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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
isw – ignore subsequent working
oe – or equivalent (and appropriate)
indep – independent
ft – follow through
SC: special case
dep – dependent

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

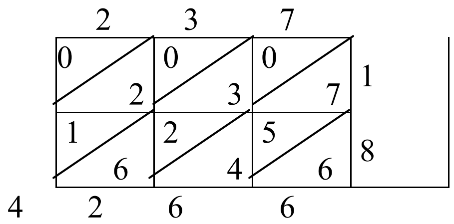
10 Money notation

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).

1380_3H					
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		$\frac{60.2\times0.799}{223} \approx$ $\frac{60\times0.8}{200} = \frac{48}{200} = 0.24$	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)	237 18 ×18 ×237 1896 126 2370 540 4266 3600 4266 **OR**  **OR** 200 30 7 2000 300 70 10 1600 240 56 8 3600 540 126 18	42.66	3	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** 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** 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** M2 for repeated addition, exactly 18 seen A1 for 42.66(p)
	(b)	10% of 85 = 85 ÷10 85 – 8.5 Or 90% of 85 = (85÷10)×9	£76.50	3	M1 for $\frac{10}{100}\times 85$ **or** 85 ÷10 (=8.5) oe M1 (dep) for 85 – ‘8.5’ A1 £76.50(p) or £76.5(p) **OR** M2 for $\frac{90}{100}\times 85$ **or** (85÷10)×9 oe A1 £76.50(p) or £76.5(p)

1380_3H					
Question		Working	Answer	Mark	Notes
4	(a)		150	1	B1 for 150 or 150^{o}
	(b)		95	2	B1 for 95 or 95^{o} B1 for full reasons, eg. alternate angles are equal **and** the sum of angles on a straight line is 180 **OR** the sum of angles on a straight line is 180 **and** corresponding angles are equal **OR** vertically opposite angles **and** co-interior (or allied or supplementary) angles

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	B1 1500 or 0.175 M1 ‘1500’ ÷ 175 oe M1 evidence of correct method to evaluate ‘1500’÷175 eg. can be implied by a division sum or a cancelled down fraction A1 8 cao **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 × 175 (=1400) **or** 9 × 175 (=1575) (M1 at least 4 repeated additions of 175 **or** at least 4 repeated subtractions of 175 from 1500 **or** *n* × 175 where *n* = 4 or 5 or 6 or 7 or 10) A1 8 cao NB: Work could be in m*l* throughout

1380_3H

Question		Working	Answer	Mark	Notes
7	(a)	6 | 1 7 7 | 5 8 9 8 | 0 2 5 6 9 9 | 0 0 2 4 5 6 8 10 | 3 Key 6|1 represents 61 seconds **OR** 60 | 1 7 70 | 5 8 9 80 | 0 2 5 6 9 90 | 0 0 2 4 5 6 8 100 | 3 Key 60|1 represents 61 seconds	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)
	(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

1380_3H					
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** $4+y^2=2y^2$ $y^2=4 \quad y=\pm 2$	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 $20B$ or $30T$)
10		2 × 5 : 3 × 10 = 10 : 30 = 1 : 3	1 : 3	2	M1 2 × 5 : 3 × 10 **or** 2 × 1 : 3 × 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		Area of *ABCD* = 12^2 = 144 *AN* = 3 cm Area of *AND* = $\frac{1}{2}\times'3'\times12$ = 18 cm^2 *MB* = 6 cm, *NB* = 9cm Area of *MBN* = $\frac{1}{2}\times6\times9$ = 27 cm^2 Area of shaded region = 144 – 27 – 18 **OR** *AN* = 3 cm or *BN* = 9 cm Area of rect **X** on *CM*= 6×9 =54 Area of triangle **Y** = $\frac{1}{2}\times6\times9$ =27 Area of top triangle **Z** = $\frac{1}{2}\times3\times12$ =18 Area of shaded region = 54+27+18	99 cm^2	6	B1 *AN* = 3 or *BN* = 9 or *CM* = 6 or *MB* = 6 M1 Area of *ABCD* = 12×12 (= 144) M1 Area of *AND* = $\frac{1}{2}\times'3'\times12$ (=18) M1 Area of *MBN* = $\frac{1}{2}\times'6'\times'9'$ (=27) M1 (dep on at least 1 previous M1) for (Area of CMND =) ‘144’ – ‘18’ – ‘27’ A1 cao **OR** B1 *AN* = 3 or *BN* = 9 or *CM* = 6 or *MB* = 6 M1 Area of rect on *CM* = ‘6’×’9’ (=54) M1 area of adj Δ = $\frac{1}{2}\times'6'\times'9'$ (=27) M1 area of top Δ = $\frac{1}{2}\times'3'\times12$ (=18) M1 (dep on at least 1 previous M1) for ‘54’+’27’+’18’ A1 cao

