OCR
Oxford Cambridge and RSA

GCSE (9–1)

Exemplar Candidate Work

MATHEMATICS

J560
For first teaching in 2015

J560/02 Summer 2018 examination series

Version 1

Contents

DOC

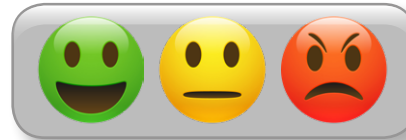**Would you prefer a Word version?**

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Introduction

These exemplar answers have been chosen from the summer 2018 examination series.

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

Please always refer to the specification https://www.ocr.org.uk/Images/168982-specification-gcse-mathematics-j560.pdf for full details of the assessment for this qualification. These exemplar answers should also be read in conjunction with the sample assessment materials and the June 2018 Examiners' report or Report to Centres available from Interchange https://interchange.ocr.org.uk/Home.mvc/Index

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

It is important to note that approaches to question setting and marking will remain consistent. At the same time OCR reviews all its qualifications annually and may make small adjustments to improve the performance of its assessments. We will let you know of any substantive changes.
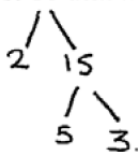
Question 1 (b)

1   **(b)** Write down two factors of 30 that are prime numbers.

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

Exemplar 1   2 marks

(b) Write down two factors of 30 that are prime numbers.

                                        (b) ....3.......... and ....5.......... **[2]**

Examiner commentary

The candidate has written 3 and 5 on the answer line – this is backed up by a factor tree coming from the 30. They have chosen 2 of the numbers from the ends of the tree and written these on the answer space provided and so gained the full 2 marks.

Exemplar 2   1 mark

                                        (b) ....1.......... and ....3.......... **[2]**

Examiner commentary

B1 for one correct (3) and one error (1) so 1 mark credited.

Many candidates wrote 3 as one of their answers, but then accompanied it by a non-prime factor e.g. 10, 15, 6 or 1 as in this case.

Question 2 (b)

2   **(b)**   A plank of wood 2.4 m long is cut into 6 pieces of equal length.

How long is each piece?

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

Exemplar 1   2 marks

(b)   A plank of wood 2.4 m long is cut into 6 pieces of equal length.

How long is each piece?

×100

$$2.4m = \frac{240cm}{6} = \frac{40}{100}$$

$$0.4$$

(b)   .... 0.4 .... m **[2]**

Examiner commentary

This candidate identifies that they need to divide 2.4 by 6. Their technique is to multiply the 2.4 by 100 converting it to cm and then divide by 6 to get 40 and then divide by 100 to get back to metres, giving a final answer of 0.4 m. The candidate gets the full 2 marks.

Exemplar 2   1 mark

(b)   A plank of wood 2.4 m long is cut into 6 pieces of equal length.

How long is each piece?

$$6\overline{)240} \quad 40$$

$$\frac{240cm}{6} = 40$$

(b)   .... 40 .... m **[2]**

Examiner commentary

This candidate has the correct method as they correctly converted 2.4 m to 240 cm and then divided by 6 to get the answer 40. However, on the answer line they have ignored the "m" units and given their answer as 40, so only M1 is awarded. If they had written 40 **cm** on the answer line they would have gained 2 marks.

If the candidate had done 24 ÷ 6 = 4 and given 4 as their answer without converting to centimetres they would have still gained M1.

Question 3(a)(i)

3 **(a)** Work out.

   (i) 10^3

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

Exemplar 1   2 marks

$$10 \times 10 \times 10 = 100$$

(a)(i) ....1000.................... **[2]**

Examiner commentary

The final answer given is 1000 so 2 marks are credited. The fact that they have written $10 \times 10 \times 10 = 100$ is treated as incomplete/part working. If they had written nothing on the answer line they would have gained M1 for $10 \times 10 \times 10$ seen.

Exemplar 2   1 mark

(a)(i) ...$10 \times 10 \times 10$.................... **[2]**

Examiner commentary

This candidate is part way to the answer and gets M1 for showing that they understand 103 means $10 \times 10 \times 10$. This highlights the importance of candidates showing their working.

Question 3(a)(ii)

(ii) $9(8 - 3 \times 2)$

(ii)   .... [2]

Exemplar 1   2 marks

(ii) $9(8 - 3 \times 2)$

BIDMAS
$9(8 - 3 \times 2)$
$9(8 - 6)$
$9(2)$
18

$9(8 - 3 \times 2)$
$9(8 - 6)$
$9(2)$
$9 \times 2 = 18$

(ii)   .... 18 .... [2]

Examiner commentary

This exemplar shows very clear working out; the candidate has written "BIDMAS" to recall which order the operations should be performed and shows each intermediate stage. They reach the correct answer of 18 and so the full 2 marks are credited.

Exemplar 2   1 mark

(ii) $9(8 - 3 \times 2)$

$8 - 6 = 2$
9×9
$9(2)$

(ii)   .... 81 .... [2]

Examiner commentary

This candidate has produced some correct working and, in this case, enough to gain the M1 method mark. They have reached 9(2) which is one step further than the 9(8 – 6) given for M1 in the mark scheme. They then evaluate 9(2) as 92 and lose the answer mark.

Many candidates partially evaluated the numbers in the brackets but then didn't reunite their bracket answer with the 9. For example, if this candidate had not written "9(2)" underneath "8 – 6 = 2" they would not have gained the M1 mark.

Exemplar 3

1 mark

(ii) $9(8 - 3 \times 2)$

$$9(5 \times 2)$$

$$9(10)$$

(ii)   90   [2]

Examiner commentary

This is an example of the SC1 mark being credited. The candidate has got the answer 90 from correctly evaluating 9(10). Although the candidate makes a mistake right at the beginning of their answer (by subtracting 3 from 8) they are given this special case mark for carrying on and completing the calculation correctly after this initial error.

Question 4(a)(i)

4 (a) Simplify.

(i) $5x - 6y - x + 3y$

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

Exemplar 1   1 mark

$4x + -3y$

(a)(i) $4x + -3y$ .... **[2]**

Examiner commentary

Here the candidate has not fully simplified the expression, leaving a + and – sign between the 4x and 3y. To get full marks this would have to be simplified to 4x – 3y, or -3y + 4x. As the answer is wrong the candidate just gets the B1 mark for 4x or -3y in their final answer.

Exemplar 2   1 mark

(i) $5x - 6y - x + 3y$

$4x - 6y + 3y$
$4x - 9y$

B1

(a)(i) $4x - 9y$ .... **[2]**

Examiner commentary

The term 4x is written as the final answer on the answer line so this candidate is awarded B1. Working shows that they have correctly identified the terms and collected them together, but this candidate has not evaluated -6y + 3y correctly. This was the most frequent error seen in this question.

Question 5(c)

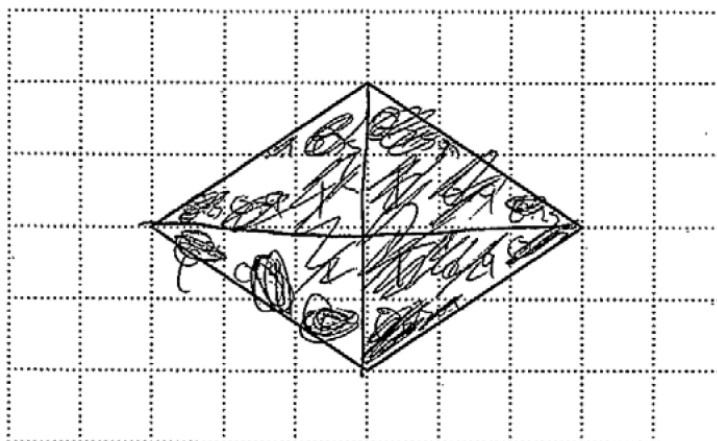**5**   A shape is drawn on a one-centimetre grid.
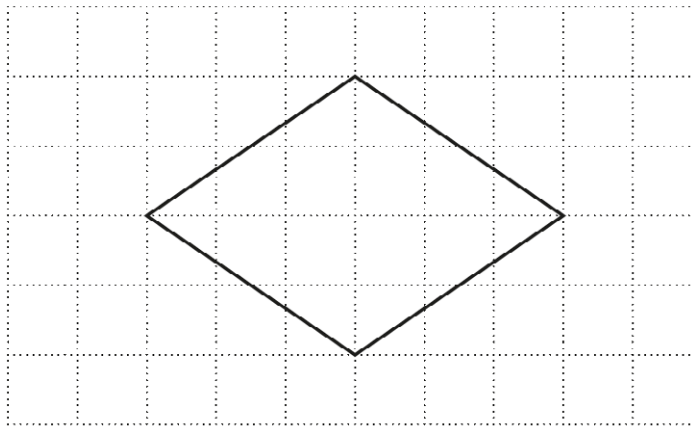
(c)   Work out the area of the shape.

(c)   .... cm^2 **[2]**

Exemplar 1   2 marks

(c)   ....12................................ cm^2 **[2]**

Examiner commentary

This candidate has written 12 on the answer line so 2 marks are credited. It appears that the candidate has counted squares in this case, backed up by 12 tally marks to the right hand side of the diagram.

Exemplar 2   1 mark

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

~~$\frac{4 \times 4}{2}$~~

$$\frac{6 \times 4}{2}$$

$$\frac{24}{2} \boxed{\text{M1}} = 22$$

(c) ....22............ cm² [2]

Examiner commentary

The answer of 22 is incorrect so the candidate cannot score full marks. They have used the formula for the area of a rhombus $\left(\frac{b \times h}{2}\right)$ so earn the M1 mark.

Any full method for calculating the area would have been accepted, such as calculating the area of the 4 composite triangles.

Question 6(b)

6 This bar chart shows the average monthly expenditure, by category, of households in a particular town in 2005 and 2015.
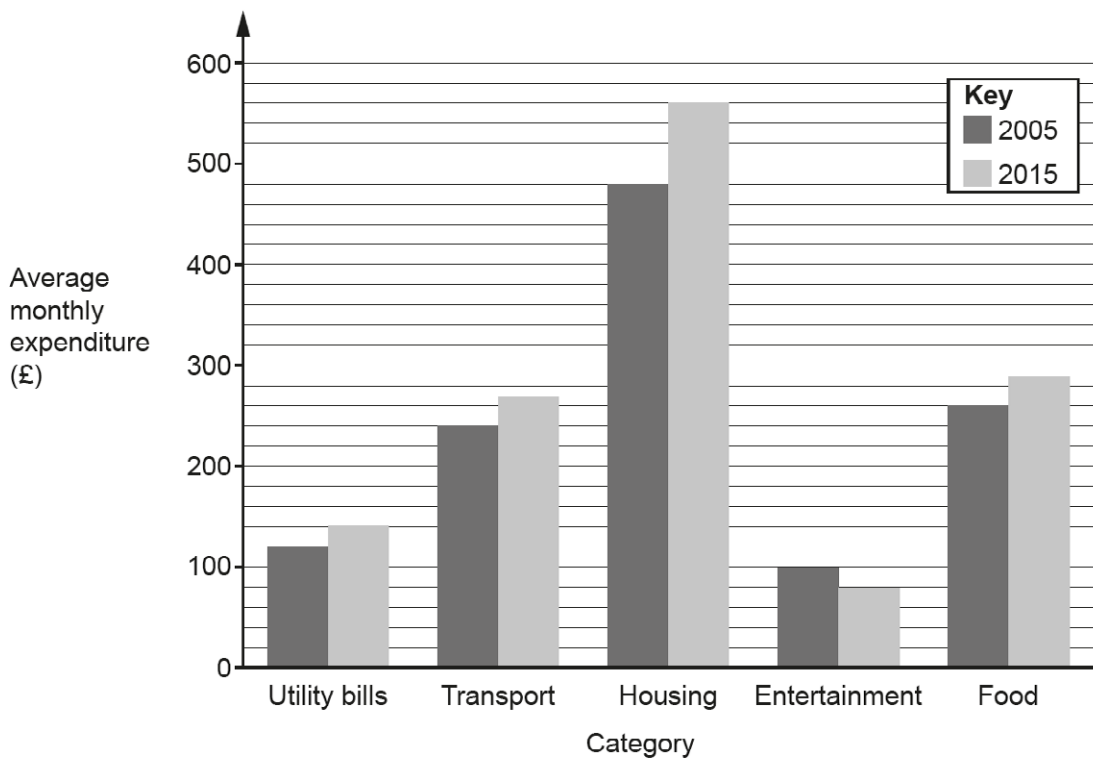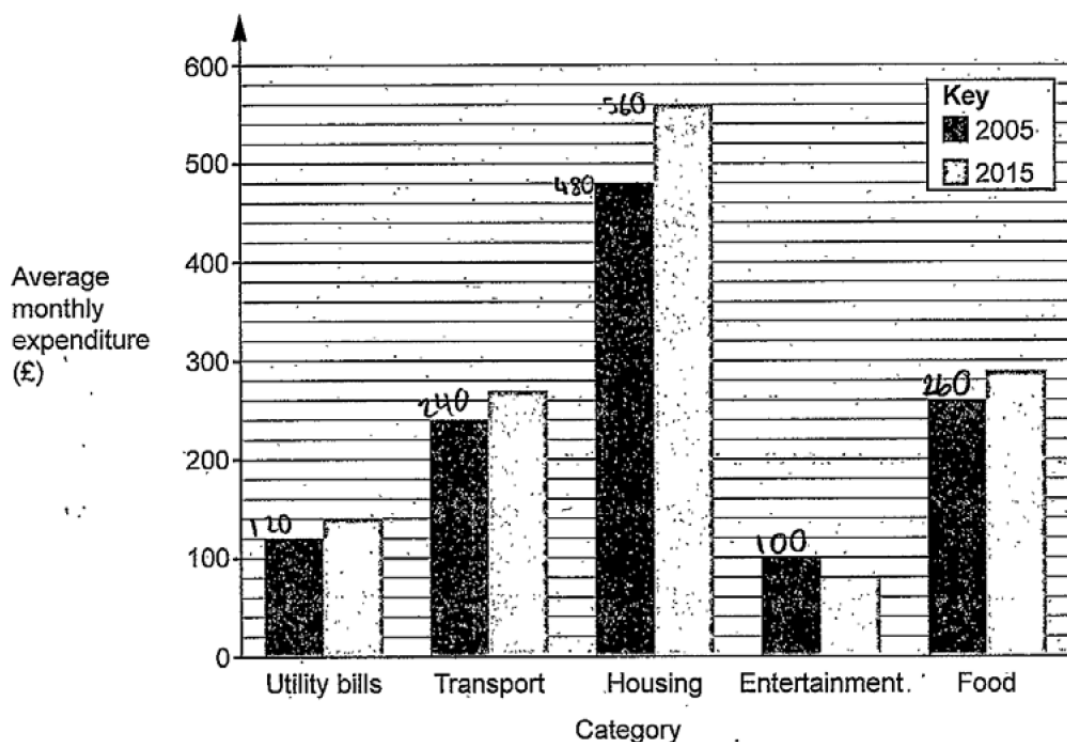

