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# Mark Scheme (Results)

## Summer 2013

## International GCSE Mathematics (4MA0) Paper 4HR

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# General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- 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.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- **Types of mark**
  - M marks: method marks
  - A marks: accuracy marks
  - B marks: unconditional accuracy marks (independent of M marks)
- **Abbreviations**
  - awrt – answers which round to.....
  - cao – correct answer only
  - ft – follow through
  - isw – ignore subsequent working

- SC - special case
- oe – or equivalent (and appropriate)
- dep – dependent
- indep – independent
- eeoo – each error or omission

- **No working**

  If no working is shown then correct answers normally score full marks

  If no working is shown then incorrect (even though nearly correct) answers score no marks.

- **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 it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

  Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.

  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 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.

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

- **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: eg. Incorrect cancelling 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 eg algebra.

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

- **Parts of questions**

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

**Apart from Questions 9, 13(a), 20dii and 23 (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.**

| Question Number | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 1 | 12 : 8 oe or 8:12 | | 2 | M1 |
| | | 1.5 oe | | A1 |
| | | | | **Total 2 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | | translation | 2 | B1 | Also accept translated, translate etc | These marks are independent but award no marks if the answer is not a single transformation |
| | | $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$ | | B1 | Also accept 2 to the left and 1 up | |
| | | | | | | **Total 2 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | (i) | 3 × 2 + 4 × 5 + 5 × 14 + 6 × 19 + 7 × 10<br>**or** 6 + 20 + 70 + 114 + 70<br>**or** 280 | | 4 | M1 | for sum of products condone one error |
| | | "280" ÷ 50 | | | M1 | (dep) for division by 50 |
| | | | 5.6 | | A1 | cao Also accept 6 if both method marks scored and 5 following 5.6 |
| | (ii) | | 5 | | B1 | ft from their (i) |
| | | | | | | **Total 4 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | (a) | | (3, 2) | 2 | B2 | B1 for 3 B1 for 2 |
| | (b) | arc(s) centre *P* radius *PA* | | 2 | M1 | |
| | | | Cross at (6, 3) | | A1 | Accept any clear indication. Condone omission of label if no ambiguity |
| | | | | | | **Total 4 marks** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | (a)(i) | $\frac{15}{100}\times 280$ or 42 | | 3 | M1 | | M2 for $\frac{85}{100}\times 280$ |
| | | 280 – "42" | | | M1 | dep | |
| | | | 238 | | A1 | cao | |
| | (ii) | $\frac{24}{0.15}$ or $24\times\frac{100}{15}$ | | 3 | M2 | for $\frac{24}{0.15}$ or $24\times\frac{100}{15}$<br>M1 for $\frac{24}{15}$ or 1.6 | |
| | | | 160 | | A1 | cao | |
| | (b) | 2 + 3 or 5 | | 3 | M1 | 5 may be denominator of a fraction or coefficient in an equation such as $5x=320$ | |
| | | $\frac{320}{5}$ or 320 ÷ "5" or 64 or $\frac{7}{5}$ oe | | | M1 | dep | |
| | | | 448 | | A1 | Also award for 128 : 192 : 448 | |
| | | | | | | | **Total 9 marks** |

| | | | | | |
|---|---|---|---|---|---|
| 6 (a)(i) | $\angle ABC = 68°$ or $\angle BCD = 112°$ | | 4 | M1 | May be stated or marked on diagram |
| | | 68 | | A1 | cao |
| (ii) | 360 − (67 + 112 + "68" + 74) | | | M1 | |
| | | 39 | | A1 | ft from their (a)(i)<br>Award 2 marks if the answer to (ii) is 107 – answer to (i) |
| (b) | (5 − 2) × 180 or 3 × 180 **or**<br>(2 × 5 − 4) × 90 or 6 × 90 **or**<br>360 + 180 **or**<br>(180−67) + (180−112) +<br>(180−"68") + (180−74) +<br>(180−"39") **or**<br>113 + 68 + 112 + 106 + 141 | | 2 | M1 | Condone 1 incorrect interior angle |
| | | 540 | | A1 | Cao<br>**SC**: Award B1 for answer of 108 |
| | | | | | **Total 6 marks** |

| | | | | | |
|---|---|---|---|---|---|
| 7 (i) | | $-1 \leq x < 3$ | 4 | B2 | B1 for either $-1 \leq x$ or for $x < 3$ as a final answer |
| (ii) | | −1 0 1 2 | | B2 | B1 for 4 correct and 1 wrong or for 3 correct and 0 wrong |
| | | | | | **Total 4 marks** |

| | | | | | |
|---|---|---|---|---|---|
| 8 | $5.2^2 + 3.8^2$ or 27.04 + 14.44 or 41.48 | | 3 | M1 | for squaring and adding |
| | $\sqrt{5.2^2 + 3.8^2}$ | | | M1 | (dep) for square root |
| | | 6.44 | | A1 | for answer rounding to 6.44 |
| | | | | | **Total 3 marks** |