1380_3H					
Question		**Working**	**Answer**	**Mark**	**Notes**
11 (contd)		**OR** $AN = 3$ cm or $BN = 9$ cm Area of $CNM = \frac{1}{2}\times 6\times 9 = 27$ cm^2 Area of $CND = \frac{1}{2}\times 12\times 12 = 72$ cm^2 Area of shaded region = 72 + 27 **OR** Area of $PDN = \frac{1}{2}\times '3'\times 12 = 18$ cm^2 Area of $CMNP = \frac{1}{2}\times(12+'6')\times '9' = 81$ cm^2 Area of shaded region =18 + 81			**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 **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

1380_3H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		Correct frequency polygon	2	B2 Fully correct polygon - points plotted at the midpoint ± ½ 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

1380_3H					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)	$c = -1$; $m = 0.5$ x | 0 | 1 | 2 y | -1 | -0.5 | 0	Correct line	3	**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 $x = 7$ **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 $x = 7$ **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 $x = 7$
	(b)		$x = 5$, $y = 1.5$	1	B1 ft on pt of intersection if on a straight line segment

1380_3H					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)		643000	1	B1 cao
	(b)	$2\times10^{7}\times8\times10^{-12}=16\times10^{7-12}=16\times10^{-5}=1.6\times10^{-4}$	1.6×10^{-4}	2	M1 for $16\times10^{7-12}$ **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 $2x$(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 $(p\pm4)(p\pm2)$ **or** $(p+a)(p+b)$ with $a,b\neq0$, $a+b=-6$ or $ab=8$ **or** $p(p-2)-4(p-2)$ **or** $p(p-4)-2(p-4)$ A1 (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	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 SC : B1 for a fully correct box and whisker diagram with min 18, max 86, LQ 32, median 38, UQ 57
17	(a)	$\frac{ED}{8}=\frac{6}{4}$ $ED = 12$	12	2	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
	(b)	$\frac{2}{5}\times 25$ **OR** 4 : 6 = AC : CD $(25\div(4+6))\times 4$	10	2	M1 $\frac{2}{5}\times 25$ oe A1 cao **OR** M1 $(25\div(4+6))\times 4$ A1 cao **OR** M1 for 25 ÷ (1 + 1.5) A1 cao

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<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>18</td><td>(a)</td><td>Correct probs.</td><td>Correct probs.</td><td>2</td><td>B1 $\frac{3}{8}$ on 1st branch
B1 $\frac{3}{7}, \frac{5}{7}, \frac{2}{7}$ correctly placed</td></tr>
<tr><td></td><td>(b)</td><td>RG, or GR
$\frac{5}{8}\times\frac{3}{7}+\frac{3}{8}\times\frac{5}{7}$

OR
A full sample space

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</table></td><td>$\frac{30}{56}$</td><td>3</td><td>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 $\frac{30}{64}$</td></tr>
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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 opposite angles in a cyclic quadrilateral is 180 (B1 for angle *BAD* = 50 or angle *BAD* = 180 - 130)
	(b)	Angle *BOD* = 100° Angle *OBD* = angle *ODC* Angle *ODC* = (360° – 230°) ÷ 2 = 65 **OR** Reflex angle *BOD* = 260 Angle *BOD* = 360 – 260 = 100 Angle *OBD* = angle *ODC* Angle *ODC* = (360° – 230°) ÷ 2 = 65 **OR** *OB* = *OD* Angle *OCD* = 130 ÷ 2 = 65 and either Angle *OCD* = angle *ODC* = 65 Or Angle *COD* = 100 ÷ 2 = 50 Angle *ODC* = 180 – (65 + 50) = 65	65°	4	M1 angle BOD = 100° or ft 2 × their answer to (a) (may be on diagram) M1 360° – (130° + "100°") and ÷2 A1 cao B1 The angle at the centre of a circle is twice the angle at the circumference **and** Angles in a quadrilateral (4 sided shape) add up to 360° or opposite angles of a kite are the same. **OR** M1 angle *BOD* = 100° or ft 2 × their answer to (a) (may be on diagram) M1 angle *ODB* = *OBD* = 40° **and** angle *CBD* = angle *CBD* = 25° A1 cao B1 The angle at the centre of a circle is twice the angle at the circumference **and** angles in a triangle add up to 180° or Base angles of an isosceles triangle are equal. **or** radii of a circle are equal

