 (a)	($\sum fx$=) 24×25 + 42×50 + 64×70 + 44×85 + 54×100 = 16 320	Conclusion + support	P	2.3a	P1 for process to interpret histogram to find frequencies, e.g. (40 − 10) × 0.8
	($\sum f$=) 24+42+64+44+54 =228		P	3.1b	P1 for process to use frequencies and midpoints
			M	1.3b	M1 for (∑fx) ÷ (∑f)
	Mean = 16 320÷228 = 71.6		A	1.3b	A1 for a value 71 – 72
			C	2.1b	C1 (dependent on P1) for an inference based on the calculated value of the mean, e.g. the evidence supports the hypothesis as the mean in 2013 is lower

Student attempt A

14 A biologist is studying the effects of global warming on animal size.
The histogram gives information about the masses of a species of snail in a sample he took in 2013 from a large lake.



The mean mass of the same species of snail taken from the lake in 2003 was 75 grams.
Is there any evidence to support the hypothesis that the mass of this species of snail has decreased?

Frequencies

0.8 × 30 = 24
2.1 × 20 = 42
3.2 × 20 = 64

24 × 25 = 600
42 × 50 = 2100
64 × 70 = 4480
49 × 85 = 3720
54 × 100 = 5400

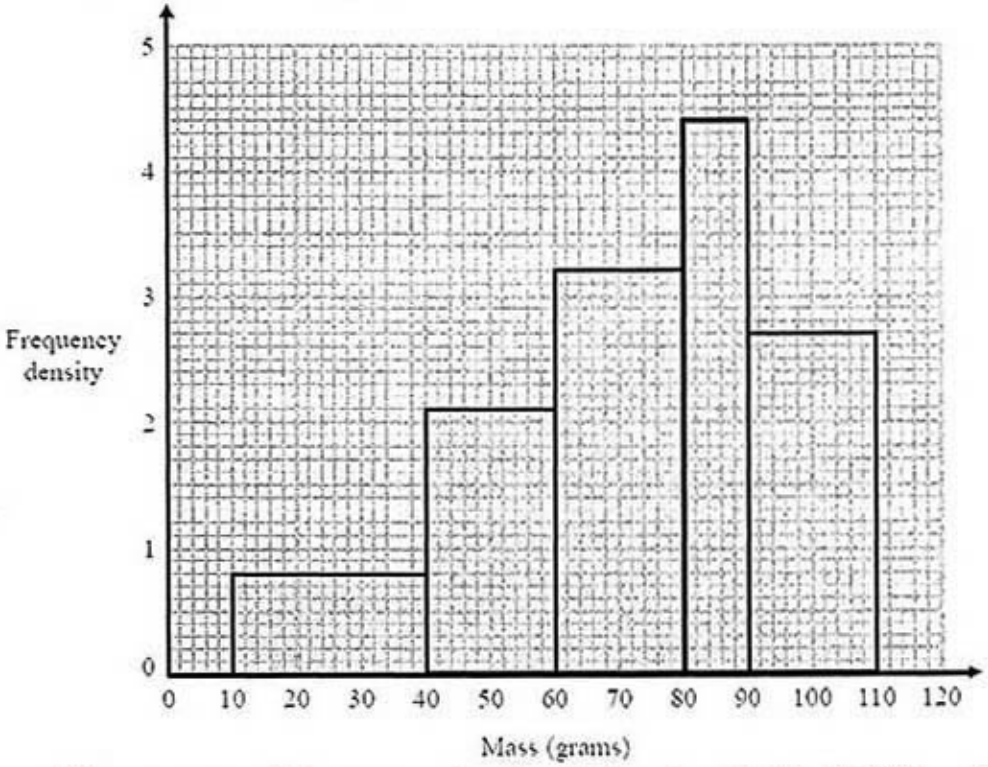
2/5

Examiner comments

The student has made a correct start, with the correct frequencies stated and used with the midpoints.

Student attempt B

14 A biologist is studying the effects of global warming on animal size.
The histogram gives information about the masses of a species of snail in a sample he took in 2013 from a large lake.



The mean mass of the same species of snail taken from the lake in 2003 was 75 grams.
Is there any evidence to support the hypothesis that the mass of this species of snail has decreased?

