GCSE MARKING SCHEME

METHODS IN MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2014

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2014 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.

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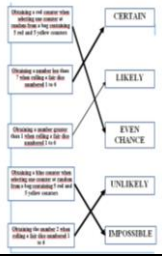
UNIT 1 (FOUNDATION TIER)

Methods in Mathematics June 2014 Unit 1 Foundation Tier	Mark	Comments
1. (a) (i) 19004 (ii) five hundred and fifty thousand (b) (i) 380 (ii) 16 (iii) 54 (iv) 13 (c) (i) 2190 (ii) 54000	B1 B1 B1 B1 B1 B1 B1 B1 8	
2. 	B4 4	B1 for each correct answer
3. Right angle 90(º) Obtuse angle Greater than 90(º) AND less than 180(º)	B1 E1 B1 E1 4	 Accept 90(º) - 180(º), between 90(º) and180(º)
4. 1st Diagram Circle : 4 Square : 5 2nd Diagram Right Hand Circle : 7 Square : -15 Bottom Circle : -18 (b)(i) 48 (ii) 8 (iii) 4	B1 B1 B1 B1 B1 B1 B1 B1 8	 FT from a negative answer in the square Accept embedded answer

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Methods in Mathematics June 2014 Unit 1 Foundation Tier	Mark	Comments
5. Any correct strategy for finding the need for paying for 9 bottles from Len's store AND 8 bottles from Deb's store	S1	
9 × 90(p) or 8 × (£)1.00	M1	Or equivalent
810(p) or (£)8.10 or (£)8	A1	Or equivalent
810(p) or (£)8.10 AND (£)8 AND Deb's store	A1	Or equivalent
		Accept 8.1 for £8.10 If units are given they must be correct
Look for: Clear process steps and labelling of calculations. Correct use of pounds and pence.		
QWC2: Candidates will be expected to • present relevant work clearly, with words explaining process or steps AND • make few if any mistakes in spelling, punctuation and grammar	QWC 2	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: Candidates will be expected to • present work clearly which is mostly relevant, with words explaining process or steps OR • make few if any mistakes in spelling, punctuation and grammar and include units in their final answer		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.
	6	QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
6. a) 1/8 b) 2/8 c) 3/8 d) 5/8 e) 2/8 f) 2/8	B1 B1 B1 B1 B1 B1	penalise once only for consistent use of incorrect denominator, provided in a fraction <1 penalise once only for incorrect notation throughout Ignore incorrect cancelling throughout
	6	*SC2 for all correct cards for parts c)-f)* *SC1 for correct cards in 2 or 3 parts from c)-f)*
7. a) For 2 correct in a form which allows comparison	B1	
For all 3 correct in a form which allows comparison	B1	
¾, 5/8, ½	B1	Or equivalent Answer only gets B0, B0, B1
b) 50/400	M1	Or equivalent eg 0.5/4
1/8	A1	
	5	
8. Appropriate sight of 90(˚)	B1	
Appropriate sight 45(˚) or 90/2	B1	2nd B1 implies 1st B1
180(˚)-45(˚)	M1	FT 180- 'their 45' provided at least one B1 awarded
135(˚)	A1	CAO
	4	An unsupported answer gets full marks

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Methods in Mathematics June 2014 Unit 1 Foundation Tier	Mark	Comments
9. (a) $8x$ (b) $-2a + 9b$ (c) -25 (d) $6xy + 14x$ (e) 5a (2b - 5)	B1 B2 B2 B2 B2 9	 Must be in an expression, B1 for sight of either $-2a$ or $9b$. Mark final answer. B1 for either -40 or 15 Must be in an expression, B1 for sight of either $6xy$ or $14x$ B1 for $5a($… - 5) or $5a(2b$ - ….) or correct partial factorisation
10 (a)(i) 1- (0.2 + 0.15 + 0.25) 0.4 (ii) Red and Yellow (b) 0.3	M1 A1 B1 B1 4	Allow intention of brackets. *(1 – 0.42=)0.58 gets SC1* *If answer of 0.4 in table and contradicted in answer space then SC1* FT from their (a)(i) provided it is ≤ 0.2 and ≠0
11 **Three times a number *c*** — **$3c$** **Add 3 to a number *c* and then multiply this total by 6** — **$6(c + 3)$** **Three times a number *c* and then add 6** — **$3c + 6$** **Add 3 to a number *c* and then divide this total by 6** — **$\frac{c + 3}{6}$**	B4 4	B1 for each correct entry
12. (a) Square or rectangle or isosceles trapezium (b) Parallelogram or rhombus or rectangle (c)(i) (-5 , 4) (ii) (5 , -4)	B1 B1 B1 B1 4	
13a) Multiples of 7 b) 28 and 35 placed correctly	B1 B2 3	B1 for either
14. 360 ÷ 9 … X … has **40** sides 360 ÷ (180 – 120) OR equivalent full method … Y … has **6** sides	M1 A1 M1 A1 4	 An unsupported answer is awarded M1, A1 e.g. looking at matching a multiple of 180 with a multiple of 120: 180 360 540 720 900 120 240 360 480 600 720 An unsupported answer is awarded M1, A1
15. Interpretation that 36cm is 8 parts 3 × 36 ÷ 8 + 36 OR (3 + 8)×36÷8 49.5(cm) or 49 ½ (cm)	S1 M1 A1 3	Or sight of 36÷8 or 36/8 or 4.5 Full method to calculate AC. FT their miscalculated 36÷8, *not for 36÷11* CAO. Do not accept 50(cm), unless 49.5 seen

