

Mark Scheme (Results)

March 2012

GCSE Mathematics (1380) Higher
Paper 3H (Non-Calculator)

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NOTES ON MARKING PRINCIPLES

1 **Types of mark**

M marks: method marks

A marks: accuracy marks

B marks: unconditional accuracy marks (independent of M marks)

2 **Abbreviations**

cao – correct answer only

ft – follow through

isw – ignore subsequent working

SC: special case

oe – or equivalent (and appropriate)

dep – dependent

indep – independent

3 **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.

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

5 **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.

6 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.

7 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.

8 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.

9 Parts of questions

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

10 Money notation

Accepted with and without the “p” at the end.

11 Range of answers

Unless otherwise stated, when any 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).

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Question		Working	Answer	Mark	Notes
1	(a)		$a + 2b$	2	M1 for $2a - a (=a)$ or $3b - b (=2b)$ A1 for $a + 2b$ or $1a + 2b$
	(b)		$8m - 12n$	1	B1 cao
2		$\frac{60.2 \times 0.799}{223} \approx$ $\frac{60 \times 0.8}{200} = \frac{48}{200} = 0.24$	0.24	3	B1 for any two of 60, 0.8, 200 seen or 48 seen M1 for at least one of 60, 0.8, 200 and a correct method to begin to evaluate eg. the numerator may be correctly evaluated or a correctly simplified fraction (NB. fraction may not be fully simplified) A1 for answer in the range 0.15 to 0.3 from correct working

1380_3H																									
Question	Working	Answer	Mark	Notes																					
3	(a)	$\begin{array}{r} 237 \\ \times 18 \\ \hline 1896 \\ 2370 \\ \hline 4266 \end{array}$ $\begin{array}{r} 237 \\ \times 237 \\ \hline 1896 \\ 540 \\ \hline 4266 \end{array}$ <p style="text-align: center;">OR</p> <p style="text-align: center;">OR</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>200</td> <td>30</td> <td>7</td> <td></td> <td></td> </tr> <tr> <td>2000</td> <td>300</td> <td>70</td> <td>10</td> <td></td> </tr> <tr> <td>1600</td> <td>240</td> <td>56</td> <td>8</td> <td></td> </tr> <tr> <td>3600</td> <td>540</td> <td>126</td> <td>18</td> <td></td> </tr> </table>	200	30	7			2000	300	70	10		1600	240	56	8		3600	540	126	18		42.66	3	<p>M1 for a complete method with relative place value correct. Condone 1 multiplication error, addition not necessary. M1 (dep) for addition of all the appropriate elements of the calculation A1 for 42.66(p) OR</p> <p>M1 for a complete grid with not more than 1 multiplication error, addition not necessary. M1 (dep) for addition of all the appropriate elements of the calculation A1 for 42.66(p) OR</p> <p>M1 for sight of a complete partitioning method, condone 1 multiplication error, addition not necessary. M1 (dep) for addition of the all the appropriate elements of the calculation A1 cao OR</p> <p>M2 for repeated addition, exactly 18 seen A1 for 42.66(p)</p>
200	30	7																							
2000	300	70	10																						
1600	240	56	8																						
3600	540	126	18																						
	(b)	$10\% \text{ of } 85 = 85 \div 10$ $85 - 8.5$ Or $90\% \text{ of } 85 = (85 \div 10) \times 9$	£76.50	3	<p>M1 for $\frac{10}{100} \times 85$ or $85 \div 10 (=8.5)$ oe M1 (dep) for $85 - '8.5'$ A1 £76.50(p) or £76.5(p) OR</p> <p>M2 for $\frac{90}{100} \times 85$ or $(85 \div 10) \times 9$ oe A1 £76.50(p) or £76.5(p)</p>																				

1380_3H					
Question		Working	Answer	Mark	Notes
4	(a)		150	1	B1 for 150 or 150°
	(b)		95+ reasons	2	<p>B1 for 95 or 95°</p> <p>B1 for full reasons, eg. <u>alternate</u> angles are equal and the sum of angles on a straight <u>line</u> is <u>180</u></p> <p>OR</p> <p>the sum of angles on a straight <u>line</u> is <u>180</u> and <u>corresponding</u> angles are equal</p> <p>OR</p> <p>vertically <u>opposite</u> angles and <u>co-interior</u> (or <u>allied</u> or <u>supplementary</u>) angles</p>