(b) How much more was the average monthly expenditure on housing in 2015 than in 2005?

(b) £ .... **[2]**

Exemplar 1   2 marks

(b) How much more was the average monthly expenditure on housing in 2015 than in 2005?

$$
\begin{array}{r}
4\,\cancel{5}'60 \\
-\ 4\ 80 \\
\hline
0\ 8\ 0
\end{array}
$$

(b) £ .... 80 .... **[2]**

Examiner commentary

The correct answer of 80 is given on the answer line and so 2 marks are credited. This is backed up by 560 – 480 seen. This candidate has also highlighted the important details in the question "housing" "2015" and "2005". They have read the numbers off the graph and written them by the bars too (the other numbers written on the "2005" bars relate to question 6(c)).

Exemplar 2

1 mark
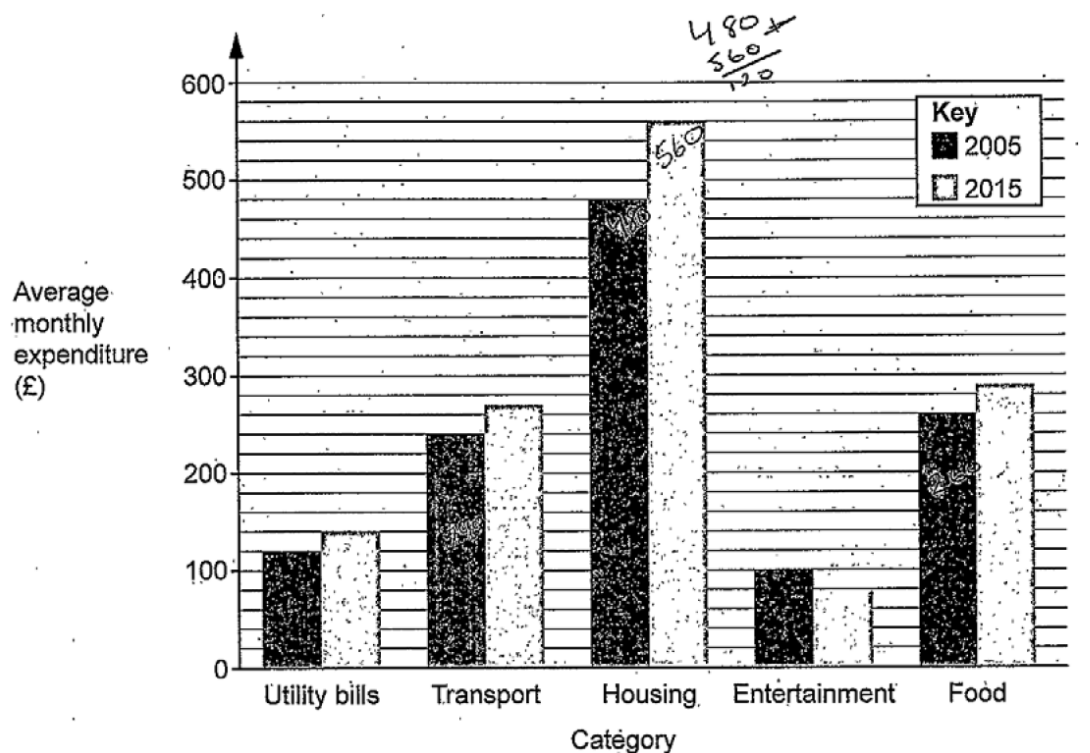
(b) £ .... 120 .... [2]

Examiner commentary

The wrong answer of 120 is given on the answer line, so the candidate cannot score full marks. However, they have shown how they got this answer, by subtracting 480 from 560. B1 is available if either 560 or 480 is seen and both are seen in this case. This is evidence that they chose the correct bars to compare, interpreted the scale and read off at least one of the bar heights correctly.

Question 6(c)

(c) The total average monthly expenditure in 2005 was £1200.

What percentage of this was spent on transport?

(c) .... % **[3]**

Exemplar 1   3 marks

$$1200 \div 10 = 120$$

transport = £240

$$240 \div 120 = 2 \times 10 = 20$$

(c) .... 20 .... % **[3]**

Examiner commentary

The correct answer of 20 is seen on the answer line so 3 marks are credited. This is backed up by working showing 10% of 1200 (£120), working out that the transport figure of £240 stated is 2 × £120 and so the final answer is 2 × 10% = 20%.

Some lower ability candidates did not use the 1200 figure given in the question, but first added up all the categories to get *their* 1200. After they had done this there was very little space left to do further calculations and no marks available for "follow through" using *their* 1200.

Exemplar 2   2 marks

(c) The total average monthly expenditure in 2005 was £1200.

What percentage of this was spent on transport?

2005 = £240

2015 =

$24 \div 120$ (÷2) (÷2)

$14 \div 60$ ÷2 ÷2

$7 \div 30$

$\dfrac{4 \cdot 2}{2 \overline{)8'0}}$
20

$\dfrac{240}{1200} \times 100$ M2

(c) .... 42 ...... % **[3]**

Examiner commentary

The candidate is attempting to do 24 ÷ 120 by cancelling down the 24 and 120 first by 2 but this is done incorrectly. This candidate has the correct expression for M2 in their working so this is what is awarded.

Exemplar 3   1 mark

120
240
480
100
260
1200

1200 = 100% M1
120 = 10%

120 × 8 = 960

10 × 8 = 80%

(c) .... 80% .... % [3]
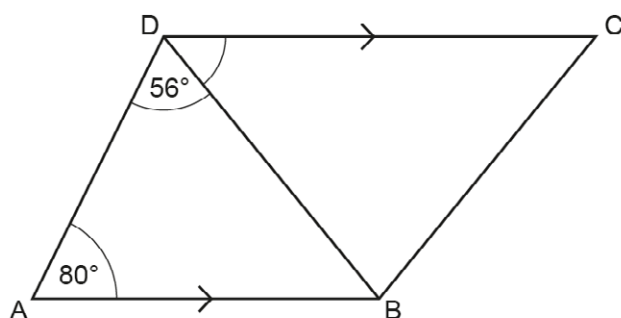
Examiner commentary

This candidate has done lots of mathematically correct work but unfortunately only 120 = 10% can be credited M1.

Question 7

7   In the diagram, AB is parallel to DC.

Not to scale
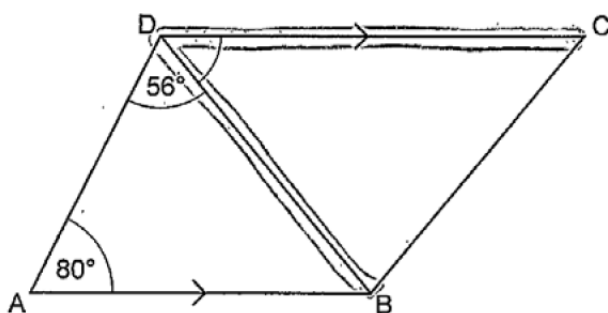
Work out angle BDC.
Give a reason for each angle you work out.

....° **[4]**

Exemplar 1   4 marks

7   In the diagram, AB is parallel to DC.

Not to scale

Work out angle BDC.
Give a reason for each angle you work out.

$$56°$$
$$80°$$ ....co-interior angles.
$$\overline{136}$$

$$180$$
$$-136$$ ← co-interior angles add to 180
$$\overline{044}$$

so angle BDC = 44°

.........................44.........................° **[4]**
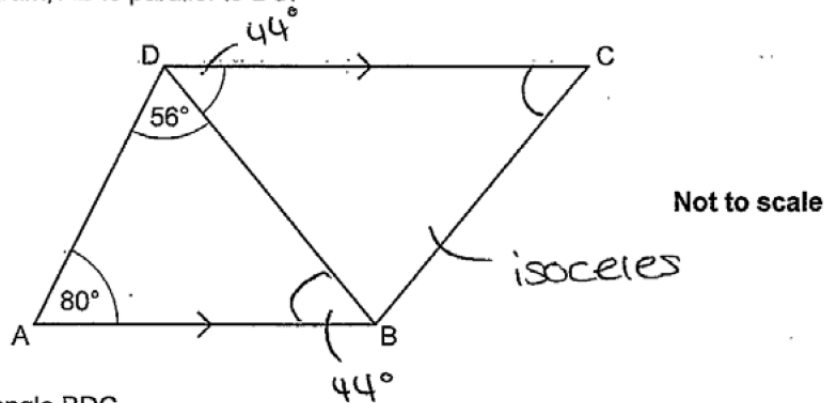
Examiner commentary

This candidate writes 44 on the answer line for BDC and also gives the correct reason of co-interior angles for their method, so full marks are credited.

Exemplar 2

2 marks

7 In the diagram, AB is parallel to DC.

Not to scale

isoceles

Work out angle BDC.
Give a reason for each angle you work out.

✗

Angle ADe = ~~D~~BDC
~~becan~~ because two bottom angles in an
isoceles triangle must be the same

$$\begin{array}{r} 56 \\ +\ 80 \\ \hline 136° \end{array}$$ $$\begin{array}{r} 180 \\ -136 \\ \hline 044° \end{array}$$ ← angle ABD

✗

so angle ADC is also 44°✗
because it is an alternate
angle to ABD

✓

this also means
~~angle~~ BDC is ~~al~~ also
(44°) (angles in an isoceles triangle)

.. 44 ✓✓° [4]

Examiner commentary

This candidate does not fully understand the three letter notation for angles and is also one of many who think that triangle BCD is isosceles. However, they do get the final answer correct so they are credited 2 marks for angle BDC = 44. They have mentioned alternate angles, but in their case this is wrong as ADC is not alternate to ABD.