| | | | | |
|---|---|---|---|---|
| 9 | $3x + 32 = 87 - 2x$ | | 4 | M1 for $3x + 32 = 87 - 2x$ |
| | $5x = 55$ or $5x - 55 = 0$ or<br>$5x = 87 - 32$ or<br>$3x + 2x = 55$ | | | M2 for correct rearrangement with $x$ terms on one side and numbers on the other AND correct collection of terms on at least one side or for correct collection to 2 terms<br>M1 for correct rearrangement with *y* terms on one side and numbers on the other e.g<br>$3x + 2x = 87 - 32$<br>**or**<br>correct collection and simplification of either numbers or $x$ terms eg $5x + 32 = 87$ **or**<br>$5x = a$ **or** $bx = 55$ |
| | | 11 | | A1 dependent on at least one M1 |
| | | | | **Total 4 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10 | (a) | 15 40 87 157 175 180 | 1 | B1 | cao | |
| | (b) | Points correct | 2 | B1 | $\pm$ ½ sq | |
| | | Curve or line segments | | B1 | ft from points if 4 or 5 correct or if points are plotted consistently within each interval at the correct heights<br>Accept curve which is not joined to the origin | |
| | (c) | 135 or 135.75 indicated on cumulative frequency graph or stated | 2 | M1 | for 135 to 135.75 indicated on cumulative frequency graph or stated | |
| | | approx 74 from correct graph | | A1 | If M1 scored, ft from cumulative frequency graph<br>If M1 not scored, ft only from correct curve & if answer is correct ($\pm$ ½ sq tolerance) award M1 A1 | |
| | | | | | **Total 5 marks** | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | | Product of positive integer powers of both<br>3 and 5 only | 2 | M1 | Powers and/or products may be evaluated eg 15 | |
| | | $3^2 \times 5$ or 45 | | A1 | Also accept $9 \times 5$ | |
| | | | | | **Total 2 marks** | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | $\angle OAP = 90°$ or $\angle AOB = 64°$ | | 3 | B1 | May be implied by second B1 | May be stated or marked on diagram |
| | $\angle OAB = 58°$ or $\angle OBA = 58°$ | | | B1 | | |
| | | 122 | | B1 | Award full marks for a correct answer | |
| | | | | | **Total 3 marks** | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | (a) | $10x + 6y = 18$<br>$21x - 6y = 75$ | $35x + 21y = 63$<br>$35x - 10y = 125$ | | 4 | M1 | for coefficients of $x$ or $y$ the same **or** for correct rearrangement of one equation followed by substitution in the other eg $5x + 3\left(\frac{7x - 25}{2}\right) = 9$ |
| | | $x = 3$ | $y = -2$ | | | A1 | |
| | | eg $5 \times 3 + 3y = 9$ | | | | M1 | (dep on first M1) for substituting for the other variable |
| | | | | 3 −2 | | A1 | cao dep Award full marks for correct values if at least first M1 scored |
| | (b) | | | 3 −2 | 1 | B1 | ft from (a) |
| | | | | | | | **Total 5 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | 3380 ÷ 1.04 **or** 3250 **or** $1.04^2$ **or** 1.0816 | | 4 | M1 | | or M2 for 3380 ÷ $1.04^2$ oe |
| | 3250 ÷ 1.04 | | | M1 | | |
| | 3125 | | | A1 | | |
| | | 255 | | A1 | cao | |
| | | | | | | **Total 4 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | (a) | | 67 | 1 | B1 | cao |
| | (b)(i) | | 113 | 2 | B1 | cao |
| | (ii) | eg sum of opposite angles of a cyclic quadrilateral = 180° | | | B1 | Accept reasons which include 'opposite' and 'cyclic' , '180° (or supplementary)' and nothing incorrect |
| | | | | | | **Total 3 marks** |

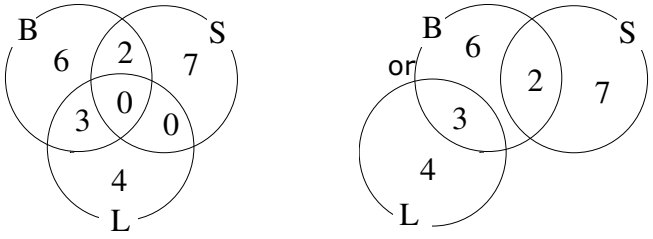
| | | | | | |
|---|---|---|---|---|---|
| 16 | $6.7^2 + 5.2^2 - 2\times 6.7\times 5.2\cos 117°$<br>**or** 44.89 + 27.04 − (−31.63…) | | 3 | M1 | |
| | 103.56… | | | A1 | for awrt 104 |
| | | 10.2 | | A1 | for awrt 10.2 (10.1766…) |
| | | | | | **Total 3 marks** |

