GCSE MARKING SCHEME

METHODS IN MATHEMATICS (LINKED PAIR PILOT)

JANUARY 2013

INTRODUCTION

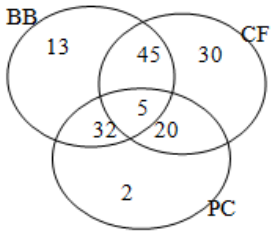
The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE METHODS IN MATHEMATICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

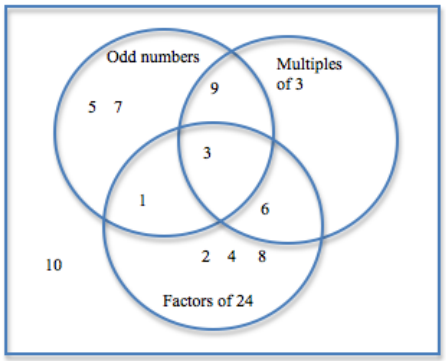
UNIT 1 - FOUNDATION TIER

Methods Unit 1 Foundation Tier January 2013		Final
1. (a) 7028	B1	
(b) nine million two hundred thousand	B1	Accept ninety two hundred thousand and nine point two million
(c) 105	B1	
(d) 79	B1	
(e) 56	B1	
(f) 1, 5, 11, 55	B2	B1 for 2 or 3 correct factors with no incorrect factors OR 3 or 4 correct factors and only 1 incorrect, Ignore duplicates.
(g) 2840	B1 8	
2.(a) (i) even chance	B1	
(ii) impossible	B1	
(iii)unlikely	B1	
(b)(i) 45/100 or equivalent	B1	Penalise consistent use of incorrect notation eg. 45 in 100 once only in part (b)
(ii) 51/100 or equivalent	B1	
(iii) 13/100 or equivalent	B1 6	If no marks awarded in (b) award SC1 if (i), (ii) and (iii) have correct numerators in a fraction < 1.
3. (a) B (0, -5)	B1	Reversed coordinates B0 throughout
C (-3, -2)	B1	
(b) D plotted at (0, 1)	B1	
(c) Line drawn through C perpendicular to AC	B1 4	
4. (a) 2678	B1	
(b) 49	B1	
(c) 706	M1	Any correct method for the multiplication of 706 by 38
× 38 OR		
5648 228	A1	For either 5648 or 21180 OR 228 or 26600 (Apply 'one error' in other methods)
21180 26600		
26828 26828	A1	CAO Place value errors get M0 A0 *Note - count incorrect multiplication of 0 by 3 and 8 as 1 error.*
(d) 15	B1	
(e) 36	B1 7	
5. (a) 9	B1	
(b) 162	B1	
Multiply (the previous term) by three	B1	Accept ' times by 3' or × 3 or equivalent
(c) × 4 and -1	B1	Accept Multiply by 4, subtract 1
(d) 6*d*	B1	
(e) 8*m* – 6*n*	B2	Award B1 for either 8*m* or – 6*n* within an expression or for 8*m* AND -6*m* written separately, eg. Award B1 for 8*m*, -6*m*. Award B1 for 8*m* + - 6*m*.
(f) 7(*y* + 2)	B1 8	ISW