1380_3H					
Question		Working	Answer	Mark	Notes
5	(a)		$\frac{7}{12}$	2	M1 for $\frac{6+1}{5+6+1}$ or $1 - \frac{5}{12}$ or $\frac{7}{n}$ where $n > 7$ or $\frac{k}{12}$ where $k < 12$ A1 for $\frac{7}{12}$ oe eg. 0.58(33...) SC : Award B1 for 7 : 12 or 7 out of 12 or 7 in 12 oe
	(b)	$\frac{1}{3} = \frac{5}{15}$ or 1:3 = 5:15 $15 - 5 - 6 = 4$ OR $\frac{x+12}{5} = 3, x = 3, 3 + 1$	4	2	M1 $\frac{1}{3} = \frac{5}{15}$ or 15 seen or 3 more green A1 cao OR M1 $\frac{x+12}{5} = 3$ A1 cao SC : Award B1 for an answer of $\frac{4}{15}$

1380_3H				
Question	Working	Answer	Mark	Notes
6	$1500 \div 175 = 8\frac{4}{7}$	8	4	<p>B1 1500 or 0.175 M1 '1500' \div 175 oe M1 evidence of correct method to evaluate '1500'\div175 eg. can be implied by a division sum or a cancelled down fraction A1 8 cao</p> <p>OR B1 1500 or 0.175 M2 at least 8 repeated additions of 175 or at least 8 repeated subtractions of 175 from 1500 or $8 \times 175 (=1400)$ or $9 \times 175 (=1575)$ (M1 at least 4 repeated additions of 175 or at least 4 repeated subtractions of 175 from 1500 or $n \times 175$ where $n = 4$ or 5 or 6 or 7 or 10) A1 8 cao</p> <p>NB: Work could be in m/ throughout</p>

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Question	Working				Answer	Mark	Notes																																																																											
7	(a)	<table border="1" style="margin-left: 20px;"> <tr><td>6</td><td>1</td><td>7</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td>5</td><td>8</td><td>9</td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td>0</td><td>2</td><td>5</td><td>6</td><td>9</td><td></td><td></td></tr> <tr><td>9</td><td>0</td><td>0</td><td>2</td><td>4</td><td>5</td><td>6</td><td>8</td></tr> <tr><td>10</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> <p>OR</p> <table style="margin-left: 20px;"> <tr><td>60</td><td> </td><td>1</td><td>7</td></tr> <tr><td>70</td><td> </td><td>5</td><td>8</td><td>9</td></tr> <tr><td>80</td><td> </td><td>0</td><td>2</td><td>5</td><td>6</td><td>9</td></tr> <tr><td>90</td><td> </td><td>0</td><td>0</td><td>2</td><td>4</td><td>5</td><td>6</td><td>8</td></tr> <tr><td>100</td><td> </td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin-left: 40px;">Key 6 1 represents 61 seconds</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin-left: 40px; margin-top: 10px;">Key 60 1 represents 61 seconds</div>				6	1	7						7	5	8	9					8	0	2	5	6	9			9	0	0	2	4	5	6	8	10	3							60		1	7	70		5	8	9	80		0	2	5	6	9	90		0	0	2	4	5	6	8	100		3							Correct Stem and Leaf diagram	3	B2 for a fully correct ordered diagram. (B1 for ordered with at most 2 errors or omissions or for correct unordered diagram) B1 for a correct key (Accept a stem of 60, 70 etc but key only acceptable if consistent with this)
6	1	7																																																																																
7	5	8	9																																																																															
8	0	2	5	6	9																																																																													
9	0	0	2	4	5	6	8																																																																											
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70		5	8	9																																																																														
80		0	2	5	6	9																																																																												
90		0	0	2	4	5	6	8																																																																										
100		3																																																																																
	(b)					87.5	2	M1 (ft ordered stem and leaf diagram) for median value is 9.5 th as evidenced by 9 th and 10 th seen or '86, 89' written or both ringed in the stem and leaf diagram or in a fully ordered list (with at most 2 errors or omissions) or indicated in an unambiguous way circled (ft stem and leaf diagram) or ('86' + '89') ÷ 2 (condone missing brackets) or 7.5 clearly coming from (6 + 9) ÷ 2 A1 for 87.5 or ft ordered stem and leaf diagram																																																																										