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<table>
<tr><th>Methods in Mathematics
June 2014 Unit 1 Foundation Tier</th><th>Mark</th><th>Comments</th></tr>
<tr>
<td>16. Considering all possible outcomes, e.g. use of two-way table, or showing all possible totals, or (Game card A) 6 possible (ways or outcomes) AND (Game card B) 16 possible (ways or outcomes)

Example:
<table>
<tr><th>+</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
</table>
Conclusion, game card B has the better chance</td>
<td>B3

UNIT 1 (HIGHER TIER)

<table>
<tr><th>Methods Unit 1 Higher Tier June 2014</th><th>Mark</th><th>Comment</th></tr>
<tr><td>1. a = 52°
b = 128°
c = 128°
d = 40°

e = 88°</td><td>B1
B1
B1
B1

B1
5</td><td>

FT their b = c
FT 92 – their a, or their b – 88,
or their c – 88, or 128 – their e</td></tr>
<tr><td>2. Considering all possible outcomes, e.g. use of two-way table, or showing all possible totals, or
(Game card A) 6 possible (ways or outcomes) AND
(Game card B) 16 possible (ways or outcomes)

Example:
<table><tr><th>+</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr></table>
Conclusion, game card B has the better chance

Look for:
• clear organisation, ordered lists or tables
• labels linking working and game cards
• clear explanation in a conclusion
• if used, correct notation for probability

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 and include units in their final 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 and include units in their final answer</td><td>B3

E1

QWC 2

6</td><td>Accept 6/25 and 16/25. No extra outcomes should be included, e.g. including numbers not on the spinners
If card A list complete, accept stopping listing card B possibilities as soon as >6 possible ways indicated correctly.

B2 for at least 1 possible outcome indicated for each of the 4 numbers on card A AND at least 2 possible outcomes indicated for each of the 4 numbers on card B, OR for all possible outcomes for card B

B1 for 1 way of scoring a number on card A AND 2 ways for a number on card B, OR all outcomes for card A

The conclusion must be based on working, i.e. provided at least B2 previously awarded

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.</td></tr>
<tr><td>3.(a) 18 or equivalent
(b) 12 or equivalent
(c) 9
(d) Numerator 0.06(0) or 1 correct step in calculation
Multiplying numerator and denominator by suitable multiple of 10 – for eliminating decimals, or correct (FT) evaluation as a decimal

1/1000</td><td>B1
B1
B2
B1
B1

B1

7</td><td>Accept a product of factors
Accept a product of factors
B1 for sight of 3, or ¼ + 2¾, or 0.25 + 2.75

FT depending on their numerator.

These 1st 2 B marks are interchangeable
A final answer of 0.001 is awarded B1, B1, B0
CAO
(Example: 0.60/60 = 0.01 or 1/100 or 6/600 is awarded B0, B1, B0
60/600 as a 1st stage is awarded B0, B0, B0</td></tr>
</table>

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4. (a) Square or rectangle or isosceles trapezium (b) Parallelogram or rhombus or rectangle (c)(i) (-5 , 4) (ii) (5 , -4)	B1 B1 B1 B1 4	
5.(a) $h + 4 = 5e$ or $-5e = -4 - h$ $e = \frac{h+4}{5}$ or $e = \frac{-4-h}{-5}$ (b) (i) 9 (ii) 6 (iii) 3	B1 B1 B1 B1 B1 5	FT until 2nd error *(e.g. 4h=5e leading to 4h/5 = e is awarded B0, B1)*
6.(a) False with valid general reason, OR a correct general statement without selection of false	E2	For example 'false, there is always 1 and the number itself', or 'false, as they have exactly two factors' E1 for sight of at least 2 prime numbers, with **no** errors in choice of primes, and a list of the factors of at least 2 prime numbers *Penalise incorrect reference to factors -1* *Choice TRUE but correct general statement allow SC1*
(b) True with valid general reason, OR a correct general statement without selection of true	E2 4	For example 'the square root is a factor times by itself, (other factors are in pairs)' E1 for evidence of working with at least 2 square numbers, with **no** errors in choice of square numbers leading to • correct factors OR • statement of the correct number of factors OR • 1 of each (1 example of factors and 1 example of number of factors) *Choice FALSE but correct general statement allow SC1*
7. $360 \div 9$ … X … has **40** sides $360 \div (180 - 120)$ OR equivalent full method working with interior angles … Y … has **6** sides	M1 A1 M1 A1 4	 An unsupported answer is awarded M1, A1 An unsupported answer is awarded M1, A1
8. Interpretation that 36cm is 8 parts $3 \times 36 \div 8 + 36$ OR $(3 + 8) \times 36 \div 8$ 49.5(cm) or 49 ½ (cm)	S1 M1 A1 3	Or sight of $36 \div 8$ or $36/8$ or 4.5 Full method to calculate AC. FT their miscalculated $36 \div 8$, *not for $36 \div 11$* CAO. Do not accept 50(cm), unless 49.5 seen
9.(a) 6 (b) 0.1212… or $0.12\dot{}$ (c) 1/40	B2 B2 B2 6	B1 for sight of 4×6 or $4 \times 2 \times 3$ or $2^3 \times 3$ OR for sight of 144. Not for 2×12, this is B0 B1 for 0.12 or 0.12… or $0.12\dot{}$ as an answer or seen in working B1 for sight of 25/1000 or equivalent unsimplified fraction