Methods Unit 1 Foundation Tier January 2013		Final
6. (Nia =) 5 × 6 + 3 × -4 (30 – 12) = 18 (Charlotte =) 3 × 6 + 5 × -4 (18 – 20) = -2 Difference = (18 - -2 =) 20 Look for • Spelling • Labels • Correct terminology • the use of simplified notation, watch for the use of '=' being appropriate For QWC2 labels and the correct use of "-" must be evident. QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	M1 A1 M1 A1 A1 Q W C 2 7	*Be aware for alternative strategies eg 10 points difference per game, so total difference is 20.* Follow through their Nia and their Charlotte if at least one M1 awarded, **providing one is negative**. QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
7. (a) 0.04, 0.3, 0.34, 0.403 (b) 3/8 + 4/8 7/8 or equivalent	B1 M1 A1 3	Any correct method
8. (a) (180 – 30) ÷ 2 =75(°) 105(°) (b) 360 ÷ 5 72(°)	M1 A1 A1 M1 A1 5	Check diagram throughout this question FT 180 - their 75 evaluated correctly, provided M1 awarded
9(a) 35 + 20 × 4 = (£)115 (b) (total cost =) 35 + 20 × number of hours	M1 A1 B2 4	For the intention of multiplying and then adding Accept use of letters. Award B1 for sight of 20 × number of hours OR for a correct description of how to calculate the cost
10. (a) $a/2 = ½ a$ $a^2 = a \times a$ $a + a = 2a$ $3a = a + 2a$ (b) (a^3 =) $a \times a \times a$ or equivalent (2(a + 3) =) 2a + 6 or equivalent	B4 B1 B1 6	Award B1 for each correct pair
11. Three circles with the number 5 in the correct place 45 correct for Brecky Bix & Crispy Flakes only 32 correct for Brecky Bix & Pop Chocs only 20 correct for Crispy Flakes & Pop Chocs only 13 30 2 (any 2 correct) The number of people that took part in the survey = 147  	B1 B1 B1 B1 B1 B1 6	CAO

Methods Unit 1 Foundation Tier January 2013		Final
12. (q=) 72 (r =) 72 (s=) 63 (t=) 45	B1 B1 B1 B1 4	 FT their q FT '108 – their s', i.e. check s + t = 108°
13.(a) Method to find prime factors 2, 2, 2, 2, 3, 3, 5, 5 $2^4 \times 3^2 \times 5^2$ (b) 1 correct trial by summing 4 (consecutive) primes 11, 13, 17, 19 Next two consecutive primes: 23, 29 112	M1 A1 B1 S1 B1 M1 A1 7	2 correct before 2nd error Ignore 1s for A1, but not for B1 FT provided an index>1 involved. Accept "." Must be sum 4 primes numbers (e.g. 7, 11, 19, 23) Seen or implied (by next prime being 23) FT their 4 numbers ('primes') to next 2 primes CAO
14.(a) Reason, e.g. '1/10 (expected if fair)', or '(6/20 =) 3/10 AND (4/20 =)2/10', or '10/40 = 2.5/10' or 'should be 2 times in 20 spins' Conclusion 'No' from a comparison with 1/10 (b) 10/40 (=1/4 = 0.25 or 25%) (c) Explanation, e.g. 'more spins'	M1 A1 B2 E1 5	Must show numerical value for reason Do not accept 10/40 = ¼ unless comparison with 1/10 Do not accept 'No' if an aspect of **reasoning statement** is incorrect, other than 1 slip in reading one of the given statements Ignore incorrect cancelling B1 for sight denominator 40, or sight of '… in/out of 40' *If no marks (a) and (b) then SC1 for sight of 10/40 (=1/4 = 0.25 or 25%) in the part (a)*

