## edexcel

Mark Scheme (Results)
Summer 2012

International GCSE Mathematics
(4MA0) Paper 3H
Level 1 / Level 2 Certificate in Mathematics
(KMAO) Paper 3H

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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

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 - the mark scheme will make it clear when this does not apply.
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 the lower mark should be awarded, unless it is clear which method the candidate has chosen.
If there is no answer on the answer line then check the working for an 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, 18, 20 and 21 (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.

| 1. (a) | $54 \times \frac{5}{6}$ |  | 2 | M1 |
| :---: | :--- | :--- | :--- | :--- |
|  |  | for $54 \times 5$ or 270 or $54 \div 6$ or 9 <br> or $\frac{5}{6}$ oe or $\frac{6}{5}$ oe |  |  |
|  |  |  | 45 |  |

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| Question |
| :--- | :--- |
| Number | Working


| 2. (a) | $\begin{array}{\|l} \hline 2 \times(-3)^{2}+4 \times(-3) \\ \text { or } 2 \times-3^{2}+4 \times-3 \\ \text { or } 2 \times 9-4 \times 3 \\ \text { or } 18-12 \\ \text { or } 18+-12 \\ \hline \end{array}$ |  | 2 | M1 | for substitution or for correct evaluation of either 18 or -12 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 6 |  | A1 | cao |  |
| (b) | $\begin{aligned} & 38=2 \times 4^{2}+4 k \\ & \text { or }(k)=\frac{A-2 x^{2}}{x} \text { oe } \end{aligned}$ |  | 3 | M1 | for correct substitution or rearrangement | SC M2 for $38-32$ |
|  | $4 k=38-32$ or $4 k=6$ |  |  | M1 | for correct rearrangement of correct substitution | 4 |
|  |  | 1.5 oe |  | A1 |  |  |
|  |  |  |  | Total 5 mark |  |  |



| 4. | $5.6^{2}+3.7^{2}$ or $31.36+13.69$ or 45.05 |  | 3 | M1 | for squaring and adding |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  | $\sqrt{5.6^{2}+3.7^{2}}$ |  |  | M1 | (dep) for square root |  |  |
|  |  |  | 6.71 |  | A1 | for answer rounding to 6.71 |  |
|  |  |  |  |  |  | Total 3 marks |  |


| 5. |  | 138 | 2 | B2for 138 in any order <br> B1 for three positive whole numbers with <br> either a sum of 12 or a range of 7 <br> SC Award B1 for 0 5 7 |
| :--- | :--- | :--- | :--- | :--- |


| 6. | Lines $x=5$ and $y=3$ drawn |  | 3 | B1 | Lines may be full or broken <br> Ignore additional lines |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  | Line $y=x$ drawn |  | B1 |  | B1Condone omission of label <br> Accept shading in or shading out, if consistent <br> Award full marks for correct region labelled <br> R even if no shading |
|  |  |  |  | Total 3 marks |  |

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| 7. | $9 \times$ height $=36$ |  | 4 | M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  | height $=4$ |  |  | A1 |  |  |
|  | $36+\frac{1}{2} \times 5 \times 4 " 4$ or $\frac{14+9}{2} \times{ }^{\prime \prime} 4 "$ |  |  | M1 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  | A1 cao |  |  |
|  |  |  |  | Total 4 marks |  |  |


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| Question <br> Number | Working | Answer | Mark | Notes |
| :--- | :--- | :--- | :--- | :--- |


| 9. (a) | $6 x-3=6$ or $2 x-1=2$ | 3 | M1 | for correct expansion ( $6 x-3$ seen) <br> or correct division of both sides by 3 <br> $(2 x-1=2)$ <br> May be implied by second M1 |
| :--- | :--- | :--- | :---: | :---: |
|  | $6 x=6+3$ or $6 x=9$ or $6 x-9=0$ <br> or $2 x=2+1$ or $2 x=3$ or $2 x-3=0$ |  | M1for correct rearrangement <br> Also award for $6 x=6+1$ or <br> $6 x=7$ or $6 x-7=0$ if preceded by <br> $6 x-1=6$ |  |
|  |  | $1 \frac{1}{2}$ oe |  | A1Award 3 marks if answer is correct and at <br> least one method mark scored |