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10.(a)(i) $4n + 3$ (ii) $-2n + 74$ (iii) $n^2 - 8$ (b) $3\times20^2 + 4$ $= 1204$	B2 B2 B2 M1 A1 8	B1 for $4n$ B1 for $-2n$. Allow SC1 for $2n + 74$ B1 for n^2, not an^2 where $a\neq1$, OR B1 for sight of second differences 2 Must clearly be 20^2 not $(3\times20)^2$ CAO
11.(a) 2×10^{10} (b) 7.3×10^9	B2 B2 4	B1 for 20×10^9 or 0.2×10^{11} or similar attempt at standard form B0 for 20 000 000 000 B1 for $10^8(5 + 6.8\times10)$ or 73×10^8 or 0.73×10^{10} or similar attempt at standard form B0 for 7 300 000 000 *If no marks in (a) & (b) then SC1 for both answers correct but not in standard form*
12.(a) (i) $6x(2x + 3y)$ (ii) $(x + 10)(x - 10)$ (b) $(x + 2)(x - 7)$ $(=0)$ $x= -2$ and $x =7$	B2 B1 B2 B1 6	B1 for a correct partially factorised expression, OR for sight of $6x(2x ...)$ or $6x(... + 3y)$ B1 for $(x \dots 2)(x \dots 7)$ Must be from factorised expression or equation FT from their pair of brackets
13.(a) Explains parallel with intersection *y*-axis at 3, e.g. 'same gradient with intersection at (y=)3' (b) Reflection (in *x*-axis) or perpendicular (through the origin) or change the sign of the y-coordinate	E1 E1 2	Must imply parallel and mention (vertical) translation Allow 'put the line up another 3 squares' Do not accept 'm=1, c=3' unless related to y = x, Accept use of knowledge 'm × -1/m = -1', or '$m_1\times m_2 = -1$' Do not accept 'diagonally downwards', 'opposite (direction)', or 'reversed (direction)', or 'swap the coordinates' Allow 'same but decreasing instead of increasing (as it is minus)', 'rotate 90° (about the origin)', 'change the sign of one of the coordinates'
14.(a) 0.35 0.8 0.2 0.8 on the correct branches (b) 0.65×0.2 $= 0.13$	B2 M1 A1 4	B1 for any two correct entries. Accept fractions
15.(a) Correct region shaded (b) Correct region shaded (c) Correct region shaded	B1 B1 B1 3	Union of A and B All shaded except the intersection of A with B All except the non overlap region of A
16. (a) 37(°) Alternate segment theorem **and** isosceles triangle (b) 55(°) (Isosceles triangle,) angle at centre twice angle at circumference	 B1 E1 B1 E1 4	The E1 mark depends on the B1 or sight of a correct method. For E marks: Do not accept calculation Or equivalent. Or equivalent.
17. $30 \times 70 = 35 \times AC$ OR $30 \times (30 + 40) = 35 \times AC$ $AC = 60$ (cm) $AB = 60 - 35$ $= 25$ (cm)	M1 A1 m1 A1 4	May be within a calculation towards AB directly May be implied in further working FT for their AC provided M1 awarded

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18.(a)(i) Sketch of $y=x^2$ symmetrical passing through the origin	B1	Mark intention to be symmetrical passing through the origin
(ii) Sketch of $y=1/x$ in appropriate 2 quadrants with axes as asymptotes	B2	B1 for sketch in 1 quadrant with axes as asymptotes, or for 2 curves appropriately in both quadrants but not clearly with intention of axes as asymptotes
(b) Sketch of $y = 2^x$ through (0,1), with 1 indicated on the y-axis or coordinate (0, 1) given	B2 5	B1 for general shape, towards zero gradient for greater negative values of x, and rising for greater positive values of x, clearly through a point on positive y-axis
19.Substitution of (2, 26), e.g. sight of $26 = k \times 2^2 + 3 \times 2$ $k = 5$	M1 A1	
Equating $y = 0$, e.g. sight of $0 = kx^2 + 3x$	M1	FT their k with $k \neq 0$, including 'k'
$x(5x + 3) = 0$	m1	Extracting common factor, accept $x(kx + 3) = 0$
(0, 0) or $x = 0$	A1	Must be from correct working
(-3/5, 0) or $x = -3/5$ or equivalents	A1 6	Accept $x = -3/k$. Not dependent on m1
20.(a) $(x + 7)^2 + 4$	B2	B1 for a= (+)7, B1 for b = 4, only award B2 for $(x +7)^2 + 4$
(b) Attempt to use common denominator	B1	e.g. allow sight of all 3 fractions denominator 20 without change to numerators
$\frac{4(3x+2) - 5(5x-2) + 14}{(20)}$ or equivalent	M2	M1 for 2 of the three terms correct. May be expressed as separate fractions, or working without consideration of the denominator
$\frac{12x + 8 - 25x + 10 + 14}{20}$ or equivalent	A1	Convincing step. FT from 1 error, i.e. M1. Must be clearly implying +10 term rather than -10 from notation Denominator must be seen
$= \frac{32 - 13x}{20}$	A1 7	Must follow from correct working
21.Sight of P(A') = 0.6	B1	
$0.6 \times x = 0.48$ OR $x = 0.48/0.6$	M1	FT their 1 - 0.4 incorrectly evaluated for M1 only, do not FT 0.4 for P(A')
$x = 0.8$	A1 3	CAO