UNIT 1 - HIGHER TIER

Methods Unit 1 Higher Tier January 2013		Final
1. (a)  	B3	Penalise any extra numbers (e.g. >10), -1 only B2 for 7, 8 or 9 of the numbers placed correctly, marking any repeats as incorrect, OR B1 for 4, 5 or 6 of the numbers placed correctly, marking any repeats as incorrect
(b) 5/10 ISW 2/10 ISW 3/10 ISW	B1 B1 B1 6	OR FT from their Venn diagram OR FT from their Venn diagram. OR FT from their Venn diagram If no marks in (b) award SC1 for 5, 2 and 3 or identifying the correct regions by listing the correct numbers *Penalise incorrect notation once only, -1*
2. (q=) 72 (r =) 72 (s=) 63 (t=) 45	B1 B1 B1 B1 4	 FT their q FT '108 – their s', i.e. check s + t = 108°
3.(a) Method to find prime factors 2, 2, 2, 2, 3, 3, 5, 5 $2^4 \times 3^2 \times 5^2$ (b) 1 correct trial by summing 4 (consecutive) primes 11, 13, 17, 19 Next two consecutive primes: 23, 29 112	M1 A1 B1 S1 B1 M1 A1 7	2 correct before 2nd error Ignore 1s for A1, but not for B1 FT provided an index>1 involved. Accept "." Must be sum 4 primes numbers (e.g. 7, 11, 19, 23) Seen or implied (by next prime being 23) FT their 4 numbers ('primes') to next 2 primes CAO
4.(a) 360(°) – 70(°) – 30(°) or equivalent full method = 260(°) 130(°) (and 130(°)) (b) An isosceles trapezium, drawn with equal sides indicated or statement 'isosceles trapezium', or equal base angles indicated, or equal 'top' angles indicated, (or symmetrical) would be a sufficient reason	M1 A1 A1 B3 6	Allow intention only if 260 seen FT 'their 260' ÷ 2 evaluated correctly OR Alternatively Reflex kite, 360 – 70 - 30 – 70 = 190, so other angles are 70 and 190, M1, A1, A1, with FT to last A1 from 1 arithmetic error only, provided M1 Accept statements or indication on their diagram. Ignore spelling. Parallel lines need to appear as such, but may not be indicated B2 for trapezium drawn which may have equal diagonals but the equal sides or equal angles are not marked i.e. intention isosceles trapezium, or B1 for an attempt to draw trapezia (at least 2) working towards equal diagonals (showing some ideas), one of these may be a rectangle *If no marks then allow SC1 for a rectangle with a pair of opposite sides indicated as equal*
5.(a) Method to evaluate, allow 1 slip in tables 5.473 rounded to 5.5 (b) 0.875 0.22(22…) 0.36(36…) terminating, recurring, recurring (decimal) stated	M1 A1 A1 B1 B1 B1 B1 7	Accept digits 5 4 7 3 with incorrect place value FT their 5.473 provided M1 awarded FT their responses provided at least B2 already awarded

Methods Unit 1 Higher Tier January 2013		Final
6.(a) 4.5 ÷ 15 (=0.3 litres) or 4500 ÷ 15 (= 300ml or cm^3) ×3 ×3 (3 × 0.3 =) 0.9(litres) or (3 × 300 =) 900(ml or cm^3) 2 tins needed (£)7.44 Look for • relevance • spelling • clarity of ongoing text explanations, • the use of notation and units For QWC2 there must be sufficient process steps, not from a simplified problem. If simplified problem then QWC1 if process steps, units and labelled staged with clear final answer QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer (b) 0.1(litre) or 100(ml or cm^3)	M1 m1 A1 A1 A1 QWC 2 B1 8	 Number of tins may be implied in later work or answer MUST FT from M1 and m1 MUST follow from working. FT for their whole number of tins provided M1 awarded If no marks then SC1 for a final answer of (£)33.48 If no marks, SC2 for an answer of £7.44 with evidence of looking at the ratio of 2:3:10 QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. FT from (a), making up to next ½ litre provided some paint needed
7.(a) Reason, e.g. '1/10 (expected if fair)', or '(6/20 =) 3/10 AND (4/20 =)2/10', or '10/40 = 2.5/10' or 'should be 2 times in 20 spins' Conclusion 'No' from a comparison with 1/10 (b) 10/40 (=1/4 = 0.25 or 25%) (c) Explanation, e.g. 'more spins'	M1 A1 B2 E1 5	Must show numerical value for reason Do not accept 10/40 = ¼ unless comparison with 1/10 Do not accept 'No' if an aspect of **reasoning statement** is incorrect, other than 1 slip in reading one of the given statements Ignore incorrect cancelling B1 for sight denominator 40, or sight of '… in/out of 40' *If no marks (a) and (b) then SC1 for sight of 10/40 (=1/4 = 0.25 or 25%) in the part (a)*

