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# Mark Scheme (Results)

## November 2012

## GCSE Mathematics Linked Pair Pilot
## Application of Mathematics (2AM01)
## Foundation (Calculator) Paper 2F

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## NOTES ON MARKING PRINCIPLES

**1** All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

**2** Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

**3** All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

**4** Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

**5** Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

**6** Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

**7 With working**

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

**8 Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**9 Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

**10 Probability**

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

**11 Linear equations**

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

**12 Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

**13 Range of answers**

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

| **Guidance on the use of codes within this mark scheme** |
| --- |
| M1 – method mark<br>A1 – accuracy mark<br>B1 – Working mark<br>C1 – communication mark<br>QWC – quality of written communication<br>oe – or equivalent<br>cao – correct answer only<br>ft – follow through<br>sc – special case<br>dep – dependent (on a previous mark or conclusion)<br>indep – independent<br>isw – ignore subsequent working |

| 5AM2F_01 | | | | | |
|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | | 2380 – 74 + 51 = 2357<br>2357 – 42 + 30 = 2345<br><br>Or<br>74 – 51 = 23, 42 – 30 = 12<br>2380 – 23 – 12 = 2345<br><br>Or<br>74 + 42 = 116, 51 + 30 = 81<br>2380 – 116 + 81 = | 2345 | 3 | M1 for 2380 – 74 (=2306) or 2380 + 51 (= 2431) oe<br>M1 for 2380 – 74 + 51 – 42 + 30 oe<br>A1 cao<br>Or<br>M1 for 74 – 51(= 23) or 42 – 30 (= 12)<br>M1 for 2380 – (74 – 51 ) – (42 – 30 )<br>A1 cao<br>Or<br>M1 for 74 + 42 (= 116) or 51 + 30 (= 81) oe<br>M1 for 2380 – (74 +42) + (51 + 30)<br>A1 cao |
| 2 | (i)<br><br><br>(ii) | 360 – (117 + 90 + 43)<br>= 360 – 250 | 110<br><br><br>Reason | 3 | M1 for 360 – (117 + 90 + 43) or 360 – 250<br>A1 for 110 cao<br><br>C1 for <u>angles</u> in a <u>quadrilateral</u> sum to <u>360º</u> |

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|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 3 | (a) | 21 18<br>19 45 –<br>1 33<br><br>15 min + 1hr + 18 min | 1h 33m | 2 | M1 for 21 18 – 19 45 or 9 18 – 7 45 or attempt to subtract by decomposing one hour into 60 minutes<br>A1 cao<br>Or<br>M1 for counting on eg 15 + 60 + 18 or answer of 93 with no units seen<br>A1 for 1 hr 33 min or 93 min<br><br>B1 **SC** for answer of 1.33 or 133 or 1.73 or 173 with or without h or hours |
| | (b) | 4.50 + 4.50 + 2.90 + 18.00<br>= 29.90<br>50 – 29.90<br><br>OR 50 – 18 – 2.90 – 2 × 4.50<br>= 50 – 29.90 | 20.10 | 3 | M1 for 4.50 + 4.50 + 2.90 + 18.00 oe<br>M1 for 50 – "(4.50 + 4.50 + 2.90 + 18.00)"<br>A1 cao<br>OR<br>M2 for 50 – 18 – 2.90 – 2(4.50) oe<br>(M1 for subtracting at least 3 items)<br>A1 cao<br>SC: B2 for an answer of 24.60 |
| 4 | (a) | | tenth | 1 | B1 for tenth, $\frac{2}{10}$ oe, 200 g, 0.2 kg |
| | (b) | | 1750 | 1 | B1 cao |
| | (c) | 8952 ÷ 100 | 89.52 | 1 | B1 cao |