Exemplar 3   2 marks

7   In the diagram, AB is parallel to DC.

Not to scale
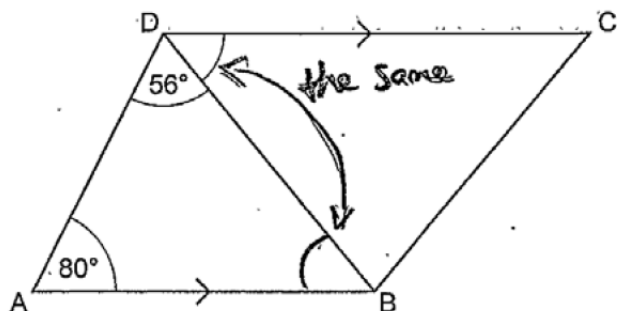
Work out angle BDC.
Give a reason for each angle you work out.

$$\triangle = 180°$$

$$80 + 56 = 136$$

$$180 - 136 = 44$$

angle BDC is 44°
because angle DBA is corresponding
to BDC ✗

44° ✓✓   ° [4]

Examiner commentary

This candidate has a good understanding of the concepts but does not remember the correct terminology. They have to use the word "triangle" and "180" - just a symbol, as shown here, is not good enough. The angles identified are the same, but the reason is alternate angles and not corresponding as written.

Exemplar 4   0 marks

7   In the diagram, AB is parallel to DC.
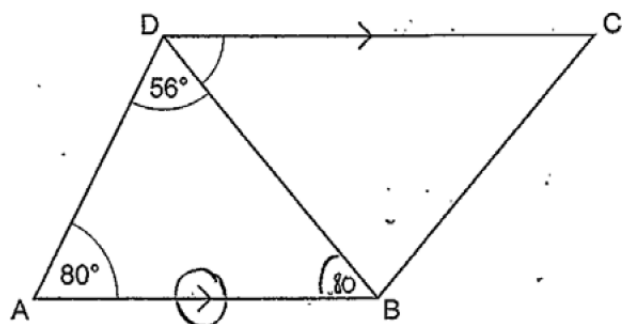
Not to scale

Work out angle BDC.
Give a reason for each angle you work out.

$A - 80°$ and has a $\rightarrow$ to B therefore meaning it is also $80°$

$$\begin{array}{r} 80 \\ \neq\ 80 \\ +\ 56 \\ \hline 216 \end{array}$$

$ABD \rightarrow 216$

$$\begin{array}{r} 360 \\ -\ 216 \\ \hline 144 \end{array}$$

360 ÷ 216

$\boxed{144}$

..........................144..........................° [4]

Examiner commentary

This candidate has little understanding of angle facts – here they think an arrow on the line means that angles on either end are equal. They do not understand that triangles add to 180 degrees; they add up the 3 angles and finally subtract from 360 degrees to get their final answer of 144 degrees. No merit to this answer so 0 marks.

Question 8

8   Liam is 0.83 metres tall.
William is 1.31 metres tall.
Jacob is taller than Liam by half the difference between Liam's height and William's height.

How tall is Jacob?

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

Exemplar 1   2 marks

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

Examiner commentary

The candidate has used the average height method here; we can see addition of the two heights and then a division by 2 (bus stop method). The answer to their division is incorrect so they lose the accuracy mark but are credited M2.

Exemplar 2   1 mark

... m **[3]**

Examiner commentary

This candidate starts the method correctly by finding the difference between 1.31 and 0.83 and scores M1. However, their answer is incorrect as their decimal point placement is incorrect. They carry on with the correct method of dividing the difference by 2, but do not add the answer onto 0.83 so cannot get the second M1. Their final answer is incorrect.

Question 10(a)(i)

10 (a) This Venn diagram shows the number of students in a Year 10 tutor group who study History (H) and Geography (G).
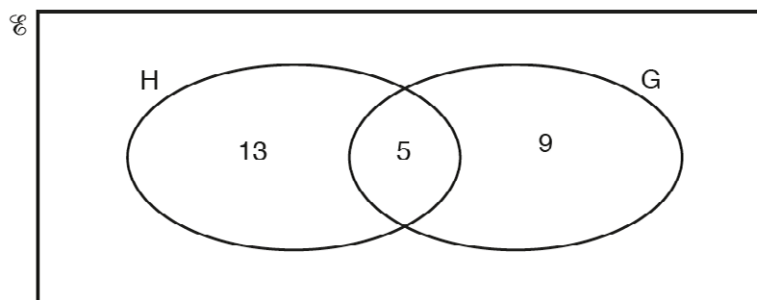
There are 29 students in the tutor group.

(i) How many students in the tutor group do not study History or Geography?

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

Exemplar 1   1 mark

10 (a) This Venn diagram shows the number of students in a Year 10 tutor group who study History (H) and Geography (G).
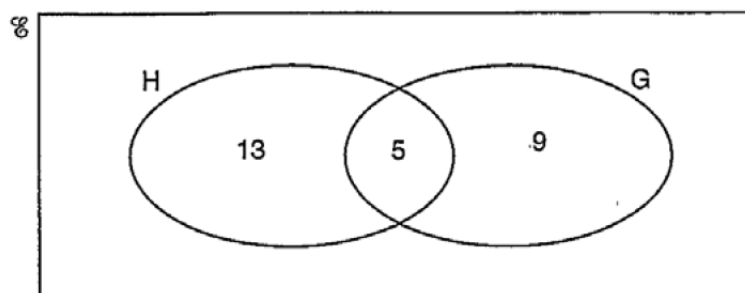

There are 29 students in the tutor group.

(i) How many students in the tutor group do not study History or Geography?

(a)(i) ....12............................ [2]

Examiner commentary

We can see the correct method in the working (13 + 9 + 5) followed by subtraction of their answer from 29. As their final answer is wrong they just score M1 for their method.

Exemplar 2   0 marks

$$\begin{array}{r} 29\,- \\ 17 \\ \hline 12 \end{array}$$

(a)(i) .... 12 .... [2]

Examiner commentary

This is very similar to Exemplar 1. However, we do not know where the 17 has come from, we just see the final subtraction. There is no evidence that the 17 was from the correct method and so, as all parts of the method are not shown, they cannot have the method mark. Zero marks are given. This is a strong case for candidates to show their working.

Question 11(a)

11   (a)   Liu has a bag only containing red grapes and green grapes.

$\frac{4}{9}$ of the grapes are red.

If there are 8 red grapes in the bag, how many grapes are green?

(a)   .... [3]

Exemplar 1   3 marks

$$R \;:\; G \;:\; \text{total}$$
$$4 \;:\; 5 \;:\; 9$$
$$\times 2 \quad 8 \;:\; 10 \;:\; 18$$

(a)   _____10_____ [3]

Examiner commentary

This candidate has laid out R(ed), G(reen) and Total in their table, shown × 2 to get values of 8, 10 and 18, and finally chosen 10 as their answer. Full marks are given.

Exemplar 2   2 marks

$$\frac{4}{9} - 8 \qquad \boxed{M2} \quad \frac{5}{9} \times 2 = 10$$

(a)   ......10 15................ [3]

Examiner commentary

Here, the candidate does lots of good work; $\frac{4}{9}$ is linked to 8 red grapes, $\frac{5}{9}$ is shown for green along with the correct multiplier of 2 and 10 (the correct answer) is seen. However, the wrong answer of 15 is given on the answer line, so just M2 is credited.

Exemplar 3   1 mark

If there are 8 red grapes in the bag, how many grapes are green?

$$\frac{4 \times 2}{9 \times 2} \quad \boxed{\frac{8}{18}} \text{ red}$$

18 green

(a) .... [3]

Examiner commentary

The candidate has linked the 8 to the $\frac{4}{9}$ clearly here and identified the $\times 2$ multiplier. However, in this case they are treating the fraction/proportion of green grapes as if it is a ratio of red to green and give the answer of 18 green grapes. This candidate gets M1 only for identifying the $\times 2$ multiplier (8 ÷ 4 in the mark scheme).

Note also the crossed out working. This is also another incorrect method where the 8 is added to the numerator (to get 12) and also added to the denominator (to get 17) and then subtracted for their first answer of "5 green".

Exemplar 4   1 mark

11   (a)   Liu has a bag only containing red grapes and green grapes.

$\frac{4}{9}$ of the grapes are red.

If there are 8 red grapes in the bag, how many grapes are green?

$$\frac{4}{9} = 8 \qquad \frac{2}{9} = 4 \quad \frac{1}{9} = 2 \quad \boxed{\frac{6}{9}} = 8 + 4 = 12$$

(a) ....12........................ [3]

Examiner commentary

There is also confusion in this candidate's response and they have made two separate attempts at answering this question.

The horizontal working on the right hand side of the page leads to the answer of 12 given on the answer line, so this is the method that was marked. This method is all correct apart from their choice of $\frac{6}{9}$ as the fraction of green grapes. An incorrect answer means that just M1 is awarded for $\frac{1}{9} = 2$.

Question 11(b)

(b) Sophia has a different bag only containing red grapes and green grapes.

The number of grapes in her bag is different, but $\frac{4}{9}$ of the grapes are also red.

She picks out a red grape from her bag and eats it.

$\frac{3}{7}$ of the remaining grapes in her bag are red.

How many of the remaining grapes in her bag are red and how many are green?

(b) .... red grapes

.... green grapes **[2]**

Exemplar 1   1 mark

(b) ....6........................ red grapes

........................8................ green grapes **[2]**

Examiner commentary

This question caused lots of problems for candidates.

This candidate has focused on the final answer of $\frac{3}{7}$ red to $\frac{4}{7}$ green. They have stated "1 = 2 grapes" as they identified in their answer to part (a) but still gain B1 for 3k red grapes and 4k green grapes (with k a positive integer > 1) seen on the answer line.

Exemplar 2

0 marks

$$R = \frac{4}{9} \rightarrow \text{eats } 1 \rightarrow R = \frac{3}{7}$$

$$\frac{28 \rightarrow 27}{63} \quad \boxed{M0}$$

(b) ....27........ red grapes

........34........ green grapes **[2]**

Examiner commentary

In this case there is no consideration that the total reduces along with the number of red grapes. This candidate says there are $\frac{28}{63}$ red grapes at the start and then $\frac{27}{63}$ after one has been eaten rather than $\frac{27}{62}$. Since they have not explicitly written an equivalent fraction and ended up with 27 : 34 as their answer (not 27 : 36 which would be equivalent to $3k : 4k$ with $k = 9$) they get neither a method nor a B mark.

Question 12(a)

12 (a) Multiply out.

$$4c(d - 5)$$

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

Exemplar 1   1 mark

12 (a) Multiply out.

$$4c(d - 5)$$

$$4c(d - 5) \qquad 4c \times -5 = -20c$$

$$4c \times d = 4cd + 20c \qquad \text{(a)} \quad \underline{4cd + 20c} \quad \text{[2]}$$

Examiner commentary

The candidate has shown us what they are multiplying out here – and their method is correct. However they lose the negative sign from in front of the 20c along the way and so get just M1 for the 4cd term on the answer line.

Exemplar 2   0 marks

$$4c(d - 5)$$

$$4cdx - 5$$

(a) .....$4. -20cd$..... **[2]**

Examiner commentary

Here 4cd is shown in the working, but then their answer is multiplied by -5 to give -20cd on the answer line. No terms given on the answer line are correct therefore this is worth 0 marks.

Question 12(b)

(b) Multiply out and simplify.

$$(3x + 2)(x - 4)$$

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

Exemplar 1   1 mark

(b) $3x^2 + 12x$ .... **[2]**

Examiner commentary

This candidate performs the multiplication using a grid method but their constant term is incorrect (-2). We can see 3 terms correct in the grid (and also below the grid) so they get M1 for 3 correct terms in their working.

Exemplar 2   1 mark

(b) $5x^2 - 20x$ .... **[2]**

Examiner commentary

This candidate performs the multiplication using a FOIL method; all their terms are correct, but they then go on to collect wrong terms together. They appear to be adding together $3x^2 + 2x = 5x^2$ and $-12x + -8 = -20x$ shown in the boxes so there are misunderstandings in their method. As they do have 4 terms correct in their working they get M1.

Question 12(c)

(c) Solve.

$$3x - 2 \leqslant 22$$

(c) .... [2]

Exemplar 1   2 marks

$$3X - 2 \leqslant 22$$
$$(+2) \qquad (+2)$$
$$3X \leqslant 24$$
$$(\div 3) \qquad (\div 3)$$
$$X = 8$$

(c) .... $X \leqslant 8$ .... [2]

Examiner commentary

A clear balance method is shown here. The candidate adds 2 to both sides correctly and then divides both sides by 3 correctly to get $x = 8$. On the answer line they then reintroduce the $\leqslant$ sign to get a completely correct solution and 2 marks are credited.