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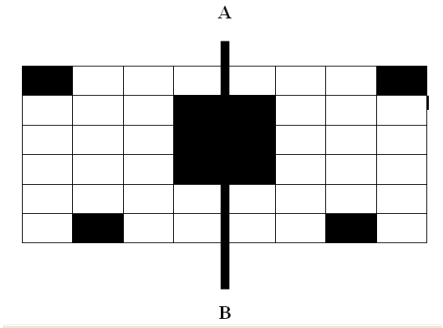
UNIT 2 (FOUNDATION TIER)

Methods in Mathematics June 2014 Unit 2 Foundation Tier	Mark	Comments
1. 79 28 12 637	B1 B1 B1 B1 4	
2. (a) 8732 (b) 2387 (c) 40% and 2/5 and 0.4 (d) (£)10- (£)1.53 = (£8.47) $\frac{(£)10- (£)1.53}{7}$ OR $\frac{(£)8.47}{7}$ (£)1.21 (e) < > > 10	B1 B1 B3 M1 M1 A1 B2 	 B2 for 3 correct and 1 incorrect B2 for 2 correct and no more than1 incorrect B1 for 1 correct and no more than 1 incorrect B1 for 2 or 3 correct and 2 incorrect CAO B1 for any two correct
3. (a) C and H B and G (b) Radius Chord 4. (a)  (b) 2 4 (c) Enlargement of scale factor 3	B1 B1 B1 B1 4

Methods in Mathematics June 2014 Unit 2 Foundation Tier	Mark	Comments
5. Lisa's ingredients × 10 2000(g of flour) OR 2kg 10 (teaspoons of mustard) 500(g of butter) Neil's ingredients × 5 5 (teaspoons of salt) 500(g of cheese) 1250(ml of milk) OR 1.25 l(itres) Look for: Correct use of Units Labels QWC2: Candidates will be expected to • present relevant work clearly, with words explaining process or steps AND • make few if any mistakes in spelling, punctuation and grammar QWC1: Candidates will be expected to • present work clearly which is mostly relevant, with words explaining process or steps OR • make few if any mistakes in spelling, punctuation and grammar and include units in their final answer	M1 A1 M1 A1 QWC 2 6	Or equivalent Attempt at least one of the three ingredients All 3 correct Or equivalent Attempt at least one of the three ingredients All 3 correct 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.
6. (a) 67/100 × 234 =(£) 156.78 (b) 2/11 × 242 = 44 (g) (c) For 2 correct in a form which allows comparison For all 3 correct in a form which allows comparison 24%, ¼, 0.3	M1 A1 M1 A1 B1 B1 B1 7	Or equivalent Or equivalent Eg 1\4 = 25% = 0.25 Or equivalent Answer only gets B0, B0, B1

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Methods in Mathematics June 2014 Unit 2 Foundation Tier	Mark	Comments
7. (a) 20/4 or 5cm 5 × 5 25 cm²	B1 M1 A1 U1	 Independent of other marks
(b) (0.6 × 1.1)/ 2 OR (60 × 110)/ 2 0.33(m²)	M1 A2	 A1 for 3300(cm^2) or 0.66/2 or 0.3×1.1 or 0.6×0.55
(c) 4 × 4 × 4 64 (cm³) 64 / (8×4) or 32h=64 2 (cm)	M1 A1 M1 A1	*Alternative method:* *4 × 4 M1* *16 (cm²) A1* *16/8 M1* *2 (cm) A1*
(d) 2π × 20 or π × 40 125.6(637...cm) to 125.7(2…cm)	M1 A1 13	 Accept 126
8. (a) x=23 (b) x=4 (c) y = 72 (d) 4a = 39 - 3 a = 9	B1 B1 B1 B1 B1 5	Allow embedded answers in all parts FT 1 error
9. (a) Listing multiples of 0.3 or 0.4, including at least one between 8 and 9. 8.4 (b) 11.008854….. 11.01 (c) 3000 (d) 0.063	S1 B1 B1 B1 B1 B1 6	OR listing multiples of 3 or 4 including at least one between 80 and 90 with the intention to then insert the decimal point. Award S1B1 for unsupported 8.4
10. Shape completed accurately with correct rotation seen	B3 3	With no other 90° rotations shown B2 for at least two lines correct in attempting to complete the shape with correct rotation of their shape with no other 90° rotations shown, OR B1 for the shape completed correctly, or a correct rotation of the part of the shape given, ignore other 90° rotations shown
11 (a) 18x – 102 = 42 OR 3x – 17 = 42/6 18x = 144 3x = 24 x=8 (b) 9x < 77 - 5 x<8 (c) x +2x +3x = 180 x=30 Three angles are 30(˚), 60(˚), 90(˚)	 B1 B1 B1 M1 A1 M1 A1 A1 8	Accept embedded answers in part (a) FT from 1 error FT until 2nd error No marks for use of "=", unless finally replaced to give x<8 then award M1 A1. SC1 for x<82/9 ISW *SC1 for the answers of 30(˚), 60(˚) and 90(˚) without forming an equation* *SC1 for the answers of 60(˚), 120(˚) and 180(˚) from equating to 360*

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Methods in Mathematics June 2014 Unit 2 Foundation Tier	Mark	Comments
12(a) Correct translation	B1	
(b) Correct rotation	B2	B1 near miss of grid lines, or for clockwise 90° about (-2, -1), or for anticlockwise 90° about (-1, -2)
(c) Correct reflection in $y = x$	B2	B1 for a reflection in $y = -x$, OR for sight of the line $y = x$
	5	
13		
$(x^2 =) 20^2-10^2$	M1	
$x^2 = 300$ or $(x =) \sqrt{300}$	A1	x=300 gets M1, A0 unless intention of square rooting is shown
(x=) 17(.32… cm)	A1	
	3	