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|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 5 | | AC direct = 64<br><br>AC via B = 32 + 28 = 60<br><br>AC via D = 39 + 26 = 65<br>OR<br>+7 – 2 = +5 | ABC<br>60 | 3 | M1 for 32 + 28 or 39 + 26 or 60 or 65 shown for ABC or ADC respectively or +7 –2 is 5km longer<br>M1 for 32 + 28 and 39 + 26 or 60 and 65 shown for ABC and ADC respectively<br>A1 for ABC and 60 |
| 6 | (a)<br><br><br>(b) | (i)<br>(ii) | cross at 1<br>cross at ½<br><br>$\frac{1}{8}$ | 2<br><br>1 | B1 for cross at 1 or very near 1<br>B1 for cross at ½ or very near ½<br><br>B1 oe |
| 7 | | 60 – 18 = 42, 42 ÷ 2 = 21<br><br>OR<br>$x + x + 18 = 60$ , $2x = 42$ | 21 | 2 | M1 for (60 – 18) ÷ 2<br>A1 cao<br>Or<br>M1 for $x + x + 18 = 60$ oe<br>A1 cao<br>Or<br>M1 for 3 trials differing by 18 eg (20, 38 ), (10, 28), (22, 40)<br>A1 cao |

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| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 8 | | | 5820 $cm^2$ | 4 | M1for 60 × 25 or 48 × 90 or 1500 or 4320 seen (ignore units)<br>M1for 60 × 25 + 48 × 90 or 1500 + 4320 seen (ignore units)<br>A1 for 5820<br><br>B1 for $cm^2$ |
| 9 | | count squares × 100 = 2900<br>or<br>put 100 in each square and count | 2600 – 3200 | 3 | B3 for answer in the range 2600 ⎪ answer <3200<br>B2 for answer between 26 and 32 inclusive or<br>2400 ⎪ answer < 2600 or 3200 < answer ⎪ 3400<br>B1 for answer in ranges 24 ≤ answer < 26 or<br>32 < answer ≤ 34 |
| 10 | (a) | | parallel lines | 1 | B1 for correct lines marked with arrows |
| | (b) | | circle | 1 | B1 for circle radius 4 cm within overlay |
| | (c) | | triangle | 2 | M1 for 38° ± 2° drawn or 7.4 cm ± 0.2 cm drawn<br>A1 for correct triangle within overlay |

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| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 11<br>**QWC** | | 3h 30 + 3h 45 + 3h 30 + 4h 15 + 2h = 15h + 120m<br>15 × 8 + 120 ÷ 60 × 10<br>or<br>15 × 8 = 120<br>2 × 10 = 20<br>120 + 20 | £140 | 4 | M1 for adding all 5 times (or 15 hours and 120 minutes)<br>M1 for 15 × 8 oe<br>M1 for 15 × 8 + ("17" – 15) × 10 oe<br>C1 for £140 indicated with correct money notation<br>Or<br>M1 for3 + 3 + 3 + 4 + 2 (= 15) and 30 + 45 + 30 + 15 (=120)<br>M1 for 15 × 8 or "17" × 8<br>M1 for 15 × 8 + '120' ÷ 60 × 10 or<br>"17" × 8 + ("17" – 15) × 2<br>C1 for £140 indicated with correct money notation<br><br>**SC** for working with 16h 20 mins B2 for multiplying15 by 8 and a remainder by 10 |
| 12 | (a) | Graph (0, 0) to (100, 2400) | conversion graph | 2 | M1 for straight line through (0, 0) or through one other correct point e.g. (10, 240) or (50, 1200) or through (100, 2400)<br>A1 cao |
| | (b) | Line from 1800 lira to graph and down | 73 – 77 | 2 | M1for line drawn from 1800 lira to their graph<br>A1 ft for '75' ± £2 |