| Question <br> Number | Working |
| :--- | :--- |


| 9. (b) | $4(2 y+1)=3(y-2)$ |  | 4 | M1 | for clear intention to multiply both sides by 12 or by a multiple of 12 $\operatorname{eg} 4(2 y+1)=3(y-2)$ $2 y+1 \times 4=y-2 \times 3$ $12 \times \frac{2 y+1}{3}=12 \times \frac{y-2}{4}$ <br> May be implied by second M1 <br> or by $8 y+1=3 y-2$ <br> or $8 y+4=3 y-2$ $\text { or } 8 y+1=3 y-6$ <br> Also award this mark for $\frac{4(2 y+1)}{12}=\frac{3(y-2)}{12}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | $8 y+4=3 y-6$ |  |  | M1 | for correct expansion of brackets or correct rearrangement of correct terms $\text { eg } 8 y-3 y=-6-4, \frac{8 y+4}{12}=\frac{3 y-6}{12}$ |
|  | $\begin{aligned} & 5 y=-6-4 \text { or } 8 y-3 y=-10 \text { or } 5 y=-10 \\ & \text { or }-5 y=6+4 \text { or } 3 y-8 y=10 \\ & \text { or }-5 y=10 \text { or } 5 y+10=0 \end{aligned}$ |  |  | M1 | for correct rearrangement with $y$ terms on one side and numbers on the other AND collection of terms on at least one side or for $5 y+10=0$ oe or for $\frac{5 y+10}{12}=0$ oe |
|  |  | -2 oe |  | A1 | Award 4 marks if answer is correct and at least one method mark scored |
|  |  |  |  |  | Total 7 marks |

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| Question |
| :--- | :--- |
| Number | Working


| 9. (b) | Alternative method |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  | $\frac{2}{3} y+\frac{1}{3}=\frac{1}{4} y-\frac{1}{2}$ |  | M1 | for correct expansion |


| 10. (a) | $1 \times 3+2 \times 6+3 \times 5+4 \times 8+5 \times 2+6 \times 1$ <br> or $3+12+15+32+10+6$ or 78 |  | 3 | M1for finding at least 4 correct products and <br> summing them |
| :---: | :--- | :--- | :---: | :---: |
|  | " 78 " $\div 25$ |  | M1 <br> (dep) for division by 25 <br> Accept division by their 25, if addition <br> shown. | 3.12 oe <br> inc $3 \frac{3}{25}, \frac{78}{25}$ |
| (b) | $5+8$ or 13 or $\frac{5}{25}+\frac{8}{25}$ |  | Also accept 3 or 3.1 if both method marks <br> scored |  |
|  |  | $\frac{13}{25}$ oe |  | A1 |


| 10. (c)(i) | $\frac{5}{25} \times \frac{4}{24} \text { oe }$ |  | 5 | M1 | for $\frac{5}{25} \times \frac{4}{24}$ oe |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\frac{20}{600} \text { oe }$ |  | A1 | for $\frac{20}{600}$ oe inc $\frac{1}{30}$ |
| (ii) | $\begin{aligned} & \frac{3}{25} \times \frac{5}{24}+\frac{6}{25} \times \frac{5}{24}+\frac{5}{25} \times \frac{3}{24} \\ & \text { or } 2 \times \frac{3}{25} \times \frac{5}{24}+\frac{6}{25} \times \frac{5}{24} \end{aligned}$ |  |  | $\begin{aligned} & \text { M1 } \\ & \text { M1 } \end{aligned}$ | for one correct product for sum of all 3 correct products |
|  |  | $\frac{60}{600} \text { oe }$ |  | A1 | $\text { for } \frac{60}{600} \text { oe inc } \frac{1}{10}$ |
|  |  |  |  |  | Note for (c)(ii): sample space method award 3 marks for correct answer; otherwise no marks. <br> $S C$ M1 for $\frac{3}{25} \times \frac{5}{25}$ or $\frac{6}{25} \times \frac{6}{25}$ or $\frac{5}{25} \times \frac{3}{25}$ <br> M1 for $\frac{3}{25} \times \frac{5}{25}+\frac{6}{25} \times \frac{6}{25}+\frac{5}{25} \times \frac{3}{25}$ or $2 \times \frac{3}{25} \times \frac{5}{25}+\frac{6}{25} \times \frac{6}{25}$ <br> SC Sample space method - award 2 marks for $\frac{66}{625}$; otherwise no marks. |
|  |  |  |  |  | Total 10 marks |