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UNIT 2 HIGHER

Methods in Mathematics June 2014 Unit 2 Higher Tier	Mark	Comment
1. Shape completed accurately with correct rotation seen	B3 3	With no other 90° rotations shown B2 for at least two lines correct in attempting to complete the shape with correct rotation of their shape with no other 90° rotations shown, OR B1 for the shape completed correctly, or a correct rotation of the part of the shape given, ignore other 90° rotations shown
2. (a) (x =) 10×8/5 x = 16 (b) (x =) 4 (c) 18x – 102 = 42 OR 3x – 17 = 42/6 18x = 144 3x = 24 or x = 24/3 x=8 (d) 9x < 77 - 5 x<8 (e) x < 85/5 or x< 17 16	 M1 A1 B1 B1 B1 B1 M1 A1 M1 A1 10	Accept embedded answers in parts (a), (b) & (c) Mark final answer. Do not accept 28/7 FT until 2nd error No marks for use of "=", unless finally replaced to give x<8 then award M1 A1. SC1 for x<82/9 ISW Or sight of 5×16 = 80 with 5×17 =85 Accept unsupported 16, or a unique answer of 16 from a trial and improvement method. Do not accept x<16. *SC1 for sight of 5x = 85, x = 17 followed by selecting x =16*
3(a) 100 × 34 / 6800 or 100 × 34 ÷ 6800 0.5(%) or ½(%) (b) 1.0225 × 34000 or 34000 + 34000 × 2.25 /100 or 102.25 × 34000/100 34765 (c) 0.26×1345 or ⅜×600 or 0.045×3600 or equivalent 349.7 (m) 225 (m) 162 (m) 160 230 350 (d) 450 × 4 ÷ 9 = 200 450 × 4 ÷ 5 = 360 Difference 160	M1 A1 M1 A1 M1 A1 A1 A1 B1 M1 A1 M1 A1 A1 14	 Accept 0.25 written as ¼ Any one correct calculation shown Accept 349 or 350 Accept 230 Accept 160 Must all be 2 significant figures FT provided at least 2 of the A marks awarded Complete method CAO Complete method CAO Depend on both M marks

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Methods in Mathematics June 2014 Unit 2 Higher Tier	Mark	Comment
4.(Area of faces are) $2e \times 3e$, $2e \times 4e$, $3e \times 4e$, (cm^2) ($2e \times 3e$, $2e \times 4e$, $3e \times 4e$) (cm^2)	M2	M1 for any one of the 3 unique expressions These marks may be implied by correct simplified expressions
(Simplified equation for the total surface area is) $52e^2 = 468$	A2	FT for M2 or M1 as appropriate, provided their simplified sum includes at least two of the expressions $6e^2$, $8e^2$, $12e^2$ and all three terms in the form ae^2. A1 for $(2 \times) [6e^2 + 8e^2 + 12e^2]$ OR $52e^2$ (cm^2) A1 for $ae^2 = 468$
$e^2 = 468/52$ (= 9) $e = 3$	B1 B1	FT 'their equation' if in the form $ae^2 = 468$ FT 'their equation' if in the form $ae^2 = 468$
(Volume = $6 \times 9 \times 12$ =) 648 (cm^3)	B1	FT 'their e' within $24 \times e^3$ correctly evaluated
Look for: • if units given, are they correct? • notation • labels and joining text 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 and include units in their final 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 and include units in their final answer	QWC 2 9	*If no marks, then allow SC2 for $3e \times 4e \times 2e = 468$ leading to an answer of $e = 2.69\ldots$ or 2.7, or SC1 for sight of $3e \times 4e \times 2e = 468$ or equivalent* 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.
5. $26.5 - 26.5 \times 0.12$ OR 26.5×0.88 (=23.3(2) 23.3(2)– $23.3(2) \times 0.08$ OR $23.3(2) \times 0.92$ (= 21.4544 or 21.436) $25.3 - 21.4544$ (= 3.8456) OR $25.3 - 21.436$(=3.864) 3.8(….°C) to 3.9(°C) from correct working	M1 M1 m1 A1 4	OR M2 for $26.5 \times 0.88 \times 0.92$ FT 'their 23.32', but not 26.5 Depends on both previous M marks FT for their 23(.32) and their 21(….) Accept 4(°C) from correct working
6. Sight of any quotient using values from the table for a/b or b/a $a = 2.5 \times b$ $b = 0.4 \times a$	M1 A1 A1 3	Or sight of 1 correct response, or answers reversed Or equivalent Or equivalent FT from $a = 0.4 \times b$ to give $b = 2.5 \times a$
7.(a) 5.6×10^{-5} (b) 2.3×10^{9}	B1 B1 2	