4/5

0·8 x 30 = 24
2·1 x 20 = 42
3·2 x 20 = 64
4·4 x 10 = 44
2·7 x 20 = 54

24 + 42 + 64 + 44 + 54 = 228
÷ 5
45·6grams

24 x 25 = 600
42 x 50 = 2100
64 x 70 = 4480
44 x 85 = 3740
54 x 100 = 5400

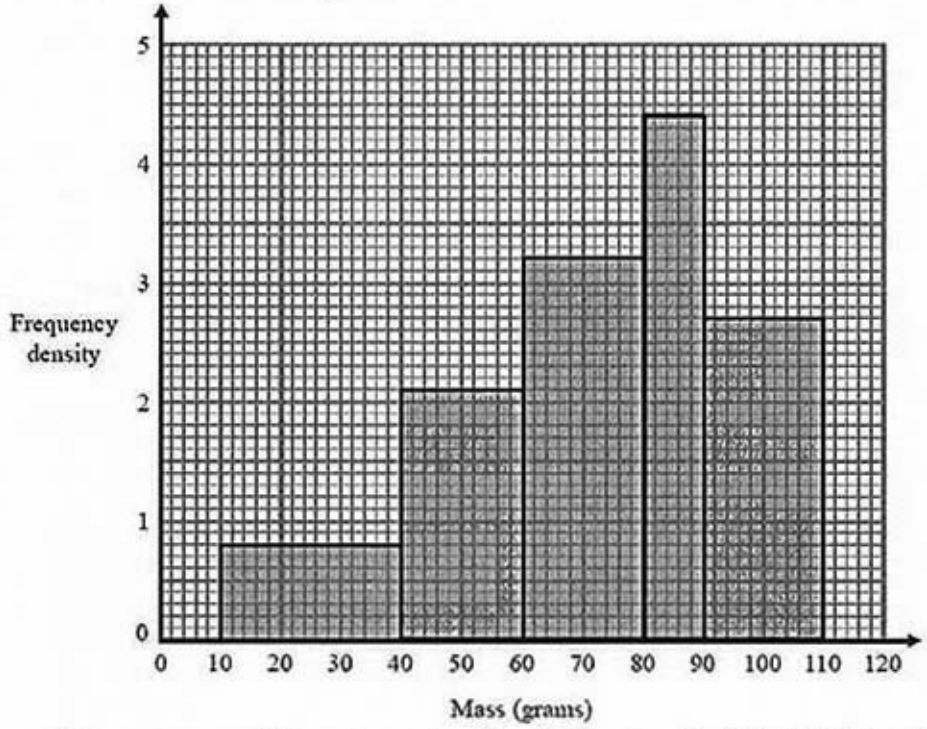
600 + 2100 + 4480 + 3740 + 5400 = 16320
16320 ÷ 228 = 71·58g

Examiner comments

A fully correct solution. However, due to the absence of a suitable conclusion, the student has failed provide an overall answer to the question.

Student attempt C

14 A biologist is studying the effects of global warming on animal size.
The histogram gives information about the masses of a species of snail in a sample he took in 2013 from a large lake.



5/5

The mean mass of the same species of snail taken from the lake in 2003 was 75 grams.
Is there any evidence to support the hypothesis that the mass of this species of snail has decreased?

Frequency = Freq density × class width

25
10-40 0.8×30 = 24
50
40-60 2.1×20 = 42
79
60-80 3.2×20 = 64
85
80-90 4.4×10 = 44
100
90-110 2.7×20 = 54
228

25×24 = 600
50×42 = 2100
70×64 = 4480
85×44 = 3740
100×54 = 5400
16320

16320 ÷ 228 = 71.6

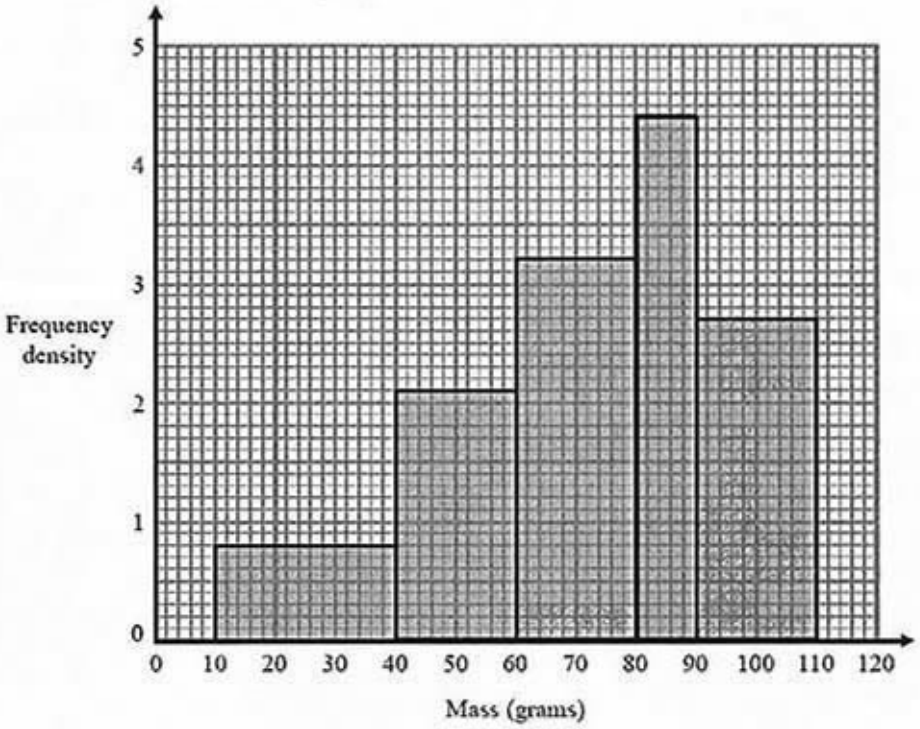
mass has decreased as, 10 years ago, the mean mass was 75g. but now it is 71.69; so has decreased

Examiner comments

A fully correct solution with an appropriate conclusion present.