| 11. (a) | $\frac{12}{3} \times 3.5$ or $\frac{15}{3} \times 3.5-3.5$ |  | 2 | M1 | for $\frac{12}{3}$ or 4 or $\frac{15}{3}$ or 5 |
| :--- | :--- | :--- | :---: | :---: | :---: |
| (b) | scale factor $=\frac{15}{3}$ or 5 or $\frac{3}{15}$ or $\frac{1}{5}$ |  |  | A1 | cao |


| 11. (c) | " 5 " ${ }^{2}$ or " 25 " |  | 2 | M | for squaring their scale factor (must be one of 5, $4, \frac{1}{5}, \frac{1}{4}$ ) or for $\left(\frac{19}{3.8}\right)^{2}$ oe or for complete correct method of finding vert ht $(h \mathrm{~cm})$ of $\triangle A B C$ and vert ht $(H \mathrm{~cm})$ of $\triangle P Q R$ $\begin{aligned} & \text { eg } \frac{1}{2} \times{ }^{\prime \prime} 3.8^{\prime \prime} \times h=2 \\ & h=\frac{4}{" 3.8^{\prime \prime}}(1.0526 \ldots) \\ & H=\frac{4}{" 3.8^{\prime \prime}} \times{ }^{2} 5 "(5.2631 \ldots) \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 50 |  | A | for 50 <br> or for answer which rounds to 50.0 <br> ft only from their scale factor of 4 ie if M1 scored for $4^{2}$ or 16 , award A1 for an answer of 32 |


| Question <br> Number | Working | Answer | Mark | Notes |
| :--- | :--- | :--- | :--- | :--- |


| 12. (a) | $l=15$ indicated on graph <br> or 70-72 inc stated | M1 |  |  |
| :---: | :--- | :---: | :---: | :---: |
|  |  |  | 2 | A1 |


| Question <br> Number | Working |
| :--- | :--- |


| 13. | finds int angle of pentagon $\frac{(5-2) \times 180}{5}$ | finds ext angle of pentagon $\frac{360}{5}$ |  | 5 |  | $\text { for } \begin{array}{r} \frac{(5-2) \times 180}{5} \\ \text { or } \frac{360}{5} \end{array}$ | Award M1A1 for int angle of pentagon shown as $108^{\circ}$ or ext angle shown as $72^{\circ}$ on printed diagram or on candidate's own diagram |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 108 | 72 |  |  | A1 | $\begin{aligned} \hline \text { for } 108 & \\ & \text { or } 72 \end{aligned}$ |  |
|  | If there is clear evidence the candidate thinks the interior angle is $72^{\circ}$ or the exterior angle is $108^{\circ}$, do not award the above two marks. |  |  |  |  |  |  |
|  | $\begin{aligned} & \text { int angle of polygon }=144 \\ & \text { or } \\ & \text { ext angle of polygon }=36 \end{aligned}$ |  |  |  | B1 | for int angle of polygon $=144$ or ext angle of polygon $=36$ | Award B1 for int angle of polygon shown as $144^{\circ}$ or ext angle shown as $36^{\circ}$ on printed diagram or candidate's own diagram |
|  | $\frac{360}{36} \text { or } \frac{180(n-2)}{n}=144 \mathrm{oe}$ |  |  |  | M1 for $\frac{360}{36}$ or $\frac{180(n-2)}{n}=144$ oe | $\text { for } \frac{360}{36} \text { or } \frac{180(n-2)}{n}=144 \mathrm{oe}$ |  |
|  |  |  | 10 |  | A1 | for 10 cao <br> Award no marks for an answer of 10 with no working <br> Award 5 marks for an answer of 10 if at least the first M1A1 are awarded |  |
|  |  |  |  |  |  |  | Total 5 marks |


| Question <br> Number | Working | Answer | Mark | Notes |
| :--- | :--- | :--- | :--- | :--- |


| 14. (a) | $3 y=2 x-6$ or $-3 y=6-2 x$ |  | 3 | M1 | May be implied by second M1 or by $y=\frac{2}{3} x+c$ even if value of $c$ is incorrect or finds coordinates of 2 points on the line eg $(3,0),(0,-2)$, table, sketch showing line cutting $x$-axis at 3 and $y$-axis at -2 |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | $y=\frac{2}{3} x-2 \text { oe or } y=\frac{2 x-6}{3} \text { oe }$ |  |  | M1 | for correct rearrangement of $3 y=2 x-6$ with $y$ as subject or for clear attempt to use $\frac{\text { vert difference }}{\text { horiz difference }}$ for their two points on $\mathbf{L}$ |
|  |  | $\frac{2}{3} \text { oe }$ |  |  | for $\frac{2}{3}$ oe inc decimal equivalent rounded or truncated to at least 2 dp <br> Do not award A1 for $\frac{2}{3} x$ |