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|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 13 | (a) | | List all 12 outcomes | 2 | B2 for listing all 12 possibilities condone repeats e.g. (3,1) and (1, 3) but not extras<br>(B1 for at least 6 correct) |
| | (b) | (2, 7) and (5, 4) | $\frac{2}{12}$ | 3 | M1 for selecting at least one total of 9<br>A2 for $\frac{2}{12}$ oe<br>(A1 for $\frac{x}{12}$ where $x < 12$ or $\frac{2}{y}$ where $y > 2$ |
| 14 | (a) | $18 \times 1.5 + 10$<br>$= 27 + 10$ | 37 | 2 | M1 for $18 \times 1.5 + 10$ or digits 37 seen<br>A1 cao |
| | (b) | $43 - 10 \div 1.5 = 33 \div 1.5$<br><br>1.5 + 1.5 + 1.5 + 1.5 etc<br>Or<br>37 + 1.5 + 1.5 + 1.5 etc<br><br>or<br>$43 = 1.5C + 10$<br>$43 - 10 = 1.5C$<br>$1.5c = 33$ | 22 | 3 | M1 for $43 - 10$ or 33 seen<br>M1 for "(43 – 10)" ÷ 1.5 oe<br>A1 for 22 cao<br>or<br>M2 for starting at '37' and adding on at least three 1.5s<br>(M1 for starting by adding at least six 1.5s )<br>A1 for 22 cao<br>or<br>M1 for setting up an equation eg $43 = 1.5C + 10$<br>M1 for $43 - 10 = 1.5C$ or $1.5c = 33$<br>A1 for 22 cao |

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| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 15 | (a) | | (9),9,9,9, 10,10 | 1 | B1 for (9), 9, 9, 9, 10, 10 (any order) |
| | (b) | 32 + 41 + 41+ 41 = 155<br>160 – 155<br>Or<br>160 –32 – 41 – 41 – 41 = 5 | 5 | 2 | M1 for 160 – 32 – 3 × 41 oe<br>A1 cao<br><br>**SC** B1 for 87 given as the answer from 160 – (32 + 41) |
| | (c) | 15 ÷ (2 + 3)<br>= 15 ÷ 5 = 3<br>3 × 3 | 9 | 3 | M1 for 15 ÷ (2 + 3) oe<br>M1 for 3 × '(15 ÷ (2 + 3))'<br>A1 cao |
| 16 | (a) | | 4 | 1 | B1 cao |
| | (b) | | 15 | 1 | B1 cao |
| | (c) | | 08 20 | 2 | B2 for answer in range 08 19 to 08 21<br><br>B1 for answer in range 08 15 to 08 25<br><br>(ignore extra times of 08 00 and 08 40 included) |

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|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 17<br>**QWC** | | **5A** =150 + 150 + 150 + 150 + 150<br>= 35p × 5 = £1.75<br><br>**2C + A** = 300 + 300 + 150<br>= £1.60 + 35p = £1.95<br><br>**3B + A** =200+200+200 +150<br>= 45p × 3 + 35p = £1.70<br><br>**3A + C** = 150+150+150+300<br>= 35p × 3 + 80p = £1.85 | £1.70 | 4 | M1 for attempt to find at least 2 different combinations of weights (can be implied by costs) with at least one correct that add to 750g<br><br>M1 for identifying and attempting to calculate the costs of two out of the four possibilities from 5A or 2C + A or 3B + A or 3A + C oe (can be implied by the costs)<br><br>**either**<br>A1 for at least 3 costs correct from £1.75, £1.95, £1.70, £1.85 ignore units)<br>C1 ft (dep on M1) for £1.70 (or 170p) identified as lowest cost from all four possible combinations<br>**Or**<br>A1 for working out 5A to £1.75 and 3B + A out to £1.70<br>**and**<br>C1 ft (dep on M1)for £1.70 (or 170p) identified as lowest cost **and** an explanation that 300g size can be replaced more cheaply by two 150g sized tins |
| 18 | (a) | | $w = x - 1$ | 2 | B2 for $w = x - 1$ oe<br>( B1 for $x - 1$ or $w = 1 - x$ or $w = x + 1$ or $x = w - 1$ oe ) |
| | (b) | | $T = 7(x - 1)$ | 1 | B1 ft for $T = 7(x - 1)$ oe |
| 19 | | 12 + 18 = 30 | $\frac{12}{30}$ | 2 | B2 for $\frac{12}{30}$ oe (eg 40%, 0.4, $\frac{2}{5}$<br>(B1 for $\frac{x}{30}$, where $x < 30$ or $\frac{12}{y}$ where $y > 12$ |

