March 2012

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

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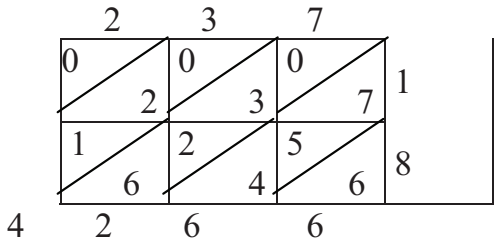
3	(a)	237 ×18 1896 2370 4266 18 ×237 126 540 3600 4266 **OR**  **OR** 200 30 7 2000 300 70 10 1600 240 56 8 3600 540 126 18	42.66	3	M1 for a complete method with relative place value correct. Condone 1 multiplication error, addition not necessary. M1 (dep) for addition of all the appropriate elements 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)

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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

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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 $\frac{4}{15}$

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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

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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

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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** $4 + y^2 = 2y^2$ $y^2 = 4 \quad y = \pm 2$	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		$2 \times 5 : 3 \times 10 = 10 : 30 = 1 : 3$	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)

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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, $NB = 9$cm 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 $CM = 6\times9 = 54$ 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 $ABCD = 12\times12$ (= 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 $\Delta = \frac{1}{2}\times'6'\times'9'$ (=27) M1 area of top $\Delta = \frac{1}{2}\times'3'\times12$ (=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

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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

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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

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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** $6a^{2+3}b^{1+1}$)

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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 $25 \div (1 + 1.5)$ A1 cao

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Question		Working	Answer	Mark	Notes
18	(a)	Correct probs.	Correct probs.	2	B1 $\frac{3}{8}$ on 1st branch B1 $\frac{3}{7},\frac{5}{7},\frac{2}{7}$ correctly placed
	(b)	RG, or GR $\frac{5}{8}\times\frac{3}{7}+\frac{3}{8}\times\frac{5}{7}$ **OR** A full sample space	$\frac{30}{56}$	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
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			–

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Question		**Working**	**Answer**	**Mark**	**Notes**
19	(a)		50^o 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^o Angle *OBD* = angle *ODC* Angle *ODC* = $(360^o - 230^o) \div 2 = 65$ **OR** Reflex angle *BOD* = 260 Angle *BOD* = 360 – 260 = 100 Angle *OBD* = angle *ODC* Angle *ODC* = $(360^o - 230^o) \div 2 = 65$ **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^o	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^o 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^o or Base angles of an isosceles triangle are equal. **or** radii of a circle are equal

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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

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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 $\frac{2P}{9.14}$

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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 $k = \left(1+\frac{\pi}{4}\right)$

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Question		**Working**	**Answer**	**Mark**	**Notes**
22		$(2+\sqrt{2})(3+\sqrt{8}) = 6+2\sqrt{8}+3\sqrt{2}+\sqrt{2}\times\sqrt{8}$ $=10+3\sqrt{2}+2\sqrt{8}$ $10+3\sqrt{2}+2\sqrt{8} = 10+3\sqrt{2}+2\times2\times\sqrt{2} = 10+7\sqrt{2}$ **OR** $(2+\sqrt{2})(3+\sqrt{8}) = (2+\sqrt{2})(3+2\sqrt{2})$ $= 6+4\sqrt{2}+3\sqrt{2}+\sqrt{2}\times2\sqrt{2}$ $6+7\sqrt{2}+\sqrt{2}\times2\sqrt{2} = 6+7\sqrt{2}+2\times2$	$10+7\sqrt{2}$	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 $(2+\sqrt{2})(3+2\sqrt{2})$ $6,\ 2\times2\sqrt{2},\ 3\sqrt{2},\ 2\times\sqrt{2}\sqrt{2}$ - 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

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Question		**Working**	**Answer**	**Mark**	**Notes**
23	(a)		**b – a**	1	B1 **b – a** or – **a + b**
	(b)	$\vec{BK} = 2 \times \vec{AB} = 2 \times (\mathbf{b} - \mathbf{a})$ $\vec{CK} = \vec{CB} + \vec{BK} = \mathbf{a} + 2 \times (\mathbf{b} - \mathbf{a})$	**2b – 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**

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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.

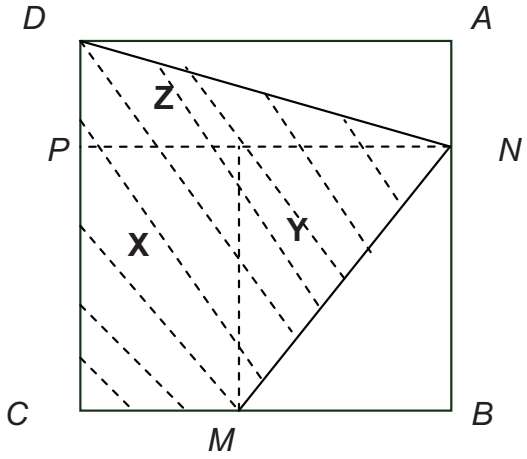
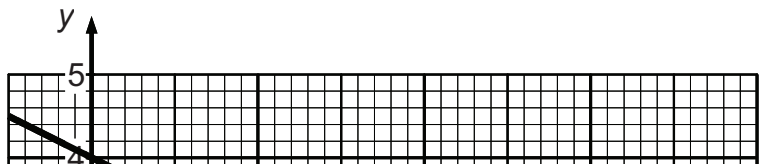


Diagram NOT accurately drawn

13.



16.