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Methods in Mathematics June 2014 Unit 2 Higher Tier	Mark	Comment
8. Idea to show or use the perpendicular height in a right angled triangle	S1	Award for statement such as '6(cm) is not the vertical height'
Height = sin58° × 6	M2	M1 for sin58° = Height/6
= 5(.088…cm)	A1	
Area = 5(.088…)× 10	M1	FT their 5(.088…cm) provided prior M1 awarded or an attempt has been made to use a trig ratio
= 50.9(cm^2) or 51(cm^2)	A1	Must be rounded. Do not accept 50.8 or 50 (from premature approximation). FT from M1
		If S1 only, then use of spurious perpendicular height <6, then also award SC1 for their perpendicular height ×10 correctly evaluated
		Alternative:
		Use of ½ absinC *S1*
		2 × ½ × 6 × 10 × sin 58° *M3*
		or M2 for ½ × 6 × 10 × sin 58°
		50.9(cm^2) or 51(cm^2) *A2*
	6	*or A1 for calculating ½ required area*
9(a) Correct translation	B1	
(b) Correct rotation	B2	B1 near miss of grid lines, or for clockwise 90° about (-2, -1), or for anticlockwise 90° about (-1, -2)
(c) Correct reflection in $y = x$	B2	B1 for a reflection in $y = -x$, OR for sight of the line $y = x$
(d) Enlargement scale factor ½	B2	B1 for any 1 line correct, or consistent incorrect fractional scale
Correct position	B1	
	8	
10. 26.7 = Π× d or 26.7 = 2 × Π× r or r = 26.7/Π	M1	
Diagonal = 8.495… to 8.5(0…) (cm)	A1	Accept rounded or truncated
$diagonal^2 = side^2 + side^2$	M1	FT their diagonal
$side^2 = diagonal^2/2$	A1	
side length = 6(.0096…cm)	A1	Do not FT from inappropriate truncation or incorrect rounding (e.g. from d = 8.4) Answer here for A1 should round to 6.01
Perimeter = 24.(….cm)	B1	FT provided both M marks awarded for 4× 'their side length'
	6	
11.(a)(i) y = x **and** y = - x indicated (2 quadrants for both)	B2	B1 for either indicated in 2 quadrants, or both indicated in 1 quadrant each B1 for indication of appropriate points at least 3 in each of the 4 quadrants *Ignore any circles drawn*
(ii) y = x and y = - x or equivalent	B2	CAO. B1 for either equation
(b) $x^2 + y^2 = 3^2$ or $x^2 + y^2 = 9$	B1	CAO
	5	
12. sin XYZ/23.8 = sin123(°)/38.9	M1	OR 23.8/sin XYZ = 38.9/sin123(°)
sin XYZ = 23.8 × sin123(°)/38.9	M1	OR $\sin^{-1}$ 0.513... *This M1 implies previous M1*
XYZ = 30.871..(°) rounded or truncated correctly	A1	
	3	

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Methods in Mathematics June 2014 Unit 2 Higher Tier	Mark	Comment
13. $y = 4 - x$ OR $x = 4 - y$ $2x^2 + x(4-x) - 5 = 0$ $2(4-y)^2 + (4-y)y - 5 = 0$ $x^2 + 4x - 5 = 0$ $y^2 - 12y + 27 = 0$ $(x - 1)(x+5) = 0$ $(y - 3)(y - 9) = 0$ $x = 1, x = -5$ OR $y = 3, y = 9$ $y = 3, y = 9$ $x = 1, x = -5$ 6	M1 M1 A1 M1 A1 A1 *No marks for trial & improvement methods*	OR For sight of $x^2 + xy = 4x$ OR Subtraction from 1st equation OR $x^2 + 4x = 5$ FT provided quadratic from an appropriate substitution method or subtraction method OR alternative method to solve , e.g. formula with correct substitution and b^2-4ac correctly simplified *If A0, A0 then SC1 for x= 1, y=3* ***OR*** *x= -5, y=9 provided algebraic method shown with appropriate M1, M1, M1 marks* *No marks for trial & improvement methods*
14(a) 6:2 and 7:QR or equivalent, or scale factor 7/6 QR = 2 × 7 ÷ 6 or equivalent QR = 2.3(33…cm) (b) AE = 4x AF = 5.5 y (Perimeter =) 6x + 8.5y or 6x +17y/2 ISW 6	B1 M1 A1 B1 B1 B1 Answers of 4x + 5.5y + 2x + 3y imply B1, B1, B0	OR 6:8 and 7:**PR** or equivalent OR **PR** = 7 × 8 ÷ 6 (= 9.33…) or equivalent CAO. Must be simplified Accept ½ (12x + 17y)
15. b = 45(°) c = 180(°) 2	B1 B1	
16(a) **HK** = **HL** + **LK** (= 5**x** + 6**y** + 3**x** – 6**y**) = 8**x** (+0**y**) (b)(i) **LN** = 3**x** – 6**y** + 18**x** – 36**y** (=21**x** – 42**y**) k = 7 (ii) Collinear (or lie along the same straight line) 5	M1 A1 M1 A1 B1	May be embedded. Award M1, A1 for sight of k=7 Do not accept parallel as a full description
17. Area of the square base = 119.8 – 4 ×23.6 = 25.4(cm^2) (Volume pyramid) 76.4 = ⅓ × 25.4 × height height = 9.02… cm (Volume cone) 44.4 = ⅓ × π × r^2 × height r^2 = 44.4/(⅓ × π × height) r^2 = (44.4 × ⅓ × 25.4) / (76.4 × ⅓ × π) r^2 = 4.69… to 4.701… (radius) 2.17 or 2.2 (cm) 8	M1 A1 m1 A1* M1* M1 A1 A1 *Height of a triangular face = 9.37(cm)*	FT their area of square base Note √25.4 = 5.0398…× 5.0398… Depends on all previous method marks, FT their height FT equivalent difficulty, isolating r^2 CAO. OR r^2 = 4.7, or an appropriate unrounded r, r = 2.1681875… to 2.17 CAO. Appropriate degree of accuracy required *Alternative for A1*, M1** *Equating heights,* 76.4 / (⅓ × 25.4) = 44.4 /(⅓ × π × r^2) *For information:* *Common height = 9.02(cm)*

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UNIT 2 (HIGHER TIER)