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Question	Working	Answer	Mark	Notes
8	(a) $13x + 1 = 11x + 8$ $13x - 11x = 8 - 1$ or $1 - 8 = 11x - 13x$	3.5	2	M1 for showing the intention to isolate either the algebraic or the numerical terms in an equation e.g. $13x - 11x$ or $8 - 1$ A1 for 3.5 or $3\frac{1}{2}$ or $\frac{7}{2}$ oe
	(b) Substitute $y = -2$ into $\frac{4}{y} + y = 2y$ LHS = $\frac{4}{-2} + (-2) = -4$ RHS = $2 \times (-2) = -4$ OR $4 + y^2 = 2y^2$ $y^2 = 4$ $y = \pm 2$	Shown	2	M1 for substituting $y = -2$ into $\frac{4}{y} + y = 2y$ or $\frac{4}{-2} + -2 = 2 \times -2$ or any correct rearrangement A1 for showing that LHS & RHS both = -4 OR M1 $4 + y^2 = 2y^2$ A1 $y = \pm 2$ from a correct process
9		$S = 20B + 30T$	3	B3 for $S = 20B + 30T$ oe (B2 for $20B + 30T$ or $S = 20B + T$ or $S = B + 30T$ or $S = 30B + 20T$) (B1 for $S =$ a linear expression in B and T , or $20B + T$ or $B + 30T$)
10	$2 \times 5 : 3 \times 10 = 10 : 30 = 1 : 3$	1 : 3	2	M1 $2 \times 5 : 3 \times 10$ or $2 \times 1 : 3 \times 2$ or sight of 10 and 30 or 10p and 30p A1 for 1 : 3 cao (SC B1 for 3 : 1 or 1p : 3p or 10 : 30 or 5 : 15 or 10p : 30p)

1380_3H				
Question	Working	Answer	Mark	Notes
11	<p>Area of $ABCD = 12^2 = 144$ $AN = 3$ cm</p> <p>Area of $AND = \frac{1}{2} \times 3 \times 12 = 18$ cm²</p> <p>$MB = 6$ cm, $NB = 9$ cm</p> <p>Area of $MBN = \frac{1}{2} \times 6 \times 9 = 27$ cm²</p> <p>Area of shaded region = $144 - 27 - 18$</p> <p>OR</p> <p>$AN = 3$ cm or $BN = 9$ cm</p> <p>Area of rect X on $CM = 6 \times 9 = 54$</p> <p>Area of triangle Y = $\frac{1}{2} \times 6 \times 9 = 27$</p> <p>Area of top triangle Z = $\frac{1}{2} \times 3 \times 12 = 18$</p> <p>Area of shaded region = $54 + 27 + 18$</p>	99 cm ²	6	<p>B1 $AN = 3$ or $BN = 9$ or $CM = 6$ or $MB = 6$</p> <p>M1 Area of $ABCD = 12 \times 12 (= 144)$</p> <p>M1 Area of $AND = \frac{1}{2} \times 3 \times 12 (= 18)$</p> <p>M1 Area of $MBN = \frac{1}{2} \times 6 \times 9 (= 27)$</p> <p>M1 (dep on at least 1 previous M1) for (Area of CMND =) '144' - '18' - '27'</p> <p>A1 cao</p> <p>OR</p> <p>B1 $AN = 3$ or $BN = 9$ or $CM = 6$ or $MB = 6$</p> <p>M1 Area of rect on $CM = '6' \times '9' (= 54)$</p> <p>M1 area of adj $\Delta = \frac{1}{2} \times 6 \times 9 (= 27)$</p> <p>M1 area of top $\Delta = \frac{1}{2} \times 3 \times 12 (= 18)$</p> <p>M1 (dep on at least 1 previous M1) for '54' + '27' + '18'</p> <p>A1 cao</p>