Methods Unit 1 Higher Tier January 2013		Final
8. Method to find the sum of the interior angles of a pentagon, e.g. 3× 180°	M1	
(Sum of interior angles) 540°	A1	
(Hence 540 – 90 – 90 so first three angles total is) 360°	B1	May be implied in later work. FT 'their 540°'
Strategy, e.g. use of trial and improvement meeting both criteria i.e. their relative angles are in the ratio 1 to 2 to 6 AND also working towards a total of 360°	S2	FT 'their 360°' Accept if working with the 2 angles of 90° and working to a total of 'their 540°', this implies previous B1 provided 540° correct. S1 for sight of their relative angles in the ratio 1 to 2 to 6 B marks are independent of S marks
(Smallest angle =) 40° OR sight of calculation 360 ÷9 ×6	B1	FT their 2nd angle twice their first angle Also FT 'their 540°'
(Largest angle =) 240°	B1	FT 6× their 1st angle, their largest angle six times their first angle provided answer >90° *Candidates working from total sum 360° rather than 540° may be awarded:* *M0, A0, FT for possible* *B1 (360-180=) 180,* *S2 (strategy 1 to 2 to 6 and working towards '180°') or S1* *B1 (1st 20°, 2nd 40°)* *B1 (1st 20°, largest 120°)*
	7	
9.(a) Correctly completing the tree diagram 0.6, 0.3. 0.3, 0.7	B2	B1 for any one pair of branches correct (total 1)
(b) 0.4 × 0.7	M1	
= 0.28	A1	
(c) 0.6 × 0.7	M1	Or other complete method. FT for their P(walk to college) ×P(walk home) correctly evaluated, or by alternative method
= 0.42	A1	
	6	
10.(a) 3	B2	B1 for one appropriate step, e.g. cancelling $\sqrt{5}/\sqrt{5}$, or sight of $\sqrt{9}$. Do not accept $\sqrt{45}/\sqrt{5}$ until simplified.
(b) ½ or 0.5 (with no working or from correct working)	B3	B2 for 1/8 AND 4 respectively OR 2^{-1} OR 4/8 B1 for 1/8 OR 4 respectively OR $2^{-3}\times(2^4)^{1/2}$
(c) 8.5×10^{-4}	B1	
(d) 3×10^9	B2	B1 for 3 000 000 000 or sight of 10^9
	8	
11.(a) $n^2 + 7$	B2	B1 for $n^2 + \ldots$ OR second difference of 2 with n^2
(b) $ax + b = 2(cx + d)$	B1	Accept intention, i.e. missing brackets. FT until 2nd error
$ax + b = 2cx + 2d$	B1	
$ax - 2cx = 2d - b$ OR $b - 2d = 2cx - ax$	B1	
$x(a - 2c) = 2d - b$ OR $b - 2d = x(2c - a)$	B1	
$x = \frac{2d - b}{a - 2c}$ OR $\frac{b - 2d}{2c - a} = x$	B1	
	7	
12. $5 \times 12 = AD \times 6$ or equivalent OR CD = 4 (cm)	M1	
AD = 10 (cm)	A1	
	2	
13.(a) (x +15)(x -1)	B2	B1 for (x…15)(x…1) or split mid term and 1st step factor
-15 and 1	B1	FT from a pair of brackets
(b) $(x + 3)^2 + 16$	B2	B1 for a=3 or B1 for b=16
	5	

Methods Unit 1 Higher Tier January 2013		Final
14.(a) Suitable uniform scales on both axes	B1	x from -5 to 2 and y from -24 to 0 OR FT their y values provided at least 3 are correct
Evidence of finding at least 5 correct points	B1	
Plotting all 8 correct points correctly	P2	P1 for at least 5 correct points plotted correctly
Intention of joining all points plotted with a curve	C1	Depends on P1 Accept if the curve slightly missing plots, it is for intention
		x: -5, -4, -3, -2, -1, 0, 1, 2 y: -10, 0, 6, 8, 6, 0, -10, -24
(b) -4 and 0	B2	FT for their curve Accept if given as coordinates. B1 for any 1 correct
(c) Use of gradient -2	M1	
Intersection with y axis found to be -8	M1	
Equation y = -2x - 8	A1	
		Or alternative method:
		$y = -2x + c$ *M1*
		$0 = -2\times -4 + c$ *or* $c = -8$ *M1*
	10	$y = -2x - 8$ *A1*
15.Attempt to use a common denominator	B1	Or multiply each term by 4x(2x+1)(2x-1)
(2x-1)(4x) + (2x+1)(4x) – (2x+1)(2x-1)	M1	For sight of, not necessarily seen as a numerator
$8x^2 – 4x + 8x^2 + 4x – 4x^2 + 1$	A2	Allow A1 for one slip, or error with the final '-' affecting the final pair of brackets
Convincing $\frac{12x^2 + 1}{4x(4x^2 – 1)}$	A2 6	A1 if convincing, but left as $\frac{12x^2 + 1}{4x(2x+1)(2x-1)}$
16.(a) 0.6 x 1 or equivalent, AND an attempt to consider the other 40%	M1	Not for sight of 60% alone
0.4 x 0.2 or 40(%)÷5 or equivalent	M1	
Showing the need to add (0.6 + 0.08)	M1	Method considers '60% + 40% of 1/5'
0.68 or equivalent	A1	
(b)Probability from part (a)×200 or 60% of 200+1/5 of 80	M1	FT from part (a), apart from 60% giving an answer of 120, this is M0 A0
136	A1 6	FT from part (a), apart from 60% A final answer of 136/200 is M1, A0