Student attempt D

14 A biologist is studying the effects of global warming on animal size.
The histogram gives information about the masses of a species of snail in a sample he took in 2013 from a large lake.



The mean mass of the same species of snail taken from the lake in 2003 was 75 grams.
Is there any evidence to support the hypothesis that the mass of this species of snail has decreased?

3/5

Frequency = Frequency Density × Class Width

Mass (g) Frequency

10 ≤ M < 40 : 30 × 0.8 = 24
40 ≤ M < 60 : 20 × 2.1 = 42
60 ≤ M < 80 : 20 × 3.2 = 64
80 ≤ M < 90 : 10 × 4.4 = 44
90 ≤ M < 110 : 20 × 3.7 = 74
248

Mid x F:

25 × 24 = 600
50 × 42 = 2100
70 × 64 = 4480
85 × 44 = 3740
100 × 74 = 7400
18320

Mean = $\frac{18320}{248}$ = 73.9

73.9g < 75g

Examiner comments

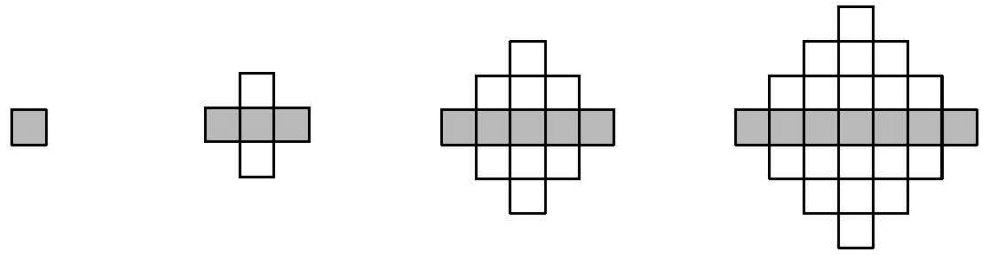
The method is fully correct, so the method and process marks can be awarded. There is an error in the arithmetic when finding the number of snails. This leads to the wrong answer and the loss of the accuracy mark. There is no final comment; there is an inequality statement present, but this is not sufficient to allow the award of the final mark.

GCSE Mathematics Paper 3H (calculator)

Exemplar question 19

Higher tier Paper 3 (calculator)

10 The diagrams show a sequence of patterns made from grey tiles and white tiles.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

The number of grey tiles in each pattern forms an arithmetic sequence.

(a) Find an expression, in terms of n, for the number of grey tiles in Pattern n.

(2)

The **total** number of grey tiles and white tiles in each pattern is always the sum of the squares of two consecutive whole numbers.

(b) Find an expression, in terms of n, for the **total** number of grey tiles and white tiles in Pattern n.
Give your answer in its simplest form.

(3)

(c) Is there a pattern for which the total number of grey tiles and white tiles is 231?
Give a reason for your answer.

(2)

The total number of grey tiles and white tiles in any pattern of this sequence is always an odd number.

(d) Explain why.

(2)

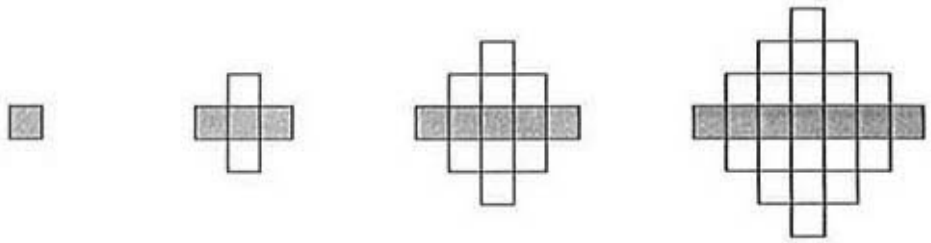
(Total for Question 10 is 9 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
10 (a)		$2n - 1$	P	2.1a	P1 for process to deduce nth term from information given, e.g. $2n + k$ oe
			A	1.3a	A1 for $k = -1$
10 (b)		$2n^2 - 2n + 1$	P	2.3a	P1 starts process for at least first 3 pattern numbers by looking for sums of squares, e.g. 1st: $1 = 0 + 1$, 2nd: $5 = 4 + 1$ 3rd: $13 = 9 + 4$ or begins to make a difference table at least as far as second differences
			P	2.2	P1 for process that leads to identification of n^2 and $(n - 1)^2$ or to identification of $2n^2$ from a difference table
			A	1.3	A1 $2n^2 - 2n + 1$
10 (c)		No with a clear correct reason given	P	2.4a	P1 for an attempt to solve the equation $2n^2 - 2n - 230 = 0$ or evaluating $2n^2 - 2n + 1$ when $n = 11$ and 12
			C	2.4a	C1 for No and evidence, e.g. 11.2... or 221 and 265
10 (d)		Complete explanation	P	2.4a	P1 for an argument in words or using symbols, e.g. in any two consecutive numbers one is even and one is odd and the square of an even number is even and the square of an odd number is odd The sum of an odd and an even number is odd
			C	2.4a	C1 conclusion with a correct complete argument

Student attempt A

10 The diagrams show a sequence of patterns made from grey tiles and white tiles.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

The number of grey tiles in each pattern forms an arithmetic sequence.