1380_3H				
Question	Working	Answer	Mark	Notes
11 (contd)	<p>OR $AN = 3$ cm or $BN = 9$ cm Area of $CNM = \frac{1}{2} \times 6 \times 9 = 27$ cm² Area of $CND = \frac{1}{2} \times 12 \times 12 = 72$ cm² Area of shaded region = $72 + 27$</p> <p>OR Area of $PDN = \frac{1}{2} \times 3 \times 12 = 18$ cm² Area of $CMNP = \frac{1}{2} \times (12 + 6) \times 9 = 81$ cm² Area of shaded region = $18 + 81$</p>			<p>OR B1 $AN = 3$ or $BN = 9$ or $CM = 6$ or $MB = 6$ M2 Area of $CNM = \frac{1}{2} \times 6 \times 9$ (=27) M1 Area of $CND = \frac{1}{2} \times 12 \times 12$ (= 72) M1 (dep on at least 1 previous M1) for '72' + '27' A1 cao</p> <p>OR B1 $AN = 3$ or $BN = 9$ or $CM = 6$ or $MB = 6$ M1 Area of $PDN = \frac{1}{2} \times 3 \times 12$ (=18) M2 Area of $CMNP = \frac{1}{2} \times (12 + 6) \times 9$ (=81) M1 (dep on at least 1 previous M1) for '18' + '81' A1 cao</p>

1380_3H					
Question		Working	Answer	Mark	Notes
12	(a)		Correct frequency polygon	2	B2 Fully correct polygon - points plotted at the midpoint $\pm \frac{1}{2}$ square (B1 All points plotted accurately not joined or one error in plotting or one omission but joined or all points plotted accurately and joined with first joined to last or all points at the correct heights and consistently within or at the ends of the intervals and joined (can include joining last to first to make a polygon)).
	(b)		$0 \leq L < 10$	1	B1 $0 \leq L < 10$ or 0 – 10 oe

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Question		Working	Answer	Mark	Notes								
13	(a)	$c = -1; m = 0.5$ <table border="1"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> </tr> <tr> <td>y</td> <td>-1</td> <td>-0.5</td> <td>0</td> </tr> </table>	x	0	1	2	y	-1	-0.5	0	Correct line	3	<p>Use of $y = mx + c$ M2 for line segment of $y = 0.5x - 1$ drawn (ignore any additional line segments) (M1 for line drawn with gradient of 0.5 or line drawn with a y intercept of -1 and a positive gradient) A1 for correct line between $x = 0$ and $x = 7$</p> <p>Table of values M1 for at least 2 correct attempts to find points by substituting values of x M1 ft for plotting at least 2 of their points (any points plotted from their table must be correctly plotted) A1 for correct line between $x = 0$ and $x = 7$</p> <p>No table of values M2 for at least 2 correctly plotted points (and no incorrect points plotted) OR line segment of $y = 0.5x - 1$ drawn (ignore any additional incorrect line segments) (M1 for at least 3 correct points with no more than 2 incorrect points) A1 for correct line between $x = 0$ and $x = 7$ B1 ft on pt of intersection if on a straight line segment</p>
	x	0	1	2									
y	-1	-0.5	0										
(b)			$x = 5, y = 1.5$	1									

1380_3H					
Question		Working	Answer	Mark	Notes
14	(a)		643000	1	B1 cao
	(b)	$2 \times 10^7 \times 8 \times 10^{-12} = 16 \times 10^{7-12} = 16 \times 10^{-5} = 1.6 \times 10^{-4}$	1.6×10^{-4}	2	M1 for $16 \times 10^{7-12}$ or 16×10^{-5} or 0.00016 or 1.6×10^n where n is an integer or $\frac{16}{100000}$ oe or $\frac{16}{100000}$ simplified correctly A1 cao
15	(a)		$2x(x - 2y)$	2	B2 cao (B1 $2x(\text{linear expression})$ or $x(2x - 4y)$ or $2(x^2 - 2xy)$ or $nx(x - 2y)$ where n is an integer)
	(b)	$p^2 - 6p + 8$	$(p - 4)(p - 2)$	2	M1 for $(p \pm 4)(p \pm 2)$ or $(p + a)(p + b)$ with $a, b \neq 0$, $a + b = -6$ or $ab = 8$ or $p(p - 2) - 4(p - 2)$ or $p(p - 4) - 2(p - 4)$ A1 for $(p - 4)(p - 2)$ (accept others letters)
	(c)	$\frac{(x+2)^2}{x+2} = \frac{(x+2)}{1}$	$x + 2$	1	B1 $x + 2$ or $\frac{(x+2)}{1}$
	(d)		$6a^5b^2$	2	B2 cao (B1 exactly 2 out of 3 terms correct in a product or a^5b^2 or $6a^{2+3}b^{1+1}$)