UNIT 2 - FOUNDATION TIER

Methods Unit 2 Foundation Tier January 2013		Final
1. F and J OR J and F B and G OR G and B	B1 B1 2	
2. (a) 27/100 × 830 224.1 (b) (1/3 of 1500 =) (£)500 (1/5 of 1500 =) (£)300 Saved 1500 – 500 - 300 Saved (£)700 (c) 30(%) 34(%) 28%, 0.3, 17/50 or equivalent	M1 A1 B1 B1 M1 A1 B1 B1 B1 9	Or equivalent. Sight of 224 is evidence of M1 CAO Ignore units. Ignore subsequent rounding if 224.1 is given *1/3 + 1/5 M1* *8/15 spent A1* FT 1500 – 'their 500' - 'their 300' *7/15 saved B1* *(£)700 B1* FT 'their 30%' and 'their 34%'
3. (a) Sector (b) Tangent Chord	B1 B1 B1 3	
4. (a) 4 squares shaded correctly (b) Correct diagram (c) Correct diagram drawn (d) correct shape drawn	B2 B2 B3 B1 8	Award B1 for 3 correct and 1 incorrect OR B1 for between 5 and 8 shaded to produce a symmetrical diagram -1 for each incorrect vertex Award B2 for 2 sections drawn correctly, B1 for 1 section correctly drawn Accept in any orientation
5. (a) 3/4 × 156 117 (b) (i) 40(%) (ii) 60(%) (c) (i) 2/6 and 4/12 (ii) 4 : 16 and 7 : 28	M1 A1 B1 B1 B2 B2 8	Or equivalent FT 100 – 'their 40' correctly evaluated Award B1 for each. If more than 2 answers offered -1 for each incorrect answer in (i) and (ii)
6. (a) (4.76 + 6.59=) 11.35 20 – 11.35 (£)8.65 (b) 50 ÷ 7.89 6	B1 M1 A1 M1 A1 5	Maybe implied FT 20 – 'their 11.35' Alternative method, award M1 for workings that could lead to 6 Answer of 6.3(37135...) is M1 A0
7. a = 4 b = 5 c = 3 d = 2	B1 B1 B1 B1 4	CAO FT 9 – 'their a' FT [13 – 'their a'] ÷ 3 FT 14 – 'their a + b + c'
8. (a) x = 13 (b) x = - 4 (c) x = 4 (d) 2x = 14 x = 7	B1 B1 B1 B1 B1 5	*Accept embedded answers throughout question* FT 'their 14 ÷ 2'. Correctly evaluated if this leads to a whole number.
9. (a) 313.6 (b) 64.36	B1 B2 3	 B1 for sight of 9.6 or 73.96