(a) Find an expression, in terms of n, for the number of grey tiles in Pattern n.

1 has 1 > 1x2 = 2 - 1 = 1
2 has 3 > 2x2 = 4 - 1 = 3
3 has 5 > 3x2 = 6 - 1 = 5

$2n - 1$

2/2

(2)

The **total** number of grey tiles and white tiles in each pattern is always the sum of the squares of two consecutive whole numbers.

(b) Find an expression, in terms of n, for the **total** number of grey tiles and white tiles in Pattern n.
Give your answer in its simplest form.

$0^2 + 1^2 = 1$ - Dpat. 1 > pattern?
$1^2 + 2^2 ? = 5$ - D pat 2
$2^2 + 3^2 = 13$ - D pat 3

must be right

$n^2 + (n-1)^2$

2/3

(3)

Student attempt A continued

(c) Is there a pattern for which the total number of grey tiles and white tiles is 231?
Give a reason for your answer.

NO because both consecutive answers that are available are too high or low.

$10^2 = 100$
$11^2 = 121$
$12^2 = 144$

$100 + 121 = 221$
$11^2 + 12^2 = 149$

1/2

(2)

The total number of grey tiles and white tiles in any pattern of this sequence is always an odd number.

(d) Explain why. Because:
You will always be adding an even number to an odd because the squares have to be consecutive.

1/2

(2)

(Total for Question 10 is 9 marks)

Examiner comments

(a) A correct expression.

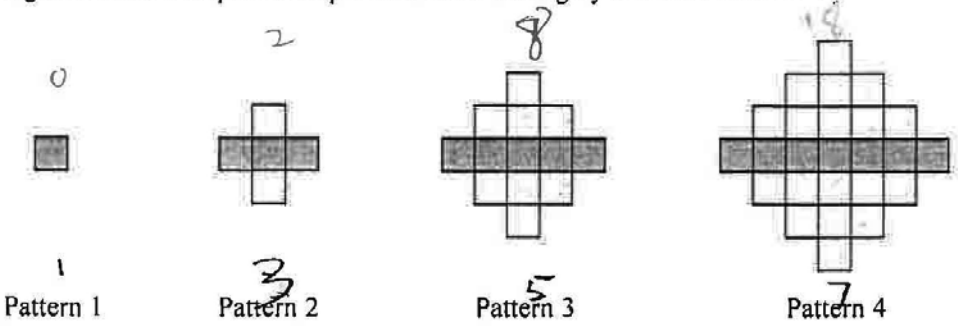
(b) Expression is correct but not simplified.

(c) The student has evaluated $10^2 + 11^2$ correctly, but not $11^2 + 12^2$; the decision, although correct, is therefore based on inaccurate figures, so the final mark cannot be awarded.

(d) A partially correct statement, but not quite complete as there is no recognition that, in two consecutive integers, there is always one odd and one even number.

Student attempt B

10 The diagrams show a sequence of patterns made from grey tiles and white tiles.



The number of grey tiles in each pattern forms an arithmetic sequence.

(a) Find an expression, in terms of n, for the number of grey tiles in Pattern n.

$2n-1$

2/2

(2)

The **total** number of grey tiles and white tiles in each pattern is always the sum of the squares of two consecutive whole numbers.

(b) Find an expression, in terms of n, for the **total** number of grey tiles and white tiles in Pattern n.
Give your answer in its simplest form.

1 2 3 4

0, 1 1, 2 2, 3 3, 4

$n^2 + (n-1)^2$

2/3

(3)

Student attempt B continued

(c) Is there a pattern for which the total number of grey tiles and white tiles is 231?
Give a reason for your answer.

2/2

No, because when $n = 11$, the total number of tiles is 221.
When $n = 12$, the total number of tiles = 265.

(2)

The total number of grey tiles and white tiles in any pattern of this sequence is always an odd number.

(d) Explain why.

If n is an even number, then n^2 is also an even number. Although, this means $n-1$ is an odd number. Therefore $(n-1)^2$ is also an odd number.
An even times an odd is an odd.
Therefore, the sequence is always odd.

1/2

(2)

(Total for Question 10 is 9 marks)

Examiner comments

(a) A correct expression.