1380_3H				
Question	Working	Answer	Mark	Notes
16		Correct box plot	3	<p>M1 for $32 + 38 (=70)$ or UQ as 70, may be stated or plotted in a diagram M1 for at least 3 correctly plotted points (min 18, LQ 32, median 57, UQ '70', max 86) with box or whiskers drawn in A1 cao</p> <p>SC : B1 for a fully correct box and whisker diagram with min 18, max 86, LQ 32, median 38, UQ 57</p>
17	<p>(a) $\frac{ED}{8} = \frac{6}{4} \quad ED = 12$</p> <p>(b) $\frac{2}{5} \times 25$</p> <p>OR $4 : 6 = AC : CD$ $(25 \div (4 + 6)) \times 4$</p>	<p>12</p> <p>10</p>	<p>2</p> <p>2</p>	<p>M1 for $\frac{6}{4}$ oe or $\frac{4}{6}$ oe or $\frac{8}{4}$ oe or $\frac{4}{8}$ oe (accept all these written as ratios) A1 cao</p> <p>M1 $\frac{2}{5} \times 25$ oe A1 cao</p> <p>OR M1 $(25 \div (4 + 6)) \times 4$ A1 cao</p> <p>OR M1 for $25 \div (1 + 1.5)$ A1 cao</p>

1380_3H

Question		Working	Answer	Mark	Notes																																																																																	
18	(a)	Correct probs.	Correct probs.	2	B1 $\frac{3}{8}$ on 1 st branch																																																																																	
	(b)	RG, or GR $\frac{5}{8} \times \frac{3}{7} + \frac{3}{8} \times \frac{5}{7}$ OR A full sample space <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>R</th> <th>R</th> <th>R</th> <th>R</th> <th>R</th> <th>G</th> <th>G</th> <th>G</th> </tr> </thead> <tbody> <tr> <th>R</th> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <th>R</th> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <th>R</th> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <th>R</th> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <th>R</th> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <th>G</th> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>-</td> <td></td> <td></td> </tr> <tr> <th>G</th> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> <td>-</td> <td></td> </tr> <tr> <th>G</th> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> <td></td> <td>-</td> </tr> </tbody> </table>		R	R	R	R	R	G	G	G	R	-					X	X	X	R		-				X	X	X	R			-			X	X	X	R				-		X	X	X	R					-	X	X	X	G	X	X	X	X	X	-			G	X	X	X	X	X		-		G	X	X	X	X	X			-	$\frac{30}{56}$	3	M1 (ft from diag) for any one correct product M1 (ft from diag) for ' $\frac{5}{8} \times \frac{3}{7} + \frac{3}{8} \times \frac{5}{7}$ ' oe or $1 - \left(\frac{5}{8} \times \frac{4}{7} + \frac{3}{8} \times \frac{2}{7} \right)$ oe A1 $\frac{30}{56}$ oe OR M1 for a complete 8 by 8 or 8 by 7 table M1 for all RG and GR identified A1 $\frac{30}{56}$ oe SC with replacement M1 $\frac{5}{8} \times \frac{3}{8}$ M1 $\frac{5}{8} \times \frac{3}{8} + \frac{3}{8} \times \frac{5}{8}$ or $\frac{30}{64}$ A0 SC: If no working then B1 for $\frac{30}{64}$
	R	R	R	R	R	G	G	G																																																																														
R	-					X	X	X																																																																														
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1380_3H					
Question		Working	Answer	Mark	Notes
19	(a)		50° reason	2	B2 for Angle $BAD = 50$ and the sum of <u>opposite angles</u> in a <u>cyclic quadrilateral</u> is <u>180</u> (B1 for angle $BAD = 50$ or angle $BAD = 180 - 130$)
	(b)	<p>Angle $BOD = 100^\circ$ Angle $OBD = \text{angle } ODC$ Angle $ODC = (360^\circ - 230^\circ) \div 2 = 65$</p> <p>OR Reflex angle $BOD = 260$ Angle $BOD = 360 - 260 = 100$ Angle $OBD = \text{angle } ODC$ Angle $ODC = (360^\circ - 230^\circ) \div 2 = 65$</p> <p>OR $OB = OD$ Angle $OCD = 130 \div 2 = 65$ and either Angle $OCD = \text{angle } ODC = 65$ Or Angle $COD = 100 \div 2 = 50$ Angle $ODC = 180 - (65 + 50) = 65$</p>	65°	4	<p>M1 angle $BOD = 100^\circ$ or ft $2 \times$ their answer to (a) (may be on diagram) M1 $360^\circ - (130^\circ + "100^\circ")$ and $\div 2$ A1 cao B1 The <u>angle</u> at the <u>centre</u> of a circle is <u>twice the angle</u> at the <u>circumference</u> and <u>Angles</u> in a <u>quadrilateral</u> (4 sided shape) add up to <u>360°</u> or opposite angles of a kite are the same.</p> <p>OR M1 angle $BOD = 100^\circ$ or ft $2 \times$ their answer to (a) (may be on diagram) M1 angle $ODB = OBD = 40^\circ$ and angle $CBD = \text{angle } CBD = 25^\circ$ A1 cao B1 The <u>angle</u> at the <u>centre</u> of a circle is <u>twice the angle</u> at the <u>circumference</u> and <u>angles</u> in a <u>triangle</u> add up to <u>180°</u> or Base <u>angles</u> of an <u>isosceles</u> triangle are <u>equal</u>. or radii of a circle are equal</p>