Methods in Mathematics Unit 2 Higher Tier June 2014	Mark	Comment
1. Shape completed accurately with correct rotation seen	B3 3	With no other 90° rotations shown B2 for at least two lines correct in attempting to complete the shape with correct rotation of their shape with no other 90° rotations shown, OR B1 for the shape completed correctly, or a correct rotation of the part of the shape given, ignore other 90° rotations shown
2. (a) (x =) 10×8/5 x = 16 (b) (x =) 4 (c) 18x – 102 = 42 OR 3x – 17 = 42/6 18x = 144 3x = 24 or x = 24/3 x=8 (d) 9x < 77 - 5 x<8 (e) x < 85/5 or x< 17 16	 M1 A1 B1 B1 B1 B1 M1 A1 M1 A1 10	Accept embedded answers in parts (a), (b) & (c) Mark final answer. Do not accept 28/7 FT until 2nd error No marks for use of "=", unless finally replaced to give x<8 then award M1 A1. SC1 for x<82/9 ISW Or sight of 5×16 = 80 with 5×17 =85 Accept unsupported 16, or a unique answer of 16 from a trial and improvement method. Do not accept x<16. *SC1 for sight of 5x = 85, x = 17 followed by selecting x =16*
3(a) 100 × 34 / 6800 or 100 × 34 ÷ 6800 0.5(%) or ½(%) (b) 1.0225 × 34000 or 34000 + 34000 × 2.25 /100 or 102.25 × 34000/100 34765 (c) 0.26×1345 or ⅜×600 or 0.045×3600 or equivalent 349.7 (m) 225 (m) 162 (m) 160 230 350 (d) 450 × 4 ÷ 9 = 200 450 × 4 ÷ 5 = 360 Difference 160	M1 A1 M1 A1 M1 A1 A1 A1 B1 M1 A1 M1 A1 A1 14	 Accept 0.25 written as ¼ Any one correct calculation shown Accept 349 or 350 Accept 230 Accept 160 Must all be 2 significant figures FT provided at least 2 of the A marks awarded Complete method CAO Complete method CAO Depend on both M marks

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Methods in Mathematics Unit 2 Higher Tier June 2014	Mark	Comment
4.(Area of faces are) $2e \times 3e$, $2e \times 4e$, $3e \times 4e$, (cm^2) ($2e \times 3e$, $2e \times 4e$, $3e \times 4e$) (cm^2)	M2	M1 for any one of the 3 unique expressions These marks may be implied by correct simplified expressions
(Simplified equation for the total surface area is) $52e^2 = 468$	A2	FT for M2 or M1 as appropriate, provided their simplified sum includes at least two of the expressions $6e^2$, $8e^2$, $12e^2$ and all three terms in the form ae^2. A1 for $(2 \times) [6e^2 + 8e^2 + 12e^2]$ OR $52e^2$ (cm^2) A1 for $ae^2 = 468$
$e^2 = 468/52$ (= 9) $e = 3$	B1 B1	FT 'their equation' if in the form $ae^2 = 468$ FT 'their equation' if in the form $ae^2 = 468$
(Volume = $6 \times 9 \times 12$ =) 648 (cm^3)	B1	FT 'their e' within $24 \times e^3$ correctly evaluated
Look for: • if units given, are they correct? • notation • labels and joining text 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 and include units in their final 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 and include units in their final answer	QWC 2 9	*If no marks, then allow SC2 for $3e \times 4e \times 2e = 468$ leading to an answer of $e = 2.69...$ or 2.7, or SC1 for sight of $3e \times 4e \times 2e = 468$ or equivalent* 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.
5. 26.5 – 26.5 ×0.12 OR 26.5 × 0.88 (=23.3(2)	M1	OR M2 for $26.5 \times 0.88 \times 0.92$
23.3(2)– 23.3(2) × 0.08 OR 23.3(2)× 0.92 (= 21.4544 or 21.436)	M1	FT 'their 23.32', but not 26.5
25.3 – 21.4544 (= 3.8456) OR 25.3 – 21.436(=3.864)	m1	Depends on both previous M marks FT for their 23(.32) and their 21(….)
3.8(….°C) to 3.9(°C) from correct working 4	A1	Accept 4(°C) from correct working
6. Sight of any quotient using values from the table for a/b or b/a	M1	Or sight of 1 correct response, or answers reversed
$a = 2.5 \times b$	A1	Or equivalent
$b = 0.4 \times a$ 3	A1	Or equivalent FT from $a = 0.4 \times b$ to give $b = 2.5 \times a$
7.(a) 5.6×10^{-5} (b) 2.3×10^9 2	B1 B1	