| Question <br> Number | Working | Answer | Mark | Notes |
| :--- | :--- | :--- | :--- | :--- |


| $14 .$ <br> (b) | $9=" \frac{2}{3} " \times 6+c$ |  | 2 | $\begin{array}{ll} \text { M1 } & \text { for correct } \\ & \text { substitution } \\ & \text { into } y=" \frac{2}{3} " x+c \\ & \text { using their answer } \\ & \text { to (a) oe } \\ \hline \end{array}$ | SC <br> Award B2 if $y-9=" \frac{2}{3} "(x-6)$ <br> seen; then isw <br> SC Award B1 for <br> $2 x-3 y=k$ where $k \neq-15$ and $k \neq 6$ with no working <br> $S C$ If M0 A0, award B1 for $y={ }^{\prime 2} \frac{2}{3}^{\prime \prime} x+c$ where $c \neq 5$ or $c \neq 0$ (ie do not award this mark <br> for $y=" \frac{2}{3} " x+5$ <br> or $y=" \frac{2}{3} " x$ ) <br> or <br> does not ft from (a) |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $y=\frac{2}{3} x+5$ |  | A1 for $y=\frac{2}{3} x+5$ oe inc $2 x-3 y=-15$ ft from their answer to (a) |  |
|  |  |  |  | $S C$ If M0 A0, award B1 for answer with ' $y=$ ' omitted which would otherwise score M1 A1 eg $\frac{2}{3} x+5$, $2 x-3$ if ans to (a) is 2 |  |
|  |  |  |  |  | Total 5 marks |

$\left.\begin{array}{|l|l|l|l|ll|}\hline \text { 15. } & (O B=) 8 \sin 30^{\circ} \text { or } 4 & & 4 & \text { M1 } & \\ \hline & (B D=) 2 \times \text { " } 4 \text { " or } 8\end{array}\right)$

| 16. | $1.2 \times 1.17$ or $\frac{120}{100} \times \frac{117}{100}$ or 1.404 oe <br> or 140.4 |  | 3 | M2 M1 for 1.2 or $\frac{120}{100}$ or 1.17 or $\frac{117}{100}$ |
| :--- | :--- | :--- | :--- | :--- |
|  |  | 40.4 |  | A1 $\quad$ Also award for 40 if M2 scored |
|  |  |  |  |  |


| 17. (a) |  | $81 a^{8} b^{4}$ | 2 | B2 | B1 for 81 B1 for $a^{8} b^{4}$ |
| :--- | :--- | ---: | ---: | ---: | :--- |
|  | (b) |  | $3 c^{4}$ | 2 | B2 |
|  | B1 for 3 B1 for $c^{4}$ |  |  |  |  |


| Question <br> Number | Working |
| :--- | :--- |

NB The mark scheme for Q18 covers the majority of methods but there are other possible approaches.
If you encounter a mathematically correct method which is not covered and
(i) the answer is correct - award full marks
or
(ii) the answer is not correct - send the response, appropriately annotated, to Review.

| 18. | $\angle C O E=x$ |  | 6 | B1 | May be stated, marked on diagram or part of an equation | B1 for each correct expression for an angle up to a max of 2 | Award all 3 B marks if M1 or M2 scored. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\angle O C D=2 x$ or $69-x$ or $34 \frac{1}{2}+\frac{1}{2} x$ | Accept$\begin{aligned} & x+y=69 \text { or } \\ & y-\frac{1}{2} x=34 \frac{1}{2} \\ & \text { (where } \angle O C D \\ & =\angle O D C=y \text { ) } \end{aligned}$ |  | $\begin{aligned} & \text { B1 } \\ & \text { B1 } \end{aligned}$ |  |  |  |
|  | $\angle O D C=2 x$ or $69-x$ or $34 \frac{1}{2}+\frac{1}{2} x$ |  |  |  |  |  |  |
|  | $\angle C O D=180-4 x$ or $111-x$ |  |  |  |  |  |  |
|  | $3 x=69$ |  |  | $\begin{array}{ll} \text { M2 } & \text { M1for a correct unsimplified } \\ & \text { equation in } x \text { eg } \\ & 69+180-4 x+x=180 \\ 69=2 x+x \\ 69-x=2 x \\ & 55.5+55.5+2 x+x=180 \\ & 111-x+2 x+2 x=180 \\ & 34 \frac{1}{2}+\frac{1}{2} x=2 x \end{array}$ |  |  |  |
|  |  | 23 |  | A1 | cao <br> Award 6 marks for an answer of 23 if M1 or M2 scored |  |  |
|  |  |  |  |  |  |  | Total 6 marks |