1380_3H				
Question	Working	Answer	Mark	Notes
19b (contd)				<p>OR M1 for obtuse Angle $BOD = 2 \times 130 (=260)$ (may be on diagram) M1 for $(360 - (360 - 260) - 130) \div 2$ A1 cao B1 for <u>angle at the centre is twice the angle at the circumference</u> and <u>sum of the angles in a quadrilateral is 360°</u> or <u>equal opposite angles in a kite</u></p> <p>OR M1 Angle $OCD = 130 \div 2$ M1 Angle $OCD = \text{angle } ODC$ A1 cao B1 for <u>Kite is symmetrical</u> and <u>angles in a triangle add up to 180°</u> or <u>radii of a circle are equal</u></p>

1380_3H				
Question	Working	Answer	Mark	Notes
20		E, B, F, C, D, A	3	B3 all correct (B2 4,5 correct) (B1 2 or 3 correct)
21	(a) $P = 3x + \frac{\pi x}{2} = x\left(3 + \frac{\pi}{2}\right)$ $x = \frac{P}{\left(3 + \frac{\pi}{2}\right)}$ OR $2P = 6x + \pi x = x(6 + \pi)$ $x = \frac{2P}{(6 + \pi)}$	$x = \frac{P}{\left(3 + \frac{\pi}{2}\right)}$	2	M1 for $x\left(3 + \frac{\pi}{2}\right)$ A1 for $x = \frac{P}{\left(3 + \frac{\pi}{2}\right)}$ oe OR M1 $2P = x(6 + \pi)$ A1 $x = \frac{2P}{(6 + \pi)}$ oe SC : B1 for $x = \frac{2P}{3 + \pi}$ oe or $x = \frac{P}{6 + \pi}$ SC Using $\pi = 3.14$, then B1 for $x = \frac{P}{4.57}$ or $\frac{2P}{9.14}$