Methods Unit 2 Foundation Tier January 2013		Final
10. Strategy for comparing sizes of coffee	S1	Eg. looking at 100 grams of coffee for each size or idea of doubling or halving.
For 200 gram jar, cost for 100 grams is (£)2.8(0) For 400 gram jar, cost for 100 grams is (£)2.95	B2	Award B1 for each. Candidates could compare another size rather than 100 grams. *Eg.* *For 200 gram jar, cost for 400 grams is (£)11.2(0) B1* *For 100 gram jar, cost for 400 grams is (£)12 B1* *Cost per gram. Award B2 for all 3 correct. Award B1 for any 1 correct.* *For 200g jar, cost is 2.8pence* *For 100g jar, cost is 3 pence* *For 400g jar, cost is 2.9(5) pence* *Grams per pound(£). Award B2 for all 3 correct. Award B1 for any 1 correct.* *For 200g jar, weight is 35.71g* *For 100g jar, weight is 33.3...g* *For 400g jar, weight is 33.89...g.* *Allow rounded or truncated answers*
The 200 gram jar AND suitable reason/explanation	E1	E.g. The 200 gram jar is the best buy because it costs less (per 100 grams than the other sizes.) OR the 200g jar because you get more coffee (per £1) OR correct workings but reason given as – The 400g better because of less waste/number of jars etc.
QWC: Look for • Correct units used • Spelling in at least 1 statement/sentence • Clarity of text explanations • Clearly linking working with size of coffee jar • the use of notation (watch for the use '=' "£" being appropriate) • 0 missing from 2.80 Count incorrect use of '=' in situations such as 200g = £5.60 within the few mistakes in mathematical form QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	Q W C 2 6	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
11. (a) (i) × 0.25 selected (ii) × 1.4 selected (b) (i) Correct explanation given of either the error in her working OR the correct workings OR both (ii) 12 + 8 × 3 = 36	B1 B1 E1 B1 4	CAO CAO Eg Susan subtracted 6 from 30 to get 24 and then divided by 2 to get 12. OR She should work out 6 ÷ 2 = 3 first and then subtract 3 from 30. OR should have used BIDMAS CAO

Methods Unit 2 Foundation Tier January 2013		Final
12.(a) ½ (12.2 + 14.3) ×9 119.25 cm^2 (b) x + 2x + 3x + 3x = 108 x = 108/9 (=12) 12(m), 24(m), 36(m) (and 36(m))	M1 A1 U1 M1 A1 A1 6	 Indept. mark Idea not notation important, Or alternative first step
13.(a) Correct translation (b) Correct rotation (c) Enlargement scale factor 2 Correct position (d) Correct reflection in x = 1	B1 B2 B2 B1 B2 8	 B1 for a near miss (intention), OR anticlockwise rotation through 90°, OR sight of all 4 × 90° rotations B1 for any 2 lines correct, or for consistent incorrect scale factor used B1 for reflection in y = 1 or either axis, OR for the sight of the line x=1 or x = 1 implied, OR reflection in any vertical line indicated
14. 3x < 30 x< 10	M1 A1 2	No marks for '=' unless final replaced to give x<10 then award M1, A1. An answer of x<30/3 gets M1, AO
15. (area of square =) 144 (area of circle =) $\pi \times 6^2$ 113 to 113.1428..... (area of shaded part =) 30.857..... to 31 cm^2	B1 M1 A1 A1 4	 FT 'their area of square' – 'their area of circle' provided M1 awarded
16. (AC^2=) $11^2 + 18^2$ AC^2= 445 or AC = $\sqrt{445}$ 21.(095...) or 21.1 (cm)	M1 A1 A1 3	Showing steps of squaring and adding. Do not penalise notation if steps are clearly intended