Exemplar 2   1 mark

$$3x - 2 \leqslant 22$$
$$+2 \qquad +2$$

$$3x \leqslant 24$$
$$\div 3 \qquad \div 3$$

$$x = 8$$

(c) .... 8 .... [2]

Examiner commentary

This candidate uses the balance method again, but although they do this correctly the inequality sign has disappeared. They earn M1 for $x = 8$.

Exemplar 3

0 marks

$$3x - 2 \leq 22$$
$$\wedge = 24$$

(c) $3x = 24 \; \sim 2 \; \overline{}22 \leq 22$ **[2]**

Examiner commentary

The candidate attempts the balance method, but their algebra structure is poor. If they had written $3x = 24$ on a separate line they would have qualified for the M1 mark, but this is only shown with arrows in the body of working and on the answer line as part of a sequence of answers to $3x$. This candidate never gets x on its own, and earns zero marks.

Question 13(a)

13 (a) Calculate.

$$\frac{3}{5} + \frac{5}{8}$$

Give your answer as a mixed number in its simplest form.

(a) .... **[3]**

Exemplar 1   3 marks

13 (a) Calculate.

Give your answer as a mixed number in its simplest form.

(a) .... **[3]**

Examiner commentary

The common denominator for the 2 fractions is worked out by listing the multiples of each denominator on the right hand side of the page – the first common multiple of 40 is circled in both lists. Both fractions are worked out correctly and then added correctly. The final answer as a mixed number is also correct so the full 3 marks are credited.

Exemplar 2

2 marks

$$8 + \frac{3}{9 \times 5} + \frac{5}{8} \times \frac{5}{\sim} = \frac{24}{40} + \frac{25}{40} = \frac{49}{40} \quad \boxed{M2}$$

Give your answer as a mixed number in its simplest form.

$$\frac{3}{5} + \frac{5}{8} = \frac{11}{13} + \frac{10}{13} = \frac{21}{13}$$

(a) ......49.40............................... [3]

Examiner commentary

This candidate has correctly converted both fractions to a common denominator and reached $\frac{49}{40}$. However, they do not know what a mixed number is and instead convert $\frac{49}{40}$ to 49.40 so earn M2 for their method. The other incorrect method underneath the circled one is ignored as it does not lead to the answer on the answer line.

Question 13(b)

(b) Work out.

$$5 \times 10^4 - 1.6 \times 10^3$$

Give your answer in standard form.

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

Exemplar 1   3 marks

(b) Work out.

$$5 \times 10^4 - 1.6 \times 10^3$$

Give your answer in standard form.

$$50000 - 1600$$

```
   1 . 6
 3
     5
  ────
 8 . 0

 1.ꓹ6 0 0
```

```
  4 9
 ꜱ̶0̶ 0 0 0
   1 6 0 0
 ─────────
 4 8 4 0 0
```

$$4\,\overbrace{8\,4\,0\,0}$$

(b) ~~8×10⁷~~ 4.84 × 10⁴ **[3]**

Examiner commentary

The two standard form numbers given are written out in full, then subtracted from each other and then converted back to standard form giving the correct answer on the answer line. The full 3 marks are credited. Note that this candidate had started incorrectly by multiplying the given numbers, but crosses out their first answer of 8×10^7.

Exemplar 2   2 marks

```
8 ×10 ×10 ×10 ×10
 ⌣  ⌣   ⌣    ⌣
 50 500 5000 50000    1.6×10×10×10 = 1600
                        ⌣   ⌣   ⌣
   50000               16  160  1600
    1600
  ───────
   48400
```

(b) ~~5.0000~~−1600 = 48400 **M2** **[3]**

Examiner commentary

The two standard form numbers given are written out in full including interim numbers as they are consecutively multiplied by the correct number of tens. The results are correctly subtracted from each other but not converted back to standard form so M2 is earned.

Exemplar 3   1 mark

$5 \times 10000 - 1 \cdot 6 \times 1000$

$5000 - 1600$

$\begin{array}{r} 5000 \\ - 1600 \\ \hline 3600 \end{array}$

(b) .... $3 \cdot 4 \times 10^{3}$ .... [3]

Examiner commentary

The two standard form numbers given are written out in full. However a mistake is made with 5×10^{4} as the candidate identifies where the decimal point will be but starts from 0.5 rather than 5.0. Expanding

1.6×10^{3} is done correctly so B1 is credited for 1600 seen.

Question 14

14   Here is the nutritional information for a 110 g serving of cereal.

Carbohydrates 99.4 g
Proteins   9.5 g
Fats   1.1 g

Emily says that more than 90% of this serving is carbohydrates.

Is she correct?
Explain your reasoning.

....

.... **[3]**

Exemplar 1   3 marks

→ Carbohydrates 99.4g more than 90%?
Proteins   9.5g
Fats   1.1g

Emily says that more than 90% of this serving is carbohydrates.

Is she correct?
Explain your reasoning.

$$\begin{array}{r} 99.4 \\ +\ 9.5 \\ 1.1 \\ \hline 110.0\,g \\ 2\ 1 \end{array}$$

110.0

10% = 11

90% = (11 × 9)

= 99

$$9\,\overline{\smash{)}90} \begin{array}{c} 10 \\ + \end{array} \begin{array}{c} 1 \\ 9 \end{array} = 99$$

10% of 110.0g = 11g meaning 90% of 110.0g is actually 99g so Emily is correct because ~~that~~ 99.0g < 99.4g [3]

Examiner commentary

Well explained answer to this question – 10% and 90% of 110g is worked out (note that the candidate also adds up the carbohydrates, proteins and fats which is already given in the question). This 90% is compared to 99.4 g and they say that "Emily is correct". All parts of the answer are correct and 3 marks are credited.

Exemplar 2   2 marks

Is she correct?
Explain your reasoning.

10% = 11 × 9

99

99.4
9.5
1.1
110.0

because if 10% of 110 is 11 you
times it by 9 to get 90% which is [3]
99

Examiner commentary

As is common, this candidate works out 10% and 90% of 110 g correctly so gets M1A1, but then does not comment on whether Emily is correct so loses the last A1.

Exemplar 3   1 mark

Is she correct?
Explain your reasoning.

$$\frac{99.4 \times 100}{110} =$$

M1

994 /11
99 /90.30 %
0040
33
7

Emily is correct because 99.4 g carbohydrates is more
than 90% so 90.30% of the content of cereal [3]

Examiner commentary

This candidate makes a correct attempt to find what percentage 99.4 is out of 110 g. This is a correct expression but there is an error in working out the division (994 ÷ 11) in the second decimal place so just the first M1 is credited.

Exemplar 4   0 marks

14 Here is the nutritional information for a 110g serving of cereal.

      Carbohydrates 99.4g
      Proteins   9.5g
      Fats   1.1g

Emily says that more than 90% of this serving is carbohydrates.

Is she correct?
Explain your reasoning.

$$1.1 = 1\%$$
$$9.5 = \frac{9.5\%}{10.5} \text{ ✗}$$

$$\begin{array}{r} 99.4 \\ 9.5 \\ 1.1 \\ \hline 110.0 \end{array}$$

No It is less than 90%. it is 89.5 %.

[3]

Examiner commentary

This candidate mixes up grams and percentages. They equate 1.1 to 1% and 9.5 to 9.5% and subtract the sum from 100%. The method is incorrect and any A marks must follow from correct method marks so zero marks are credited.

Question 15

15 Here is the floor plan of a rectangular room.

4.5 m

3 m

Not to scale
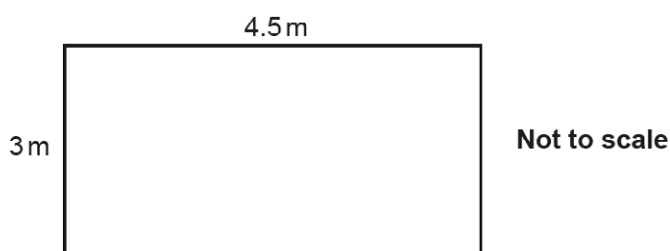
Tim buys carpet tiles for this room.

Each tile is a square measuring 50 cm by 50 cm.
The tiles are only sold in packs of ten.
Each pack costs £20.
Tim pays for fitting at a rate of £7.50 per square metre, with any fraction of a square metre rounded up.

Work out the **total** cost of the tiles and fitting.

£ .... **[6]**

Exemplar 1   6 marks

$3 \times 4 \cdot 5 = $ [14.5 ... × 7.50]

14

6 × 9 = 54

6 × 20

120

2

£105
£120

£ 225 .... **[6]**

Examiner commentary

This candidate got the right answer here (£225) so we just need to check that this is not from wrong working. There is not much explanation written down but all of the calculations given are relevant or correct. 3 × 4.5 is calculated correctly and the rounding up to 14 is done by crossing out the answer of 13.5. 14 × 7.50 is worked out and added to 6 × 20 so all 6 marks are credited.

Exemplar 2   4 marks

$3m \div 50cm = 6$

$4.5m \div 50cm = 9$

$6 \times 9 = 59 \div 10 = 5.9 \quad 6 \times 20 =$ ✗

$£120$

$3 \times 4.5 = 13.5 \longrightarrow 14 \times 7.5 = 105$

$70 \to 28$

$98 + 5 = 103 + 2 = 105$

$120 + 105 = 225$

£ _____ 225 _____ [6]

Examiner commentary

Here the candidate got the right answer of £225, but on checking the working out we can see an error multiplying 6 by 9. Instead of getting 6 marks the candidate drops down to 4 marks as they get the available 4 method marks.
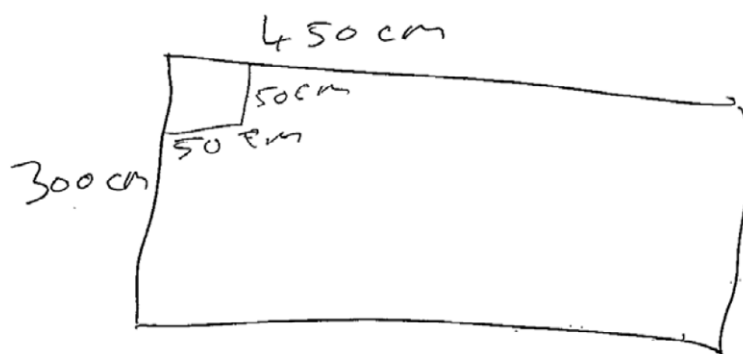
Exemplar 3

3 marks

$$450 \text{ cm} \quad \boxed{M1}$$

$$\boxed{M1} \quad 6 \quad 300 \text{ cm} \quad 9 \quad 6 \quad 300 \text{ cm}$$

$$9 \quad 450 \text{ cm}$$

9 along

$6 \times 9 = 56$

$56 \rightarrow 60$ tiles $\boxed{M1}$ $\boxed{FT}$ ✗

6 packs £20 = 120

remained

£ .... 120 ✗ **[6]**

Examiner commentary
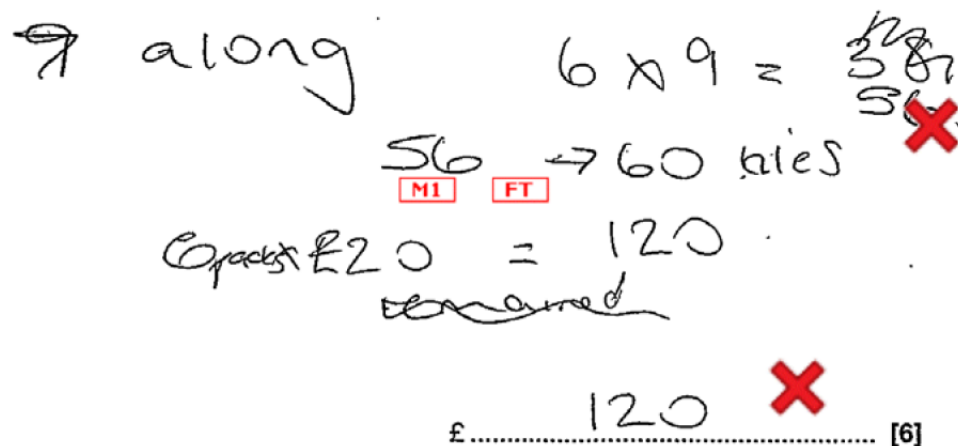
In this exemplar the candidate has found the floor needs 9 × 6 tiles but again the multiplication is incorrectly worked out (56). This gets the first and second M marks. Their number of tiles is rounded up and they identify that 6 packs are needed which they multiply by £20 to get the cost of the tiles (third M1 credited). However, this is where the working stops and the candidate does not consider the fitting cost at all. This answer gets 3 marks in total.