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| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 20 | (a) | Smart phone 838<br>DVDs 4 × 16 = 64<br>Lawnmower<br>57 ÷ 3 × 12<br>= 19 × 12 = 228<br><br>838 + 64 + 228 = 1130 | 1130 | 3 | M1 for 57 ÷ 3 × 12 or 228 seen<br>M1 for 838 + 4 × 16 + '57 ÷ 3 × 12'<br>A1 cao |
| **QWC** | *(b) | 4500 ÷ 500 = 9<br>9 × 2.40<br>= 21.60<br><br>Or<br>22 ÷ 2.40 = 9.1666...<br>9.1666... × 500<br>= 4583.33...<br><br>Or<br>£2.40 needs 500 points<br>£24 needs 5000 points<br>24 – 2.40 needs 4500 points<br>£21.60 needs 4500 points | No with explanation | 4 | M1 for 4500 ÷ 500 ( = 9) (maybe implied by 9 lots of 500 seen)<br>M1 for '9' × 2.40<br>A1 cao for 21.60<br>C1 (dep on M1) f.t. for 'No' Decision must be stated and must be attributable from a correct method.<br>for 22 ÷ 2.40 ( = 9.1666)<br>Or<br>M1 for '22 ÷ 2.40' × 500<br>A1 for answer in range 4583 to 4583.33....<br>C1 (dep on M1) f.t. for 'No' Decision must be stated and must be attributable from a correct method.<br><br>Or<br>M1 for £24 (or 2400p) = 5000<br>M1 for 24 – 2.40 (or 2400 – 240) = 4500<br>A1 cao for 21.60<br>C1 (dep on M1) f.t. for 'No' Decision must be stated and must be attributable from a correct method. |

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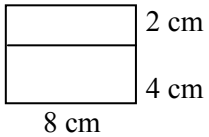
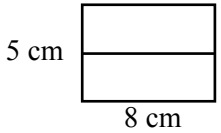
|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 21 | | | 131.89 | 5 | B2 for $PR$ = 21 m (± 0.6 m)<br>or at least 3 bushes 0.5 to 0.9 cm apart on $PR$<br>(B1 for $PR$ = 7cm (± 0.2 cm) or at least 3 bushes 1.8 to 2.2 cm apart on $PR$)<br><br>M1 "21" ÷ 2 or for indication of 10 or 11 bushes (may be on diagram)<br>M1 (dep on 2 marks earned previously) for '11' × 11.99<br>A1 cao |
| 22 | | 12 are red.<br>1/3 are red<br>12 × 3 =<br><br>2 blue for 1 red<br>24 blue for 12 red<br>24 + 12 = | 36 | 3 | M1 for P(red) = 1/3<br>M1 for 1/3 × 36 = 12 red or 12 × 3<br>A1 for 36 cao<br><br>OR<br>M1 for 2 blue for 1 red<br>M1 for 24 blue for 12 red or 24 + 12<br>A1 for 36 cao |
| 23 | (a) |  | side elevation | 2 | B2 for 8 cm by 6 cm side elevation with horizontal line at height of 4 cm<br>( B1 for any rectangle base 8 cm or height 6 cm) |
| | (b) |  | plan | 2 | B2 5cm by 8cm rectangle, any orientation, with line joining the mid-points of the 5 cm side<br>( B1 for any rectangle with one side 5 cm) |