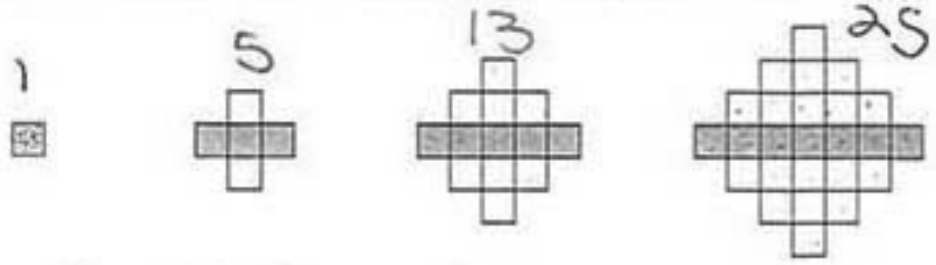
(b) Expression is correct but not simplified.

(c) The student has evaluated $10^2 + 11^2$ and $11^2 + 12^2$, and has the correct figures to support their decision.

(d) In order to gain both marks this student would need to go further and consider n being an odd number.

Student attempt C

10 The diagrams show a sequence of patterns made from grey tiles and white tiles.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

The number of grey tiles in each pattern forms an arithmetic sequence.

(a) Find an expression, in terms of n, for the number of grey tiles in Pattern n.

$2n-1$

2x2

2/2

(2)

The **total** number of grey tiles and white tiles in each pattern is always the sum of the squares of two consecutive whole numbers.

(b) Find an expression, in terms of n, for the **total** number of grey tiles and white tiles in Pattern n.
Give your answer in its simplest form.

1, 5, 13, 25

4 8 12

4 4

$\rightarrow 2n^2 + 2n + 1$

$1 \times 1 \times 2 = 2 \quad (2-1=1)$

$2^2 \times 2 = 8 \quad (8-3=5)$

$3^2 \times 2 = 18 \quad (18-5=13)$

$4^2 \times 2 = 32 \quad (32-7=25)$

3/3

(3)

Student attempt C continued

(c) Is there a pattern for which the total number of grey tiles and white tiles is 231?
Give a reason for your answer.

The total number is always a multiple of 4, plus one (eg 13 is 12+1). 231 − 1 is 230 and 230 is not a multiple of 4. (it is always a multiple of 4 be ?)

0/2

(2)

The total number of grey tiles and white tiles in any pattern of this sequence is always an odd number.

(d) Explain why.

because $2n^2 - 2n$ b must be an even number, (it is a multiple of 2) if you add 1 (+1) to a even number you will always get an odd.

2/2

(2)

(Total for Question 10 is 9 marks)

Examiner comments

(a) A correct expression.

(b) A correct simplified expression.

(c) Incorrect.

(d) The student has gone back to part (b) and used this expression for their explanation.

NB As can be seen by these exemplars, there were several different correct approaches that could be taken to answer this question.

Exemplar question 20

Higher tier Paper 3 (calculator)

11 Alfred studies animal populations on an island.

The size of an animal population at the start of 2014 was 2500.
The size of this animal population increases exponentially.
Alfred assumes that the rate of increase is 20% per year.

(a) Using his assumption, work out the size of this animal population at the start of 2009.

(3)

(b) Alfred's assumption is too high. Explain how your answer to part (a) is affected.

(1)

(Total for Question 11 is 4 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
11 (a)	$2500 = P \times 1.20^5$ $P = 2500 \div 1.20^5 = 1004.69$	1005	P M A	3.1c 1.3a 1.3a	P1 for process to translate problem into algebraic form, e.g. $2500 = P \times 1.20^5$ M1 $P = 2500 \div 1.20^5$ A1 1005
11 (b)		Correct explanation	C	3.5	C1 for an explanation eg the original population size will be greater

Student attempt A

11 Alfred studies animal populations on an island.

The size of an animal population at the start of 2014 was 2500.

The size of this animal population increases exponentially.

Alfred assumes that the rate of increase is 20% per year.

(a) Using his assumption, work out the size of this animal population at the start of 2009.

2014 = 2500
2013 = 2500 × 0.8
= 2000
2012 = 2000 × 0.8
= 1600
2011 = 1600 × 0.8
= 1280
2010 = 1280 × 0.8
= 1024
2009 = 1024 × 0.8
= 819.2

0/3

(3)

(b) Alfred's assumption is too high. Explain how your answer to part (a) is affected.

Because the percentage increase must be different and give an integer as an answer.

0/1

(1)

(Total for Question 11 is 4 marks)

Examiner comments

(a) A common incorrect method that is frequently seen when students are asked to solve original value (reverse percentage) problems.

(b) An incorrect statement.

Student attempt B

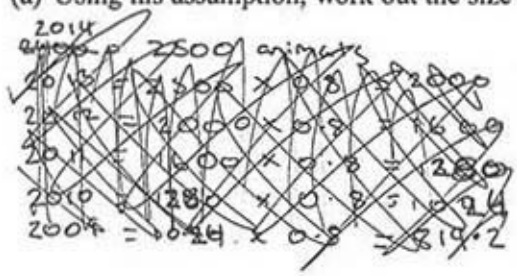
11 Alfred studies animal populations on an island.