1380_3H					
Question		Working	Answer	Mark	Notes
21	(b)	$A = x^2 + \frac{\pi}{2} \left(\frac{x}{2} \right)^2 = \left(1 + \frac{\pi}{8} \right) x^2$	$k = 1 + \frac{\pi}{8}$	3	<p>M1 for $A = x^2 + \frac{\pi}{2} \left(\frac{x}{2} \right)^2$ (condone missing brackets around $\frac{x}{2}$) or $A = x^2 + \frac{\pi}{2} \times \frac{x^2}{4}$ oe</p> <p>M1 for $A = x^2 \left(1 + \frac{\pi}{8} \right)$ oe or $k = 1 + \frac{\pi}{2} \left(\frac{1}{2} \right)^2$</p> <p>A1 cao</p> <p>SC B1 for $A = x^2 + \frac{\pi}{2} \times \frac{x^2}{2}$</p> <p>SC B2 for $k = \left(1 + \frac{\pi}{4} \right)$</p>

1380_3H				
Question	Working	Answer	Mark	Notes
22	$(2 + \sqrt{2})(3 + \sqrt{8}) = 6 + 2\sqrt{8} + 3\sqrt{2} + \sqrt{2} \times \sqrt{8}$ $= 10 + 3\sqrt{2} + 2\sqrt{8}$ $10 + 3\sqrt{2} + 2\sqrt{8} = 10 + 3\sqrt{2} + 2 \times 2 \times \sqrt{2} = 10 + 7\sqrt{2}$ <p>OR</p> $(2 + \sqrt{2})(3 + \sqrt{8}) = (2 + \sqrt{2})(3 + 2\sqrt{2})$ $= 6 + 4\sqrt{2} + 3\sqrt{2} + \sqrt{2} \times 2\sqrt{2}$ $6 + 7\sqrt{2} + \sqrt{2} \times 2\sqrt{2} = 6 + 7\sqrt{2} + 2 \times 2$	$10 + 7\sqrt{2}$	4	<p>M1 3 or 4 out of 4 terms correct 6, $2\sqrt{8}$, $3\sqrt{2}$, $\sqrt{2}\sqrt{8}$ - terms may be simplified and could be in a list M1 for 10 from $6 + \sqrt{2}\sqrt{8}$ B1 $\sqrt{8} = \sqrt{4} \times \sqrt{2}$ oe or $\sqrt{8} = \sqrt{4 \times 2}$ A1 $10 + 7\sqrt{2}$ cao</p> <p>OR</p> <p>B1 $\sqrt{8} = \sqrt{4} \times \sqrt{2}$ or $\sqrt{8} = \sqrt{4 \times 2}$ M1 3 or 4 out of 4 terms ft from the expansion of $(2 + \sqrt{2})(3 + 2\sqrt{2})$ 6, $2 \times 2\sqrt{2}$, $3\sqrt{2}$, $2 \times \sqrt{2}\sqrt{2}$ - terms may be simplified and could be in a list M1 for 10 from $6 + 2 \times \sqrt{2}\sqrt{2}$ A1 $10 + 7\sqrt{2}$ cao</p>

1380_3H					
Question		Working	Answer	Mark	Notes
23	(a)		$\mathbf{b} - \mathbf{a}$	1	B1 $\mathbf{b} - \mathbf{a}$ or $-\mathbf{a} + \mathbf{b}$
	(b)	$\vec{BK} = 2 \times \vec{AB} = 2 \times (\mathbf{b} - \mathbf{a})$ $\vec{CK} = \vec{CB} + \vec{BK} = \mathbf{a} + 2 \times (\mathbf{b} - \mathbf{a})$	$2\mathbf{b} - \mathbf{a}$	3	M1 for a correct vector statement for \vec{CK} eg. $\vec{CK} = \vec{CA} + \vec{AK}$ or $\vec{CK} = \vec{CB} + \vec{BK}$ M1 for $\vec{BK} = 2\vec{AB}$ or $\vec{BK} = 2(\mathbf{b} - \mathbf{a})$ or $\vec{AK} = 3\vec{AB}$ or $\vec{AK} = 3(\mathbf{b} - \mathbf{a})$ (may be seen as part of a vector equation BUT $2(\mathbf{b} - \mathbf{a})$ or ' $2(\mathbf{b} - \mathbf{a})$ ' or $3(\mathbf{b} - \mathbf{a})$ or ' $3(\mathbf{b} - \mathbf{a})$ ' by itself does not score M1) A1 $2\mathbf{b} - \mathbf{a}$ or $-\mathbf{a} + 2\mathbf{b}$