UNIT 2 - HIGHER TIER

Methods 2 Higher January 2013		Final
1.(a) $(281.6/880) \times 100$ 32(%) (b) $640 + 0.35 \times 640$ OR 640×1.35 864 (c) 460000 (d) 0.29 (e) $12.5 - \frac{3}{8} \times 40$ -2.5	M1 A1 M1 A1 B1 B3 M1 A1 10	 Allow 460000.0 B2 for 0.2858… rounded or truncated, OR B1 for sight of 0.08(1699…) Not for reversed unless answer is correct showing intention. Award SC1 for an answer of 2.5
2. (a) ¼ or 0.25 (b) $14x - 26 = 16$ OR $7x - 13 = 16/2$ $14x = 42$ OR $7x = 21$ $x = 3$ (c) $x + 4 = 6 \times 12$ $x = 68$ (d) $x < 34/5$ or $x < 6.8$ Answer of 6 (e) $3x < 30$ $x < 10$	 B1 B1 B1 B1 M1 A1 M1 A1 M1 A1 10	Accept embedded answers in (a) , (b) & (c) Accept 2/8 FT until 2nd error Or $x/12 = 6 - 4/12$ An answer of 6 implies '<' applied, so M1, A1 No marks for '=' unless final replaced to give $x<10$ then award M1, A1. An answer of $x<30/3$ gets M1, AO
3.(a) ½ (12.2 + 14.3) ×9 119.25 cm^2 (b) $x + 2x + 3x + 3x = 108$ $x = 108/9$ (=12) 12(m), 24(m), 36(m) (and 36(m))	M1 A1 U1 M1 A1 A1 6	 Independent mark Idea not notation important, Or alternative first step
4.(a) Correct translation (b) Correct rotation (c) Enlargement scale factor 2 Correct position (d) Correct reflection in $x = 1$	B1 B2 B2 B1 B2 8	 B1 for a near miss (intention), OR anticlockwise rotation through 90°, OR sight of all 4 × 90° rotations B1 for any 2 lines correct, or for consistent incorrect scale factor used B1 for reflection in $y = 1$ or either axis, OR for the sight of the line $x=1$ or $x = 1$ implied, OR reflection in any vertical line indicated
5.(a) $(x^2 =) 13.8^2 - 7.3^2$ $x^2 = 137.15$ or $x = \sqrt{137.15}$ 11.7(….cm) or 12(cm) (b) $y/4.5 = 11.2/8$ $y = 6.3$ (cm) $z/8.4 = 8/11.2$ $z = 6$ (cm)	M1 A1 A1 M1 A1 M1 A1 7	Showing steps of squaring and subtracting Scale factor 11.2/8 (=1.4) used appropriately Scale factor 11.2/8 (=1.4) used appropriately

Methods 2 Higher January 2013		Final
6.Shows understanding of summing three consecutive numbers	S1	Understanding of 'sum', 'consecutive' using numerical or algebraic example to show ×3 middle value Accept x+y+z = 3y as an example of ×3 middle value Do not accept x+x+x=3x or 1x+2x+3x=6x
x, x+1, x+2 OR x-1, x, x+1 OR equivalent	M1	Expressing 3 consecutive numbers algebraically
Correct simplified sum of their algebraic terms	A1	Sum using single variable
Convincing conclusion, e.g. 3(x+1)	E1	If their sum is 3x for middle term x, then award E1 due to their effective use of initial choice
Work must be relevant in order to award QWC marks, not engaging with the problem QWC0	Q W C	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.
Look for • clarity of initial text explanation (e.g. writing that 'first number is x'), • the use of notation (watch for the use of '=' being appropriate) • spelling in any initial or final explanation	2	QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.
QWC2: Candidates will be expected to • present work clearly, with words explaining start, process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer		QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
QWC1: Candidates will be expected to • present work clearly, with words explaining start, process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	6	
7.(a) 84 - 0.06 × 84 OR 0.94 × 84	M1	
78.96(kg) or 79(kg)	A1	Do not accept premature approximation 78.9, but FT
78.96 × 0.972 OR 78.96 – 0.028 × 78.96	M1	FT their 78.96 or 79 provided the value is <84
76.7(4912 kg) or 76.7(88kg) or 76.8(kg) or 77(kg)	A1	Or 76.75 or 76.74 *If no marks, then SC1 for an answer of 76.6(08) from a reduction of 8.8%. No FT to (b)*
(b) $\frac{(84 - 76.76912)}{84} \times 100$ or equivalent full method	M1	FT their '76.7', provided ≠ 76.6(08) from 8.8%
8.632…% rounded or truncated from correct working	A1 6	Accept an answer of 8.333..% from using 77kg, or 8.69…% from using 76.7, …
8.Label axes 'length (of tile)' and 'width (of tile)'	B1	Either order
Both scales uniform from 0 to 8 inclusive	B1	
Sight of any two points correct, in list or plotted	M1	Only one of these point can be (0,8) or (8,0). If only (0,8) and (8,0), then M0
Straight line drawn from (0,8) to (8,0) exclusive	A1 4	Accept including (0,8) and (8,0). Allow if the line touches the axes, but intention clear to end at the axes ±2mm. However, A0 if this line extends much beyond an axis *Treat line from (0,4) to (4,0) as MR-1, with axes 0 to 4 required*
9.(a) Considering 57.96 as 126%	B1	Or equivalent with 1.26
57.96/1.26	M1	
46 (cm)	A1	
(b) 3.02×10^{14}	B2 5	B1 for 3.0248×10^{14} or 3.025×10^{14} or 302 480 000 000 000 or 302 000 000 000 000 or 302 500 000 000 000