| Question <br> Number | Working | Answer | Mark | Notes |
| :--- | :--- | :--- | :--- | :--- |


| 19. | eg $\frac{72}{360} \times \pi \times 5.4^{2}-\frac{1}{2} \times 5.4^{2} \times \sin 72^{\circ}$ |  | 5 | M1for $\frac{72}{360}$ oe inc 5 |
| :--- | :--- | :--- | :---: | :---: | :---: |
|  |  |  | M1for $\pi \times 5.4^{2}$ <br> or value which rounds to 91.6 seen |  |
|  |  |  | M1for completely correct method of finding the <br> area of triangle $O A B$ eg $\frac{1}{2} \times 5.4^{2} \times \sin 72^{\circ}$ <br> or $5.4 \times$ sin $36^{\circ} \times 5.4 \times \cos 36^{\circ}$ |  |
|  | $18.321 \ldots$ (or $18.312 \ldots)-13.866 \ldots$ | 4.46 or 4.45 |  | A1for either area correctly evaluated - may be <br> rounded or truncated to 1 dp |
|  |  | for answer rounding to 4.46 <br> $(\pi \rightarrow 4.4536 \ldots)$ <br> or for answer rounding to 4.45 <br> $(3.14 \rightarrow 4.44607 \ldots)$ <br> If all M1s scored, award 5 marks for an <br> answer which rounds to 4.46 or 4.45 |  |  |
|  |  |  | Total 5 marks |  |


| 20. | 42.875 seen |  | 4 | B1 |
| :--- | :--- | :--- | :--- | :--- |
|  | $\sqrt[3]{42.875}$ |  |  | Also accept 42.874\&, 42.87499... throughout |
|  | $6 \times 3.5^{2}$ |  | Also award for 3.5 if first B1 scored ie if <br> 42.875 seen |  |
|  |  | 73.5 |  | M1dep on both B1s |

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| Question | Working |
| :--- | :--- |


| 21. | $2 x^{2}=20-3 x$ <br> May be implied by second M1 |  | 5 | M1 | $y=2\left(\frac{20-y}{3}\right)^{2}$ <br> May be implied by second M1 |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | $2 x^{2}+3 x-20(=0)$ |  |  | M1 | $2 y^{2}-89 y+800(=0)$ |
|  | $(2 x-5)(x+4)(=0)$ <br> or $2 x(x+4)-5(x+4)(=0)$ <br> or $x(2 x-5)+4(2 x-5)(=0)$ <br> or $\frac{-3 \pm \sqrt{3^{2}-4 \times 2 \times(-20)}}{2 \times 2}$ <br> or $\frac{-3 \pm \sqrt{9+160}}{4}$ <br> or $\frac{-3 \pm \sqrt{169}}{4}$ or $\frac{-3 \pm 13}{4}$ |  |  | M1 | $\begin{aligned} & (2 y-25)(y-32)(=0) \\ & \text { or } 2 y(y-32)-25(y-32)(=0) \\ & \text { or } y(2 y-25)-32(2 y-25)(=0) \\ & \text { or } \frac{89 \pm \sqrt{(-89)^{2}-4 \times 2 \times 800}}{2 \times 2} \\ & \text { or } \frac{89 \pm \sqrt{7921-6400}}{4} \\ & \text { or } \frac{89 \pm \sqrt{1521}}{4} \text { or } \frac{89 \pm 39}{4} \end{aligned}$ |
|  |  | $x=\frac{5}{2}, x=-4$ |  | A1 | $y=\frac{25}{2}, y=32$ <br> dep on all method marks |
|  |  | $\begin{aligned} & x=\frac{5}{2}, y=\frac{25}{2} \\ & x=-4, y=32 \end{aligned}$ |  | A1 | $\begin{aligned} & x=\frac{5}{2}, y=\frac{25}{2} \\ & x=-4, y=32 \end{aligned}$ <br> dep on all preceding marks Accept answers given as coordinates |
|  |  |  |  |  | Total |

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