The size of an animal population at the start of 2014 was 2500.

The size of this animal population increases exponentially.

Alfred assumes that the rate of increase is 20% per year.

(a) Using his assumption, work out the size of this animal population at the start of 2009.



2014 = 2500 animals
2013 = 2083 1/3
2012 = 1736 1/9
2011 = 1446 11/54
2010 = 1205.63
2009 = 1004

2/3

1004

(3)

(b) Alfred's assumption is too high. Explain how your answer to part (a) is affected.

my answer to part a will be higher

1/1

(1)

(Total for Question 11 is 4 marks)

Examiner comments

(a) The method is correct, but the final figure has been rounded down rather than up.

(b) A correct statement.

Student attempt C

11 Alfred studies animal populations on an island.

The size of an animal population at the start of 2014 was 2500.

The size of this animal population increases exponentially.

Alfred assumes that the rate of increase is 20% per year.

2014 - 2009 = 5

(a) Using his assumption, work out the size of this animal population at the start of 2009.

~~2500 ÷ 1.2^5~~

$2500 \div 1.2^5 = 1004.7$ → Real world answer: 1005

3/3

(3)

(b) Alfred's assumption is too high. Explain how your answer to part (a) is affected.

It would mean that as the population increased to a lesser degree (from the years 2009-14, ~~it would~~ the population in 2009 would be greater than the worked out value, as it would have to be larger in order to get to a population 2500 with a lesser degree of increase.

1/1

(1)

(Total for Question 11 is 4 marks)

Examiner comments

(a) A correct solution.

(b) A very comprehensive correct statement.

Student attempt D

11 Alfred studies animal populations on an island.

The size of an animal population at the start of 2014 was 2500.

The size of this animal population increases exponentially.

Alfred assumes that the rate of increase is 20% per year.

(a) Using his assumption, work out the size of this animal population at the start of 2009.

$2500 \times 1.2^{-5} = 1004.69$

2/3

(3)

(b) Alfred's assumption is too high. Explain how your answer to part (a) is affected.

The answer to part (a) will be larger.

1/1

(1)

(Total for Question 11 is 4 marks)

Examiner comments

(a) A correct method of solution, but the student has not considered their answer in the context of the problem and left the answer as a decimal rather than rounded to an integer value.

(b) A correct statement.

Student attempt E

11 Alfred studies animal populations on an island.

The size of an animal population at the start of 2014 was 2500.

The size of this animal population increases exponentially.

Alfred assumes that the rate of increase is 20% per year.

(a) Using his assumption, work out the size of this animal population at the start of 2009.

2014 - 2009 = 5

~~2500 0.8~~

$2500 \div 1.2^5 = 1004.69593$

2/3

(3)

(b) Alfred's assumption is too high. Explain how your answer to part (a) is affected.

The population in 2009 is smaller than expected

0/1

(1)

(Total for Question 11 is 4 marks)

Examiner comments

(a) A correct method of solution, but the student has not considered their answer in the context of the problem and left the answer as a decimal rather than rounded to an integer value.

(b) An incorrect statement.

Student attempt F

11 Alfred studies animal populations on an island.

The size of an animal population at the start of 2014 was 2500.

The size of this animal population increases exponentially.

Alfred assumes that the rate of increase is 20% per year.

(a) Using his assumption, work out the size of this animal population at the start of 2009.

2014 = $\frac{6}{5}$ of 2013 2500 ÷ 6 × 5 = 2083

2013 = $\frac{6}{5}$ of 2012 2083 ÷ 6 × 5 = 1736

2012 = $\frac{6}{5}$ of 2011 1736 ÷ 6 × 5 = 1447

2011 = $\frac{6}{5}$ of 2010 1447 ÷ 6 × 5 = 1206

2010 = $\frac{6}{5}$ of 2009 1206 ÷ 6 × 5 = 1005

2009 = 1005

3/3

(3)

(b) Alfred's assumption is too high. Explain how your answer to part (a) is affected.

It would change what I would divide and multiply 2500 by to work out how many animals there were in the previous year

0/1

(1)

(Total for Question 11 is 4 marks)

Examiner comments

(a) A correct solution.

(b) The student has failed to answer the question.

Student attempt G

11 Alfred studies animal populations on an island.

The size of an animal population at the start of 2014 was 2500.

The size of this animal population increases exponentially.

Alfred assumes that the rate of increase is 20% per year.

(a) Using his assumption, work out the size of this animal population at the start of 2009.

120% = 2500

2014
2013 2500/120 x100 = 2083
2012 2083/120 x100 = 1736
2011 1736/120 x 100 = 1446
2010 1446/120 x100 = 1205
2009 1205/120 x 100 = 1005

2016
13
12
11
10
09

1004 (rounded down)

2/3

(3)

(b) Alfred's assumption is too high. Explain how your answer to part (a) is affected.