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10.(a) ½ × 9 × 4 = 18 (cm^2) (b) Overall strategy: use of ratio and trigonometry 9 ÷ 5 (= 1.8) (AP =) 5.4 (cm) Using angle APD = angle PDC Tan PDC = 4/5.4 Angle PDC = $\tan^{-1}$ 0.74074074 Angle PDC = 36.5(28855…°)	M1 A1 S1 M1 A1 B1 M1 A1 A1 9	 May include extra, ⅖ × 9 or allow ⅗ × 9 OR using angle PDC = 90 – angle ADP OR using perpendicular from P to DC. *Check diagram* FT their '5.4' provided their value is less than 9 OR Tan ADP = 5.4/4, must be clear that it is this angle OR Angle ADP = 53.(471…°)
11.Volume hemisphere = $2/3 \times \Pi \times 10^3$ Realising height of the cone = 10 (cm) Volume of cone = $1/3 \times \Pi \times 10^2 \times 10$ Volume gel = $2/3 \times \Pi \times 10^3 - 1/3 \times \Pi \times 10^3$ Answers in the range 1046.6 to 1048(cm^3)	M1 B1 M1 M1 A1 5	(Answers in the range 2093 to 2095(.238...cm^3)) (Answers in the range 1046.6 to 1048(cm^3)) *Needs to be from a difference consideration, not volume of the cone **and** provided at least M1 previously awarded* CAO
12.(a) 3:5 and 4.5:QR or equivalent, or scale factor 1.5 QR = 1.5 × 5 or equivalent PR = 12 (cm) (b) MN = 4.5y DN = 2.5 y (Perimeter =) 3x + 7y	M1 A1 A1 B1 B1 B1 6	OR 3:8 and 4.5:PR or equivalent OR PR = 4.5 × 8 ÷ 3 or equivalent CAO. Must be simplified An answer of ½ (6x + 14y) implies B1, B1, B0
13.General idea of tan curve and crosses axes at 0°, 180° and 360° Correct sketch tending to infinity correctly at 90° and 270° only	B1 B2 3	 B1 for correct sketch with idea of tending to infinity at 90° and 270° only but curving back instead of approaching vertical lines
14.(a) cos A = $\frac{7.2^2 + 5.8^2 - 10.8^2}{2 \times 7.2 \times 5.8}$ cos A = -0.373….. 111.9(059597…°) or 112° (b) Attempt use of ½ absinC ½ × 7.2 × 5.8 × sin 'their A' Answer between 19.35(cm) and 19.4(cm) inclusive	M2 A1 A1 M1 m1 A1 7	M1 for $10.8^2 = 7.2^2 + 5.8^2 - 2 \times 7.2 \times 5.8 \times \cos A$, OR M1 for 1 slip in rearranged form Not for FT of inappropriate rounding or truncation Accept any values for a, b & C, for choice & quote rule 'their A' ≠ 7.2, 5.8 or 10.8 CAO *Candidates choosing to calculate a different angle first, no marks until they reach the '½absinC' stage then FT for their angle with appropriate sides used.*
15. Equation x(x+8) = y Sight of x(x+8)= y AND y =1284 + x, OR x(x + 8) = x + 1284 $x^2 + 7x – 1284 = 0$ $x = \{-7 \pm \sqrt{(7^2 - 4 \times 1 \times -1284)}\}/2$ $x = \{-7 \pm \sqrt{5185}\}/2$ x = 32.5(0347… (and -39.5…) (Dimensions are) 32.5(cm) by 40.5(cm)	B2 B1 B1 M1 A1 A1 A1 8	Allow B1 for sight of x(x + 8) Must be rearranged form y =1284 + x, FT from 1 error Allow 1 slip FT for +ve x and x+8 provided M1 awarded, with answer correct to 1 d.p. *Watch for alternative with elimination of x instead of y, and mark accordingly*

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