1380_3H					
Question		**Working**	**Answer**	**Mark**	**Notes**
19b (contd)					**OR** M1 for obtuse Angle *BOD* = 2 × 130(=260) (may be on diagram) M1 for (360 – (360 – 260) – 130)÷2 A1 cao B1 for angle at the centre is twice the angle at the circumference **and** sum of the angles in a quadrilateral is 360^{o} **or** equal opposite angles in a kite **OR** M1 Angle *OCD* = 130 ÷ 2 M1 Angle *OCD* = angle *ODC* A1 cao B1 for Kite is symmetrical **and** angles in a triangle add up to 180^{o} **or** radii of a circle are equal

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 π = 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	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 M1 for $A = x^2(1 + \frac{\pi}{8})$ oe or $k = 1 + \frac{\pi}{2}\left(\frac{1}{2}\right)^2$ A1 cao **SC** B1 for $A = x^2 + \frac{\pi}{2} \times \frac{x^2}{2}$ **SC** B2 for $k = \left(1 + \frac{\pi}{4}\right)$

1380_3H					
Question		**Working**	**Answer**	**Mark**	**Notes**
22		$\left(2+\sqrt{2}\right)\left(3+\sqrt{8}\right)=6+2\sqrt{8}+3\sqrt{2}+\sqrt{2}\times\sqrt{8}$ $=10+3\sqrt{2}+2\sqrt{8}$ $10+3\sqrt{2}+2\sqrt{8}=10+3\sqrt{2}+2\times2\times\sqrt{2}=10+7\sqrt{2}$ **OR** $\left(2+\sqrt{2}\right)\left(3+\sqrt{8}\right)=\left(2+\sqrt{2}\right)\left(3+2\sqrt{2}\right)$ $=6+4\sqrt{2}+3\sqrt{2}+\sqrt{2}\times2\sqrt{2}$ $6+7\sqrt{2}+\sqrt{2}\times2\sqrt{2}=6+7\sqrt{2}+2\times2$	$10+7\sqrt{2}$	4	M1 3 or 4 out 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** $\sqrt{8}=\sqrt{4\times2}$ A1 $10+7\sqrt{2}$ cao **OR** B1 $\sqrt{8}=\sqrt{4}\times\sqrt{2}$ **or** $\sqrt{8}=\sqrt{4\times2}$ M1 3 or 4 out of 4 terms ft from the expansion of $\left(2+\sqrt{2}\right)\left(3+2\sqrt{2}\right)$ $6,\ 2\times2\sqrt{2},\ 3\sqrt{2},\ 2\times\sqrt{2}\sqrt{2}$ - 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

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

11.

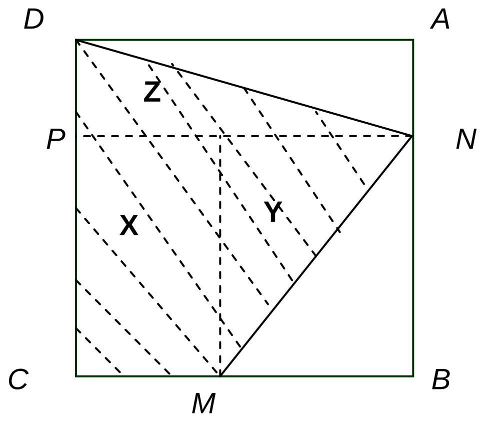
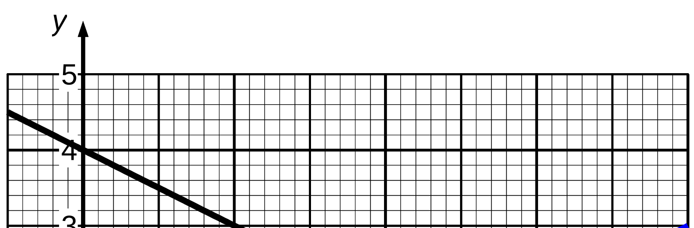
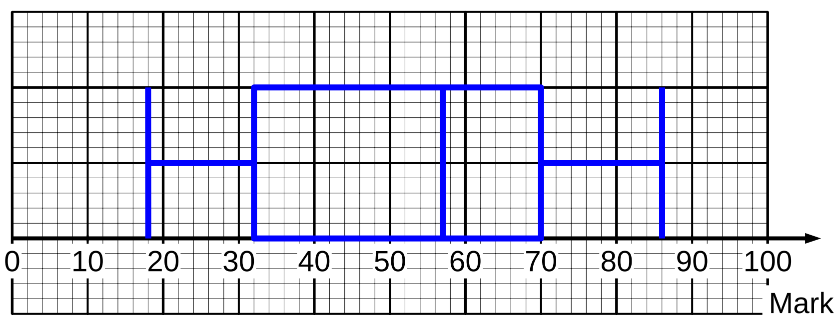


Diagram NOT accurately drawn

13.



16.



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