| | | | | | |
|---|---|---|---|---|---|
| 17 (a) | $y = kx^3$ or $ky = x^3$ | | 3 | M1 | for $y = kx^3$ but not for $y = x^3$ |
| | 250 = 1000*k* | | | M1 | for 250 = 1000*k*<br>Also award for $250 = k \times 10^3$ |
| | | $y = \frac{1}{4}x^3$ oe | | A1 | for $y = \frac{1}{4}x^3$ oe<br>Award 3 marks if answer is $y = kx^3$ and *k* is evaluated as $\frac{1}{4}$ oe in part (a) or part (b) |
| (b) | $54 = "\frac{1}{4}" x^3$ | | 2 | M1 | dep on at least first M1 in part (a) |
| | | 6 | | A1 | ft from $x^3 = 54 \div "\frac{1}{4}"$ oe |
| | | | | | **Total 5 marks** |

| | | | | | |
|---|---|---|---|---|---|
| 18 (a) | $\frac{6}{10}+\frac{3}{10}$ | | 2 | M1 | |
| | | $\frac{9}{10}$ oe | | A1 | |
| (b) | $\frac{6}{10}\times\frac{5}{9}$ oe and no other terms | | 2 | M1 | |
| | | $\frac{30}{90}$ oe inc $\frac{1}{3}$ | | A1 | Sample space method – award 2 marks for a correct answer; otherwise no marks |
| (c) | $\frac{6}{10}\times\frac{3}{9}$ oe or for $\frac{3}{10}\times\frac{1}{9}$ oe or for $\frac{7}{10}\times\frac{3}{9}$ | | 3 | M1 | SC<br>M1 for $\frac{6}{10}\times\frac{3}{10}$ oe or $\frac{3}{10}\times\frac{1}{10}$ oe<br>M1 for $\frac{6}{10}\times\frac{3}{10}+\frac{3}{10}\times\frac{6}{10}+\frac{3}{10}\times\frac{1}{10}+\frac{1}{10}\times\frac{3}{10}$ oe |
| | $\frac{6}{10}\times\frac{3}{9}+\frac{3}{10}\times\frac{6}{9}+\frac{3}{10}\times\frac{1}{9}+\frac{1}{10}\times\frac{3}{9}$ oe or for $\frac{7}{10}\times\frac{3}{9}+\frac{3}{10}\times\frac{7}{9}$ oe | | | M1 | |
| | | $\frac{42}{90}$ oe inc $\frac{7}{15}$ | | A1 | Sample space method – award 3 marks for a correct answer; otherwise no marks |
| | | | | | **Total 7 marks** |

| | | | | | |
|---|---|---|---|---|---|
| 19 | $2\times\pi\times3.4\times8.3$ **or** $56.44\pi$ **or** 177.3... | | 4 | M1 | |
| | $\pi\times3.4^2$ **or** $11.56\pi$ **or** 36.31... | | | M1 | |
| | $2\times\pi\times3.4^2$ **or** $23.12\pi$ **or** 72.63.. | | | M1 | |
| | | 286 | | A1 | for awrt 286 |
| | | | | | **Total 4 marks** |

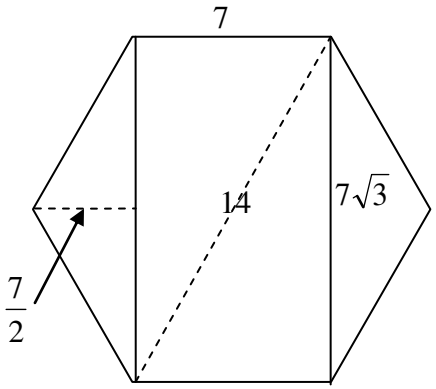
| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | (a) | | 4.25 16.5 | 1 | B1 | for both values correct |
| | (b) | | Points | 2 | B1 | Allow $\pm$ ½ sq ft from their table |
| | | | Curve | | B1 | ft from their points if at least 6 points plotted correctly |
| | (c) | | 0.1 to 0.2 and 3.7 | 2 | B2 | B1 for each correct value $\pm$ ½ sq ft from their graph if at least 1 mark scored in (b) tol |
| | (d)(i) | | 3 | 3 | B1 | cao |
| | (ii) | Draw $y = 3x$ | | | M1 | from $x = 1$ to at least $x = 3$ |
| | | | approx 2.7 | | A1 | ft from their graph if at least 1 mark scored in (b) and dep on M1 |
| | | | | | | **Total 8 marks** |

| | | | | | |
|---|---|---|---|---|---|
| 21 |   or   | | 3 | M2 | for complete, correct Venn Diagram (outline, labels and numbers) (accept blank instead of 0<br><br>M1 for correct outline and labels and at least 3 non-zero numbers correct excluding 11, 9, 7(in L) |
| | | 22 | | A1 | cao |
| | | | | | **Total 3 marks** |