Exemplar 4

2 marks

450 cm

50 cm

50 cm

300 cm

450×300

	400	50
300	120,000	15,000

$\dfrac{135,000}{100} = 1,350$

7.50×1350

	700	50
1000	700000	50000
300	210000	15000
50	35000	2500

700000
210000
50000
35000
15000
1,012,580   ÷ 100

£ .... [6]

10,125

Answer.

Examiner commentary

This candidate uses cm throughout and makes it quite a bit more difficult for themselves. They work out the area of the floor (300 × 450) and gain the first M1. This is then (incorrectly) converted fr om cm^2 to m^2 by dividing by 100 to get 1350 m^2. This figure is then multiplied by (£)7.50 to get the fitting cost and so gain the fourth M1 (their 14 × 7.5). Note that in this case there is no need to round up as *their* 13.5 is already a whole number. They make no reference to or work out any calculations for the number of tiles so gain no further marks.

Question 16(a)

16 Four identical trapeziums are placed on a coordinate grid as shown.

Not to scale
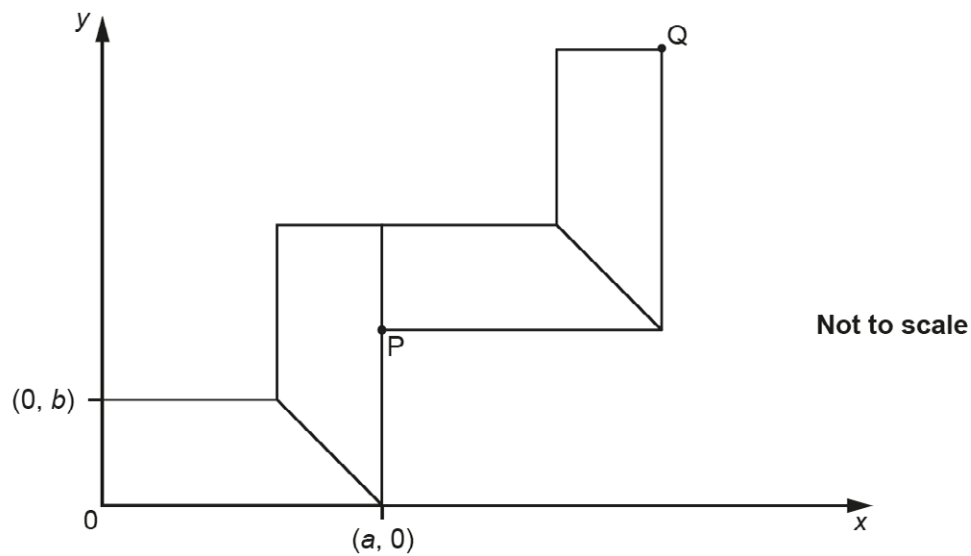
(a) Write down algebraic expressions for the coordinates of point P.

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

Exemplar 1   1 mark

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

Examiner commentary

Very few candidates achieved 2 marks for this question. This is one of the better responses.

The candidate has gained one mark for the *x* coordinate (*a*).

Exemplar 2

0 marks

Not to scale
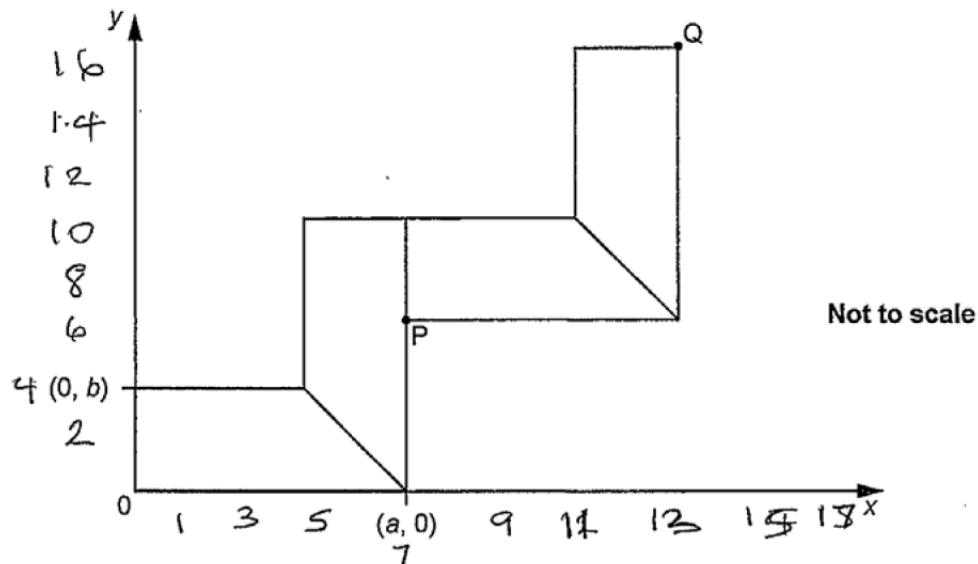
(a) Write down algebraic expressions for the coordinates of point P.

(a) (..............6.............. ; ....7..............) **[2]**

Examiner commentary

This is quite typical of the answers given. The candidate ignores the algebra aspect and puts a scale on each axis. This candidate has given point P the coordinates (6, 7) so zero marks are credited. Note that this candidate did not go back and correct this answer after extra information was given in part (b).

Question 16(b)

(b) The coordinates of point Q are (16, 13).

Work out the value of *a* and the value of *b*.

(b)   *a* = ...

   b = ... **[4]**

Exemplar 1   4 marks
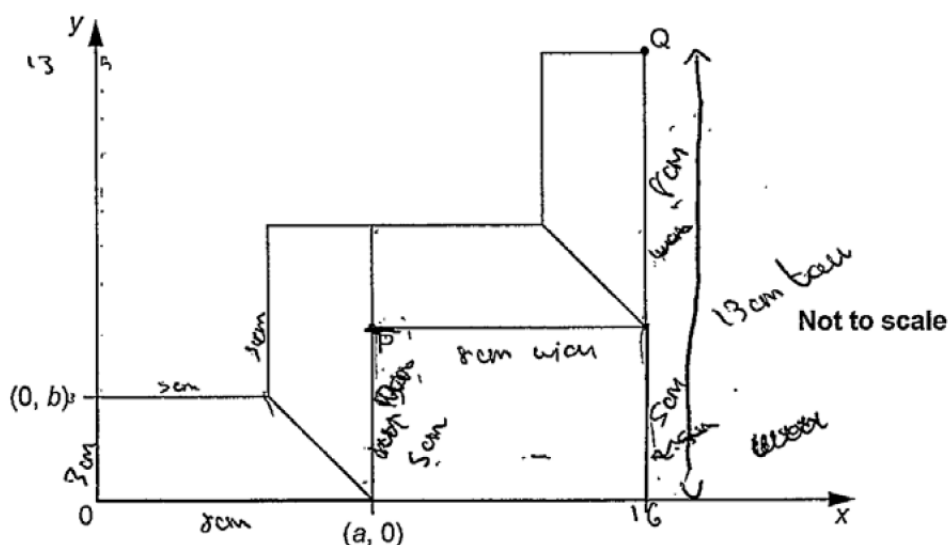
(b) The coordinates of point Q are (16, 13).

Work out the value of *a* and the value of *b*.

$$O - Q = 16$$
$$O - a = 16 \div 2 = 8$$
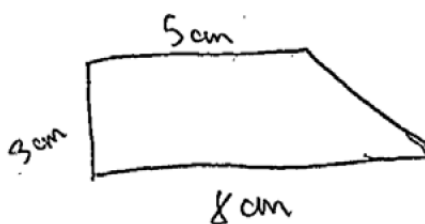
(b)   *a* = ...8...............

   b = ...3............... **[4]**

Examiner commentary

This candidate has worked out the lengths of the shapes using the 16 and 13 given, ignoring any algebra from part (a). Both coordinates are correct so 4 marks are credited.

Exemplar 2   2 marks
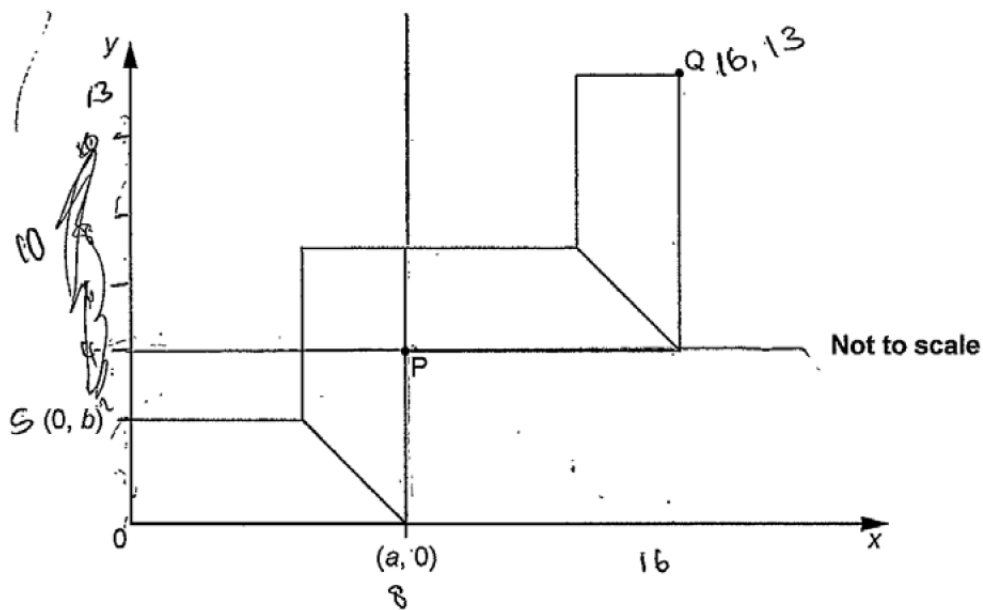
(b) The coordinates of point Q are (16, 13).

Work out the value of a and the value of b.

(b) $a =$ ....8............................

       $b =$ ....5.................................... **[4]**

Examiner commentary

This candidate does not appear to have worked out matching lengths of the identical trapeziums, but they have worked out that a = 8 so get 2 marks for that answer. No algebra is being used so no partial marks for b can be credited.

Exemplar 3   1 mark

Not to scale
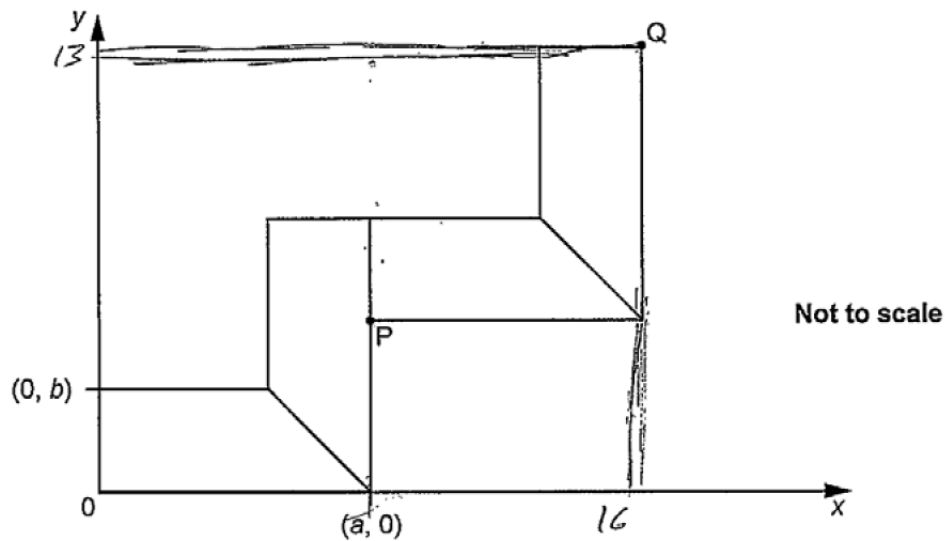
(b) The coordinates of point Q are (16, 13).

Work out the value of a and the value of b.

(b) $a =$ *8, 0*   SC

       $b =$ *0, 3*   **[4]**

Examiner commentary

This candidate gets the Special Case mark (SC1) for $a = (8, 0)$ or $b = (0, 3)$. They have not used any algebra, so no partial method marks are available.