The initial population at 2009 would be higher as the increase is much smaller

1/1

(1)

(Total for Question 11 is 4 marks)

Examiner comments

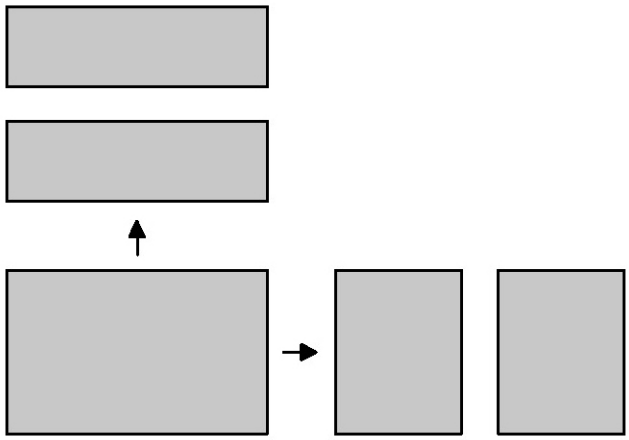
(a) The method is correct, but the final figure has been rounded down rather than up.

(b) A correct statement.

Exemplar question 21

Higher tier Paper 3 (calculator)

12 A rectangular sheet of paper can be cut into two identical rectangular pieces in two different ways.



When the original sheet of paper is cut one way, the perimeter of each of the two pieces is 50 cm.

When the original sheet of paper is cut the other way, the perimeter of each of the two pieces is 64 cm.

What is the perimeter of the original sheet of paper?

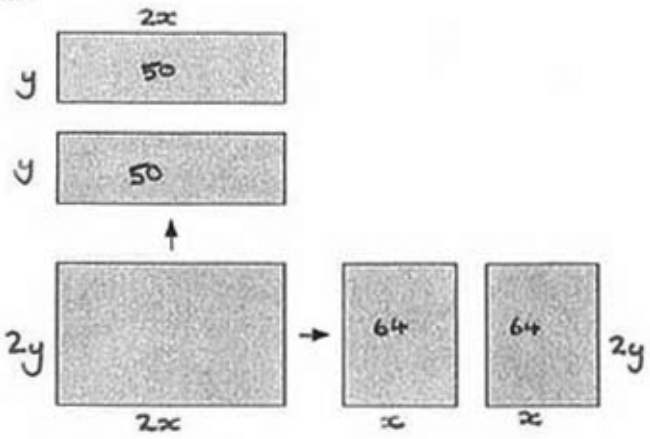
(Total for Question 12 is 5 marks)

Mark scheme

Question	Working	Answer	Mark	AO	Notes
12	Let h and w be the dimensions of the original rectangle $h + 2w = 50$ $2h + w = 64$ $w = 12$, $h = 26$ Perimeter $= 2 \times 12 + 2 \times 26$	76 cm	P P P A	3.2 3.1d 3.1d 3.1d 1.3b	P1 for correct process to set up equations, e.g. $\frac{h}{2} + \frac{h}{2} + w + w = 50$ and $\frac{w}{2} + \frac{w}{2} + h + h = 64$ P1 for correct process to find value of one variable P1 for correct process to find value of other variable P1 for correct process to find numerical value of perimeter, e.g. $2 \times$ ('12' + '26') A1 cao

Student attempt A

12 A rectangular sheet of paper can be cut into two identical rectangular pieces in two different ways.



When the original sheet of paper is cut one way, the perimeter of each of the two pieces is 50 cm.

When the original sheet of paper is cut the other way, the perimeter of each of the two pieces is 64 cm.

What is the perimeter of the original sheet of paper?

$4y + 2x = 50 \longrightarrow 8y + 4x = 100$

$4x + 2y = 64 \longrightarrow 2y + 4x = 64$

$6y = 36$

$y = 6$

$x = 13$

$6 = y \therefore 12 = 2y$

$13 = x \therefore 26 = 2x$

$12 + 26 = 38$

$38 \times 2 = 76$ cm

5/5

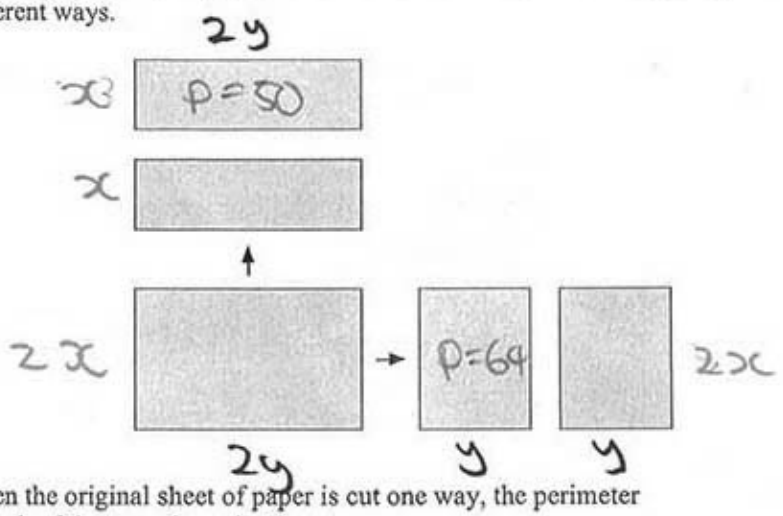
(Total for Question 12 is 5 marks)

Examiner comments

A fully correct solution.