| | | | | | |
|---|---|---|---|---|---|
| 22 | $\frac{42}{6}$ or 7 | | 5 | B1 | |
| | $\frac{1}{2}\times 7^2\times \sin 60°$ or 21.2(1...<br><br>Or<br><br>$7\times\sqrt{14^2-7^2}$ and $\frac{1}{2}\times 7\times\sqrt{14^2-7^2}$ | | | M2 | Alternative methods<br>M1 for $\sqrt{7^2-3.5^2}$ or $7\sin 60°$ or 6.062...<br>M1 (dep) for $\frac{1}{2}\times 7\times$"6.062..." or 21.21...<br>Or<br>M1 for $\sqrt{14^2-7^2}$ and 3.5<br>M1 for $7\times$"12.12" and $\frac{1}{2}\times 3.5\times$"12.12..."<br>Or<br>Other equivalent methods. |
| | "21.21..." × 6<br>or<br>$7\times$"12.12" + $2\times$"21.21" | | | M1 | dep on preceding 3 marks summing all the areas to make up the hexagon |
| | | 127 | | A1 | for answer rounding to 127 |
| | | | | | **Total 5 marks** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 23 | (a) | $\frac{x(x+3)}{(2x-1)(x+3)}$ | | 2 | M1 | for factorising numerator and denominator | |
| | | | 2 | | A1 | cao dep on method mark | |
| | (b) | $y=\frac{x}{2x-1}$ | | 3 | M1 | | Alternative method $x=\frac{y}{2y-1}$ |
| | | $2xy-x=y$ or $x(2y-1)=y$ | | | M1 | for isolating $x$ terms (or $y$ terms in alt method) | $2xy-y=x$ or $y(2x-1)=x$ |
| | | | $\frac{x}{2x-1}$ | | A1 | dep on both method marks. Accept $\frac{-x}{-2x+1}$ | |
| | | | | | | | **Total 5 marks** |

**ALTERNATIVES FOR QUESTION 22**




$7\times 7\sqrt{3}+2\times\frac{1}{2}\times\frac{7}{2}\times 7\sqrt{3}$

$7\times 12.12...+3.5\times 12.12$

$84.87...+42.43.....$

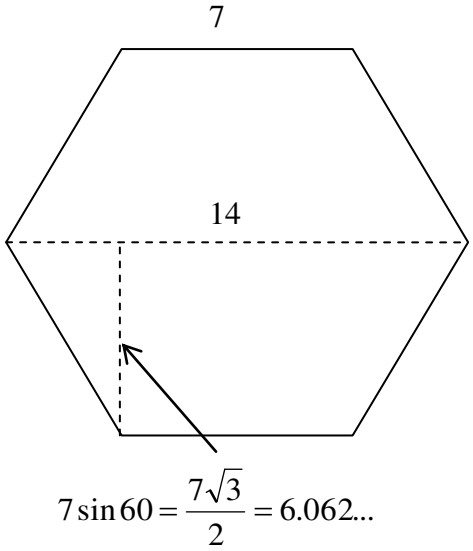
$\frac{147}{2}\sqrt{3}$

$7\times 7\sqrt{3}+2\times\frac{1}{2}\times 7\times 7\times\sin 60$

$7\times 12.12...+3.5\times 12.12$

$84.87...+42.43.....$

$\frac{147}{2}\sqrt{3}$

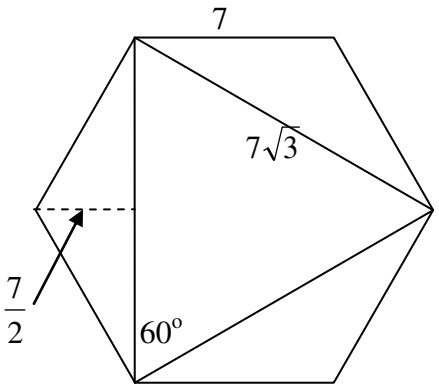



$\frac{1}{2}\left(7+14\right)\times\frac{7\sqrt{3}}{2}=\frac{21}{2}\times\frac{7\sqrt{3}}{2}$

$=10.5\times 6.06...=\quad 63.65.....$

$\frac{1}{2}\left(7+14\right)\times\sqrt{7^2-3.5^2}=\frac{21}{2}\times\frac{7\sqrt{3}}{2}$

$=10.5\times 6.06...=\quad 63.65.....$




$\frac{1}{2}\times 7\sqrt{3}\times 7\sqrt{3}\times\sin 60+3\times\frac{1}{2}\times\frac{7}{2}\times 7\sqrt{3}$

63.65..+ $5.25\times 12.12.....$

63.65...+ 63.65.....

127.3...

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