Question 17(c)

17 Viraj cycled from his home to visit his aunt.
He drew this graph to show his journey.
He stopped at a shop 7 km from his home.
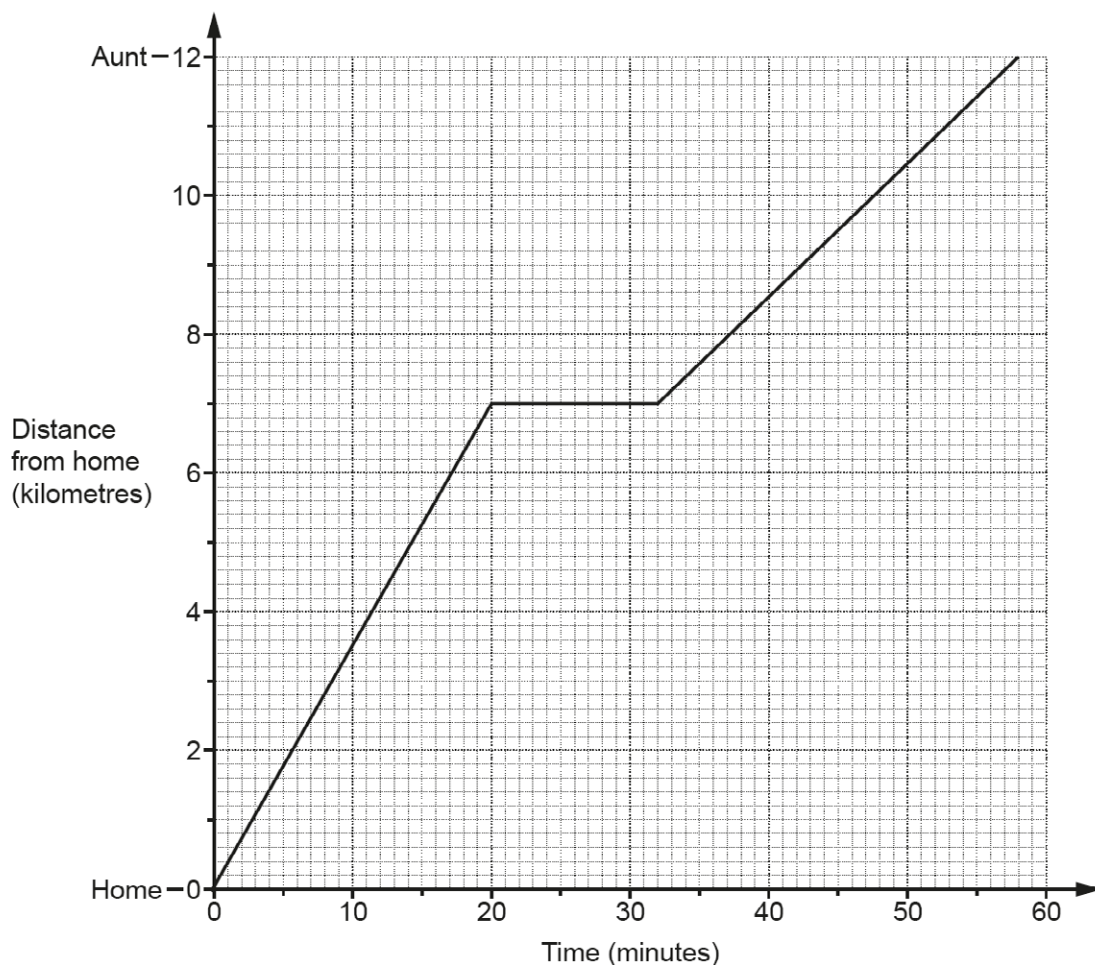
(a) State one assumption that Viraj made when he drew his graph.

....

.... **[1]**

Exemplar 1   2 marks

Distance = Speed / Time

Distance = Speed ~~Distance~~

$s = \dfrac{7000}{20} =$

$20\overline{)7000}$

7 km = 20 mins
Sun = 28 mins

(c) .... metres per minute **[3]**

Examiner commentary

This candidate writes out the correct formula for speed and then substitutes the correct numbers into their formula so gets B1 for 7000 and M1 for 7000 ÷ 20. There is an attempt to use the bus stop method, but the technique has been forgotten.

Exemplar 2   1 mark

Give your answer in metres per minute.

20 mins to go 7000m [B1]

2 mins to go 350 meters

700 / 2 ⟋ 350 meters
350
200

(c) ....35.... **✗** metres per minute [3]

Examiner commentary

Here the candidate has written out the relevant time and distance as "20 mins to go 7000 m" which is correct but they do not translate this into an arithmetic calculation. They appear to have mixed up halving and division by 10 as the next line should read "2 mins to go 700 m". Note that their crossed out working cannot be marked as it has been crossed out and there is other working shown. This candidate can only be credited B1 for the 7000 seen.

Exemplar 3   1 mark

(c) Work out Viraj's average speed between his home and the shop.
Give your answer in metres per minute.

$42 = \dfrac{d}{t}$

$= \dfrac{7 \text{ km}}{20 \text{ mins}}$

7 ÷ 20

2.94
7)20.60

(c) ....2.9.. metres per minute [3]

Examiner commentary

This script shows a quite typical layout for those candidates who have no recall of multiplication tables (× 7 in this case). They have remembered the formula for speed, $\dfrac{d}{t}$ shown, and then have written 7 ÷ 20 (no conversion to metres). Instead of dividing 7 by 20, they set up the bus stop method the wrong way round and divided 20 by 7. To do this they work out all the multiples of 7 in calculations (repeated additions). As it is obvious they intend to work out 7 ÷ 20 (it is written down twice here) they get M1 for their method, even though the application is incorrect.

Question 18(a)

18   The table shows the relative frequencies of the results for a football team after a number of games.

Result of game	won	lost	drew
Relative frequency	0.2	0.45	

    (a)   Complete the table.   **[2]**

Exemplar 1   2 marks

Result of game	won	lost	drew
Relative frequency	0.2	0.45	0.35

(a)   Complete the table.   **[2]**

$$0.45 + 0.20 = 0.65$$
$$1.00 - 0.65 = 0.35$$

Examiner commentary

This candidate has added the "won" and "lost" relative frequencies correctly, subtracted their answer from 1 to give 0.35 and then written their answer in the correct box in the table. This is clearly laid out and explicitly shows the addition and subtraction. Full marks are credited.

Exemplar 2   1 mark

Result of game	won	lost	drew
Relative frequency	0.2	0.45	0.53 M1

(a)   Complete the table.   **[2]**

$$0.47$$

Examiner commentary

The candidate did not write out the addition and gets the wrong answer due to a common mistake with place value. However, they then correctly subtract their incorrect 0.47 from 1 to get 0.53 and are credited 1 mark for the correct method of addition followed by subtraction from 1.

Question 18(b)

(b) The team lost 10 more games than they won.

How many games did the team play altogether?

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

Exemplar 1   3 marks

(b) The team lost 10 more games than they won.

How many games did the team play altogether?

$$0.45 -$$
$$0.20$$
$$\overline{0.25} = 10 \text{ games.}$$
$$\therefore 4 \times 0.25 = 40$$

(b) .... 40 .... **[3]**

Examiner commentary

One of the rare correct solutions is seen here with a clear layout. The candidate subtracts "won" from "lost", equates to 10 games and then finds the multiple to take their answer of 0.25 to 1 and does the same to the 10. Fully correct solution gains 3 marks.

Exemplar 2   2 marks

$$0.20 \quad 0.45 \quad 0.35 \qquad 2.5 = 1 \text{ game}$$

W   L   D

$$2.5 \times \boxed{8} \quad 2.5 \times \boxed{18} \quad 2.5 \times \boxed{14} \qquad 8 + 18 + 14$$
$$= 20 \qquad\quad = 45 \qquad\quad = 35 \qquad\qquad =$$

$$20 + 45 + 35$$
$$= 100$$

(b) .... ~~100~~ 36 .... **[3]**

Examiner commentary

This is an unusual method to work out the total number of games. The candidate appears to start with decimal relative frequencies and then carry on with percentages for their working out. They appear to have subtracted 20 from 45 = 25 and equated this to 10 games; this is implied by their stating that 1 game = 2.5. They then go on to work out how many 2.5s are in 20, 45 and 35 – giving the correct answers of 8, 18 and 14. However, their final calculation adding 8, 18 and 14 is incorrect and they lose the final mark.

Exemplar 3   1 mark

M1

$$0.25 = 10 \text{ games} \qquad 0.25$$
$$0.12 = 5 \text{ games} \qquad +$$
$$0.6 = 2 \text{ games}$$

$$0.6 \times 5 = 0.30 = 10 \text{ games}$$

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

Examiner commentary

This candidate starts off correctly by stating that 0.25 = 10 games. However they then try halving, but truncate 0.25 to 0.12, incorrectly half 0.12 to 0.6 and incorrectly half 5 games to 2 games. They end up with 0.25 = 10 games and also 0.30 = 10 games and do not progress further. However, they have associated 0.25 with 10 games at the start so M1 is gained.

Question 19(a)

19   Ifsaw noticed this information on her car's dashboard at the end of her journey.
She started her journey with a full tank of fuel and her miles travelled set to zero.
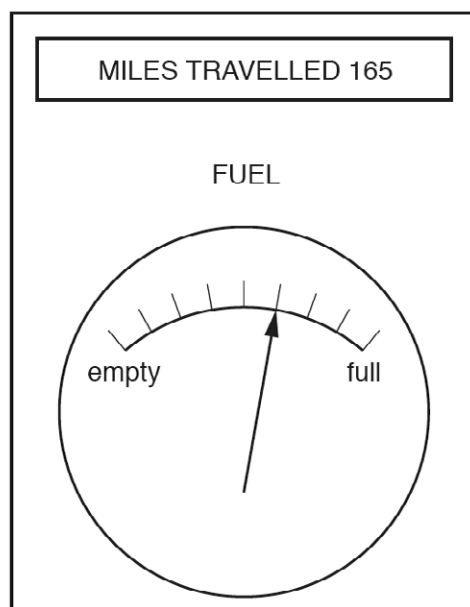
(a)   Work out how far Ifsaw's car can travel on a full tank of fuel.

(a)   .... miles   **[3]**

Exemplar 1

3 marks
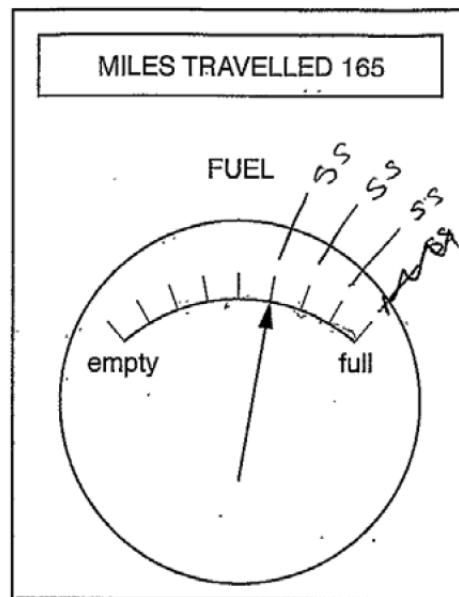
(a) Work out how far Ifsaw's car can travel on a full tank of fuel.

-3 of the 8 = 5 parts left

$$3 \overline{)16^15} = 55$$

$55 \times 8 =$

$$\begin{array}{r} 55 \\ 8 \\ \hline 440 \\ 4 \end{array}$$

(a) .... 440 .... miles **[3]**

Examiner commentary

The candidate identifies that there are 8 intervals and the petrol gauge has gone down 3 (– 3) and there are 5 left. They correctly divide 165 by 3 and then multiply their answer by 8 to get 440 so all 3 marks are credited.

Exemplar 2   2 marks

$$165 \div 3 = 55 \times 2 = 110$$

$$150 \div 3 = 60$$
$$15 \div 3 = 5$$
$$\rightarrow 55$$

$$165 \times 2 + 110 = 1320$$

$$\downarrow$$

$$1,210$$

$$1320$$

(a) .... miles **[3]**

Examiner commentary

This candidate clearly writes out the steps they are taking. They build up the 8 intervals by adding 3 + 3 + 2. However, although their division is correct, they go wrong with their multiplication of 165 × 2 which does not equal 1210. They do show the correct method so they earn M2 for the equivalent of 165 ÷ 3 × 8.

Exemplar 3

1 mark

MILES TRAVELLED 165

FUEL

empty   full

(a) Work out how far Ifsaw's car can travel on a full tank of fuel.