1380_3H					
Question	Working	Answer	Mark	Notes	
24	(a)	$(a+1)^2 = a^2 + 2a + 1 \neq a^2 + 1$ OR Pick any non-zero value of a and show that LHS \neq RHS OR $(a+1)^2 = a^2 + 2a + 1$ Solves $a^2 + 2a + 1 = a^2 + 1$ to get $a = 0$ and indicates a contradiction	Correctly shown	2	M1 for $(a+1)^2 = a^2 + 2a + 1$ or $a^2 + a + a + 1$ (Expansion must be correct but may not be simplified) A1 for statement that $a^2 + 2a + 1 \neq a^2 + 1$ (eg. they are different) OR M1 for correct substitution of any integer into both expressions eg. $(2+1)^2$ and $2^2 + 1$ A1 for correct evaluation of both expressions and statement that they are not equal (eg. they are different) OR M1 $(a+1)^2 = a^2 + 2a + 1$ or $a^2 + a + a + 1$ A1 Solves $a^2 + 2a + 1 = a^2 + 1$ to get $a = 0$ and indicates a contradiction
	(b)	$a^2 + 2a + 1 + b^2 + 2b + 1 = c^2 + 2c + 1$ But $a^2 + b^2 = c^2$ So $2a + 2b + 1 = 2c$	AG	3	M1 use of Pythagoras in either triangle – one of $a^2 + b^2 = c^2$ or $(a+1)^2 + (b+1)^2 = (c+1)^2$ A1 $a^2 + 2a + 1 + b^2 + 2b + 1 = c^2 + 2c + 1$ and $a^2 + b^2 = c^2$ A1 $2a + 2b + 1 = 2c$
	(c)	LHS is odd, RHS is even	Explanation	1	B1 eg. LHS is odd, RHS is even or one side is odd and the other side is even oe

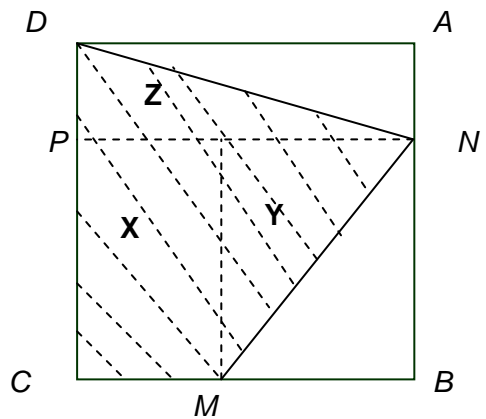
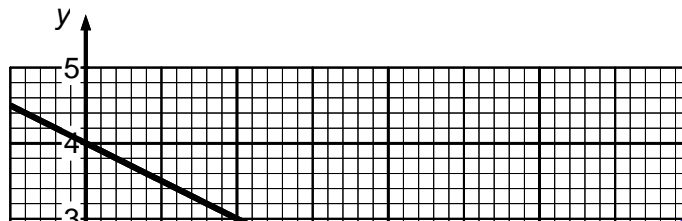
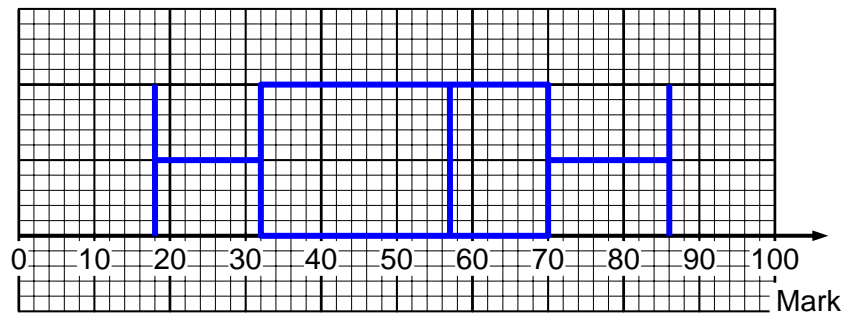


Diagram NOT
accurately drawn

13.



16.



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