<table>
<tr><th colspan="6">5AM2F_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>*24<br>QWC</td><td></td><td>eg <DGF = 60 (line = 180)<br><AFG = 80 (<s in Δ AFG)<br><EFC = 100 = <BCA (corresponding angles)<br><br>eg <DGF = 60 (line = 180)<br><AFG = 80 (<s in Δ AFG)<br><DCF = 100 (opposite <s)<br>(allied angles sum to 180)</td><td>Yes<br>with<br>reasons</td><td>3</td><td>B1 for at least two correct angles given or marked on the diagram.<br><br>C1 for any one reason given from <u>angles</u> on a <u>line</u> = <u>180</u>, <u>angles</u> in a <u>triangle</u> = <u>180</u>, <u>vertically opposite</u> angles are <u>equal</u> or <u>angles</u> in <u>a quadrilateral</u> add to <u>360</u> , <u>exterior</u> angle of a triangle = <u>sum of interior opposite</u> angles<br><br>C1 for Yes with clearly identified angles with fully correct reasons that define the parallel lines e.g. identified <u>alternate</u> angles <u>equal</u>, identified <u>corresponding</u> angles <u>equal</u>, identified <u>allied</u> or <u>co-interior angles</u> sum to <u>180</u></td></tr>
<tr><td>25</td><td></td><td>x + x – 5 + 2x < 30<br>x + x + 2x < 30 + 5<br>4x < 35<br>x < 35 ÷ 4<br><br>Or<br><br><table><tr><td>S</td><td>10</td><td>9</td><td>8</td></tr><tr><td>M</td><td>5</td><td>4</td><td>3</td></tr><tr><td>J</td><td>20</td><td>18</td><td>16</td></tr><tr><td>Sum</td><td>35</td><td>31</td><td>27</td></tr><tr><td></td><td>no</td><td>no</td><td>yes</td></tr></table></td><td>8</td><td>4</td><td>M1 for x – 5 for Martin or 2x for James<br>M1 (dep on M1) for x + ‘x – 5’ + ‘2x’ < 30 ( or = 30)<br>M1 (dep on M2) for complete correct method to solve their equality or inequality or 8.75 oe seen<br>A1 cao<br><br>Or for trial and improvement method<br><br>M1 for x – 5 for Martin or 2x for James (can be implied by one correct trial)<br>M1 for 3 trials with correct ages (totals not needed) or 2 trials with correct ages and totals<br>M1 for a trial total < 30 and a trial total > 30 or 8, 3, 16 identified as answer<br>A1 cao</td></tr>
</table>

| 5AM2F_01 | | | | | |
|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 26 | | Area cross section is<br>½ (1.2 + 1.8) × 1.5<br>= 1.5 × 1.5 = 2.25<br>Or<br>1.5 × 1.2 + ½ 1.5 × (1.8 – 1.2)<br>1.8 + 0.45 = 2.25<br>Or<br>1.5 × 1.8 – ½ 1.5 × (1.8 – 1.2)<br>2.7 – 0.45 = 2.25<br>Volume = 2.25 × 2 =<br><br>Or<br>Cuboid volume is<br>1.2 × 2 × 1.5 = 3.6<br>Triangular prism volume is<br>½ × 1.5 × (1.8 – 1.2) × 2 =0.9<br>3.6 + 0.9<br><br><br><br>Or<br>Outer cuboid volume is<br>2 × 1.5 × 1.8 = 5.4<br>Triangular prism volume is<br>½ × 1.5 × (1.8 – 1.2) × 2 = 0.9<br>5.4 – 0.9 | 4.5 | 4 | **Volume from area of cross section × length**<br><br>M2 for ½ (1.2 + 1.8) × 1.5 oe or<br>1.5 × 1.2 + ½ 1.5 × (1.8 – 1.2) or<br>1.5 × 1.8 – ½ 1.5 × (1.8 – 1.2) or 2.25 given as cross sectional area<br>(M1 for (1.2 + 1.8) × 1.5 or 1.5 × 1.2 + 1.5 × (1.8 – 1.2) or<br>1.5 × 1.8 – 1.5 × (1.8 – 1.2))<br>M1 for "2.25" × 2<br>A1 cao<br><br>**SC** B2 for answer of 9 if this method is used<br><br>Or **Volume from cuboid vol + triangular prism vol**<br><br>M1 for 1.2 × 2 × 1.5 or 3.6 given as volume of cuboid<br>M1 for ½ × 1.5 × (1.8 – 1.2) × 2 or 0.9 given as volume of triangular prism<br>M1 for "3.6" + "0.9" where (3.6" and "0.9" are volumes<br>A1 cao<br><br>**SC** B2 for answer of 5.4 if this method is used<br><br>Or **Volume from cuboid vol – triangular prism vol**<br><br>M1 for 2 × 1.5 × 1.8 or 5.4 given as volume of outer cuboid<br>M1 for ½ × 1.5 × (1.8 – 1.2) × 2 or 0.9 given as volume of triangular prism<br>M1 for "5.4" − "0.9" where "5.4" and "0.9" are both volumes<br>A1 cao<br><br>**SC** B2 for answer of 3.6 if this method is used |

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