132
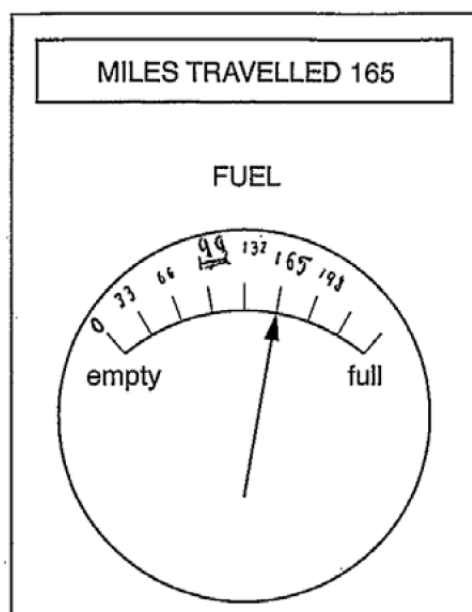
$$\begin{array}{r} 3\,5 \\ 5 \\ \hline 1\,7\,5 \end{array}$$

$$\begin{array}{r} 2\,5 \\ 5 \\ \hline 1\,2\,5 \end{array}$$

132

$$\begin{array}{r} 9\,9 \\ 3\,3 \\ \hline 1\,3\,2 \end{array}$$

$$\begin{array}{r} 3\,3 \\ 5 \\ \hline 1\,6\,5 \end{array}$$

$$\begin{array}{r} 1\,3\,2 \\ 3\,3 \\ \hline 1\,6\,5 \\ 3\,3 \\ \hline 1\,9\,8 \\ .3\,3 \\ \hline 2\,3\,1 \end{array}$$

$$\begin{array}{r} 6\,6 \\ 3\,3 \\ \hline 9\,9 \end{array}$$

$$\begin{array}{r} 2\,3\,1 \\ 3\,3 \\ \hline 2\,6\,4 \end{array}$$

SC

(a) .... 2 6 4 .... miles **[3]**

Examiner commentary

This candidate has gone wrong from the beginning by thinking that the fuel gauge moves left to right, so that 165 miles is for 5 intervals. They try 35 × 5 to make 165, then try 25 × 5 and finally get the right number by working out 33 × 5. Once they have the 33 they then consecutively add 33s until they have added 8 together to get 264, forgoing the multiplication they had performed first and writing the interim numbers on the gauge, apart from the last 2. This candidate has done some good work and got the right answer for their understanding so they are credited SC1.

Question 20(a)

20 (a) Here are three similar triangles.

Not to scale

15 cm

21 cm

4 cm

x cm

5 cm

8 cm
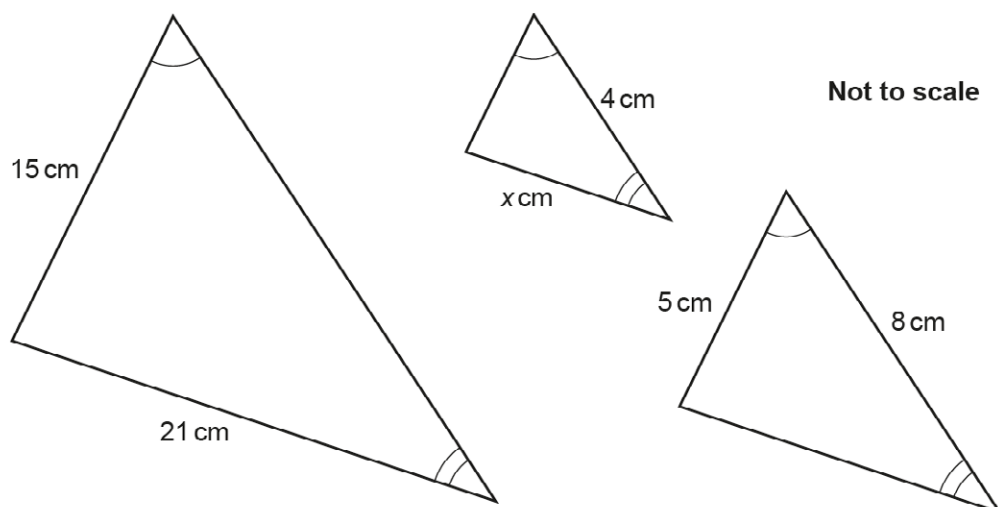
Work out the value of x.

(a) x = ... [3]

Exemplar 1   2 marks

20 (a) Here are three similar triangles.
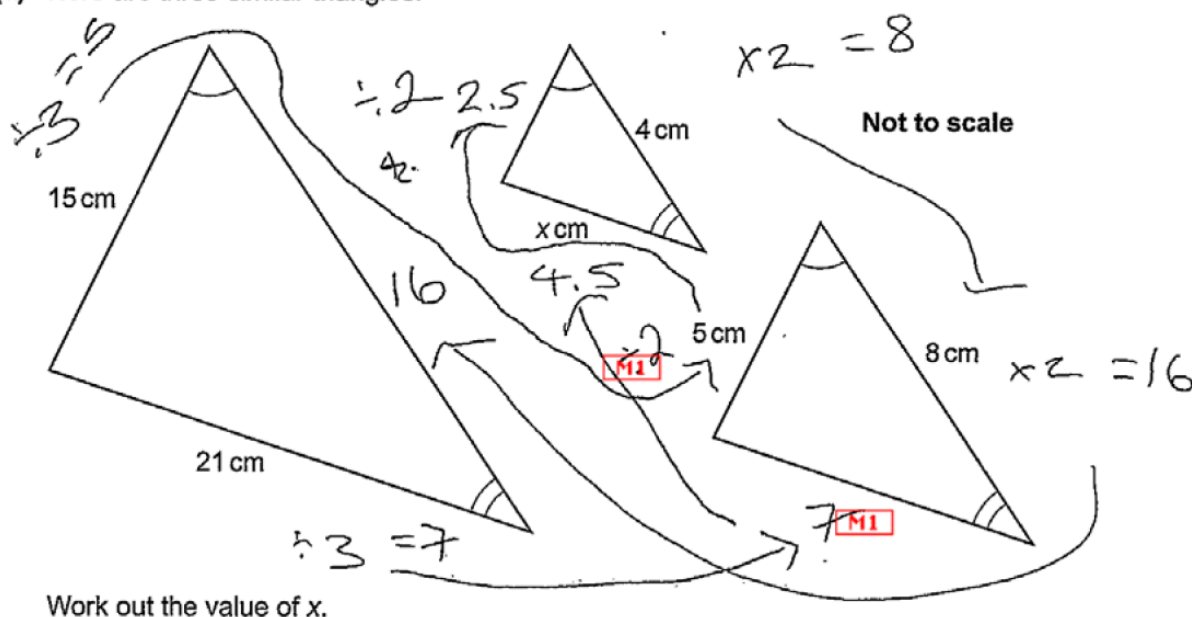
Work out the value of x.

(a) x = ...4.5........ ✗ [3]

Examiner commentary

This candidate has identified the multipliers between the similar triangles, although they are not all correct. They earn the first M1 for placing 7 on the medium triangle in the correct place (from 21 ÷ (15 ÷ 3) = 7). They also earn M1 for placing 2.5 on the small diagram in the correct place (from 5 ÷ (8 ÷ 4)).

Exemplar 2

1 mark

20 (a) Here are three similar triangles.

$$19 \quad \frac{\begin{array}{c|c|c} & 20 & 1 \\ \hline 20 & 400 & 20 \\ \hline 1 & 20 & 1 \end{array}}{} \quad 441$$

$$\begin{array}{r} 4.5 \\ 4.5 \\ 4.5 \\ 4.5 \\ \hline 18.0 \end{array}$$

Not to scale

15 cm ÷3

$$2^2 + 15^2 = x^2$$
$$\sqrt{441}$$

2.5 [M1]

4 cm

x cm

x

21 cm ÷3 =

5 cm

8 cm

Work out the value of x.

$$\frac{6.5}{2}$$

$$8^2 - 5^2 =$$

$$\begin{array}{c} 5 \; \cancel{64} = 25 \; \sqrt{39} \quad 6.5 \\ \underline{25} \qquad\qquad 6\overline{)39}^{30} \\ 3.9 \end{array}$$
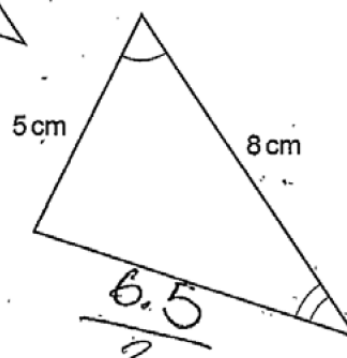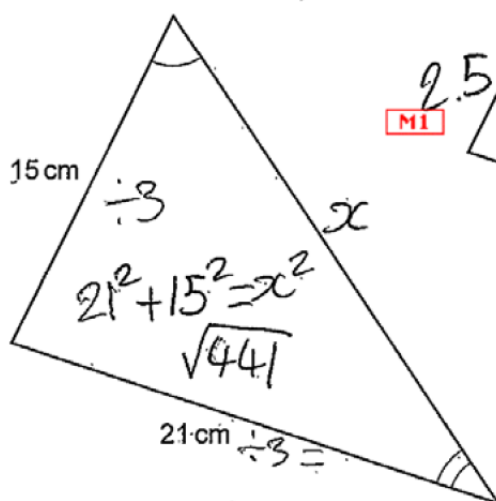
$$4^2 - 2.5^2 =$$

(a) $x = $ ___3.25 cm___ **[3]**

Examiner commentary

In this exemplar the candidate has identified multipliers are relevant but is also using Pythagoras' theorem. They have identified (÷ 3) on the large triangle but have abandoned the attempt to divide 21 by 3 and instead have used Pythagoras to estimate the bottom side of the medium triangle by working out $8^2 - 5^2 = 39$ and then incorrectly calculated the square root of 39 as 6.5. Their answer of 3.25 on the answer line is then obtained by use of the correct divisor of 2 from medium to small triangle. This response is worth M1 for the 2.5 shown on the small triangle.

Question 20(b)

(b) The diagram shows two right-angled triangles, OAB and OCD.
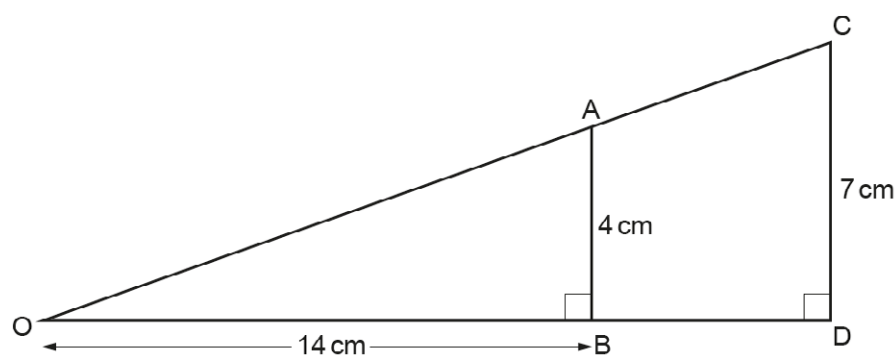
Work out the length of BD.

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

Exemplar 1   3 marks

(b) The diagram shows two right-angled triangles, OAB and OCD.

$7 - 4 = 3$
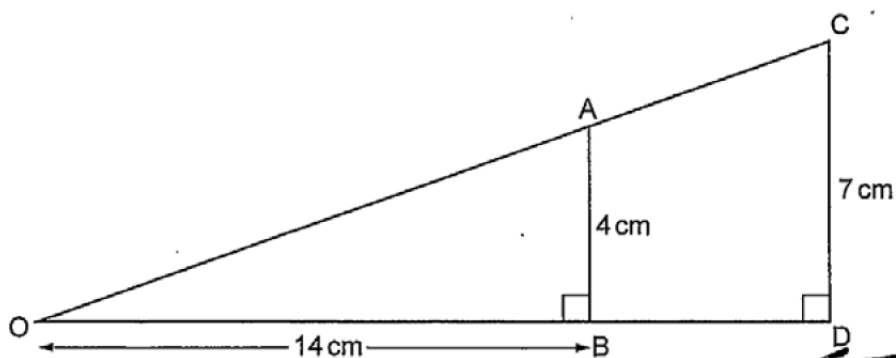
$4 \div 3 = \dfrac{3}{4}$

Work out the length of BD.

$14 \times 4 = 56 \div 2 = 28$

$14 \div 4 = 3.5 \times 3 = 10.5$

(b) ___10.5___ cm **[3]**

Examiner commentary

This candidate has identified that this question is again about similar triangles. They have the correct answer of 10.5 on the answer line and this is backed up by working showing that they are efficiently comparing the triangles OBA and AEC (where E is where a horizontal line from point A to line CD). The candidate scores full marks.