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Methods in Mathematics Unit 2 Higher Tier June 2014	Mark	Comment
8. Idea to show or use the perpendicular height in a right angled triangle	S1	Award for statement such as '6(cm) is not the vertical height'
Height = $\sin 58° \times 6$	M2	M1 for $\sin 58° =$ Height/6
$= 5(.088\ldots\text{cm})$	A1	
Area = $5(.088\ldots) \times 10$	M1	FT their 5(.088…cm) provided prior M1 awarded or an attempt has been made to use a trig ratio
$= 50.9(\text{cm}^2)$ or $51(\text{cm}^2)$	A1	Must be rounded. Do not accept 50.8 or 50 (from premature approximation). FT from M1 *If S1 only, then use of spurious perpendicular height <6, then also award SC1 for their perpendicular height ×10 correctly evaluated* *Alternative:* *Use of ½ absinC* *S1* *$2 \times ½ \times 6 \times 10 \times \sin 58°$* *M3* *or M2 for $½ \times 6 \times 10 \times \sin 58°$* *$50.9(\text{cm}^2)$ or $51(\text{cm}^2)$* *A2* *or A1 for calculating ½ required area*
	6	
9(a) Correct translation	B1	
(b) Correct rotation	B2	B1 near miss of grid lines, or for clockwise 90° about (-2, -1), or for anticlockwise 90° about (-1, -2)
(c) Correct reflection in $y = x$	B2	B1 for a reflection in $y = -x$, OR for sight of the line $y = x$
(d) Enlargement scale factor ½	B2	B1 for any 1 line correct, or consistent incorrect fractional scale
Correct position	B1	
	8	
10. $26.7 = \Pi \times d$ or $26.7 = 2 \times \Pi \times r$ or $r = 26.7/\Pi$	M1	
Diagonal = 8.495… to 8.5(0…) (cm)	A1	Accept rounded or truncated
$\text{diagonal}^2 = \text{side}^2 + \text{side}^2$	M1	FT their diagonal
$\text{side}^2 = \text{diagonal}^2/2$	A1	
side length = 6(.0096…cm)	A1	Do not FT from inappropriate truncation or incorrect rounding (e.g. from d = 8.4) Answer here for A1 should round to 6.01
Perimeter = 24.(….cm)	B1	FT provided both M marks awarded for 4× 'their side length'
	6	
11.(a)(i) y = x **and** y = - x indicated (2 quadrants for both)	B2	B1 for either indicated in 2 quadrants, or both indicated in 1 quadrant each B1 for indication of appropriate points at least 3 in each of the 4 quadrants *Ignore any circles drawn*
(ii) y = x and y = - x or equivalent	B2	CAO. B1 for either equation
(b) $x^2 + y^2 = 3^2$ or $x^2 + y^2 = 9$	B1	CAO
	5	
12. $\sin XYZ/23.8 = \sin 123(°)/38.9$	M1	OR $23.8/\sin XYZ = 38.9/\sin 123(°)$
$\sin XYZ = 23.8 \times \sin 123(°)/38.9$	M1	OR $\sin^{-1} 0.513...$ *This M1 implies previous M1*
XYZ = 30.871..(°) rounded or truncated correctly	A1	
	3	
13. $y = 4 - x$ OR $x = 4 - y$	M1	OR For sight of $x^2 + xy = 4x$
$2x^2 + x(4-x) - 5 = 0$ $\quad 2(4-y)^2 + (4-y)y - 5 = 0$	M1	OR Subtraction from 1st equation
$x^2 + 4x - 5 = 0$ $\quad y^2 - 12y + 27 = 0$	A1	OR $x^2 + 4x = 5$
$(x - 1)(x+5) = 0$ $\quad (y - 3)(y - 9) = 0$	M1	FT provided quadratic from an appropriate substitution method or subtraction method OR alternative method to solve , e.g. formula with correct substitution and b^2-4ac correctly simplified
x = 1, x = -5 OR y = 3, y =9	A1	
y = 3, y = 9 x = 1, x = -5	A1	*If A0, A0 then SC1 for x= 1, y=3* ***OR*** *x= -5, y=9 provided algebraic method shown with appropriate M1, M1, M1 marks*
	6	*No marks for trial & improvement methods*

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Methods in Mathematics Unit 2 Higher Tier June 2014	Mark	Comment
14(a) 6:2 and 7:QR or equivalent, or scale factor 7/6 QR = 2 × 7 ÷ 6 or equivalent QR = 2.3(33…cm) (b) AE = 4x AF = 5.5 y (Perimeter =) 6x + 8.5y or 6x +17y/2 ISW	B1 M1 A1 B1 B1 B1 6	OR 6:8 and 7:**PR** or equivalent OR **PR** = 7 × 8 ÷ 6 (= 9.33…) or equivalent CAO. Must be simplified Accept ½ (12x + 17y) Answers of 4x + 5.5y + 2x + 3y imply B1, B1, B0
15. b = 45(°) c = 180(°)	B1 B1 2	
16(a) **HK** = **HL** + **LK** (= 5**x** + 6**y** + 3**x** – 6**y**) = 8**x** (+0**y**) (b)(i) **LN** = 3**x** – 6**y** + 18**x** – 36**y** (=21**x** – 42**y**) k = 7 (ii) Collinear (or lie along the same straight line)	M1 A1 M1 A1 B1 5	 May be embedded. Award M1, A1 for sight of k=7 Do not accept parallel as a full description
17. Area of the square base = 119.8 – 4 ×23.6 = 25.4(cm^2) (Volume pyramid) 76.4 = ⅓ × 25.4 × height height = 9.02… cm (Volume cone) 44.4 = ⅓ × π × r^2 × height r^2 = 44.4/(⅓ × π × height) r^2 = (44.4 × ⅓ × 25.4) / (76.4 × ⅓ × π) r^2 = 4.69… to 4.701… (radius) 2.17 or 2.2 (cm)	M1 A1 m1 A1* M1* M1 A1 A1 8	 FT their area of square base Note √25.4 = 5.0398…× 5.0398… Depends on all previous method marks, FT their height FT equivalent difficulty, isolating r^2 CAO. OR r^2 = 4.7, or an appropriate unrounded r, r = 2.1681875… to 2.17 CAO. Appropriate degree of accuracy required *Alternative for A1*, M1** *Equating heights,* 76.4 / (⅓ × 25.4) = 44.4 /(⅓ × π × r^2) *For information:* *Common height = 9.02(cm)* *Height of a triangular face = 9.37(cm)*

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