Student attempt B

12 A rectangular sheet of paper can be cut into two identical rectangular pieces in two different ways.



When the original sheet of paper is cut one way, the perimeter of each of the two pieces is 50 cm.

When the original sheet of paper is cut the other way, the perimeter of each of the two pieces is 64 cm.

What is the perimeter of the original sheet of paper?

$2(x+2y)=50$ $\quad 2(2x+y)=64$

$\div 2 \quad \div 2$

$x+2y=25 \quad 2x+y=32$

3/5

$x+2y=25 \quad (\times 2)$

$-\ 2x+y=32$

$2x+4y=50$

$2x+y=32$

$3y=18$

$\div 3$

$y=6$

$x+12=25$

-12

$x=13$

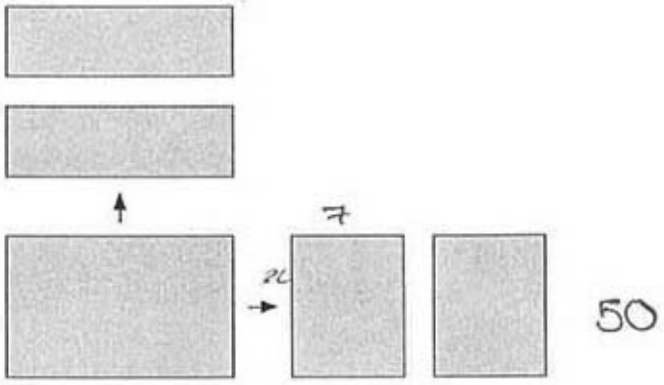
(Total for Question 12 is 5 marks)

Examiner comments

The student has successfully translated the problem into a pair of simultaneous equations. The correct values for their variables have been found, but there is no attempt to find the perimeter of the original sheet of paper.

Student attempt C

12 A rectangular sheet of paper can be cut into two identical rectangular pieces in two different ways.



When the original sheet of paper is cut one way, the perimeter of each of the two pieces is 50 cm.

When the original sheet of paper is cut the other way, the perimeter of each of the two pieces is 64 cm.

4/5

What is the perimeter of the original sheet of paper?

11 + 14 ← 4 sides, 50 ÷ 4 = 12.5ish each

12 + 26 → 13 + 12 + 13 + 12 = 50

→ 6 + 26 + 6 + 26 = 64

→ 12 + 26 + 12 + 26 = 76

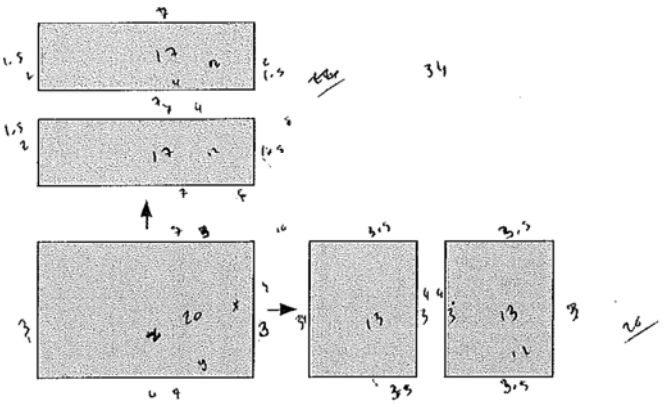
(Total for Question 12 is 5 marks)

Examiner comments

A fully correct solution apart from the lack of units with the final answer.

Student attempt D

12 A rectangular sheet of paper can be cut into two identical rectangular pieces in two different ways.



When the original sheet of paper is cut one way, the perimeter of each of the two pieces is 50 cm.

When the original sheet of paper is cut the other way, the perimeter of each of the two pieces is 64 cm.

What is the perimeter of the original sheet of paper?

$2x + 2y$

$x + 2y + x + 2y$

$2x + 4y =$

$y + 2x + y + 2x$

$2y + 4x$

$2x + 4y = 64$

$2y + 4x = 50 \times 2$

$4y + 8x = 100$

$6x = 36$

$x = 6$

$2y + 24 = 50$

$2y = 26$

$y = 13$

$2x + 2y$

$12 + 26 = 38$

38cm

3/5

(Total for Question 12 is 5 marks)

Examiner comments

There is some confusion in this response over the definition of x and y. The student's diagram shows x and y being used for the dimensions of the original sheet of paper. The simultaneous equations are therefore incorrect. There are correct processes seen for the solution of these simultaneous equations and the subsequent use of the found values to find the perimeter. Three process marks can therefore be awarded.

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