Exemplar 2   1 mark

Work out the length of BD..

$4 = 14$

$2 = 7$

$1 = 3.5$ cm (circled)

$3.5 \times 4 = 7 \times 2 = 14$

$7 \times 1.75 = \dfrac{3.5}{3.5} = \dfrac{3.5}{3.5}$

$\dfrac{10.6}{1}$

$\begin{array}{r} 10.5 \\ 10.5 \\ \hline 21. \quad \text{M1} \\ 3.5 \\ \hline 23.5 \quad ✗ \end{array}$

(b) .... 23.5 .... cm [3]
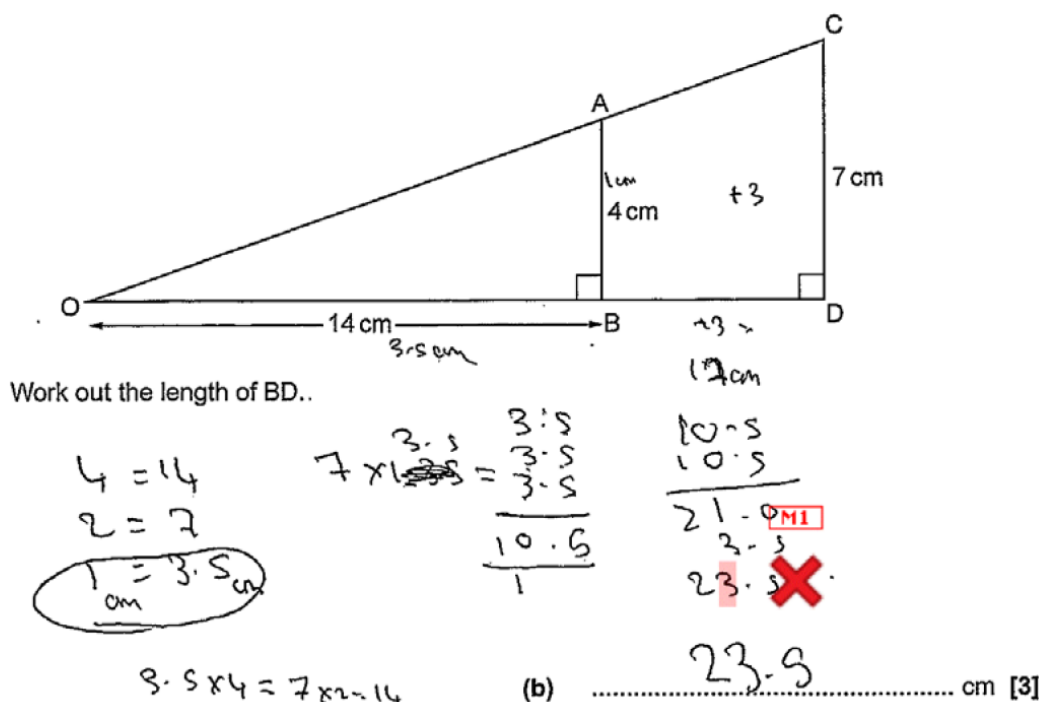
Examiner commentary

This candidate has identified the ratio 4 : 14 and then simplified it to 1 : 3.5. They then attempt to work out OD as 7 × 3.5 but their addition goes wrong and they end up with the wrong answer of 23.5. They get M1 for OD = 7 × 3.5 but cannot have A1 as their answer is wrong. They do not go on to work out BD so just the M1 is credited. The 10.5 seen is just an interim value during their calculation of OD.

Exemplar 3   1 mark

Work out the length of BD.

$\dfrac{7}{4} = 4\overline{)7.3^{3}0^{2}0}$ giving 1.75

$14 \times 1.75 =$
1400×175

$\begin{array}{r} 100000 \\ 70000 \\ 40000 \\ 28000 \\ 5000 \\ 2000 \\ \hline 245000 \\ 1\ 1 \end{array}$

1000	400
100 100000	40000
70 70000	28000
5 5.000	2000

245 000 ⌐

(b) .... 17 .... cm [3]
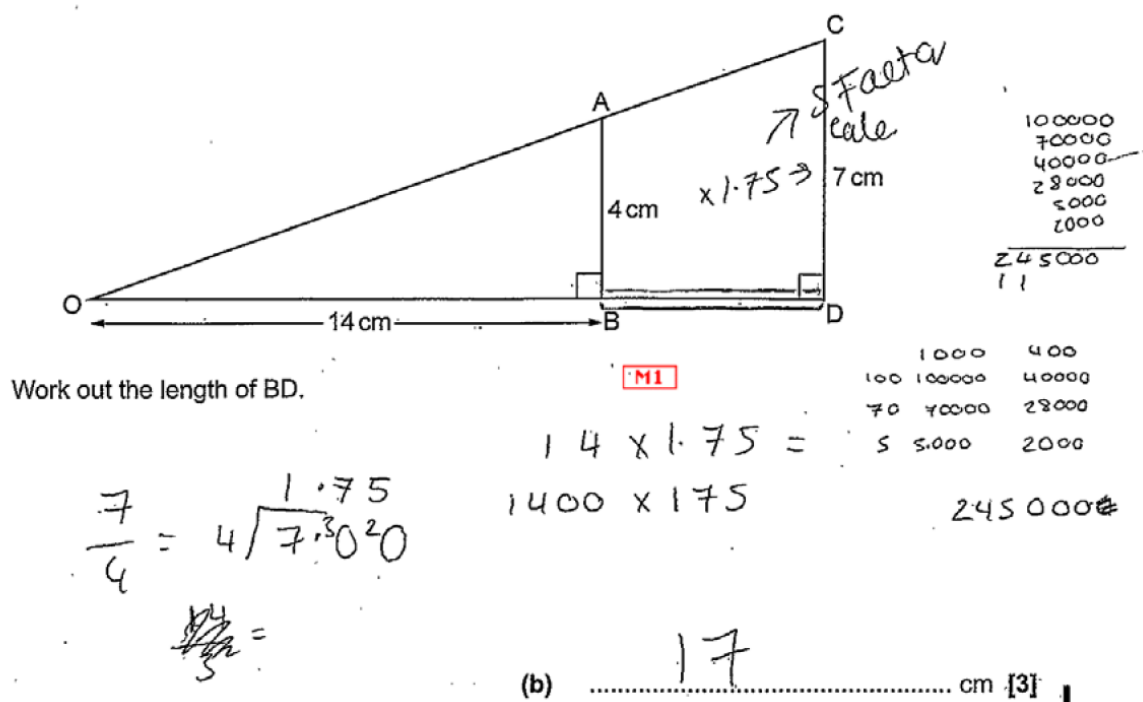
Examiner commentary

In this exemplar the candidate has picked out the ratio of 7 : 4 = OD : 14 and attempts to work out 14 × 1.75. They do the calculation 1400 × 175 correctly (245000) but they do not reach the answer of 24.5 for OD. It is unclear where the 17 on the answer line comes from. This candidate is credited M1 for the 14 × 1.75 only.

Question 21

21 This shape consists of three semicircles.
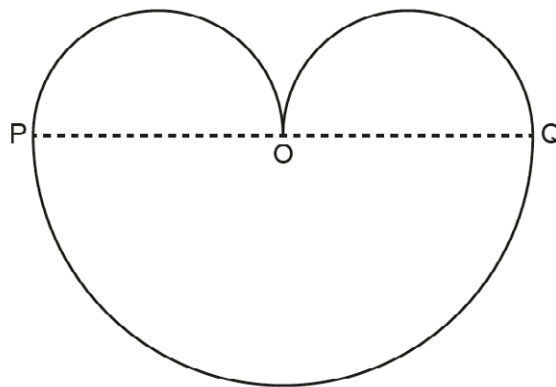
OP = OQ.
The length of PQ is $4x$ cm.

Show that the area, in cm^2, of the whole shape is $3\pi x^2$.   **[5]**

Exemplar 1   5 marks

21 This shape consists of three semicircles.
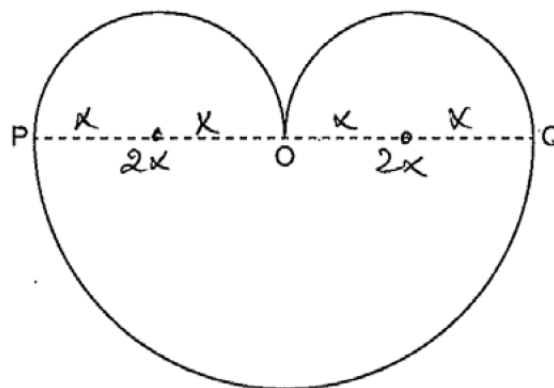
OP = OQ,
The length of PQ is $4x$ cm.

Show that the area, in cm^2, of the whole shape is $3\pi x^2$.   **[5]**

$PQ = 4x \Rightarrow PO = OQ$ mean $PO = OQ = 2x$

So the radius of $\perp$ circles is x.

I circle is $A_{PO} = \dfrac{\pi R^2}{2} = \dfrac{x^2 \pi}{2}$ II circle is $A_{OQ} = \dfrac{x^2 \pi}{2}$

②—Because it is half of circle.

III circle is $A_{PQ} = \dfrac{\pi R^2}{2} = \dfrac{(2x)^2 \pi}{2} = \dfrac{4x^2 \pi}{2}$

For the whole shape the area is:

$$\dfrac{x^2 \pi}{2} + \dfrac{x^2 \pi}{2} + \dfrac{4x^2 \pi}{2} = \dfrac{6x^2 \pi}{2}^{12} = \boxed{3x^2 \pi} \quad \text{True.}$$

Examiner commentary

This candidate is one of the very few taking this Foundation paper to achieve full marks on this question. They very clearly set out the algebraic values given: PQ = 4*x*, PO = OQ = 2*x* and radius of (small semicircle) is *x*. They then work out the areas of the 3 constituent shapes (labelling them I, II and III). This is done by stating the formula they are using, then substituting values into the formula and then simplifying. Finally, they add together the constituent parts, simplify and then compare to the answer given, making a comment (True) that the worked out value and the given value are the same. Full marks are credited.

Exemplar 2   1 mark

$$PQ = 4x \text{ cm. So } r = 2x \quad \boxed{B1}$$

$$\therefore PO = 2x \text{ cm} \quad \text{So } r = \underline{\underline{x \text{ cm}}}$$

$$OQ = 2x \text{ cm}$$

Total area = area of Semi circle PQ (large)
plus area of full circle at top (smaller
two halves)

$$\text{So Area} = \cancel{2\frac{1}{2}} \pi r^2 = \pi x^2 \times 2 \quad \boxed{M0} = 2\pi x^2$$

$$+ \text{ Area of large semi} - \text{circle} = \frac{\pi 2 x^2}{2} = 1\boxed{\pi}x^2 \quad \boxed{M0}$$

$$\text{Total} \therefore = 2\pi x^2 + \pi x^2 = 3\pi x^2. \cancel{z}$$

Examiner commentary

This is a more able candidate's response, but errors in their working meant that most marks were lost. They have started well by stating the algebraic values given and what their method is going to be (adding a semicircle and a circle). They then attempt to work out the area of the circle (made from 2 small semicircles). The formula is correct (πr^2) but they then multiply by 2 when they substitute the values in, so never get a correct expression for the 2 small semicircles. They then attempt to work out the area of the big semicircle but do not include brackets around the 2*x* and so their expression for this is also incorrect. They add their 2 incorrect values and get the answer given but this is from incorrect working so just B1 for either radius given at the start is credited.

Exemplar 3 | 1 mark

$PO = 2x \, cm = r$ of PQ

$\pi 2^2 = PQ$

Circumfrence
~~Perimeter~~
$= \pi \times diametre$

area
$= \pi r 2$

Circum
~~Perim~~ $= PQ = \pi \times 4x$

diametre

$\div 2 = \pi \times 2x$

radius
of $PO = 0.5^2$
of $OQ = 0.5^2$

$\pi \times 2x + 0.5 \times 0.5$
$= 3\pi x^2$

Examiner commentary

This candidate starts off quite well by stating the radius of PQ and formula for area of a circle. However, when substituting into the area formula for the big circle the *x* is omitted. They then go on to work out the circumference of the big semicircle and add it to their radii of the two smaller semicircles and this is then 'fudged' to attempt agreement with the answer given. This candidate is credited just B1 for the correct radius of PQ.